TENDER DOCUMENT

FOR

DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING, COMMISSIONING & VALIDATION

OF

CLEAN ROOM WORKS

INCLUDING AIR CONDITIONING, ELECTRICAL & GAS LINES SYSTEM

AT SiC LABORATORY

(Clean Room of 100000 Class)

Centre for Materials for Electronics Technology (C-MET)
[Ministry of Electronics and Information Technology (MeitY), Govt.of India]
IDA Phase-III, HCL (PO), Cherlapally, Hyderabad – 500 051
Tel: 040-27267006/27265587, Fax: 040-27261658
www.cmet.gov.in

TENDER FOR (Ref.: HD/PUR/SP-35/CR/21/2017-18)

I. NOTICE FOR INVITATION OF TENDERS

Sealed Tenders on Item Rate basis are invited by Centre for Materials for Electronics Technology (C-MET), Hyderabad Laboratory an autonomous R&D Society under Ministry of Electronics & IT (MeitY), Govt. of India, For **DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING, COMMISSIONING & VALIDATION OF CLEAN ROOM WORKS INCLUDING AIR CONDITIONING, ELECTRICAL & GAS LINES SYSTEM AT SiC LABORATORY (Clean room of 100000 class).**

The sealed envelop addressed to the following should contain tender reference No, tender for and last date of submission along with From address of the Tenderer. Tender box is kept at Library at First floor of main office Building.

Director
C-MET
IDA PHASE III, CHERLAPALLY
Hyderabad– 500051
Phone No. 040 -27262437/27267006/27265587

Earnest Money Deposit (EMD): an amount of Rs. 3,50,000/- (Rupees three lakhs and fifty thousand only) in the form of a bankers cheque or demand draft in favour of Director C-MET Payable at Hyderabad from any nationalized bank.

Duration for completion of work	: 3-4 months from the date of Purchase Order/Work Order
Last date and time for receipt of tenders	: 26.02.2018 upto 17:00 Hrs.

Director, C-MET is not bound to accept the lowest tender and reserves the right to accept or reject any or all Tenders without assigning any reason whatsoever.

The blank tender documents with eligibility criteria terms and conditions are to be downloaded from C-MET website: www.cmet.gov.in **OR** https://eprocure.gov.in.

No tender fee, if the documents are downloaded from website. However, if the prospective bidder/tenderer needs hard copy of tender document it can be obtained on payment of Rs.1500+ 18% GST as detailed below in person:

Interested eligible Bidders may obtain the Tender Document on submission of a written application along with the tender document fee Rs. 1500/- (Rupees thousand five hundred only) + applicable GST thereon @ 18% GST in Indian rupees or equivalent by demand draft in favour of “Centre for Materials for Electronics Technology” payable at Hyderabad from

The Administrative Officer
Centre for Materials for Electronics Technology
IDA Phase III, Cherlapally, HCL Post
Hyderabad - 500051, Telangana State, India.

Note: Bidders who download tender documents from our web site shall send an email to venkatesan@cmet.gov.in immediately giving the tender reference number, date of downloading, your full address and contact details. This will help us post any corrigendum or addendum to the tender taken place after the bidder downloaded it.

GENERAL INFORMATION TO THE TENDERERS/BIDDERS

1. Scope of Tender:

Centre for Materials for Electronics Technology (C-MET), Hyderabad Laboratory (referred to as Owner in these documents) invites tenders for **design, supply, erection, installation, testing, commissioning & validation of Clean Room works including airconditioning, electrical & gas lines system at SiC laboratory (Clean room of 100000 class)** detailed in the Notice Inviting Tenders (NIT). The successful tenderer shall complete the works within the completion date specified in the Notice Inviting Tenders (NIT).

2. Non Association / Relation:

Should a contractor or a tenderer have a relative, employed in C-MET or in case of partnership firm or company incorporated under the Indian company act, should a partner or relative of the partner or a share holder be employed in a responsible capacity in C-MET, the authority inviting the tender should be informed of the fact at the time of submission of tender, failing which the tender may be rejected. If such fact is suppressed at the time of tendering and comes to light at any time after acceptance of tender, the contract may be rescinded.

3. Eligibility Criteria: As per tender documents

4. Qualification of the Tenderer: As per tender documents

5. Cost of Tendering & Inspection of site

(a) The bidder shall bear all costs associated with the preparation and submission of his Tender, and the C-MET will in no case/way be responsible and liable for those costs.

(b) The bidder, at the bidders's own responsibility shall visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a contract for **design, supply, erection, installation, testing, commissioning & validation of Clean Room works including airconditioning, electrical & gas lines system at SiC laboratory** (Clean Room of 100000 class) at C-MET, Cherlapally, Hyderabad. The costs of visiting the site shall be at the Tenderer's own expense.

(c) The tenderer should inspect the site during working days (i.e. Monday to Friday) from 10.00 hrs to 17.00 hrs. (except Govt. holidays).

6. The following points need attention before submitting the bids by the Bidders:

1) Bids containing deviations from bidding document terms and other requirements shall be rejected, at the discretion of C-MET.

2) Bids not accompanied by Bid security (Earnest Money Deposit) shall be summarily rejected. (see exceptions) [section II instructions to Bidders clause 15]

3) Non-compliance with even a minor technical requirement should be specifically stated by the bidders.

4) Bidders should furnish their complete address/e-mail id/authorized contact person for the purpose of further correspondence pertaining to bidding document.

5) Corrections in the tender bid should be noted over and initialed at the place of corrections with official stamp as far as possible avoided.

6) Negligence of the bidder in preparing tender bid confers no right to withdraw the bid after it was opened.

7) Specifications, conditions, schedule and drawings of bidding document constitute an integral part of the bid.

8) The bid, along with enclosures, drawings and technical literature, should be in English only.

9) All equipment, system & components should be designed to perform as per cGMP specifications and should include all required accessories and there should not be any optional accessories in this bidding document under tropical conditions.

10) The bidding documents shall be governed and interpreted according to the laws of the Union of India.

11) All the bidders should quote for the items as per the specifications and details given in this bidding document only. In case, alternative designs, etc. are to be offered by the bidders, they may do so but this should be stated separately in the offer. C-MET reserves its right to accept or reject such alternative offers, without assigning any reasons there for to the bidders.

12) C-MET reserves the right to accept or reject any or all bids without any explanation to bidders.

13) The bidder should have manufacturing facility of clean room panels, finishes and HVAC, should be a registered firm and should have minimum experience of 3 years in similar field/area.

14) The bidder should have completed minimum 5 clean room projects.

15) The bidder should furnish all relevant & satisfactory completion certificates which are subjected for verification.

16) The required certificates should be on the name of the bidder only.

17) As stated above only manufacturer of clean room works are permitted to quote for this bid (strictly dealers are not permitted to quote for this tender.).

18) Bidders should cover all their employees who work at our premises i.e., C-MET, HHyderabad under Workman Ccompensation Act, 1923.

19) Safety and security of their employees and material is responsibility of the bidders only.

20) Bidders shall ensure that all their employees who work at our site strictly follow safety and security measures.

7. CHECK LIST

S No	Nomenclature	Yes/No	Remarks/Reasons
1	Have you submitted the Bid Security (EMD)?		
2	Have you quoted bid prices in terms of instructions to bidders?		
3	Have you given the bid form, price schedule in the prescribed format?		
4	Have you submitted the original bidding document completed in all respects, duly signed and sealed?		
5	Have you quoted the delivery period correctly and precisely?		
6	Have you kept your offer valid for 120 days?		
7	Have you furnished copies of your PAN & GST?		
8	Have you furnished the statements of deviations?		
9	Have you included prices of all standard accessories in the price of the machine?		
10	Have you quoted for all the special accessories?		
11	Have you furnished registration certificates?		
12	Have you furnished the satisfactory completion certificates of the projects?		

Signature _____

(In the Capacity of)

Duly Authorized to sign bid for and on behalf of

(Name & Address of Bidder with stamp)

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SECTION - I

CENTRE FOR MATERIALS FOR ELECTRONICS TECHNOLOGY (C-MET)
(Scientific Society, Ministry of Electronics and Information Technology (MeitY), Govt. of India)
IDA PHASE – III, CHERLAPALLY, HCL (PO), HYDERABAD – 500 051

INVITATION FOR BID

Centre for Materials for Electronics Technology (C-MET), Hyderabad invites sealed bids under two bid system from reputed eligible bidders for the following:-

Sl. No.	Bid Ref.	Cost of Document	Description	Estimated Cost/EMD Amount (Rs.)	Sale of Bid		Last date & time - Receipt & opening of Technical Bids	Completion period
					From	To		
1	HD/ PUR/ SP-35/ CR/21/ 2017-18	Rs.1500/-*	**Clean Room works including airconditioning, electrical & gas lines system at SiC laboratory** (Clean Room of 100000 class)	3,50,000	See schedule below			3-4 months from the date of award of contract

*** Downloaded from website : Free; If required hard copy Rs.1500/- + applicable GST @ 18%. C-MET shall not be responsible for any postal delay. Document will be sent through SPEED POST only.**

Schedule:-

Sl. No.	Description	Date & Time
i)	Commencement of Sale of tender documents	**27.01.2018 onwards**
ii)	Last date for seeking written clarification (for discussion in Pre-bid meeting)	**12.02.2018 upto 1700 hours**
iii)	Pre-Bid Meeting	**14.02.2018 at 1400 hours**

iv)	Last date of sale of tender documents	Upto 14.02.2018
v)	Last date & time for Deposit of Tenders	**26.02.2018 upto 1700 hours**
vi)	Date & time for opening of Technical Bid	**27.02.2018 at 1200 hours**
vii)	Place of opening of the Tender	C-MET, Hyderabad
viii)	Date and Time for opening of Financial Bids for technically qualified bidders	To be decided by C-MET and intimated to the responsive bidders
ix)	Validity of tenders	120 days from the date of opening of tenders

1) Eligibility and Qualification requirements

The bidders must meet the following minimum qualifying criteria **for Design, Supply, Installation, Testing, Commissioning & Validation of Clean Room works including airconditioning, electrical & gas lines system at SiC laboratory** (Clean Room of 100000 class) **on turn key basis.**

a) Bidder's annual financial turnover in any of the last three financial years ending 31st March shall not be less than Rs. 200.00 lakhs per year.

b) Registered with any government organization and should have executed industrial clean room works during the last five years as mentioned below.

- One similar nature of work (industrial clean room work) costing not less than **Rs. 100.00 lakhs (exclusive of taxes)**

or

- Two similar nature of works (industrial clean room work) costing not less than **Rs. 60.00 lakhs (exclusive of taxes)**

or

- Three similar nature of work (industrial clean room work) costing not less than **Rs. 40.00 lakhs (exclusive of taxes)**

c) The bidder/s in support of their eligibility should submit a copy of the relevant P.O./ W.O., satisfactory completion, TDS Certificate received from their clients for the works:

S No	Name of the work	Date of award/ completion	Total outlay (inclusive of taxes)	Amount exclusive of taxes	Quantity (area) in which clean room works undertaken

d) Bidder/s shall furnish a certified copy of the Annual Report for the previous completed three years (audited balance sheet and profit & loss account) along with their PAN No.

2) Bidding Document

The Bid document can be downloaded by the Bidder/Firm from our website www.cmet.gov.in or www.eprocure.nic.in.

C-MET shall not be responsible for any delay in receipt of the bidding document.

3) Submission of bid

The bidders who submit the bidding document are eligible for submission of bids in their names only.

4) Bid Security/Earnest Money Deposit (EMD)

All bids must be accompanied by bid security (EMD) should be in the form as specified in the bidding document. Bids not accompanied with EMD, shall be summarily rejected.

NOTE: If any vendor is exempted from payment of Bid security/EMD, copy of relevant Government Order needs to be furnished alongwith Technical Bid. In this connection, prospective bidder may see Rule 170 (i) of General Financial Rules 2017 to check his certificate is valid for the purpose of exemption.

5) Opening of Bids

(i) The Tenderers who wish to participate in the opening of the tenders may depute their representatives to the C-MET, Hyderabad-500 051 on the respective due date, time and venue as indicated in the instruction sheet of this Tender Document with an authority letter addressed to the Director, C-MET, IDA Phase-III, Cherlapally, HCL Post, Hyderabad - 500 051 which should be produced to the officers who are opening the tenders, on demand to prove the bonafides of the representative who participates in the opening of the tender. In case the representative of the tenderer fails to produce such an authority letter on behalf of the tenderer, he will be debarred from participating in the opening of the tenders.

(ii) The Tenderer's representative, who reaches the venue of the Tender Opening late, i.e., after the starting time specified for opening of the tenders, may not be allowed to take part in the tender opening. It should be noted that **only one representative of each tenderer** would be permitted to participate in the tender opening.

6) Rights Reserved by C-MET

C-MET does not bind itself to accept the lowest bid. C-MET reserves the right to award the job either in part or full. C-MET at its sole discretion and without assigning any reason thereof, also reserves the right to accept any/or reject any or all bids.

Director
C-MET, Cherlapally
Hyderabad

SECTION II

INSTRUCTIONS TO BIDDERS

TABLE OF CLAUSES

Section II
INSTRUCTIONS TO BIDDERS

A. Introduction

1.Source of Funds
C-MET shall undertake the expenditure from the available SiC project funds.
2. Eligible Bidders
2.1 This invitation for Bids is open to all manufactures who meet the minimum eligibility criteria, if any, specified in this bidding document.
3. Eligible Goods and Services
3.1 All goods and ancillary services to be supplied under the Contract shall have their origin in eligible source.
3.2 For purposes of this clause, "origin" means the place where the goods are produced. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.
3.3 The origin of goods and services is distinct from the nationality of the Bidder.
4. Cost of Bidding
4.1 The Bidder shall bear all costs associated with the preparation and submission of its bid, and C-MET hereinafter referred to as "the Purchaser", will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. The Bidding Documents

5.1 The goods required, bidding procedures and contract terms are prescribed in the Bidding Documents.

In addition to the Invitation for Bids, the Bidding Documents include:

(a) Instructions to Bidders;
(b) General Conditions of Contract;
(c) Special Conditions of Contract;
(d) Schedule of Requirements;
(e) Technical Specifications;
(f) Bid Form and Price Schedules;
(g) Bid Security Form;
(h) Contract Form;
(i) Performance Security Form
(j) Technical and commercial deviation statement forms
(k) Completion Certificate Form

5.2 The Tenderer shall be deemed to have examined all instructions, forms, terms, and specifications in the Documents. Failure to furnish the information required by the Tender Document or submission of a Tender not substantially responsive to the Tender Documents in every respect will be at the Tenderer’s risk and may result in the rejection of the Tender.

5.2.1 The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale

drawing and figured dimensions in preference to scale and Special Conditions in preference to General Conditions.

5.2.2. In case of any discrepancy between the Schedule of Quantities, the specifications and/ or the drawings, given in the tender document the following order of preference shall be observed:

Description of Schedule of Quantities

Particular Specification and Special condition, if any. Specifications

Latest edition Indian Standard Specifications of B. I. S.

Drawings

6. Clarification of Bidding Documents

A prospective Bidder requiring any clarification of the Bidding Documents may contact C-MET.

7. Amendment of Bidding Documents

7.1 At any time prior to the last 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.

7.2 The amendment shall be attached to the bidding documents subsequently.

7.3 In order to afford prospective Bidders reasonable time in which to take the amendment into account in preparing their bids, the Purchaser may, at its discretion, extend the last date for the submission of bids.

C. Preparation of Bids

8. Language of Bid

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

8.2. **Two Bid System:**

8.2.1 Bid shall be prepared in a two bid system format as per the following:
The bid should be enclosed with a **Technical bid and Commercial Bid** with the outer cover enclosing

a) Covering letter indicating the interest.
b) Checklist of enclosed documents in the format given in the tender.
c) Bid Security/EMD of Rs. 3.50 lakhs in form of Demand Draft/Bank Guarantee

8.2.2 Envelope I - Bidder's Capability Statement and Technical Bid. The envelop I should contain

- Capability Statement as specified in the document and
- A Technical Bid fulfilling the requirements as set forth in the document:

Mainly the technical bid should include BOQ based on our drawings and makes as per the Bidders estimation.

Deviations from Technical Specifications if any, as per the deviation statement format enclosed in the document.

Project Planning& Scheduled as per the time specified.

Action plan for execution of the Project

Work Methodology.

8.2.3 Envelope II - Price Bid

Price Bids should contain bidders offer as specified in Clause 10, 11 and 12, will be held in the safe custody at C-MET office until Technical Bids have been evaluated completely. The instructions for the preparation of Price Bids are provided in this document. The Price Bid shall be submitted as per format enclosed in the document. The bidder will have option to change their price bid till it is opened based on the technical discussions and modifications required in their technical bid to suit the user's requirements.

9. Documents comprising the bid

9.1.1 The Bid prepared by the Bidder shall comprise the Technical Bid and Commercial Bid:

9.1.1.1 Technical Bid: The technical bid should contain

a) Earnest Money Deposit or the bid security in accordance with Clause 15.0.

b) Documentary evidence establishing bidder's eligibility and qualifications in accordance with Clause 14.0 that the goods and services to be supplied by the bidder are eligible goods and services and conform to the bidding documents.

c) Complete description of the Goods and Services the Bidder intends to supply with quantities and makes

9.1.1.2 Commercial Bid

The commercial bid should contain a complete description of the Goods and Services the Bidder intends to supply and a price schedule completed in accordance with clause nos. 10, 11 and 12.

9.1.2 The documentary evidence of the Bidder's qualifications to perform the Contract if its bid is accepted, shall establish to the Purchaser's satisfaction:

a. That, in the case of a Bidder offering to supply Goods under the Contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the Goods manufacturer or producer to supply the goods in the Purchaser's country (original equipment manufacturer certificate).

b. That the Bidder has the financial, technical and production capability necessary to perform the contract.

9.1.3 That, in the case of a Bidder not doing business within the Purchaser's country, the Bidder is or will be (if successful) represented by an agent in the purchaser's country equipped and able to carry out the Supplier's maintenance, repair and spare parts stocking obligations prescribed by the conditions of the Contract and/or Technical Specifications.

9.1.4 Even though the applicants meet the above criteria, they are subject to be disqualified if they have:

- Made untrue or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and or, Record of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, or financial failures etc.

9.1.5 Notwithstanding anything stated above, the purchaser reserves the right to assess the Bidders capabilities and capacity to execute the contract satisfactorily before deciding on award.

9.1.6 Documentary evidence established in accordance with Clause 2 that the Goods and ancillary Services to be supplied by the Bidder are eligible Goods and Services and conform to the Bidding Documents:

a. The documentary evidence of the Goods and Services' eligibility shall consist of a statement in the Price Schedule on the country of origin of the Goods and services offered which shall be confirmed by a certificate of origin issued at the time of shipment.

b. The documentary evidence of the Goods' and Services' conformity to the Bidding documents may be in the form of literature, drawings and data, and shall furnish:

I. A detailed description of the goods essential technical and performance characteristics.

II. A list giving full particulars, including available sources of all spare parts, special tools, etc. Necessary for the proper and continuing functioning of the Goods for a period of two years, following commencement of use by the Purchaser, and

III. A clause-by-clause commentary on the Purchaser's Technical specifications demonstrating the Goods' and Services' substantial responsiveness to those specifications or a statement of deviations and exceptions to the provisions of the Technical Specifications in the format furnished in Section XI (A).

IV. Any exceptions the Bidder wishes to take to the delivery schedule given in the Schedule of Requirements, the payment schedule or any other aspect of the General or Special Conditions of Contract, including a justification for the exception in the format furnished in Section XI (B).

10 Bid Form

10.1 The Bidder shall complete the Bid Form and the Price Schedule furnished in the Bidding Documents, indicating the goods to be supplied, a brief description of the goods, their country of origin, quantity and prices.

10.2 Original bidding document duly signed and sealed should be submitted on or before the specified date and time at the office of C-MET, Hyderabad.

11. Bid Prices

11.1 The contract shall be for the whole works as described in tender document based on the priced Schedule of Quantities submitted by the Tenderer.

11.2 The tender submitted on behalf of a Firm/Company, shall be signed by a person who has the proper legal authority on behalf of the Company to enter into the contract; otherwise, the tender is liable to be rejected. Each page of the tender document and each drawing accompanying is required to be signed by the authorized person submitting the tender, affixing the Firm/company seal in token of their having examined and acquainted themselves with the contents of each page. The forms of tender are to be filled in completely. Any tender with any of the documents not duly signed is liable to be rejected.

11.3 The Tenderer shall fill in the rates for all items of the Works described in the Schedule of quantities along with total tender price. **In case the rates are not filled for any of the Items of Schedule of Quantities, in such cases the rate will be considered as zero and the contractor has to accept for the amount arrived based on zero rate for non quoted items**. Failure to comply with either of these conditions will make the tender liable for rejection and forfeiture of Earnest money.

11.4 All duties, taxes, and other levies payable by the Contractor under the contract, or for any other cause, shall be included in the rates, prices and total tender price submitted by the tenderer. Tenderers must include in their rates, the cost of transportation of materials to site, Goods & Service Tax, Cess as per Building & Other Construction Workers Cess Act, and any other tax and duty levied by the Central / State Government. None of the above taxes & levies will be entertained separately by the Owner and no tax exemption forms will be issued by the Owner. All the taxes levied other than IT should be paid either directly by the contractor to the statutory authorities and challans / proof of payment with acknowledgement shall be provided by the contractor before release of the payment of next bill or shall be deducted at source. Contractor should also take a Group Insurance Policy for his Workmen, Supervisors and Engineers working on site for an adequate insurance cover. C-MET shall not be responsible for any accident or any untoward/unforeseen event involving workmen, labour, supervisor or engineer or any person directly or indirectly associated with the execution of work. The insurance policy to be obtained by the successful Tenderer must be comprehensive and shall cover all associated risks (known and unknown) from any Government Insurance Company.

11.5 The rates quoted in the tender shall include cost of hire for any tools and tackles, shed for materials, marking out and transportation complete, cleaning the buildings and surroundings after execution of the total works and dumping the waste at designated place as directed by the Owner in all respects. The rates quoted in the tender shall be treated as rates for finally completing the item of work.

11.6 The quantities furnished in the schedule of quantities are only probable quantities and are liable to alterations, by omission, deductions or additions to any extent at the discretion of Owner. Payments will be regulated on the actual quantities of work done at accepted rates. Any item of work may be omitted from the schedule of quantities and may be awarded to another agency at any time / stage of the work for which no compensation will be paid by the Owner i.e. for non-operated BOQ items and short closed BOQ items.

11.7 The rates and prices quoted by the Tenderer shall be fixed for the duration of the contract and shall not be subject to escalation or adjustment on any account even if the work is delayed due to unavoidable circumstances beyond the control of owner/consultant.

11.8 The calculations made by the tenderer should be based upon quantities of the items of work which are furnished in the Schedule of Quantities, but it must be clearly understood that the contract is not a lump sum contract. The Owners do not in any way assure, represent or guarantee that the said probable quantities are correct or that the work would correspond thereto. The items of work irrespective of the quantities which may vary shall be carried out at the same accepted tender rates and no escalation in the rates will be entertained whatsoever. Any item of work may be omitted from the schedule of quantities and may be awarded to another agency at any time / stage of the work.

11.9 The tenderers must obtain for themselves on their own responsibility andtheir own expenses all the information which may be necessary, including risks, contingencies and other circumstances to enable them in making a proper tender and for entering into a contract, and must examine the drawings, specifications and

conditions and inspect the site of the work, nature of the work, availability of power, water, shelter for workmen and all the matters pertaining thereto before submitting the tender.

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

i. The item wise price of goods to be supplied shall be on FOR site basis inclusive of applicable taxes & duties. The item wise price shall also include the charges for packing and forwarding, transportation, transit insurance and all other local costs incidental to delivery of the goods to their final destination, storage insurance and safe custody at site.

ii. The item wise price of supervision for installation, testing and commissioning as described in the technical specifications and in accordance with Special Conditions of Contract with regard to erection, testing and putting the equipment into satisfactory operation including successful completion of performance and guarantee tests to be performed at the final destination by the bidder should be indicated separately and shall be inclusive of applicable taxes and duties.

iii. The cost of service cover/incidental services listed in Clause 9 of the Special Conditions of Contract.

iv. The bidder should also submit the price schedule summary.

11.11 Fixed Price

Price quoted by the Bidder shall be fixed during the bidder's performance of the Contract and not subject to variation on any account. A bid submitted with an adjustable price quotation for such goods and services will be treated as non-responsive and rejected pursuant to Clause 24.

11.5 Price Break-up

Bidders shall furnish the cost separately for the supply and supervision for installation/ commissioning along with detailed cost break -up (item wise), which will be applicable for progressive payments. Items and works for which no break-up price is furnished by the bidder will not be paid for by the purchaser when supplied/executed and shall be deemed covered by the other break-up prices. Wherever items are mentioned in terms of length, prices should be quoted on per meter basis. However for evaluation purpose, prices quoted as indicated in Para 11.2 above only will be considered. Wherever there is more than one item, unit rates should be indicated separately.

11.6 Notwithstanding anything stated elsewhere in the bidding documents, irrespective of mode of the contracting with the successful bidder, the successful bidder will be liable for the payment of Indian Income Tax, surcharge on Income Tax and any other Corporate Tax, turnover tax etc. if attracted under the provisions of the law. The purchaser shall not bear any tax liability whatsoever irrespective of the mode of contracting.

12. Bid Currencies

12.1 For all goods and services covered in this Bidding Document, prices shall be quoted in Indian Rupees only.

13 Documents Establishing Bidders' Eligibility and Qualifications

13.1 Pursuant to Clause 9, the Bidder shall furnish, as part of its bid, documents establishing the Bidder's eligibility to bid and its qualifications to perform the Contract if its bid is accepted.

13.2 The documentary evidence of the Bidder's eligibility to bid shall establish to the Purchaser's satisfaction that the Bidder, at the time of submission of its bid is eligible to bid as defined under Clause 2.

13.3 The documentary evidence of the Bidder's qualifications to perform the Contract if its bid is accepted, shall establish to the Purchaser's satisfaction:

a) That, in the case of a Bidder offering to supply goods under the Contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the goods' manufacturer or producer to supply the goods. The bid shall include Manufacturers' Authorization Form in their letterhead. Offers from other agencies, brokers and middlemen will not be accepted.

b) That the Bidder has the financial, technical and production capability necessary to perform the Contract. To this end, all bids submitted shall include the following information:

I. Copies of original documents defining the constitution or legal status, place of registration and principal place of business of the company or firm or partnership etc.

II. Details of experience and past performance of the bidder on the contracts similar nature within the last 5 years and details of current contracts in hand and other commitments. Bidder should meet the minimum qualifying criteria to be eligible for award of contract pursuant to Clause 9 above.

a. The Bidder should be a manufacturer who must have designed, manufactured, tested and supplied the equipment(s) similar to the type specified in the Schedule of Requirements which shall be in successful operation for at least two years as on the date of bid opening.

b. Bidders shall invariably furnish documentary evidence (Client's certificate) in support of the satisfactory operation of the equipment as specified above.

III. The bidder should furnish a brief write-up, backed with adequate data, explaining his available capacity (both technical and commercial) for manufacture and supply, installation and commissioning of the tendered items within the specified time of completion, after meeting all their current commitments.

IV. The bidder should confirm that all the facilities exist in his factory for inspection and testing and these will be made available to the Purchaser or his representative for inspection.

V. Major items of plant and equipment available/ installed in the Bidder's Factory premises;

VI. Details of Qualification and experience of key personnel for successful execution of the contract;

VII. Reports on financial standing of the Bidder such as profit and loss statements, balance sheets and auditor's report of the past three years, bankers certificates etc.

VIII. Information regarding any current litigation in which the Bidder is involved.

13.4 Bidders who meet the criteria given above at 13.2 and 13.3 are subject to be disqualified, if they have made untrue or false representation in the forms, statements and attachments submitted in proof of the qualification requirements or have record of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion or financial failure etc.

14 Documents Establishing Goods' Eligibility and Conformity to Bidding Documents

14.1 Pursuant to Clause 9.1 the Bidder shall furnish, as part of its bid, documents establishing the eligibility and conformity to the Bidding Documents of all goods and services, which the Bidder proposes to supply under the Contract.

14.2 The documentary evidence of the goods' and services' eligibility shall consist of a statement in the Price Schedule on the country of origin of the goods and services offered which shall be confirmed by a certificate of origin issued at the time of shipment.
14.3 The documentary evidence of the goods' and services' conformity to the Bidding Documents may be in the form of literature, drawing and data, and shall furnish:

a. A detailed description of the goods' essential technical and performance characteristics.

b. A list giving full particulars, including available sources and current prices, of all spare parts, special tools, etc. necessary for the proper and continuous functioning of the goods for a period of two years, following commencement of the goods' use by the Purchaser; and

c. A statement of deviations and exceptions to the provisions of the technical specification in the format furnished in the bidding document (Section XI (A)- Technical Deviation Statement Form) and a clause by clause commentary on the deviations demonstrating the goods' and services' substantial responsiveness to the purchaser's specifications despite the deviations. 14.4 Pursuant to Clause 14.3(c) above, the Bidder shall note that standards for workmanship, material and equipment, and references to brand names or catalogue numbers designated by the Purchaser in its Technical Specifications are intended to be descriptive only and not restrictive.

15 Bid Security (Earnest Money Deposit)

15.1 Pursuant to Clause 9.0 the Bidder shall furnish, as part of its bid, bid security as specified in the Schedule of Requirements.
15.2 The bid security is required to protect the Purchaser against the risk of Bidder's conduct, which would warrant the security's forfeiture, pursuant to Clause 15.7.
15.3 The bid security shall be denominated in **Indian Rupees** only, and shall be in one of the following forms:

a) A bank guarantee or irrevocable Letter of Credit issued by a Nationalized Indian bank/Scheduled/Private Bank or a Scheduled foreign bank operating in India, in the form provided in the Bidding Documents and valid for 60 days beyond the validity of the bid from the date of opening of bids. The guarantees given by other banks should be confirmed by a nationalized Indian bank or a foreign bank operating in India. Or

b) A demand draft/banker’s cheque in favor of C-MET, Hyderabad

15.4 Any bid not accompanied with bid security in accordance with paras. 15.1 and 15.3 will be rejected by the Purchaser as non-responsive, pursuant to Clause 24.
15.5 Unsuccessful Bidder's bid security will be discharged/returned as promptly as possible but not later than 30 days after the expiration of the period of bid validity prescribed by the Purchaser, pursuant to Clause 16.
15.6 The successful Bidder's bid security will be discharged upon the Bidders executing the Contract, pursuant to Clause 33, and furnishing the performance security, pursuant to Clause 34.
15.7 The bid security may be forfeited:

a)If a Bidder withdraws or modifies its bid during the period of bid validity specified by the Bidder on the Bid Form; or

b) In the case of these successful Bidder, if the Bidder fails to furnish performance security in accordance with Clause 34.

16. Period of Validity of Bids

16.1 Bids shall remain valid for 120 days after the date of bid opening prescribed by the Purchaser, pursuant to Clause19. A bid valid for a shorter period shall be rejected by the Purchaser as non-responsive.

16.2 In exceptional circumstance, the Purchaser may prior to the expiry of initial validity period solicit the Bidder's consent to an extension of the period of validity for another 30 days. The request and the responses thereto shall be made in writing or scanned letter through e-mail or fax. The bid security provided under Clause 15 shall also be suitably extended. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request will not be required nor permitted to modify its bid.

17 Format and Signing of Bid

17.1 The Bidder shall prepare two copies of the bid, clearly marking each one as "Original Bid" and "Copy of Bid" as appropriate. In the event of any discrepancy between them, the original shall govern.

17.2 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to bind the Bidder to the Contract. The latter authorization shall be indicated by written power-of-attorney accompanying the Bid. All pages of the bid, except for un amended printed literature, shall be initialed by the person or persons signing the bid.

17.3 The bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case corrections shall be initialed by the person or persons signing the bid.

D. Submission of Bids

18 Sealing and Marking of Bids

18.1 The Bidders shall seal the original and each copy of the bid in an inner and an outer envelope, duly marking the envelopes as "original" and "copy."

18.2 The inner and outer envelopes shall be addressed to the Purchaser at the following address:

The Director, C-MET, IDA Phase - III
Cherlapally, HCL Post, Hyderabad - 500 051

In case of second stage bids also, the same sealing and marking of the envelopes should be followed.

18.3 The inner envelope shall indicate the name and address of the Bidder to enable the bid to be returned unopened in case it is declared "late."

18.4 If the outer envelope is not sealed and marked as required by Clause. 18.2, the Purchaser will assume no responsibility for the bid's misplacement or premature opening. A bid opened prematurely for this cause will be rejected by the Purchaser and returned to the bidder.

18.5 Bids received through fax/e-mail will be rejected.

19 Last date for Submission of Bids

19.1 Bids must be received by the Purchaser at the address specified not later than the time specified for receipt of the bids in the Invitation for Bids (Section I).

19.2 The Purchaser may, at its discretion, extend this last date for the submission of bids by amending the Bidding Documents in accordance with Clause 7, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the last date as extended.

20 Late Bids

20.1 Any bid received by the Purchaser after the last date for submission of bids prescribed by the Purchaser, pursuant of Clause 19, will be rejected and returned unopened to the Bidder.

21 Modifications and Withdrawal of Bids

21.1 The Bidder may modify or withdraw its bid after the bid's submission, provided that written notice of the modification or withdrawal is received by the Purchaser prior to the last date prescribed for submission of bids.

21.2 The Bidder's modification or withdrawal notice shall be prepared, sealed, marked and dispatched in accordance with the provisions of Clause 18 with the outer and inner envelopes additionally marked "modification" or "withdrawal" as appropriate. A withdrawal notice may also be sent by fax but followed by a signed confirmation copy by post, marked not later than the last date for submission of bids.

21.3 No bid may be modified subsequent to the last date for submission of bids.

21.4 No bid may be withdrawn in the interval between the last date for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Bid Form. Withdrawal of a bid during this interval may result in the Bidder's forfeiture of its bid security, pursuant to Clause 15.7.

E. Bid Opening and Evaluation

22 Opening of Bids by Purchaser

22.1 Bid Opening and Evaluation

22.2 The Purchaser will open only in the presence of Bidders' representatives who choose to attend, at the time and date indicated in the Invitation For Bids (IFB)(Section I) at the office of C-MET, Hyderabad. The Bidders' representatives who are present shall sign a register evidencing their attendance.

22.3 The Bidders‟ names, bid prices, discount, presence or absence of the requisite bid security, and such other details as the Purchaser, at its discretion, may consider appropriate will be announced during the opening.

23 Clarifications of Bids

23.1 To assist in the examination, evaluation and comparison of the bids the Purchaser may, at its discretion, ask the Bidders for a clarification of its bids. The request for clarification and the response shall be in writing and no change in the price or substance of the bid shall be sought, offered or permitted.

24 Preliminary Evaluations.

24.1.1 The Purchaser will examine the bids to determine whether they are complete, whether any computational errors have been made, whether required financial instruments/securities/sureties have been furnished, whether the documents have been properly signed, and whether the bids are generally in order.

24.1.2 Where the bidder has quoted and the bid security furnished is inadequate, the bid will be treated as non-responsive.

24.1.3 The purchaser will also examine whether the bid is complete. If the prices of certain components/sub-assemblies/spare parts are not included and if the goods or equipment or otherwise considered functional, the Purchaser will load the bid with the cost of these exclusions as estimated by the Purchaser or as quoted by the other responsive bidders, whichever is higher for evaluation. If the Purchaser considers that with these omissions, the offered goods/equipment is not functional, then the bid will be treated as incomplete and non-responsive.

24.2 Where the bidder has quoted for more than one pack/items if the bid security furnished is inadequate for all the packs/items, the purchaser shall take the price bid into account only to the extent the bid is secured. For this purpose, the extent to which the bid is secured shall be determined by evaluating the requirement of bid security to be furnished for the packs/items included in his bid (offer) in the serial order of the schedule of requirements of the bidding document.
24.3 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If the Bidder does not accept the correction of the errors, its bid will be rejected. If there is a discrepancy between words and figures, the amount in words will prevail.
24.4 Prior to the detailed evaluation, the Purchaser will determine the substantial responsive to the bidding documents. For purposes of these clauses, a substantially responsive bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviations. A material deviation is one which affects in any substantial way the functionality, scope, quality or performance of the deliveries or which limits in any substantial way inconsistent with the bidding documents, the Purchaser's rights or the bidder's obligations under the contract and the rectifications of which deviations would affect unfairly the competitive position of other bidders presenting substantially responsive bids. The Purchaser's determination of a bid's responsiveness is to be based on the contents of the bid itself without recourse to extrinsic evidence.
24.5 A bid determined as not substantially responsive will be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the nonconformity.
24.6 The Purchaser may waive any minor informality or non-conformity or irregularity in a bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of the Bidder.

25 Conversions to Single Currency.
25.1 All bid prices shall be in **Indian Rupees** only.

26 Evaluations and Comparison of Bids
26.1 The Purchaser will evaluate and compare the bids previously determined to be substantially responsive, pursuant to Clause 24 & 25. No bid will be considered if the complete requirement covered under the pack/item is not included in the bid. The discounts if any offered by the bidder will be taken into account in the evaluation of bids so as to determine the lowest evaluated cost for the Purchaser in deciding award(s).
26.2 The evaluation and comparison of bids will be done on the basis of item wise quoted price inclusive of supply, installation, testing & commissioning including applicable taxes and duties as mentioned in price schedule & clause 11.2.

27 Contacting the Purchaser
27.1 Subject to Clause 23, no 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.
27.2 Any effort by a Bidder to influence the Purchaser in the Purchaser's bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidder's bid.

F. Award of Contract

28 Post Qualifications
28.1 The determination will take into account the Bidder's financial, technical and production capabilities. It will be based upon an examination of the documentary evidence

of the Bidder's qualifications submitted by the Bidder, pursuant to Clause 13, as well as such other information as the Purchaser deems necessary and appropriate including details of experience and records of past performance.

29 Award Criteria

29.1 Subject to clause 31, the Purchaser will award the contract for each pack to the successful bidder whose bid has been determined to be substantially responsive and has been determined as the lowest evaluated bid provided further the bidder is determined to be qualified to perform the contract satisfactorily as per clause 28.

30 Purchasers Right to Vary Quantities at the Time of Award.

30.1 The Purchaser reserves the right to vary the quantities at the time of award of the contract, if the need arises in consultation with the successful bidder.

31 Purchasers" Right to Accept Any Bid and to Reject Any or All Bids

31.1 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.

32 Notification of Award

32.1 Prior to expiration of the period of bid validity, the Purchaser will notify the successful Bidder in writing by registered letter/courier/fax/e-mail, to be confirmed in writing by registered letter/courier, that its bid has been accepted.

32.2 The notification of award will constitute the formation of the Contract.

32.3 Upon the successful Bidder's furnishing of performance security pursuant to Clause 34, the Purchaser will promptly notify each unsuccessful Bidder and will discharge its bid security, pursuant to Clause 15.

33 Signing of Contract

33.1 At the same time as the Purchaser notifies the successful Bidder that its bid has been accepted, the Purchaser will request the Bidder to submit the Contract Form/s as provided in the Bidding Documents, incorporating all agreements between the parties.

33.2 Within 30 days of receipt of the Contract Form/Purchase Order, the successful Bidder shall sign and date the Contract/s and return it/them to the Purchaser.

34 Performance Security

34.1 The EMD of successful bidder will be retained as Performance security. In case of EMD submitted as Bank Guarantee, the bidder shall agree to replace bank guarantee of the EMD towards Performance Guarantee.

34.2 Within 30 days of the receipt of notification of award from the Purchaser, the successful Bidder shall furnish the performance security in accordance with the Conditions of Contract @ 10% of the PO/WO value, in the Performance Security Form provided in the Bidding Documents or another form acceptable to the Purchaser.

34.3 C-MET may as alternate to Performance security deduct the amount from running bills and return the same after due performance of the contract.

34.4 Failure of the successful Bidder to comply with the requirement of Clause 33 or Clause 34 shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security, in which event the Purchaser may make the award to the next lowest evaluated bidder or call for new bids as per CVC norms issued from time to time.

34.5 If the bid of the successful bidder is seriously unbalanced in relation to C-MET’s estimate of the real cost of the work to be performed under the contract, C-MET may

require additional performance security to protect C-MET against financial loss in the event of subsequent default of the successful bidder under the contract. The value of the additional performance security shall be decided by the Purchaser based on mutual discussions with the successful bidder. The additional performance security shall be valid until the delivery of such items or the Purchaser may decide as. This security shall be released on appropriate basis with respect to completion of execution of those items against which the additional security is obtained.

35 Import of goods

35.1 No import license shall be provided by the purchaser for goods offered against this bid.

36.0 During Execution

The Contractor shall carry out all the works strictly in accordance with the drawing, details and instructions of the Consultants/Owner. If in the opinion of the Consultants, changes have to be made in the design, and they desire the contractor to carry out the same, the Contractor shall be bound to comply. The Consultants/Owner decisions in such cases shall be final.

36.1 The Contractor is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the schedule of quantities and rates. Schedule of instructions in respect of such additional items and their quantities will be issued in writing by the Consultants/owner with the prior consent from the Owner. Rates for such items of work will be recommended by the Consultants/Owner for approval by the Owner on the basis of Analysis of Rates which will be derived from **actual prevailing market rates of similar item along with 15% as contractor's profit & overhead**. The rates approved by the Owner in such cases will be final.

36.2 The Consultants/ Owner may at any time / stage of execution demand for the Analysis of Rates for any item / items of work which in their opinion is are abnormally high / low rates or required for the Analysis of Rates of other tender / extra item / items. The Contractor is bound to present the same and if the Contractor is unable to present a justified Analysis of Rates for any item / items, the rate / rates for such item may be adjusted accordingly and the decision of the Owner in such cases shall be final.

36.3 The Contractor shall get the quality of work done inspected for material and workmanship at different stages of execution as per instructions given by the Consultants/ Owner or their representative time to time. Any item of work done which is found not conforming to the Contract shall be rejected by the Consultants/Owner. The decision of the Consultants/ Owner in such cases shall be final.

36.4 The Consultants/ Owner may instruct at any stage of execution for testing of any material taken at random. The Consultants/Owner will decide the testing laboratory/
agency and the cost of testing including the expenses for sending the samples to the laboratory / agency and receipt of test reports shall be borne by the Contractor. The material shall be rejected in case the test reports are not within the permissible

limits. In case material is found to be of sub-standard quality, the same shall be rejected by the Consultants/Owner. The decision of the Consultants/ Owner in such cases shall be final.

36.5 The Contractor shall not be entitled to any compensation suffered by him on account of delays in commencing or executing the work whatever the cause of delay may be, including delays arising out of modifications to the work entrusted to him or in any subcontracts connected therewith or delays in awarding contracts for other trades of the project or in commencement or completion of such other works or in procuring Government controlled or other building materials for any other reasons whatsoever. The Owner shall not be liable for any sum besides the tender amount, subject to such variations as are provided for herein and as instructed by Consultants/ Owner. However, necessary time extension will be given if the delays are not attributed to the Contractor.

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SECTION III

GENERAL CONDITIONS OF CONTRACT

TABLE OF CLAUSES

Section III.
GENERAL CONDITIONS OF CONTRACT

1. Definitions

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

a. The Contract" means the agreement entered into between the Purchaser and the Supplier, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein;

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 of the equipment, machinery, and/or other materials, 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, such as installation, commissioning, provision of technical assistance, training and other such obligations of the Supplier covered under the Contract;

e. "The Purchaser" means the Organization purchasing the Goods and services and would include the term "Owner";

f. "The Supplier" means the individual or firm supplying the Goods and services under this Contract; and would include the term "Contractor".

g."Engineer-in-charge" means the Engineer designated as such or other Engineer appointed from time to time by the Purchaser and notified in writing to the Supplier to act as Engineer-in-charge for the purposes of contract.

h. "Works" means all goods to be provided and work (Services) to be done by the supplier under the contract.

i. The Consultants" means the Consultants appointed by the Owner for preparing all the drawings, details and specifications of items required for the execution of the work and supervise and monitor the execution at site along with checking and verifying Contractor's bill.

j. The terms 'tenderer" or "bidder" means the invidiual or firms responsing to the tender.

1.2 The Contractor shall offer the Engineer or any representative of Consultants/Owner every facility and assistance for examining the works and materials. The Engineer or any representative of the Consultants shall have power to give notice to the Contractor or to his staff, of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the Consultants. Such examinations shall not in any way exonerate the contractor from the obligations to remedy any defects which may be found to exist at any stage of the work or after the same is completed.

2. Application

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

3. Country of Origin

3.1 For purpose of this Clause "origin" means the place where the Goods were mined, grown or produced, or from which the Services are supplied. Goods are produced

when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.

3.2 The origin of Goods and Services is distinct from the nationality of the Supplier.

4. Standards

4.1. 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.

5. Use of Contract Documents and Information

5.1 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 the 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.

5.2 The Supplier shall not, without the Purchaser's prior written consent, make use of any document or information enumerated in para. 5.1 except for purposes of performing the Contract.

5.3 Any document, other than the Contract itself, enumerated in Para. 5.1 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.

6. Patent Rights

6.1 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.

7. Performance Security

7.1 Within 30 days after the Supplier's receipt of notification of award of the Contract, the Supplier shall furnish performance security to the Purchaser in the amount specified in the Special Conditions of Contract.

7.2 The proceeds of the performance security shall be payable to the Purchaser as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract.

7.3 The Performance Security shall be denominated in the currency of the Contract or in a freely convertible currency acceptable to the Purchaser, and shall be in the following form:

a. A bank guarantee or irrevocable Letter of Credit, issued by a Nationalized Indian Bank/Scheduled Bank/ Private Bank or a foreign bank operating in India. The guarantees issued by other banks should be confirmed by a Nationalized Indian Bank or a foreign bank operating in India. OR

b. Demand Draft or Banker's Cheque in favour of C-MET, Hyderabad. Such bank guarantee/letter of credit shall be valid till the expiry of the warranty period + 60 days.

7.4 The performance security will be discharged by the Purchaser and returned to the Supplier not later than 60 days following the date of completion of the Supplier's performance obligations, including any warranty obligations, under the Contract.

8. Inspection and Tests

8.1 The Purchaser or its representative shall have the right to inspect and/or test the Goods to confirm their conformity to the Contract. The Special Conditions of Contract and/or the Technical Specifications shall specify what inspections and tests the Purchaser requires and where they are to be conducted. The Purchaser shall notify

the Supplier in writing of the identity of any representatives, if retained for these purposes.

8.2 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 Good's final destination. Where conducted on the premises of the Supplier or it's 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. In case of any defects or deficiency notified by the Purchaser's inspection authority, the Supplier will rectify and make good the same without delay and not proceed with further processing of such item(s) of Goods without obtaining approval from the inspection authority.

8.3 Should any inspected or tested Goods fail to conform to the Specifications, the Purchaser may reject them and the Supplier shall either replace the rejected Goods or make all alterations necessary to meet specification requirements free of cost to the Purchaser.

8.4 The Purchaser's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival at the destination 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 from the country of origin.

8.5 Tests upon completion

8.5.1 The Supplier shall give to the Purchaser 21 days notice of the date after which he will be ready to make the tests of completion (the Test). Unless otherwise agreed, the Tests shall take place within 14 days after the said date on such day or days, as the Purchaser shall notify the Supplier.

8.5.2 If the Purchaser fails to appoint a time after having been asked to do so, or does not attend at the time and place appointed, the Supplier shall be entitled to proceed with the Tests in his absence. The tests shall then be deemed to have been made in the presence of the Purchaser and the results of the Tests shall be accepted as accurate.

8.5.3 If the Tests are being unreasonably delayed by the Supplier the Purchaser may give notice requiring the Supplier to make the tests within 21 days after the receipt of such notice. The supplier shall make the Tests on such days within that period as the Supplier may fix and of which he shall give notice to the Purchaser.

If the Supplier fails to make the Tests within 21 days the Purchaser may himself proceed with the Tests. All tests so made by the Purchaser shall be at the risk and cost of the Supplier and the cost thereof shall be deducted from the Supplier's price. The test shall then be deemed to have been made in the presence of the Supplier and results of the tests shall be accepted as accurate.

8.5.4 If the Goods/services or any section fails to pass the Tests, the Supplier may require such tests to be repeated on the same terms and conditions. All costs to which the Purchaser may be put to by the repetition of the tests under this sub-clause or under sub clause 8.5.14 shall be deducted from the Contract Price.

8.5.5 If the Purchaser and the Supplier disagree on the interpretation of the test results each shall give a statement of his views to the other within 14 days after such disagreement arises. The statement shall be accompanied by all relevant evidence. The Purchaser will review both the statements and render a final decision within a further period of fourteen (14) days, which shall be binding on the Supplier.

8.5.6 If the Goods/Services or any Section fails to pass the Tests on the repetition thereof under sub-clause

8.5.4 the Purchaser after due consultation with the Supplier, shall be entitled to:

a) Order one further repetition of the Tests under the conditions of sub-clause 8.5.4 or

b) Reject the Goods or a section thereof in which event the Purchaser shall have the same remedies against the Supplier as are provided under sub-clause 8.5.12.

c) Issue a taking over certificate, if the Purchaser so wishes, notwithstanding that the Goods are not complete. The Supplier's price shall then be reduced by such amount as may be agreed to by the Purchaser and the Supplier or failing an agreement, as may be determined through arbitration.

8.5.7 In considering the results of tests carried out under sub-clause 8.5.11 and 8.5.14 and the Purchaser shall make allowances for the effect of any use of the Goods by him on the performance or other characteristics of the Goods.

8.5.8 As soon as the Goods/Services or any section thereof has passed the tests, the Purchaser shall issue a certificate to the Supplier to that effect.

8.5.9 The Goods and Services shall be accepted by the Purchaser when they have been completed in accordance with the contract, except in minor respects that do not affect the use of the Goods for their intended purposes and having passed the tests on completion and a taking over certificate has been issued or deemed to have been issued in accordance with sub-clause 8.5.10.

8.5.10 The Supplier may apply by notice to the Purchaser for a taking over certificate not earlier than 14 days before the goods will in the Supplier's opinion be complete and ready for taking over under sub-clause 8.5.9.

The Purchaser shall within 28 days after the receipt of the Supplier's application either:

a) Issue the taking over certificate to the Supplier stating the date on which the works were complete and ready for taking over, or

b) Reject the application giving his reasons and specifying the work required to be done by the Supplier to enable the taking over certificate to be issued.

c) If the Purchaser fails either to issue the taking over certificate or to reject the Supplier's application within the period of 28 days he shall be deemed to have issued the taking over certificate on the last day of that period.

d) If the services are divided by the Contract into sections the Supplier shall be entitled to apply for separate taking over certificate for each such section.

8.5.11 The Purchaser shall not use any part of the Goods unless taking over certificate has been issued in respect thereof.

If nevertheless the Purchaser uses any part of the Goods that part which is used shall be deemed to have been taken over at the date of such use. The Purchaser shall on request of the Supplier issue a taking over certificate accordingly. If the Purchaser uses any part of the Goods before taking over, the Supplier shall be given the earliest opportunity of taking such steps as may be necessary to carry out the tests on completion.

8.5.12 If the Supplier fails to remedy a defect or damage pointed out by the Purchaser within a reasonable time, the Purchaser may fix a final time for remedying the defect or damage.

If the Supplier fails to do so, the Purchaser may:

a) Carry out the work himself or by others at the Supplier"s risk and cost, provided that he does so in a reasonable manner. The costs properly incurred by the Purchaser in remedying the defect or damage shall be deducted from the Contract Price, but the Supplier shall have no responsibility for such work, or

b) Require the Supplier to grant the Purchaser a reasonable reduction in the Contract Price to be agreed or fixed by arbitration or

c) If the defect or damage is such that the Purchaser has been deprived of substantially the whole of the benefits of the Goods or a part thereof, he may terminate the Contract, in respect of such parts of the Goods as cannot be put to the intended use. The Purchaser shall, to the exclusion of any remedy be entitled to recover all sums paid in respect of such parts of the Goods together with the cost of

dismantling the same, clearing the site and returning plant to the Supplier or otherwise disposing of it in accordance with the Supplier's instructions.

8.5.13 If the defect or damage is such that repairs cannot be expeditiously carried out on the site, the Supplier may with the consent of the Purchaser remove from the site for the purpose of repair any part of the works which is defective or damaged, after furnishing a suitable guarantee as may be prescribed by the Purchaser.

8.5.14 If the replacement or renewals are such that they may affect the performance of the services, the Purchaser may request that the tests on completion be repeated to the extent necessary. The request shall be made by notice within 28 days after the replacement or renewal. The tests shall be carried out in accordance with clauses 8.5.1 to 8.5.3.

8.5.15 until the final certificate of commissioning has been issued; the Supplier shall have the right of access to all parts of the Goods and to the records of the working and performance of the Goods and Services. Such right of access shall be during the Purchaser's normal working hours at the Supplier's risk and cost. Access shall also be granted to any duly authorized representative of the Supplier whose name has been communicated in writing to the Supplier.

Subject to the Purchaser's approval, the Supplier may also at his own risk and cost make any tests, which he considers desirable.

8.5.16 The Supplier shall not be liable for any defect resulting from designs furnished or specified by the Purchaser.

8.5.17 The Supplier shall, if required by the Purchaser in writing, search for the cause of any defect, under the directions of the Purchaser. Unless the defect is one for which the Supplier is liable under this clause, the cost of the services carried out by the Supplier in searching for the cause of the defect shall be added to the Contract Price.

8.6 Nothing in the clause 8 shall in any way relieve the Supplier from any warranty or other obligations under this Contract.

9. Packing and Marking

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 temperature, 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 documents within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to Clause 18 and any subsequent instructions given by the Purchaser.

9.3 Each package shall be marked to indicate:

a) Name of the Supplier d) Purchase Order number

b) Details of items in Gross, net and tare the package weights of the item

c) Name of the Consignee f) Destination

10 Delivery and Documents

10.1 Delivery of the Goods shall be made by the Supplier in accordance with the terms specified by the Purchaser in its Schedule of Requirements and the Special Conditions of Contract.

11. Insurance

11.1 The Goods supplied under the Contract shall be fully insured in Indian Rupees or a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage at site, delivery and upto to handing over of the plant and equipment in the manner specified in the Special Conditions of Contract.

11.2 Where delivery of the Goods is required by the Purchaser on a CIF basis, the Supplier shall arrange and pay for marine insurance naming the Purchaser as the beneficiary.

11.3 The Supplier shall provide a copy of the insurance policy along with invoice to the purchaser who will make arrangements to extend the validity of the policy, if necessary.

11.4 Should any loss or damage occur, the Supplier should - **a.** Initiate and pursue claim till settlement, and

b. Promptly make arrangements for repair and/or replacement of any damaged item/s irrespective of settlement of claim by the underwriters.

12. Transportation

12.1 Where the Supplier is required under the Contract to deliver the Goods FOR DESTINATION, as specified in the schedule of requirements. Transportation shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.

12.3 Where the Supplier is required to affect delivery under any other terms, for example, by post or to another address in the source country, the Supplier shall be required to meet all transport and storage expenses until delivery.

12.4 In all the cases, transportation of the Goods up to the project site shall be the responsibility of the Bidder and the cost thereof shall be included/indicated in the contract price.

12.5 Where the Supplier is required under the Contract to deliver the Goods CIF, no further restriction shall be placed on the choice of the ocean carrier.

13. Incidental Services

13.1 As specified in the Special Conditions of Contract, the Supplier may be required to provide any or all of the following services:

a. Performance or supervision of on-site assembly and/or start-up of the supplied Goods;

b. Furnishing of tools required for assembly and/or maintenance of the supplied goods;

c. Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods; and manuals covering the operation and maintenance of automation software and control systems.

d. Performance or supervision or maintenance and/or repair of the supplied Goods, for a period of time agreed by the parties, provided that this service shall not relieve the Supplier of any warranty obligations under this Contract; and

e. Conduct of training of the Purchaser's personnel, at the Supplier's plant and/or onsite, in assembly, start-up operation, maintenance and/or repair of the supplied Goods.

13.2 Prices charged by the Supplier for the preceding incidental services, if not included in the price for the Goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged from other parties by the Supplier for similar services.

14. Spare Parts

14.1 As specified in the Special Conditions of Contract, the Supplier may be required to provide any or all of the following materials and notifications pertaining to spare parts manufactured or distributed by the Supplier:

a. Such spare parts as the Purchaser may elect to purchase from the Supplier, provided that this election shall not relieve the Supplier of any warranty obligations under the Contract; and

b. In the event of termination of production of the spare parts:

i. Advance notification to the Purchaser of the pending termination, in sufficient time to permit the Purchaser to procure its needed requirements; and
ii. Following such termination, furnishing at no cost to the Purchaser, the blueprints, drawings and specifications of the spare parts, if and when requested.

15. Warranty/Guarantee

15.1 The Supplier warrants that the Goods and equipment, supplied, installed and commissioned under the Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Supplier further warrants that the Goods supplied under this Contract shall have no defect arising from design, materials or workmanship (except insofar as the design or material is required by the Purchaser's Specifications) or from any act or omission of the Supplier, that may develop under normal use of the supplied Goods in the conditions obtaining in the country of final destination. The Supplier also guarantees that the Goods supplied shall perform satisfactorily as per the signed/rated/-installed capacity as provided for in the Contract.

15.2 This warranty/guarantee shall remain valid for 12 months after the Goods have been delivered at site, installed and the plant successfully tested, commissioned and accepted by the Purchaser. The automation systems, instruments and controls will be guaranteed against system malfunction for a period of one year from the date of commissioning.

15.3 The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty. Warranty cards of standard items shall be handed over to Purchaser for its maintentance or for furture reference.

15.4 Upon receipt of such notice, the Supplier shall, with all reasonable speed, repair or replace the defective Goods or parts thereof, without costs to the Purchaser other than, where applicable, the cost of inland delivery of the repaired or replaced Goods or parts from the port of entry to the final destination.

15.5 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.

16. Payment

16.1 The method and conditions of payment to be made to the Supplier under the Contract shall be specified in the Special Conditions of Contract.

16.2 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 Services performed, and by shipping documents, submitted pursuant to Clause 10, and fulfillment of other obligations stipulated in the Contract.

16.3 Payments shall be made promptly by the Purchaser within sixty (60) days of submission of an invoice/claim by the Supplier.

16.4 All payments under this contract shall be made in **Indian Rupees** only.

17. Prices

17.1 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 its bid.

18. Change Orders

18.1 The Purchaser may, at any time, by a written order given to the Supplier pursuant to Clause 31, 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 shipment or packing;

c. The place of delivery; or
d. The Services to be provided by the Supplier.

18.2 If any such change causes an increase or decrease in the cost of, or the time required for, the Supplier's performance of any part of the work under the Contract, whether changed or not changed by the order, 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.

19. Contract Amendment

19.1 Subject to Clause 18, no variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.

20. Assignment

20.1 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.

21. Subcontracts

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

21.2 Sub contracts must comply with the provisions of clause 3

22. Delays in the Supplier's Performance

22.1 Delivery of the Goods and performance of Services shall be made by the Supplier in accordance with the time schedule specified by the Purchaser in its Schedule of Requirements.

22.2 An unexcused delay by the Supplier in the performance of its delivery obligations shall render the
Supplier liable to any or all of the following sanctions:
Forfeiture of its performance security, imposition of liquidated damages, and/or termination of the Contract for default.

22.3 If at any time during performance of the Contract, the Supplier or its subcontractor(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, in which case the extension shall be ratified by the parties by amendment of the Contract.

23. Liquidated Damages

23.1 Subject to Clause 25, if the Supplier fails to deliver any or all the goods or perform the services within the times period (s) specified in the Contract, the Purchaser shall, without prejudice to its other remedies under the Contract, deduct from the contract prices, as liquidated damages, a sum equivalent to:
(1) 0.5% of the full contract value for every completed week (week comprising of 7 days including holidays and any incomplete week shall be ignored for the calculations of liquidated damages) of delay in the supplies/commissioning.

23.1.2 The total amount so deducted shall not exceed 10% of the Contract value. Once the maximum is reached, the Purchaser may consider termination of the Contract pursuant to Clause 24.

23.2 Any incremental taxes and levies on account of delay in performance of the Contract by the Supplier shall be to the Supplier's account.

24. Termination for Default

24.1 Suppliers default:

24.1.1 If the supplier shall assign the Contract, without the consent in writing of the Purchaser first obtained, or if in the opinion of the Purchaser, the Supplier:
a. Has abandoned the Contract, or
b. Without reasonable excuse has failed to commence the Works or has suspended the progress of the works for twenty eight days after receiving from the purchaser written notice to proceed, or
c. Despite previous warnings by the Purchaser, in writing, is not executing the works in accordance with the Contract, or neglecting to carry out his obligations under the contract so as seriously to affect the carrying out of the Works.
Then the Purchaser may, after giving fourteen days notice in writing to the Supplier, enter upon the Site and expel the Supplier there from without thereby avoiding the contract, or releasing the Supplier from any of his obligations or liabilities under the contract, or affecting the rights and powers conferred by the Contract on the Purchaser and may himself complete the works or may employ any other Supplier to complete the Works without prejudice to any other remedy of the Purchaser. The Purchaser or such other Supplier shall have free use for such completion of so much of the Supplier's Equipment as may be on the Site in connection with the works without being responsible to the Supplier for fair wear and tear thereof and to the inclusion of any right of the Supplier over the same.
24.1.2 The Purchaser shall, as soon as may be practicable after any such entry and expulsion by the Purchaser, fix and determine by or after reference to the parties, or after such investigation or enquiries as he may think fit to make or institute, and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Supplier in respect of work then actually done by him under the Contract and the value of any unused or partially used materials on the Site.
24.1.3 If the Purchaser shall enter and expel the Supplier under this Clause, he shall not be liable to pay to the Supplier any money on account of the Contract until the costs of execution and all other expenses incurred by the Purchaser have been ascertained and the amount thereof certified. The Supplier shall then be entitled to receive only such sum or sums, if any, as the Purchaser may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Supplier on due completion by him, then the Supplier shall, upon demand, pay to the Purchaser the amount of such excess and it shall be deemed a debt due by the Supplier to the Purchaser and shall be recoverable accordingly.
24.1.4 If the Purchaser pursuant to this Clause takes the Works or part thereof out of the Supplier's hands the Supplier's Liability under Clause for delay in completion shall immediately cease, without prejudice to any such liability that may at that time already be recoverable from the Supplier by the Purchaser.
24.1.5 Consequent to such termination of Contract, the Purchaser shall also be entitled to recover the advance paid, if any, to the Supplier along with interest @ 21% per annum compounded quarterly on the last day of March, June, September and December on the advance paid for the entire period for which the advance was retained by the Supplier.
24.2 Default of the Purchaser
24.2.1 In the event of the Purchaser:
a. Failing to pay to the Supplier the amount due within 60 days after the same shall have become due under the terms of the Contract subject to any deduction that the Purchaser is entitled to make under the Contract, or
b. Becoming bankrupt or (being a company) going into liquidation other than for the purpose of a scheme of reconstruction or amalgamation, or

c. Being unable to continue to meet his contractual obligations for unforeseen reasons due to economic dislocation

The Supplier shall be entitled without prejudice to any other rights or remedies (and in respect of paragraph

(a) above as an alternative to the provisions of Clause 16 for Payment to terminate his employment under the Contract by giving 30 days prior notice in writing to the Purchaser.

24.2.2 Upon the giving of such notice the Supplier shall with all reasonable dispatch remove from the Site all suppliers" equipment brought by him thereon.

24.2.3 In the event of such termination the Purchaser shall be under the same obligations to the Supplier in regard to payment as if the Contract had been terminated under the provisions of Sub-Clause 25.4.2 hereof but in additions payment specified therein, the Purchaser shall pay to the Supplier the amount of any reasonable loss or damage to the Supplier arising out of or in connection with or by consequence of such termination.

24.2.4 Nothing in this clause contained shall prejudice the right of the Supplier to exercise, either in lieu of or in addition to the rights and remedies in this Clause specified any other rights or remedies to which the Supplier may be entitled.

25. Force Majeure

25.1 Notwithstanding the provisions of Clauses 22, 23, 24, the Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

25.2 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 restricted to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

25.3 If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such condition 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.

25.4 Termination in Consequence of Force Majeure

25.4.1 If circumstances of Force Majeure have occurred and shall continue for a period of 182 days then, notwithstanding that the Supplier may by reason thereof have been granted an extension of Time for Completion of the Works, either party shall be entitled to serve upon the other 28 days' notice to terminate the Contract. If at the expiry of the period of 28 days Force Majeure shall still continue the Contract shall terminate.

25.4.2 If the Contract shall be terminated as aforesaid the Supplier shall be paid by the Purchaser (in so far as such amounts or items shall not have already been covered by payments on account made to the Supplier) for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:

a. The amounts payable in respect of any preliminary items, so far as the work or service comprised therein has been carried out or performed, and a proper proportion as certified by the Purchaser of any such items the work or service comprised in which has been partially carried out or performed.

b. The cost of materials or goods reasonably ordered for the Works or for use in connection with the Works which shall have been delivered to the Supplier or of which

the Supplier is legally liable to accept delivery (such materials or goods becoming the property of the Purchaser upon such payment being made by him).
c. A sum, to be certified by the Purchaser, being the amount of any expenditure, which in the circumstances was reasonably incurred by the Supplier in the expectation of completing the whole of the Works, in so far as such expenditure shall not have been covered by the payments in this Sub-Clause before mentioned.
d. The reasonable cost of removal under Sub-Clause 2 of this Clause and (if enquired by the Supplier) return thereof to the Supplier's works in his country or to any other destination at no greater cost.
e. The reasonable cost of repatriation of all the Supplier's staff and workmen employed on or in connection with the Works at the time of such termination. Provided always that, against any payments due from the Purchaser under this Sub-Clause, the Purchaser shall be entitled to be credited with any outstanding balances due from the Supplier for advances in respect of Plant and materials, and any sum previously paid by the Purchaser to the Supplier in respect of the execution of the Works.

26. Termination for Insolvency

26.1 The Purchaser may at any time terminate the Contract by giving written notice to the Supplier, without compensation to the Supplier, if:
a. The Supplier becomes bankrupt or otherwise insolvent,
b. The Supplier being a Company is wound up voluntarily by the order of a Court receiver, liquidator or Manager appointed on behalf of the debenture holders or circumstances shall have arisen which entitle the court or debenture holders to appoint a receiver, liquidator or a Manager, 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.

27. Termination for Convenience

27.1 The Purchaser, may by written sent to the `Supplier, 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 work under the Contract is terminated, and the date upon which such termination becomes effective.

27.2 The Goods that are complete and ready for shipment within 30 days after the Supplier's receipt of notice of termination shall be purchased by the Purchaser at the Contract terms and prices. For the remaining Goods, the Purchaser may elect:
a. To have any portion completed and delivered at the Contract terms and prices; and/or
b. To cancel the remainder and pay to the Supplier an agreed amount for partially completed Goods and for materials and parts previously procured by the Supplier.

28. Resolution of Disputes

28.1 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.

28.2 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 specified in the Special Conditions of Contract. These mechanisms may include, but are not restricted to, conciliation mediated by a third party, adjudication in an Agreed national or international forum, and/or international arbitration. The mechanism shall be specified in the Special Conditions of Contract.

29. Governing Language

29.1 The Contract shall be written in the language of the bid, as specified by the Purchaser in the Instructions to Bidders. Subject to Clause 30, that 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 that same language.

30. Applicable Law

30.1 The Contract shall be interpreted in accordance with the laws of the Union of India.

31. Notices

31.1 Any notice given by one party to the other pursuant to the Contract shall be sent in writing or by fax /e-mail and confirmed in writing to the address specified for that purpose in the Special Conditions of Contract.

31.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

32. Taxes and Duties

32.1 A supplier shall be entirely responsible for payment of all taxes, duties, license fees, etc. until taking over of the works by the Purchaser.

33. Right to use defective Goods

If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the Goods proves to be unsatisfactory, the Purchaser shall have the right to continue to operate or use such Goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Purchasers' operation.

34. Jurisdiction

For the settlement of any dispute arising out of the contract against this bid, only the Courts at Hyderabad shall have jurisdiction.

SECTION IV

SPECIAL CONDITIONS OF CONTRACT

PART – I(TERMS AND CONDITIONS)

TABLE OF CLAUSES

Item
Number

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

PART - 1

1. The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract. The corresponding clause number of the General Conditions is indicated in parentheses.

2. Definitions (Clause 1)

(a) The Purchaser is Centre for Materials for Electronics Technology (C-MET), Hyderabad.

(b) The Supplier is (Name of Supplier).

3. Country of Origin (Clause 3)

4. Equivalency of Standards and Codes (Clause 4)

Wherever reference is made in the contract to the respective standards and codes in accordance with which goods and materials are to be furnished, and work is to be performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly set forth in the Contract. Where such standards and codes are national in character, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Purchaser's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Supplier and submitted to the Purchaser at least 30 days prior to the date when the Supplier desires the Purchaser's approval. In the event the purchaser determines that such proposed deviations do not ensure equal or higher quality, the Supplier shall comply with the standards set forth in the documents.

5. Performance Security (Clause 7)

5.1 The Performance Security shall be in the amount of 10% of the Contract price.

5.2 Additional Performance Security, if deemed necessary, shall be submitted as mutually agreed by the Purchaser and the successful bidder at the time of acceptance of the contract/Purchase order.

6. Inspection and Tests (Clause 8)

6.1 The inspection of the Goods shall be carried out at factory /site to check whether the Goods are in conformity with the technical specifications attached to the purchase

order form and shall be in line with the inspection/test procedures laid down in the Schedule of Specifications and the Contract conditions by our Technical consultant

6.2 Manufacturer must have suitable facilities at their works for carrying out various performance tests on the equipment. The bidder should clearly confirm that all the facilities exist for inspection and shall be made available to the inspecting Authority.

6.3 A load and functional tests as indicated in the specifications must be carried out at the manufacturer's works. Reliability of the equipment shall be demonstrated to the satisfaction of the appointed inspector or inspecting Agency.

6.4 Approved supplier's drawings shall not be departed from except as provided in the Bidding Document.

6.5 The Purchaser shall have the right at all reasonable times to inspect, at the Supplier's premises all Supplier's drawings of any part of the work.

6.6 The supplier shall provide, within the time stated in the contract or in the programme, drawings showing how the plant is to be designed and any other information required for –

a) Preparing suitable foundations or other means of support.

b) Providing suitable access on the site for the plant and any necessary equipment to the place where the plant is to be erected and

c) Making necessary electrical connections from the panel board provided in the individual sections to the machines.

6.7 Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance manuals together with drawings of the goods and equipment as built. These shall be in such details as will enable the Purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications. The manuals and drawings shall be in the ruling language (English) and in such form and numbers as stated in the contract. Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawings have been supplied to the Purchaser.

6.8 The goods be accepted after inspection by the Purchaser, his representative or any inspection agency appointed by Purchaser and the costs for such Inspector/Agency shall be borne by the Purchaser.

7. Delivery and Documents (Clause 10)

Upon shipment/dispatch, the supplier shall notify to the purchaser by cable or telex the full details of dispatch including purchaser order no., description of the goods, quantity, mode of transport, place of loading, date of dispatch etc. The supplier will mail the following documents to the purchaser with a copy to the Insurance Company:

Original and five copies of:

(i) The Supplier's invoice showing purchase order no. Goods description, quantity, unit price, total amount;

(ii) Delivery note/case-wise detailed packing list identifying contents of each package/lorry receipt;

(iii) Manufacturer"s/Supplier's guarantee certificate;

(iv) Inspection Certificate issued by the nominated inspection agency, and the Supplier's factory inspection report;

(v) Certificate of origin;

(vi) Insurance policy;

(vii) Any other document evidencing payment of statutory levies.

(viii) The supplier's certificate certifying that the defects pointed out during inspection have been rectified. Note: The nomenclature used for the item description in the invoice/s, packing list/s and delivery note/s etc. Should be identical to that used in the purchase order. The dispatch particulars including name of transporter, LR no. And date should also be mentioned in the invoice/s.

8. (a) Insurance (clause 11)

The insurance shall be in an amount equal to 110% of the FOR Destination value of the goods from "warehouse to warehouse" on "All Risks" basis including Strike, Natural calamities but exclusive of War Risk valid for a period not less than 3 months after the date of arrival of Goods at final destination.
(b) For installation and commissioning job, Marine-cum-Erection insurance policy shall be obtained which shall be valid up to commissioning, including one month for testing and commissioning.

9. Incidental services (Clause 13)

9.1 The incidental services for supply, installation and commissioning contract, as follows shall be provided by the Supplier:

(a) Furnishing of tools required for assembly and maintenance of the supplied goods;
(b) Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods;
(c) On-site assembly and start-up of the supplied Goods;
(d) Furnishing of layout drawing etc. as specified in clause 3 of Special Conditions of Contract Part II.

10. Spare Parts (Clause 14)

Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spares such as gaskets, plugs, washers, belts, etc. during the warranty period for supply. Other spare parts and components shall be supplied as promptly as possible but in any case within three months of placement of order.

11. Warranty/Guarantee (Clause 15)

The warranty/guarantee shall be as per provision under Clause 15 of General Conditions.

12. Payment (Clause 16)

12.1 Payment terms:

Unless otherwise agreed to in writing between the Purchaser and the Supplier, payment for the delivery of the items or materials and installation shall be made as follows:

(a) 70% of the material supply value, on supply of items at the site on certification of Engineer In charge the related test certificates (maximum 5 instalment payment for entire supplies) + 100% GST.

(b) (i) Balance 20% of material supply as per para (a) above shall be payable after completion of erection, commissioning, installation and testing as per scope of work in all respects.

(ii) 90% of installation charges + 100% GST shall be payable after successful erection, commissioning, installation and testing of the Air Conditioning & Clean Room Works including Electrical & Gases.

(c) Balance 10% of material supply and installation as per para (a) and (b) (ii) shall be payable after submission of Performance Bank Guarantee (PBG) for the warranty period.

13. Resolution of Disputes (Clause 28)

13.1 In the event of any dispute in the interpretation of the terms of the order/contract or difference of opinion between the parties on any point in the order/contract arising out of or in connection with the agreement accepted order/contract or with regard to performance of any obligation hereunder by either party, the parties hereto shall use their best efforts to settle such disputes or difference of opinion amicably by mutual

negotiations. In case no agreement is reached, either party may forthwith give to the other, a notice in writing of the existence of such question, dispute or difference of opinion and the same shall be referred to the adjudication of sole arbitrator to be appointed by C-MET whose decision in the matter shall be final and binding on the parties.

The Arbitration proceedings shall be governed under the provisions of the Indian Arbitration and Conciliation Act, 1996 and the rules there under or any statutory modifications thereof for the time being in force. In the order/contract, the venue of such Arbitration shall have jurisdiction regarding any matter arising out of order/contract at Hyderabad.

Performance under the Contract shall, if reasonably possible, continue during the Arbitration proceedings and payments due to the Supplier by the Purchaser shall not be withheld, unless they are the subjects of the Arbitration proceedings. All awards for claims equivalent to Rupees thirty thousand or more shall be in writing and state the reasons for the amounts awarded.

14. Notices (Clause 31)

For the purpose of all the notices, the following shall be the address of the Purchaser and Supplier.

Purchaser- C-MET, Hyderabad:

Supplier (To be filled in at the time of Contract signature)

PART – II: SPECIAL CONDITIONS OF CONTRACT
(Terms and conditions For Installation)
TABLE OF CLAUSES

Item Topic

1. SUFFICIENCY OF TENDER

The Supplier by bidding shall be deemed to have satisfied himself as to all the conditions and circumstances affecting the Contract Price, as to the possibility of executing the works as shown and described in the Contract, as to the general circumstances at the site of the works, as to the general labour position at site and to have determined the prices accordingly.

2. PROGRAMME OF INSTALLATION AND COMMISSIONING

As soon as practicable after the acceptance of the bid, the Supplier shall submit to the Purchaser for his approval a comprehensive programme in the form of PERT network/ bar chart and any other form as may be required by the Purchaser showing the sequence of order in which the Supplier proposes to carry-out the works including the **Design Qualification(DQ), Manufacture, Factory acceptance test, Installation qualification, Performance qualification** for AC system, clean room facility delivery to site, erection and commissioning thereof. After submission to and approval by the Purchaser of such programme, the supplier shall adhere to the sequence of order and method stated therein. The submission to and approval by the Purchaser of such programme shall not relieve the Supplier of any of his duties or responsibilities under the Contract. The programme approved by the Purchaser shall form the basis of evaluating the pace of all works to be performed by the supplier. The Supplier shall update the PERT Network every month, submit it to the Purchaser and shall inform the Purchaser the progress on all the activities falling on schedule for the next reporting date. This should meet the target date fixed by the purchaser. The time limit for completion of entire activitiy shall be 90 days from the date of receipt of purchase/work order.

3. DRAWINGS

The Supplier should visit the site to acquaint himself in respect of existing site conditions and to know the details/information required for understanding the nature and type of civil construction works involved in the project. Complete drawings of the

indented works are furnished under the head Drawings. During the site visit as well as during Pre-bid meeting, doubts if any of the drawings may be get it clarified.

4.0 SUPPLIER'S SUPERINTENDENCE (AND) DEPLOYMENT OF ERECTION TEAM AND CONDUCT OF PERSONNEL

The Supplier shall employ one or more competent representatives, whose name or names shall have previously been communicated in writing to the Purchaser by the Supplier, to superintend the carrying out of the works on the site. The said representative or if more than one shall be employed, then one of such representatives shall be present on the site during all times, and any orders or instructions which the Purchaser may give to the said representative of the Supplier shall be deemed to have given to the Supplier. The said representative shall have full technical capabilities and complete administrative and financial powers to expeditiously and efficiently execute the work under the contract.

4.1 The Supplier shall, execute the works with due care and diligence within the time for completion and employ Supplier's team comprising qualified and experienced engineers together with adequate skilled. Semi-skilled and unskilled workmen in the site for carrying out the works. The Supplier shall ensure adequate workforce to keep the required pace at all times as per the schedule of completion. Supplier shall also ensure availability of competent engineers during commissioning/start up, trial runs, Operation of the plant/equipment till handing over of the plant.

4.2 The Supplier shall furnish the details of qualifications and experience of their senior supervisors and engineers assigned to the work site, including their experience in supervising erection and commissioning of plant and equipment of comparable capacity.

4.3 When the Supplier or Supplier's representative is not present on any part of the work where it may be desired to give directions in the event of emergencies, orders may be given by the Purchaser and shall be received and observed by the supervisors or foremen who may have charge of the particular part of the work in reference to which orders are given. Any such instructions, directions or notices given by the Purchaser shall be deemed to have been given to the Supplier.

4.4 The Supplier shall furnish to the Purchaser a fortnightly labour force report showing by classifications the number of employees engaged in the work. The Supplier's employment records shall include any reasonable information as may be required by the Purchaser. The Supplier should also display necessary information as may be required by statutory regulations.

4.5 None of the Supplier's supervisors, engineers, or laborers may be withdrawn from the work without notice to the Purchaser and further no such withdrawals shall be made if in the opinion of the Purchaser, it will adversely affect the required pace of progress and/or the successful completion of the work.

4.6 The Purchaser shall be at liberty to object to any representative or person, skilled, semi-skilled or unskilled worker employed by the Supplier in the execution of or otherwise about the works who shall, in the opinion of the Purchaser, misconduct himself or be incompetent, or negligent or unsuitable, and the Supplier shall remove the person so objected to, upon receipt of notice in writing from the Purchaser and shall provide in that place a competent representative at Supplier's own expense within a reasonable time.

4.7 In the execution of the works no persons other than the Supplier, sub- Supplier and their employees shall be allowed on the site except by the written permission of the Purchaser.

5.0 PURCHASER'S INSTRUCTIONS

The Purchaser may in his absolute discretion, issue from time to time drawings and/or instructions, directions and clarifications which are collectively referred to as Purchaser's instructions in regard to:

5.1 Any additional drawing and clarifications to exhibit or illustrate details.

5.2 Variations or modifications of the design, quality or quantity of work or the additions or omissions or substitution of any work.

5.3 Any discrepancy in the drawings or between the schedule of quantities and/or specifications.

5.4 Removal from the site of any material brought there by the Supplier, which are unacceptable to the Purchaser and the substitution of any other material thereof.

5.5 Removal and/or re-execution of any work erected by the Supplier, which are unacceptable to the Purchaser.

5.6 Dismissal from the work of any persons employed there upon who shall in the opinion of the Purchaser, misconduct himself, or be incompetent or negligent.

5.7 Opening up for inspection of any work covered up.

5.8 Amending and making good of any defects.

6.0 RIGHT OF THE PURCHASER

6.1 Right to direct works:

6.1.1 The Purchaser shall have the right to direct the manner in which all works under this Contract shall be conducted, in so far as it may be necessary to secure the safe and proper progress and specified quality of the works. All work shall be done and all materials shall be furnished to the satisfaction and approval of the Purchaser.

6.1.2 Whenever in the opinion of the Purchaser, the Supplier has made marked departures from the schedule of completion or when circumstances or requirement force such a departure from the said schedule, the Purchaser, in order to ensure compliance with the schedule, shall direct the order, pace and method of conducting the work, which shall be adhered to by the Supplier.

6.1.3 If in the judgment of the Purchaser, it becomes necessary at any time to accelerate the overall pace of the plant erection work, the Supplier, when directed by Purchaser, shall cease work at any particular point and transfer Supplier's men to such other point or points and execute such works, as may be directed by the Purchaser and at the discretion of the Purchaser.

6.2 Right to order modifications of methods and equipment

If at any time the Supplier's methods, materials or equipment appear to the Purchaser to be unsafe, inefficient or inadequate for securing the safety of workmen or the public, the quality of work or the rate of progress required, the Purchaser may direct the Supplier to ensure safety, and increase their efficiency and adequacy and the Supplier shall promptly comply with such directives. If at any time the Supplier's working force and equipment are inadequate in the opinion of the Purchaser, for securing the necessary progress as stipulated, the Supplier shall if so directed, increase the working force and equipment to such an extent as to give reasonable assurance of compliance with the schedule of completion. The absence of such demands from the Purchaser shall not relieve the Supplier of Supplier's obligations to secure the quality, the safe conducting of the work and the rate of progress required by the contract. The Supplier alone shall be and remain liable and responsible for the safety, efficiency and adequacy of Supplier's methods, materials, working force and equipment, irrespective of whether or not the Supplier makes any changes as a result of any order or orders received from the Purchaser.

6.3 Right to inspect the work

6.3.1 The Purchaser's representative shall be given full assistance in the form of the necessary tools, instruments, equipment and qualified operators to facilitate inspection.

6.3.2 The Purchaser reserves the right to call for the original test certificates for all the materials used in the erection work.
6.3.3 In the event the Purchaser's inspection reveals poor quality of work/materials, the Purchaser shall be at liberty to specify additional inspection procedures if required, to ascertain Supplier's compliance with the specifications of erection work.
6.3.4 Even though inspection is carried out by the Purchaser or Purchaser's representatives, such inspection shall not, however, relieve the Supplier of any or all responsibilities as per the contract, nor prejudice any claim, right or privilege which the Purchaser may have because of the use of defective or unsatisfactory materials or bad workmanship.

7.0 SUPPLIER'S FUNCTIONS

7.1 The Supplier shall provide everything necessary for proper execution of the works, according to the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein, provided that the same can reasonably be inferred there from and if the Supplier finds any discrepancy therein, Supplier shall immediately refer the same to the Purchaser whose decision shall be final and binding on the Supplier.
7.2 The Supplier shall proceed with the work to be performed under this Contract in the best and workman like manner by engaging qualified and efficient workers and finish the work in strict conformance with the drawings and specifications and any changes/modifications thereof made by the Purchaser.

7.3 VARIATIONS

7.3.1.1 The Purchaser shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion be desirable, he shall have power to order the Supplier to do and the Supplier shall do any of the following:
a. Increase or decrease the quantity of any work included in the contract,
b. Omit any such work,
c. Change the character or quality or kind of any such work,
d. Change the levels, lines, position and dimensions of any part of the works, and
e. Execute additional work of any kind necessary for the completion of the works and no such variation shall in any way vitiate or invalidate the contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract price.
7.3.1.2 No such variations shall be made by the Supplier without an order in writing of the Purchaser. Provided that no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this clause, but is the result of the quantities exceeding or being less than those stated in the Contract/Bill of Quantities. Provided further that if the Supplier shall within seven days confirm in writing to the Purchaser and such confirmation shall not be contradicted in writing by the Purchaser within 14 days, it shall be deemed to be an order in writing by the Purchaser**.**
7.3.2.1 All extra or additional work done or work omitted by order of the Purchaser shall be valued at the rates and prices set out in the contract if in the opinion of the Purchaser, the same shall be applicable. If the contract does not contain any rates or prices applicable to the extra or additional work, then suitable rates or prices shall be agreed upon between the Purchaser and the Supplier. In the event of disagreement the Purchaser shall fix such rates or prices as shall, in his opinion, be reasonable and proper.
7.3.2.2 Provided that if the nature or amount of any omission or addition relative to the nature or amount of the whole of the works or to any part thereof shall be such that, in the opinion of the Purchaser, the rate or price contained in the Contract for any item of the works is, by reason of such omission or addition, rendered unreasonable or

inapplicable, then a suitable rate or price shall be agreed upon between the Purchaser and the Supplier. In the event of disagreement the Purchaser shall fix such other rate or price as shall, in his opinion, be reasonable and proper having regard to the circumstances.
Provided also that no increase or decrease under sub-clause 7.3.2.1 of this clause or variation of rate or price under sub -clause 7.3.2.2 of this clause shall be made unless, as soon after the date of the order as is practicable and, in the case of extra or additional work, before the commencement of the work or as soon thereafter as is practicable, notice shall have been given in writing:
a. By the Supplier to the Purchaser of his intention to claim extra payment or a varied rate or price, Or
b. By the Purchaser to the Supplier of his intention to vary a rate or price.
7.3.2.3 If, on certified completion of the whole of the works, it shall be found that a reduction or increase greater than 15 per cent of the sum named in the Letter of Acceptance results from the aggregate effect of all Variation Orders but not from any other cause, the amount of the Contract Price shall be adjusted by such sum as may be agreed between the Supplier and the Purchaser or, failing agreement, fixed by the Purchaser having regard to all material and relevant factors, including the Supplier's site and general overhead costs of the contract.
7.3.2.4 The Supplier shall send to the Purchaser's representative once in every month an account giving particulars, as full and detailed as possible, of all claims for any additional payment to which the Supplier may consider himself entitled and of all extra or additional work ordered by the Purchaser which he has executed during the preceding month.
No final or interim claim for payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the Purchaser shall be entitled to authorize payment to be made for any such work or expense, notwithstanding the Supplier's failure to comply with this condition, if the Supplier has, at the earliest practicable opportunity, notified the Purchaser in writing that he intends to make a claim for such work.
7.4 The work shall be carried out as approved by the Purchaser or his authorized representative/s from time to time, keeping in view the overall schedule of completion of the project. The Supplier's job schedule must not disturb or interfere with Purchaser's or other Suppliers' or Contractors' schedules of day-to-day work. The Purchaser will provide all reasonable assistance for carrying out the jobs.
7.5 Night work will be permitted only with prior approval of the Purchaser. The Purchaser may also direct the Supplier to operate extra shifts over and above normal day shift to ensure completion of contract as per schedule. Adequate lighting wherever required should be provided by the Supplier at no extra cost. The Supplier should\ employ qualified electricians and wiremen for these facilities. In case of Supplier's failure to provide these facilities and personnel, the Purchaser has the right to arrange such facilities and personnel and to charge the cost thereof to the Supplier.
7.6 The Supplier shall, in the joint names of the Supplier and the Purchaser, insure the received goods and equipment and so far as reasonably practicable the Works and keep each part thereof insured for the Contract Sum or such other value as may be mutually agreed between the Purchaser and the Supplier against all loss or damage from whatever cause arising, other than the excepted risks, from the date of shipment or the date on which it becomes the property of the Purchaser, whichever is the earlier, until it is taken over by the Purchaser. The Supplier shall insure against the Supplier's liability in respect of any loss or damage occurring whilst the Supplier is on Site for the purpose of making good a defect or carrying out the Tests on Completion.
7.7 The Purchaser shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Supplier or any sub-Supplier,

save and except an accident or injury resulting from any act or default of the Purchaser, his agents, or servants. The Supplier shall indemnify and keep indemnified the Purchaser against all such damages and compensation, save and except as aforesaid and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

7.8 The Supplier shall insure against such liability with an insurer approved by the Purchaser, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him on the works shall, when required, produce to the Purchaser or Purchaser's representative such policy of insurance and the receipt for payment of the current premium.

Provided always that, in respect of any persons employed by any sub-supplier, the Supplier's obligations to ensure as aforesaid under this sub- clause shall be satisfied if the sub-supplier shall have insured against the liability in respect of such persons in such manner that the Purchaser is indemnified under the policy, but the Supplier shall require such sub -supplier to produce to the Purchaser or Purchaser's representative, when required, such policy of insurance and the receipt for the payment of the current premium.

7.9 Whenever proper execution of the work under the Contract depends on the jobs carried out by some other supplier, in such cases the Supplier should inspect all such erection and installation jobs and report to the Purchaser regarding any defects or discrepancies. The Supplier's failure to do so shall constitute as acceptance of the other supplier's installation/jobs as fit and proper for reception of Supplier's works except those defects which may develop after execution. Supplier should also report any discrepancy between the executed work and the drawings.

The Supplier shall extend all necessary help/co-operation to other suppliers working at the site in the interest of the work.

7.10 The Supplier shall keep a check on deliveries of the Goods covered in the scope of erection work and shall advise the Purchaser well in advance regarding possible holdup in Supplier's work due to the likely delay in delivery of such Goods to enable him to take remedial actions.

7.11 The Supplier shall be permitted to substitute equipment of equal on better performance subject to approval by the Purchaser; which approval shall not be unreasonably withheld, provided however that the Supplier establishes to the Purchaser's satisfaction that the performance of the substituted equipment is equal or better than the performance of the equipment specified in the contract and without any increase in the Contract price.

8.0 DUTIES OF THE SUPPLIER VIS-A-VIS THE PURCHASER:

8.1 The Goods, if any, to be supplied by the Purchaser for erection, testing and commissioning by the Supplier, shall be as listed in the Contract.

8.2 Besides the utilities/services as specified in battery limits the following assistance/facilities shall also be provided to the Supplier by the Purchaser for carrying out the installation work.

8.2.1 The main processing building for manufacturing of **SiC** Lab as specified in the main drawing for building and for pre-fabricated modular partitions Air movements, Air Flow Pressures differentials as per the classification of Rooms / Zones of classification Class B,C,D and clean room light fittings are mentioned in the drawing and above false ceiling it is proposed to take the ducts, piping ,cables, services lines etc.

8.2.2 Supplier shall carry-out final adjustments of foundations, leveling and dressing of foundation surfaces, bedding and grouting of anchor bolts, bed plates etc. required for seating of equipment in proper position. The Supplier shall be responsible for the reference lines and proper alignment of the equipment. However, all minor civil works which form and inseparable part of the installation and erection job like digging trenches for laying of cables, conduits and underground pipes, making cut-outs in

walls, floors and ceilings for pipelines, adjustment, leveling, dressing and grouting of foundations, grouting of supports are to be carried out by the Supplier at no extra cost. The necessary refilling/ repairs of these cutouts, pockets and trenches shall be done by the Supplier. The Supplier should arrange for laying the supports, cutouts, grouting of bolts, etc. when the civil works are in progress, so as to avoid refilling/repair works. The damages occurring to civil and other works are to be made good by the Supplier at Supplier's own costs.

8.2.3 Necessary temporary water for carrying out the installation shall be supplied at only one point within the project site by the Purchaser free of charge. All necessary distribution tapping from this point onwards shall be the Supplier's responsibility.

8.2.4 Necessary temporary power for carrying out the installation shall be arranged by the Supplier at Supplier's own cost. The necessary authorization letter will be issued by the Purchaser on written request by the Supplier. The temporary power may not be reliable at the site and this could affect the welding operations and other installation works. Supplier shall provide stabilizer and Diesel Generators "as necessary", to ensure adequate quality of welds and to ensure no delay in installation due to temporary power instability. No extra cost shall be paid by the purchaser on this account.

8.2.5 If the power is provided by the Purchaser, the recovery shall be @ 0.5% of the total purchase order value (supply, installation and commissioning). The charges will be deducted from the labour charges of installation and commissioning and testing bills of the supplier. However, the supplier shall supply all the items such as switchgear, cabling etc. required for getting temporary power.

8.3 The details of temporary water and power requirements shall be furnished one month in advance by the Supplier to enable the Purchaser to make timely arrangement.

8.4 If the Supplier suffers delay and/or incurs costs from failure on the part of the Purchaser to give possession of the civil works in accordance with the mutually agreed schedule, the Purchaser shall determine:

a. Any extension of time to which the Supplier is entitled under Clause 22 of GCC and;

b. The amount of such costs, which shall be added to the Contract Price, and shall notify the Supplier accordingly.

9.0 SUPPLY OF TOOLS, TACKLES AND MATERIALS

The Supplier shall, at his own expense, provide all the necessary equipment, tools and tackles, haulage power, consumables necessary for effective execution and completion of the works during erection and commissioning.

10.0 PROTECTION OF PLANT

10.1 The Purchaser shall not be responsible or held liable for any damage to person or property consequent upon the use, misuse or failure of any erection tools and equipment used by the Supplier or any of Supplier's sub- suppliers even though such tools and equipment may be furnished, rented or loaned to the Supplier or any of Supplier's sub-suppliers. The acceptance and/or use of any such tools and equipment by the Supplier or Supplier's sub-supplier shall be construed to mean that the Supplier accepts all responsibility for and agrees to indemnify and save the Purchaser from any and all claims for said damages resulting from the said use, misuse or failure of such tools and equipment.

10.2 The Supplier and Supplier's sub-supplier shall be responsible, during the works, for protection of work, which has been completed by other Suppliers. Necessary care must be taken to see that the Supplier's men cause no damage to the same during the course of execution of the work.

10.3 All other works completed or in progress as well as machinery and equipment that are liable to be damaged by the Supplier's work shall be protected by the Supplier and

protection shall remain and be maintained until its removal is directed by the Purchaser.

10.4 The Supplier shall effectively protect from the effects of weather and from damages or defacement and shall cover appropriately, wherever required, all the works for their complete protection.

10.5 The work shall be carried out by the Supplier without damage to any work and property adjacent to the area of Supplier's work to whomsoever it may belong and without interference with the operation of existing machines or equipment.

10.6 Adequate lighting, guarding and watching at and near all the storage handling, fabrication, pre-assembly and erection sites for properly carrying out the work and for safety and security shall be provided by the Supplier at Supplier's cost. The Supplier should adequately light the work area during nighttime also. The Supplier should also engage adequate electricians/wiremen. Helper etc. to carry out and maintain these Lighting facilities. If the Supplier fails in this regard, the Purchaser may provide lighting facilities as he may deem necessary and charge the cost thereof to the Supplier.

10.7 The Supplier shall take full responsibility for the care of the works or any section or portions thereof until the date stated in the taking over certificate issued in respect thereof and in case any damage or loss shall happen to any portion of the works not taken over as aforesaid, from any cause whatsoever, the same shall be made good by and at the sole cost of the Supplier and to the satisfaction of the Purchaser. The Supplier shall also be liable for any loss of or damage to the works occasioned by the Supplier or the Supplier's Sub-Supplier in the course of any operations carried out by the Supplier or by the Supplier's Sub-Suppliers for the purpose of completing any outstanding work or complying with the Supplier's obligations.

11.0 UNLOADING, TRANSPORTATION AND INSPECTION

11.1 The Supplier shall be required to unload all the Goods from the carriers, received at site after Supplier's team arrives at site. The Supplier shall plan in advance, based the information received from the Purchaser, Supplier's requirement of various tools, tackles, jacks, cranes, sleepers etc. required to unload the material/equipment promptly and efficiently. The Supplier shall ensure that adequate and all measures necessary to avoid any damage whatsoever to the equipment at the time of unloading are taken. Any demurrage/detention charges incurred due to the delay in unloading the material/equipment and releasing the carriers shall be charged to the Supplier's account. The Supplier shall be responsible for receipt at site of all Goods and Supplier's equipment delivered for the purposes of the Contract.

11.2 The Supplier shall safely transport/shift the unloaded Goods and equipment to the storage area.

11.3 All the Goods received by the Purchaser prior to arrival of the Supplier at site shall be handed over to the Supplier and there upon the Supplier shall inspect the same and furnish a receipt to the Purchaser. The manner in which the inspection shall be carried out is enumerated below:

11.3.1 The materials/equipment would be carefully unpacked by opening the wooden cases/other modes of packings as the case may be.

11.3.2 Detailed inventory of various items would be prepared clearly listing out the shortages, breakages/damages after checking the contents with respect to the supplier's packing list, the Purchaser's Contract and approved equipment drawings. The Supplier shall also check every equipment for any shortage/shortcoming that may eventually create difficulty at the time of installation or commissioning.

11.3.3 All the information and observations by the Supplier shall be furnished in the form of INSPECTION REPORT' to the Purchaser with specific mention / suggestions which in the opinion of the Supplier should be given due consideration and immediate necessary actions, to enable the Purchaser to arrange repair or replacement well in

time and avoid delays due to non-availability of equipment and parts at the time of their actual need.

11.3.4 The inspection for all the Goods handed over to the Supplier shall be completed within three week's period.

11.4 The protection, safety and security of the Goods so taken over from the Purchaser shall be the responsibility of the Supplier, until they are handed over to the Purchaser after erection, commissioning and testing as per the terms of the Contract.

12. STORAGE OF GOODS

The Supplier shall be responsible for the proper storage and maintenance of all Goods under Supplier's custody. Supplier shall take all required steps to carry out frequent inspection of equipment/materials stored as well as erected equipment until the same are taken over by the Purchaser. The following procedure shall apply for the same.

12.1 The Supplier's inspector shall check stored and installed Goods to observe signs of corrosion, damage to protective coating to parts, open ends in pipes, vessels and equipment, insulation resistance of electrical equipment etc. The Supplier shall immediately arrange a coat of protective painting whenever required. A record of all observations made on Goods, defects noticed shall be promptly communicated to the Purchaser and Purchaser's advice taken regarding the repairs/rectifications. The Supplier shall thereupon carry out such repairs/ rectifications at Supplier's own cost. In case the Supplier is not competent to carry out such repairs/ rectifications, the Purchaser reserves the right to have this done by other competent agencies at the Supplier's responsibility and risk and the entire cost for the same shall be recovered from the Supplier's bills.

12.2 The Supplier's inspector shall also inspect and provide lubrication to the assembled Goods. The shafts of such equipment shall be periodically rotated to prevent rusting as well as to check freeness of the same. **12.3** The Inspector shall check for any signs of moisture or rusting in any Goods.

12.4 If the commissioning of Goods is delayed after installation of the Goods, the Supplier shall carry out all protective measures suggested by the Purchaser during such period.

12.5 Adequate security measures shall be taken by the Supplier to prevent theft and loss of Goods handed over to the Supplier by the Purchaser. The Supplier shall carry out periodical inventory checks of the Goods received, stored and installed by the Supplier and any loss noticed shall be immediately reported to the purchaser. A proper record of these inventories shall be maintained by the Supplier. The Supplier should not sell, assign, mortgage, hypothecate or remove Goods which have been installed or which may be necessary for completion of the work without the written consent of the Purchaser.

12.6 A suitable grease recommended for protection of surfaces against rusting (refined from petroleum oil with lanclin minimum (70 deg C) and water in traces) shall be applied over all Goods as required once in every six months.

12.7 All Goods shall be stored inside a closed shed or in the open depending upon whether they are of indoor or outdoor design. The space heaters where provided into the electrical equipment shall be kept connected with power supply irrespective of their type of storage. Where space heaters are not provided adequate heating with bulb is recommended. For transformers heating of oil shall be done by giving 440 V supply and short-circuiting the LT terminals. Frequent checks on insulation resistance are essential for all electrical equipment and record of the inspection reports and meter readings shall be maintained equipment wise. Such records shall be presented to the Purchaser whenever demanded.

12.8 All the necessary Goods required for protection as described above shall be arranged by the Supplier and such cost shall be included in the Contract Price.

13. APPROVALS

13.1 The Supplier shall obtain the necessary approvals of the Factory Inspector, Boiler Inspector, Electrical Inspector, Weights & Measures Inspector, Explosive Inspector and any other state and local authorities as may be required and the cost of obtaining such approvals shall be included in the Contract Price. All the necessary details, drawings, submission of application and proformas will be furnished by the Supplier to the purchaser for verification/ signature. The necessary application duly filled-in, together with the prescribed fees shall be submitted to the appropriate authorities by the Supplier on behalf of the Purchaser. However all the actual statutory prescribed fees paid by the Supplier shall be reimbursed by the Purchaser upon production of the receipt/vouchers.

13.2 Wherever necessary or required, the Supplier shall furnish the necessary test and/or inspection certificates etc. from the appropriate authorities as per IER and other statutory regulations and the cost for obtaining these certificates shall be included in the Contract Price.

14. REVIEW AND CO-ORDINATION OF ERECTION WORK

The Supplier shall depute senior and competent personnel to attend the site coordination meetings that would generally be held at the site every month. The Supplier shall take necessary action to implement the decisions arrived at such meetings and shall also update the erection schedule.

15. EXTENSION OF TIME FOR COMPLETION

Should the amount of extra or additional work of any kind or any cause of delay referred to in these conditions, or exceptional or adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, as described in Clause 25 of the General Conditions of Contract, other than through a default of the Supplier, be such as fairly to entitle the Supplier to an extension of time for the completion of the works, the Purchaser shall determine the amount of such extension and shall notify the Supplier accordingly. Provided that the Purchaser is not bound to take into account any extra or additional work or other special circumstances unless the Supplier has within twenty-eight days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the Purchaser full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

PART - III: SPECIAL CONDITIONS OF CONTRACT FOR PROCESSING EQUIPMENTS AND UTILITIES INSTALLATION

Item Number **Topic**

1. Mechanical Installation
2. General Installation
3. Service Piping Installation
4. Special Instructions and specifications
5. Insulation of Piping and Equipment
6. Interconnections of Service and Electricals with equipment
7. Guidelines for expansion work
8. Clean up of Works Site
9. Cleaning chemicals and lubricants
10. Testing, commissioning and start-up
11. Painting
12. Training of personnel

SPECIAL CONDITIONS OF CONTRACT (PROCESSING EQUIPMENT AND UTILITIES INSTALLATION) 1.0 MECHANICAL INSTALLATION

The installation work would comprise:

a. General installation i.e. positioning and installing all the processing, miscellaneous and service equipment as per approved layout drawings and as per the contract.
b. Supply and installation of structural platforms and tables.
c. Supply and installation of all service and product piping including ancillary items.
d. Insulation and cladding of piping and equipment including supply of materials.
e. Interconnections of services and electrical with equipment.
f. Guide line for expansion work.
g. Clean up of work site.
h. Supply of all cleaning chemicals, passivation, boroscopic, x-rays and lubricants.
i. Testing, commissioning and start-up.
j. Painting including supply of paints as approved by the Owner.
k. Training of personnel.

Detailed specifications are given in the subsequent clauses.

2.0 GENERAL INSTALLATION

2.1 Positioning of Equipment

The work involves preparation of access for moving of the plant and equipment including their fittings from the work site go-down or from the place within the site where they have been unloaded, to the place of erection, decorating and placing on the foundation wherever required. All the civil foundations as per the manufacturer/supplier"s drawings shall be part of the scope of supplier. The Supplier shall place the equipment and carry out final adjustment of the foundations including alignment and dressing of foundation surface, embedding and grouting of anchor bolts and bedplates. The Supplier shall be responsible for obtaining correct reference lines for purpose of fixing the alignment of various equipment from master benchmarks provided by the Purchaser.

Tolerances shall be as specified in equipment manufacturers drawings or as stipulated by the purchaser. No equipment shall be permanently bolted down to foundations or structure until the alignment has been checked by the Supplier and witnessed by the Purchaser. The Supplier shall carry out minor

alterations in the anchor bolts, pockets etc., at no extra cost and set the equipment properly as per approved layout, drawings and manufacturer"s instructions. The

Supplier shall supply all the necessary foundation/anchor bolts and bed plates if required without extra cost.

The Supplier shall supply, fix and maintain, at his own cost, during the erection work, all the necessary centering, scaffolding, staging required not only for proper execution and protection of the said work but also for protection of the surrounding plant and equipment. The Supplier shall take out and remove any or all such centering, scaffolding, staging planking etc., as occasion shall require or when ordered to do so and shall fully reinstate and make good all things disturbed during execution of the work, to the satisfaction of the Owner. The Supplier shall be paid no additional amount for the above.

2.2 Structural Platforms, Service Pipe Bridge and Tables

Structural platforms shall be required to provide access for various equipments.

Pipe support bridges/gantry shall be required for supporting the pipes from the ground, including road crossings outside the buildings. Platforms, bridges/gantry and tables shall be fabricated keeping stability and other functional as well as aesthetic requirements into consideration as approved by the Owner. The payment for these shall be part of the contract for such items.

The supplier shall arrange for any civil works required for the above works based on the drawings and load details provided in the bid. Necessary templates and other accessories required by the civil contractor shall be provided by the bidder.

3.0 SERVICE PIPING INSTALLATION

3.1 General Guidelines

All piping systems shall comply with the latest editions of the following regulations wherever applicable.

3.1.1 Regulations of explosives inspectorate.

3.1.2 All applicable Indian Standards.

3.1.3 All applicable State Government/Central Government laws/acts.

3.1.4 The successful tenderer has to prepare all erection drawings of the proposed plant including equipment positions and service-piping positions (Isometric, where required), spacing between pipes, all other relevant details and submit these drawings to C-MET for approval.

3.2 Scope of Supply

The Supplier shall supply all materials, measuring instruments and all other items as shown in the flow diagram/specifications and schedule of quantities. All the pipes & fittings and insulation material etc. should be of class and make as approved by the Owner. Prior approval of the Owner must be obtained by the Supplier for the class and make of all materials. The Supplier should furnish the details of makes selected by him, in the proforma given below:

S.No	Nomenclature	List of approved makes	Make selected

3.3 Scope of Piping Erection

This to be performed by the Supplier as outlined below:

3.3.1 The scope of erection for piping, includes all system covered in the flow diagrams and specifications.

3.3.2 The Supplier"s work commences/terminates at the pipe connections with valves or flanges as specified in flow diagrams/battery limits.

3.3.3 The Supplier shall also install necessary pipings and any specialities furnished with or for equipment such as relief valves, built-in-pass and other items of this type.

3.3.4 The Supplier shall install primary elements for flow measurements, control valves and on-line metering equipment.

3.3.5 The Supplier shall perform necessary internal machining of pipes for installing orifices, flow nozzles, control valves etc.

3.3.6 The Supplier shall install all pipes, valves and specialities being procured from other sources.

3.4 Testing of Piping

3.4.2 The Supplier shall test all piping & equipments systems mentioned below including valves and specialities and instruments as per procedure mentioned under 3.4.4.

a) Steam Distribution piping
b) WFI water piping
c) DM water
d) Soft and raw water
e) Compressed Air
f) SS Piping for process, injection water ,chilled water and purified water
g) Waste water
h) Pressure vessels and Auto claves & Fermenters Etc.

3.4.2 All piping shall be internally cleaned and flushed by the Supplier after erection in a manner suited to the service and as directed by the Owner.

3.4.3 For hydrostatic testing and water flushing, the Supplier shall furnish necessary pumps, equipment, instruments and piping etc.

3.4.4 The details of testing pressures for various pipelines are mentioned below:

Sr.No.	Name	Test pressure	Test medium
i.	HP Steam pipelines	27 kg/sq. cm	Water
ii.	LP Steam pipelines	8 kg/sq. cm	Water
iii.	Water pipe lines (Soft, raw, chilling and ETP raw & soft)	8 kg/sq. cm	Water
iv.	Furnace oil/LS HS	16 kg/sq. cm	Water
v.	SS pipes	6 kg to 10 kg/sq. cm	Water
vi.	Air	12 kg/sq. cm	Air
vii.	**Refrigeration pipelines:**		
a)	Suction	16 kg/sq. cm	Nitrogen
b)	Discharge	24 kg/sq. cm	Nitrogen
c)	For complete Absolute zero System for 48 hours -		

Note:

1. Duration of test shall be 30 minutes for all pipes mentioned at i, ii, iii, iv & v with no allowable pressure drop.

2. For airline duration of test is 8 hrs with allowable pressure drop of 0.1kg/sq. cm.

3. For refrigeration line duration of test is 24 hrs with allowable pressure drop of 0.2 kg/sq. cm.

4. The vacuum test for complete system should be given for 48 hours at absolute zero.

5. The Owner/Engineer in-charge shall provide only water at available supply point from which the Supplier's temporary piping shall be connected.

3.5 Other Guidelines

3.5.1 Colour code shall be used to identify pipe material. The Supplier shall be able to identify on request all random piping prior to field fabrication.

3.5.2 The Supplier shall be responsible for the quality of welding done by them and shall conduct tests to determine the suitability of the welding procedure by him.

3.5.3 All piping supports, guides, anchors, hangers, rollers with structural framework shall be supplied and erected by the Supplier. Only anchor fasteners of adequate size shall be provide for support from RCC structures and Hilmit Gun shall be used for fastening the anchors. The kinds of pipe supports like CI clamps, wooden saddles,

roller supports and support framework shall be as per the design approved by the Owner prior to taking up the work.

3.5.4 All piping shall be suspended, guided and anchored with due regard to general requirements and to avoid interference with other pipes, hangers, electrical conduits and their supports, structural embers and equipment and to accommodate insulation and conform to buildings structural limitations. It is the responsibility to the piping Supplier to avoid all interference while locating hangers and supports.

3.5.5 Anchors and/or guides for pipelines or for other purposes shall be furnished, when specified, for holding the pipeline in position for alignment. Hangers shall be designed fabricated and assembled in such a manner that they cannot become disengaged by any movement of the support pipes.

3.5.6 All piping shall be wire brushed and purged with air blast to remove all rust, mill scale from inner surface. The method of cleaning shall be such that no material is left on the inner or on outer surfaces, which will affect the service-ability of the pipes.

3.5.7 Effective precautions such as capping and sealing shall be taken to protect all pipe ends against ingress of dirt and damage during transit or storage. The outside of the steel pipes (black) shall be painted with two coats of red oxide paint or as directed by the Owner.

3.5.8 All pipes in the corridor shall be supported from the sidewall.

3.5.9 Pipe support shall be of steel, adjustable for height and primers coated with rust preventive paints and finish coated with dark admiral grey of approved shade.

Where pipes and clamps are of dis-similar material, gaskets shall be provided in between. Pacing of pipe supports shall not exceed the following:

Pipe size Spacing between supports

Up to 12mm :1.5m
15 to 25mm : 2.0m
30 to 150mm: 2.0m
Over 150mm: 2.5m

3.5.10 Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor slab by clamps or collars attached to pipe and with a 15mm thick rubber pad or any resilient material. Where pipes pass through the terrace floor, suitable flashing shall be provided to prevent water leakage. Risers shall have a suitable clean out at a lower point and air vent at the highest point.

3.5.11 Pipe sleeves at least 3mm thick, 50mm/100mm larger in diameter than the pipes shall be provided wherever pipe passes through walls and slabs. Anullar space shall be filled with fiberglass and finished with retainer rings where these are located outside clean rooms. And inside clean rooms, annular space shall be filled with silicon sealant . No extra payment shall be made on account of providing the sleeves.

3.5.12 All piping works shall be carried out in a workman like manner, causing minimum disturbance to the services, buildings, roads and structures. The entire piping work shall be organized, in consultation with other agencies work, so that laying of pipe support, pipes and pressure testing for each area shall be carried out in one stretch.

3.5.13 Cutouts details in the floors and slabs for installing various pipe are to be provided by the contractor immediately after receipt of the purchase order, so as to make the cutouts ready by civil contractor.

3.5.14 The contractor shall make sure that the clamps, brackets, clamp saddles and hangers provided for pipe supports are adequate. Piping layout shall take due care for expansion and contraction in pipes include expansion joints wherever required.

3.5.15 All pipes shall be accurately cut to the required size in accordance with the relevant BIS code and burrs removed before laying. Open ends of the piping shall be

closed as the pipe is installed to avoid entrance of foreign matters. Where reducers are to be made in horizontal runs, eccentric reducers shall be used for piping to drain fully. In other locations concentric reducers may be used.

3.5.16 All buried pipes shall be cleaned and coated with zinc chromate primer and bitumen paint, then wrapped with three layers of fibre glass tissue, each layer laid in bitumen.

3.5.17 Auto purge valve shall be provided with all high points in the piping system for venting. Air valve shall be 15mm, pipe size valves with screwed joints. Discharge from the air valves shall be piped through an equal size mild steel, hot galvanized pipe to the nearest drain or sump. These pipes shall be pitched towards drain point.

3.5.18 Tee-off connections shall be through equal or reducing tees. Otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.

4.0 SPECIAL INSTRUCTIONS AND SPECIFICATIONS

4.1 Steam Piping

4.1.1 Steam piping work can be classified into two categories:

a) High-pressure steam piping when the working pressure of steam is more than 3.1 kg/sq.cm (50 psi).

b) Low-pressure steam piping when the working pressure of steam is below 3.1 kg/sq.cm (50 psi).

All the pipes and fittings used for high pressure steam piping work should conform to IBR and they should be IBR certified and also to be identified with number and mark showing that they are tested by the Boiler Inspector and supported with duly authentic certificates to this effect. ALL HIGH PRESSURE STEAM PIPES SHALL BE SEAMLESS TYPE, SCHEDULE 40.

4.1.2 The high pressure steam piping after installation should be hydraulically tested in presence of the Boiler Inspector for his approval.

4.1.3 The high-pressure steam piping work should also include fabrication and installation of pressure reducing stations strictly conforming to IBR.

4.2 Chilled Water Piping:

All the piping for chilled water, ammonia, soft and raw water, steam pipes and air shall generally of welded construction. Whenever welding is done for pipes of smaller size special care should be exercised to avoid clogging of flow area with the welding material.

4.3 SS Piping;

4.3.1 The pipe supports for SS piping including the clamps shall be of SS pendants with SS pipes. The SS pipe sleeves used for pipe supports and accessories like nipples, clamps, ASE plates etc. shall be supplied by supplier.

4.3.2 Pipe supports for SS piping are to be provided at distance of not less than 2.5m c/c or as instructed by Engineer-in-charge.

4.3.2 PROCUDURE TO BE ADOPTED FOR SS WELDING

a) The SS pipes shall be cut square and joints to be prepared without damage to the electro polishing of the pipes.

b) The welding shall be done using ORBITOL welding procedure, with boroscopy and radiography .

c) The joints then shall be cleaned using proper passivation procedures like cleaning with nitric acid, abrasive material such as 3M abrasive weld cleaning cloth so that proper polishing is maintained at the weld joints, etc.,.

d) Weld penetration of the inner side of the pipe shall be avoided.

5.0 INSULATIONN OF PIPING AND EQUIPMENT

5.1 Insulation of Chilled Water and Refrigeration Pipeline

All the chilled water pipelines shall be insulated by expanded polystyrene or polyurethane foam or any other high-grade insulation acceptable to the Purchaser.

This insulation could be in pre-formed sections or cast in situ. The insulation with pre-formed sections shall be carried out in the following manner.

5.1.1 Before starting insulation work all pipelines shall be tested for 8.5 kg/sq. cm pressure.

5.1.2 The surface of the pipes to be insulated should be properly cleaned.

5.1.3 Hot bitumen of 85/40 or 85/25 conforming to IS 702 should be applied uniformly @ 1.5 kg per sq.m.on the surface of the pipes.

5.1.4 A similar layer of bitumen should be applied on the inner surface and on the edges of the insulation sections.

5.1.5 The sections should then be stuck to the coated pipes with joints staggered. Adjacent sections should be tightly pressed together.

5.1.6 All joints should be properly sealed with bitumen.

5.1.7 A thick vapour seal of hot bitumen @ 2.5 kg/sq. cm should be applied uniformly on the outer surfaces of the pipe sections and allowed to dry.

5.1.8 In case the insulation sweats or the specified/required insulation properties are not attained, the entire insulation in such region shall be redone with fresh material, entirely at the Supplier's cost.

5.1.9 The thickness of insulation may be as per standard procedure/or as per section VI (technical specifications).

Note: In situ insulation shall be carried out as per standard procedure**.**

5.2 Insulation of Steam and Heater Pipe Lines

All the steam and Heater pipelines shall be insulated with mineral wool or equivalent of specified thickness. The insulation shall be carried out in the following manner and should be supplied in the form of properly required sizes.

5.2.1 Clean the surfaces to be insulated. Apply a coat of red oxide primer and fix glass wool/mineral wool of specified thickness, tightly to the pipes, butting all joints and tie with lacing wire.

5.2.2 It should then be covered with GI wire netting of 20 mm x 24 SWG.

5.2.3 In case the insulation does not have the desired insulation properties, the entire insulation will have to be redone at the Supplier's cost to give the desired results.

5.2.4 In case of condensate return piping all the steps mentioned above shall be executed except that thickness of the insulation shall be 25 mm.

RECOMMENDED THICKNESS OF EXPANDED POLYSTYRENE FOR PIPE INSULATIONS NORMAL PIPE SIZES

Temp 15mm 20mm 25mm 32mm 40mm 50mm 65mm 80mm 100mm 125mm 150mm InoC 1/2" 3/4" 1" 1x1/4" 1x1/2" 2" 2x1/2" 3" 4" 5" 6" ----------

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20 25 25 25 25 25 25 40 40 40 50 50
10 25 25 25 40 40 40 40 40 50 50 50
0 40 40 40 50 50 50 50 50 50 50 75
(-)10 50 50 50 50 65 65 75 75 75 75 75
(-)20 50 50 65 65 65 75 75 75 100 100 100
(-)30 65 65 65 75 75 100 100 100 100 100 100

Above data is based on average conditions and should be modified to suit the individual technical requirements.

5.3 Aluminium/SS Cladding

5.3.1 The chilled water, refrigeration, water, & Heater/steam lines after insulations shall be covered by Aluminium/SS cladding.

5.3.2 Aluminium cladding will be done with 22-gauge aluminum sheet with proper roves and overlaps and screwed in position with 12 mm. self-tapping parker screws.

5.3.3 SS sheet cladding will be done with 26 gauge sheet with proper grooves and overlaps and screwed in position with 12 mm self tapping parker screw. The SS sheet cladding will be required only in the internal areas.

5.4 All the necessary materials of quantity and make approved by the Owner, required for carrying out insulation, cladding and other works mentioned above, shall be supplied by the Supplier.

PART -IV

6.0 INTER CONNECTIONS OF SERVICE AND ELECTRICALS WITH EQUIPMENT

6.1 The Supplier shall lay service piping and provide connections with the equipment complying strictly with the equipment manufacturers' instructions. The Supplier shall also carry out all the interconnecting service piping with the various items of plant/system. The work shall be complete with capillary piping if required and connections with instruments and controls supplied with the equipment.

6.2 The Supplier shall also carry out electrical connections for equipment with the control panels including equipment lighting as per the wiring diagrams of the equipment suppliers. Connection shall be made for small electrically operated devices on equipment installed as accessories to, or assembled with equipment. Connections regarding instruments, float switches, limit switches, pressure switches, thermostats and other miscellaneous equipment shall be done as per manufacturers' drawings & instructions.

7.0 GUIDELINES FOR EXPANSION WORK

7.1 Shutdowns

Plant shutdown shall be required for making tappings/interconnections of the new equipment proposed to be installed under expansion with the existing equipment. These shut downs should be planned carefully well in advance to enable the Owner to take suitable actions for ensuring normal Plant operations. The details of shut downs; the numbers and duration should be worked out and intimated to the Owner for approval. The Supplier should ensure completion of all the necessary works well within the allowed time so that no inconvenience is caused in regular operation and working of the existing plant.

7.2 Cleanliness

Wherever the Supplier is required to work in existing plant area he should take due care and extra precautions to ensure absolute cleanliness and minimum hindrance for proper working of the existing plant.

7.3 Change over

The programmes for change over from existing plant system to new plant system should be prepared by the Supplier and should be got approved by the Owner.

7.4 Modifications and rectifications of existing plant and equipment

During expansion work, the Supplier shall be required to carry out modifications, repairs/replacement of the existing equipment. The alterations/modifications not specified in the contract/order and or minor in nature requiring not more than 24 man-hours for each item, will be carried out by the Supplier without any extra cost. However, if the modifications are of major nature and if not specified in the Contract/order, the Supplier shall be paid for such works based on man-hour rates.

8.0 CLEAN UP OF WORKS SITE

8.1 All soils, filth or other matters of an offensive nature taken out of any trench, drain or other places shall not be deposited on the surfaces, but shall at once be carted away by the Supplier from the site of work for proper disposal.

8.2 The Supplier shall not store or place the equipment, materials or erection tools on the drive ways and passages and shall take care that his work in no way restricts or impedes traffic or passage of men and materials during erection. The Supplier shall without any additional payment, at all time keep the working

and storage area used by him free from accumulation of dust or combustible materials, waste materials rubbish packing, wooden planks to avoid fire hazards and hindrance to other works.

8.3 If the Supplier fails to comply with these requirements in spite of written instructions from the Owner, the Owner will proceed to clear these areas and the expenses incurred by the Owner in this regard shall be payable by the Supplier. Before completion of the work, the Supplier shall remove or dispose off in a satisfactory manner all scaffolding, temporary structures, waste and debris and leave the promises in a condition satisfactory to the Owner. Any packing materials received with the equipment shall remain as the property of the owner and may be used by the Supplier on payment of standard charges to the Owner and with prior approval of the Owner. At the completion of his work and before final payment, the Supplier shall remove and shall restore the site to neat workman like conditions at his cost.

9.0 CLEANING CHEMICALS AND LUBRICANTS

The necessary quantities of cleaning chemicals and the first charge of oil and lubricants required for the installation, commissioning, testing and start- up of all the equipment till handing over are to be supplied by the Supplier and nothing extra would be paid for these.

10.0 TESTING, COMMISSIONING AND START-UP

10.1 The Supplier shall operate, maintain and give satisfactory trial run of the plant in such manner and for such periods as has been specified in Section VI (Technical Specifications).

10.2 The commissioning shall also include the following for each equipment:

10.2.1 Field dis-assembly and assembly of equipment, instruments and controls where required for access to fixing or adjustment.

10.2.2 Clean out of lubrication system including chemical cleaning wherever required.

10.2.3 Circulation of lubricant to check flow.

10.2.4 Clean out and check out of all the service lines.

10.2.5 Check out and commissioning of instruments, equipment and plants, filtering of transformer and other oils so that if deteriorated, they shall attain the required properties/standards, specified tests in this regard must be carried out by approved authorities and their satisfactory reports submitted to the Owner before start-up.

10.2.6 Recharging or make-up filling of lubricant oil up to the desired level in the lubrication system of individual machine.

10.2.7 Operation in empty condition to check general operation details wherever required and wherever possible.

10.2.8 Closed loop dynamic testing with water wherever required.

10.2.9 Operation under load and gradual load increase to attain maximum rated output.

10.2.10 Trouble shooting during the trial period.

10.3 The Supplier shall demonstrate proper working of all mechanical and electrical controls; safety and protective device, in presence of the Owner's engineer and the same should be duly recorded.

10.3.1 Commissioning of automation system:

The supplier should provide a detailed schedule of testing all automation and control systems.

All controlled or monitoring devices on the plant should be tested from the relevant control centre and recorded to be operating as designed, including feed back detection.

A log of these operations is to be maintained, and each completed group of tests to be signed by the supplier's commissioning engineer.

The purchaser reserves the right to witness as much of these test procedures, as he may feel necessary.

Testing procedures and commissioning period will be as specified in Section VI.
10.4 After conducting testing, in case a particular equipment is not working properly or not giving rated output the Supplier will furnish a detailed report to the Owner stating therein the detailed account on the performance of the equipment with possible reasons for improper or not working of the same.
10.4 After satisfactory commissioning and start-up, the Supplier shall keep/depute his representatives at the plant in the manner, for the duration and for the performance of such tasks as specified in Section VI.
10.5 The testing, commissioning and start up are considered to be satisfactory only when the cumulative performance meets the designed qualifications.

11.0 PAINTING

All the equipment/machineries like motors, pumps, HT/LT panel, transformer, switch boards, starters, junction boxes, isolators, storage tanks, supporting structures, pipe supports and MS/GI pipes and all exposed and visible iron parts included in the scope of erection/commissioning shall be given double coat
of paint of approved shade over a double coat of anti-corrosive primer wherever necessary irrespective of the condition of original paint of equipment/machineries/structures/supports. All surfaces wherever required must be properly cleaned from scale, dirt and grease prior to painting. Spray painting must preferably be used on all the equipment/machineries and wherever practicable. Suitable and necessary cleaning/ wiping of sight/dial glasses, other non-metallic parts, flooring, walls and other surfaces which have been spoiled by paint during painting must also be carried out by the Supplier.
Lettering and other markings, including capacity and flow direction markings, shall also be carried out by the Supplier on the tanks, pipe lines, starters, motors, isolators and wherever else necessary, as directed and as per the standard practice of installation. ISI colour codes and colour charts must be adhered to.
Supply of all paints and all other materials required is included in the scope of supply of the Supplier under this contract/order.

12.0 TRAINING OF PERSONNEL

The supplier shall train the staff for operating the clean room facility including trouble shooting. Therefore, the supplier team of personnel shall involve C-MET staff during the course of installation; testing, commissioning of the facility to familiarize with the work.

APPLICABLE INDIAN STANDARDS

A. MECHANICAL

IS: 660 Safety code for mechanical refrigeration.
IS: 661 Code of practice for thermal insulation of cold storages.
IS: 702 Industrial bitumen.
IS: 778 Gunmetal gate, globe and check valves for general purposes.
IS: 1703 Ball valves including floats for water supply purposes.
IS: 1239 Mild steel tubes, tubular and other wrought steel pipe fittings.
IS: 2041 Steel plates for pressure vessels used at moderate and low temperatures.
IS: 2379 Colour code for the identification of pipelines.
IS: 2494 V-belts for industrial purposes.
IS: 2629 Hot dip galvanizing of iron and steel.
IS: 2825 Code for unfired pressure vessels.
IS: 3233 Glossary of terms for safety and relief valves.
IS: 3503 Steel for pressure vessels and welded structures.
IS: 3601 Steel tubes for mechanical and general engineering purposes.
IS: 3615 Glossary of terms used in refrigeration and air conditioning.

IS: 3624 Pressure and vacuum gauges.
IS: 3696 Safety code for scaffolds and ladders.
IS: 4049 Formed ends for tanks and pressure vessels.
IS: 4503 Shell and tube type heat exchangers.
IS: 4671 Expanded polystyrene for thermal insulation purposes.
IS: 4736 Hot dip steel coatings on steel tubes.
IS: 4831 Units and symbols for refrigeration.
IS: 4984 HDPE pipes for potable water supplies, sewage and industrial effluents.
IS: 5428 Gauge glasses.
IS: 6392 Steel pipe flanges.
IS: 9520 Nominal sizes for valves.
IS: 8623 Selection, use and maintenance of respiratory protective devices.
IS: 9762 Polythene floats for ball valves.
IS: 9890 General purpose ball valves.
IS: 10005 SI units.
IS: 10234 Recommendations for general pipeline welding.
IS: 11329 Finned type heat exchanger for room air conditioner.
IS: 11330 Refrigeration oil separator.
IS: 2501 Solid drawn copper tubes for general engineering purposes
IS: 10773 Wrought copper tubes for refrigeration and air conditioning
ISO 14644-1: for cleanroom HVAC system(Classification of Air cleanliness)
ISO 14644-2: Specifications for testing and monitoring
ISO 14644-3: Metrology and test methods.
ISO 14644-4: Design, construction and start-up
ISO 14644-5: Operations
IS: 655 For Ducting

B. ELECTRICAL

IS: 325 Three phase induction motors.
IS: 1248 Electrical measuring instruments and their accessories.
IS: 2705 Current transformers.
IS: 2968 Dimensions of slide rails of electric motors.
IS: 3480 Flexible steel conduits for electrical wiring.
IS: 4064 Air break switches.
IS: 8544 Motor starters for voltages not exceeding 1000 V.
IS: 9537 Conduits for electrical installation.
IS: 10028 Selection, installation and maintenance of transformers.
IS: 10118 Selection, installation and maintenance of switchgear and control gear.
SP: 30 National electrical code.
NOTE Other standards to be followed for electrical work are
listed in Special Conditions of Contract.

SECTION -V
SCHEDULE OF REQUIREMENTS

ELIGIBILITY CRITERIA INFORMATION CHECKLIST TO ACOMPANY THE TECHNICAL (BID) TENDER

S No	Documents to be submitted	Description	Photocopy of documents to be submitted	Remarks	Page No
1	2	3	4	5	6
1 (a)	Tenderer registration under approrpirate class with Govt/PSU	Registration	Yes/No		
(b)	Partnership deed in case of firms & Articles of association in case of companies				
2	Copy of PAN card and copy of latest IT returns submitted alongwith proof of receipt	PAN & IT Return			
3	Work completion certificates in support of Annual Turn Over in Clean room works (as per Format at Statement -I)	Annual turnover			
4	Work completion certificates in support of satisfactory completion of similar works (as per Format at Statement -II)	Similar works			
5	Experience certificates in support of execution of Industrial clean room (as per Format at Statement - III)	Executed details			
6	Statement of existing coming/ongoing works with	Existing commitments			

	Govt/PSU/MNC etc (as per Format at Statement -IV A)				
7	Statement of works for which tenders are submitted as per Statement IV - B)	Works awarded/ likely to be awarded			
8	Availability of equipment (as per Format at Statement -V)	Equipment			
9	Availability of key personnel (as per Format at Statement -VI)	Key personnel			
10	Information of litigation history (as per Format at Statement -VII)	Details			
11	Declaration of testing equipment (as per Format at Statement -VIII)	Testing eqpt			
12	Credit facilities/solvency certificate from banks	Credit facilities			
13	Bid Security/Earnest Money Deposit (EMD)	EMD			
14	GST Registration details	GST			
15	Annual Turnover for clean room only duly certify by a CA supported by P&L statement and TDS certificate for last 3 years				

All the statements copies of the certificates, documents etc., enclosed to the Technical bid shall be given page numbers on the right corner of each certificate, which shall be indicated in Remarks - column (5) against each item.

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – I

Details of value of Clean Room Works (original) executed in each year during the last three financial years by the Contractor:

S No	FINANCIAL YEAR	VALUE IN INR
1	2014-15	
2	2015-16	
3	2016-17	

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – II

Details of similar Industrial clean room works completed in the name of the Tenderer during the last five financial years.

S No	Name of the work	Name of the organisation (Govt/Private)	Date of Agreement & date	Contact official details with Tele/Mobile/ email id	Value of contract	Date of completion Stipulated
1	2	3	4	5	6	7

Date of completion`	Value of work done year wise during the last 5 (five) years					Total value of work done
	1st	2nd	3rd	4th	5th	
8	9					10

Attach relevant certificates showing work wise / year wise value of work done and date of completion.

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – III

The details of execution of Industrial clean room during the last 5 Financial years (work wise and year wise)

S No	Financial year	Name of work (s)	PO/WO value	Remarks
1	2	3	4	5
1	2012-13			
2	2013-14			
3	2014-15			
4	2015-16			
5	2016-17			

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – IV A

Details of Existing Commitments

Details of works on hand and, yet to be completed as on the date of submission of the Tender and works for which Tender s have been submitted are to be furnished:

S.No.	Name of work	Address of Agreement concluding authority	Agt No. & Date	Value of Contract	Stipulated period of completion	Value of work done so far	Balance value of works to be completed	Anticipated date of completion	Updated value of balanced work
1	2	3	4	5	6	7	8	9	10

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – IV

Details of works for which Tenders are submitted [awarded / likely to be awarded]

S No	Name of work	Name of the organisation	Estimated value of work	Stipulation period of completion	Date of submission of tender	Present status
1	2	3	4	5	6	7

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – V

Availability of Equipment for Testing & Commissioning

The tenderer should furnish the information required below, regarding the availability of the equipment, required for execution & commissioning.

Sl.No.	Details	Number	Number		
			Owned	Leased	To be procured
1	2	3	4	5	6

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – VI

Availability of Key Personnel

Qualification and experience of Key Personnel proposed to be deployed for the execution of the Contract					
Sl. No.	Name	Designation	Qualification	Total Experience	Working with the Tenderer since
1	2	3	4	5	6

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

STATEMENT – VII

Information on litigation history in which Tenderer is the Petitioner

S No	Case No	Year of filling	Court where filed	Subject matter/ prayer in the case	Details of respondents	Present status
1	2	3	4	5	6	7

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

A declaration regarding the testing equipment's owned shall be produced by the Tenderer as below;

STATEMENT – VIII

DECLARATION

"I, _____do hereby solemnly affirm and declare that I /we own the following testing equipment for using on the subject work and also declare that I / We will abide by any action such as disqualification or determination of Contract or blacklisting or any action deemed fit, if the department detects at any stage that I/we do not possess the testing equipment listed below.

Sl. No	Details	No.	Year of Purchase	Capacity	Any other data	Is it in working condition?
1	2	3	4	5	6	7

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

`

SECTION VI

BASIS OF DESIGN

AIR CONDITIONING & CLEAN ROOM WORKS INCLUDING
ELECTRICAL & GASES **FOR**
SiC LABORATORY

TENDER SPECIFICATION AND BILL OF QUANTITIES OF EQUIPMENT/ITEMS AS ESTIMATED BY C-MET

It is expressly mentioned for all the bidders that the Bill of Quantities mentioned below are indicative and needs to be reconfirmed by the bidders to ensure that the* Clean Room works including airconditioning, electrical & gase lines system at SiC laboratory** (Clean Room of 100000 class) ***as required under turnkey project. Under no circumstances lack of performance of the total system can be related to either bill of quantities indicated in the tender or insufficiency of tender specifications mentioned in the tender. Bidder shares the entire responsibility for the quotation.

TENDER SPECIFICATIONS

1.0 BASIS OF DESIGN

INPUT DATA

SITE	**:**	**HYDERABAD**
AMBIENT CONDITIONS		**:**
Summer	:	106 Deg.F DB & 78 Deg.F WB
Monsoon	:	85 Deg.F DB & 81 Deg.F WB
Winter	:	55 Deg.F DB & 48 Deg.F WB
INSIDE CONDITIONS	**:**	23 ºC ±2 DB & RH NMT 60%
AIR CONDITIONING AREA	**:**	As per attached Room Book
HEIGHT	**:**	As per attached Room Book
OCCUPANCY	**:**	As per Attached Room Book
EQUIPMENT LOAD	**:**	As per Attached Room Book
FRESH AIR	**:**	As per Attached Room Book
ROOMS PRESSURE	**:**	As per Attached Room Book
ROOMS CLASSIFICATION	**:**	As per Attached Room Book
POWER REQUIREMENT	**:**	As per Attached Electrical Load sheet

2. SYSTEM DESCRIPTION

COOLING LOAD & PLANT SELECTION:-

- The total cooling loads works out for the above said areas is **44TR** including fresh air load.
- System proposed shall be with DX type Air handling units in conjunction with air cooled scroll condensing units .
- The main AHU shall be inter connected with 4 nos of 11TR condensing units for the total areas. The fresh air shall be fed to main AHU as a replenishment air against exhaust air that is required for internal equipments like fume hoods etc. The total exhaust air qty considered is 2600 CFM.
- Consider hard copper piping along with fittings for inter connecting the AHU& Condensing units.
- Air cooled condensing units are considered with energy efficient Scroll compressors and with non CFC refrigerant of R410A. The related ancillary works of Insulated supply and return air ducting, aluminium powder coated grills etc

3. DESIGN PARAMETERS

Performance rating of the units shall be based as per the requirement.
Design parameters for selection of condensing units:

Type of Condensing Unit	:	Air cooled scroll condensing unit
Refrigerant	:	R 410 A / Equivalent
Type of compressor	:	Scroll
Delivered Capacity	:	As given in the BOQ
Suction saturation temperature	:	40 ºF
Ambient Temperature	:	106 deg. F
Power Consumption at @ 100% Load	:	Shall not exceed 1.4 IKW / TR
Number of compressors	:	Single
Number of incoming feeder	:	One

Vibration isolation springs / pads, complete refrigerant piping accessories like suction strainer, liquid line drier, expansion valves, etc, shall be supplied with the condensing unit. Condensing unit shall have protection mesh for compressor section and condenser section. Design parameters for selection of AHU:

Maximum face velocity across pre filters	=	500 ft/min
Maximum face velocity across fine filters	=	500 ft/min
Maximum fan outlet velocity	=	1800 ft/min
Maximum fan speed	=	1450 RPM (Max)
Maximum fan motor speed	=	1450 RPM

Design Parameters for duct design shall be:

Maximum flow velocity for A/c ducts	=	1500 ft/min
Maximum velocity at supply air outlet	=	500 ft/min
Maximum friction in AC ducts per 100 ft length	=	0.10 Inches

Design parameters for cooling coil design:

Maximum face velocity across coil	=	500 ft/min

4. MODE OF MEASUREMENTS:

Mode of Measurement for payment of items of ducting and piping & their insulation shall be as follows:

4.1 DUCTING:

Payment for ducting shall be on the basis of the external surface area of the ducting including all material and labour for installed duct. The Rate/SM of the external surface shall include all wastages, flanges, gaskets for joints, bolts and nuts, duct supports and hanger vibration isolation pads or suspenders, flexible connections, inspection doors, running vanes, straight vanes, and any item which will be required to complete the external insulation and acoustic lining. The external area shall be calculated by measuring the overall width and depth (including the corner joints) in the center of the duct section from flange face to flange face in case of ducts length with uniform cross section. Total area will be arrived by adding up the area of all duct sections. In case of taper pieces average width and depth will be worked out as follows:-

W 1 = Width of small cross section
W 2 = Width of large cross section
D 1 = Depth of small cross section
D 2 = Depth of large cross section

Average Width = $\frac{W1 + W2}{2}$ Average Depth = $\frac{D1 + D2}{2}$

Width and depth in the case of taper pieces shall be measured at the edge of the collar of the flange for duct sections flatted with angle iron flanges, otherwise at the bottom of the flange where the flanges are of duct sheet. For circular pieces the diameter of the section midway between large and small diameters shall be measured and adopted as the mean diameter for calculating the surface area of the taper piece. Duct measurements for calculation of area shall be taken before applications of insulation. For the special pieces like bends, branches and tees etc., same principles of area measurements as for liner and outer periphery along the curvature angle of the piece shall apply.

4.2 DUCT/THERMAL INSULATION:

This item is provided separately for various thickness and shall be paid for an area basis of un-insulated duct. The area of the duct to be insulated shall be measured before application of insulation. The Thermal insulation shall also be paid on the basis of the area to be covered. This includes the measurement of beam circumference to be insulated.

4.3 GRILLS AND DAMPERS:

These shall be measured on the basis of physical dimensions of the damper and grills installed at site. The physical measurement shall exclude the flanges on all sides and would be clear inside-to-inside dimension of the damper, grill area.

5. CODES & STANDARDS

The design, manufacture, installation, inspection and testing of Air Filters shall comply with all currently applicable statutory regulation, and safety codes in the locality where the Air Filters are to be installed. The equipment shall also conform to the requirement of the latest applicable Indian / International Standard. Nothing in this specification shall be construed to

relieve the Contractor of his responsibility. In particular, the equipment shall conform to the latest edition of the following standards.

MIL-STD-282	:	DOP Smoke Penetration Method
EN 1822	:	Testing of HEPA filters
DW 142 AMAC & 10	:	For construction & leakage testing of ducts as per class.
ISO 14644 Part I	:	Classification of air cleanliness.

In case of any conflict in the standard and this specification, the decision of the Employer shall be final and binding.

5.1 I.S. CODES:

Following IS Codes will be applicable for the project:

a) HVAC

1. Safety Code for Air-conditioning	:	IS : 659 - 1964
2. Safety Code for Mechanical ref.	:	IS : 660 - 1963
3. Code of practice & Measurement procedure		
i. for Testing refrigerant compressors	:	IS : 5111 - 1969
4. Specifications for 3 phase induction motor	:	IS : 325 - 1970
i. Also confirm to IS : 1231 for foot mounted		
ii. and for flanged mounted motors	:	IS : 2223.
5. Degree of protection provided by enclosures		
i. for low voltage switch gear and control gears:		IS : 2147 – 1962
6. Code of practice for installation and		
i. maintenance of switch gear	:	IS : 3012 – 1965
7. Code of practice for Fire	:	IS : 3016 – 1982
8. Glossary of terms used in refrigeration and		
i. air-conditioning	:	IS : 3615 – 1967

b) INSULATION WORK

1. Expanded polystyrene for Thermal Insulation purposes	:	IS : 4671 - 1984
2. Code of practice for thermal insulation of cold storage	:	IS : 661 - 1974
3. Code of practice for application and finishing of thermal insulation material at temp. from 80 to 41ºC.	:	IS : 7240 – 1981
4. Code of practice for application and finishing of thermal insulation material at temp from 40 – 700ºC	:	IS : 7413 -1981
5. Specifications for bonded mineral wool	:	IS : 8183 – 1976
6. Glossary of items symbols and units relating to Thermal materials	:	IS : 3069
7. Industrial Bitumen	:	IS : 702

c) ELECTRICAL

1. Air circuit breaker (ACB)	:	IS : 2516
2. MCCB/MPCB	:	IS : 13947
3. Fuses	:	IS : 13703
4. Current Transformer	:	IS : 2705-1992

5.	MCC	:	IS : 8623
6.	Electrical Panel	:	IS : 13947 (Part2)

6 TESTS AT SITE:

GENERAL:

The Contractor must perform all inspection and tests of the system as a whole and of components individually as required, under the supervision of the Engineer, in accordance with the provisions of the applicable 'ASHRAE' standards or approved equal and as per site requirements. All tests shall be recorded in the format approved by Consultant/Owner.

REFRIGERANT PIPING SYSTEM:

All refrigerant pipes and fittings shall be hard drawn copper tubes and wrought copper/brass fittings suitable for connection with silver solder/ phos-copper.

All joints in copper piping shall be sew at joints using low temperature brazing and/or silver solder. Before joining any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc while constructing the joints. Subsequently, it shall be thoroughly blown out using nitrogen.

Refrigerant lines shall be sized to limit pressured rop between the evaporator and condensing unit to less than 0.2kg per sq.cm.

Horizontal suction line shall be pitched towards the compressor and no reducers shall be provided for proper oil return.

After the refrigerant piping installation has been completed to be pressure tested. Pressure shall be maintained minimum for 24 hours. Vaccum testing to be done for minimum 24 hours

All refrigeration piping shall be installed strictly as per the instructions and recommendations of air conditioning equipment manufacturer.

DUCT WORK:

All branches and outlets shall be tested for air quantity, and the total of the air quantities shall be within plus three percent (3%) of fan capacity. Fire dampers, volume control dampers and splitter dampers shall be tested for proper operation.

FILTERS:

All Pre/Fine filters shall be tested of type and routine test as per the requirement of BS:6540/ASHRAE-52-76.
Filter Face Velocity:

For 50mm thick Pre Filters, maximum face velocity shall be 2.54 m/s.
For Fine filters, maximum face velocity shall be 2.54 m/s.

BALANCING AND ADJUSTMENT:

All air handling/ventilation equipment, ductwork and outlets shall be adjusted and balanced to deliver the specified air quantities indicated, at each inlet and outlet. If these air quantities cannot be delivered without

exceeding the speed range of the sheaves or the available Horsepower, the Engineer shall be notified before proceeding with the necessary rectification and balancing of air distribution system

ELECTRICAL EQUIPMENT:

All electrical equipment shall be cleaned and adjusted at site before connection of power. The contractor as per relevant IS/IE rules shall carry out the following minimum tests:

Wire and Cable continuity tests.

Insulation resistance test between phase to phase, phase to earth and phase to neutral on all circuits and equipment, using a 1000volt Megger.

The earth resistance between conduit system and earth must not exceed half (0.5) ohm.

The phase rotation tests.

Operating tests on all protective relays to prove their correct operation before energizing the main equipment including secondary injection test at site.

Operating tests on all starters, circuit breakers, etc.

PERFORMANCE TESTS:

The installation as a whole shall be balanced and tested upon completion and all relevant information including the following shall be submitted to the Owner. Air volume passing through each unit duct, grill etc.,. Differential pressure readings across each filter, fan, coil and through each Pump, Chiller and Condenser. Electrical current reading in Amperes of full and average load running and starting together with name plate, current in each electrical motor. Daily records should be maintained of hourly readings, taken under varying degrees of internal heat load and use and occupation, of wet and dry bulb temperatures, upstream 'ON-COIL' of each cooling coil. Also suction temperatures and pressures for each refrigerating unit. The current and voltage drawn by each machine. Any other reading shall be taken which the Engineer may subsequently specify.

MISCELLANEOUS:

The above tests are mentioned here in amplification but not by way of limitation to the provisions of conditions of contract and specification. Duration of the test shall be continuous 72 working hours. Contractor shall carry out three seasonal tests each of 72 hours duration during defect liability period. The date of commencement of all tests listed above shall be subject to the approval of the Engineer and in accordance with the requirements of this specification. The contractor shall supply the skilled staff and all necessary instruments and carry out any test of any kind on a piece of equipment, apparatus, part of system or on a complete system if the Owner requests such a test for determining specified or guaranteed data as given in the specifications or on any damage resulting from the tests shall be repaired and/or damaged material replaced all to the satisfaction of the Owner. In the event of any repair or any adjustment having to be made giving sufficient notice, in order that Engineer-in-chief or Officer-in-charge. The contractor must inform Engineer-in-chief or Officer-in-charge when such tests are to be made, giving sufficient notice, in order that Engineer-in-chief or Officer-in-charge. Complete records of all tests must be kept and 3 copies of these and location must be furnished to the Engineer-in-chief or Officer-in-charges. The contractor may be required to repeat the test as

required, should the ambient conditions at the time not given, in the opinion of the Engineer-in-chief or Officer-in-charge, sufficient and suitable indication of the effect and performance of the installation as a whole or of any part, as required.

7. SCOPE OF WORK AND COMPLETION MILESTONES

Supply , installation , Testing , Balancing and Handing over of Entire HVAC and clean room facility for proposed building at C-Met at Charlapalli.

Completion of work : The entire work should be completed and handed over with in 10-12 weeks time

8. TECHNICAL SPECIFICATIONS

8.1 AIR COOLED SCROLL CONDENSING UNITS.

8.1.1 SCOPE

The scope of this section comprises the supply, erection, testing and commissioning of air cooled scroll condensing units, conforming to these specifications and in accordance with Schedule of Quantities.

8.1.2 Type

The condensing unit shall be similar to air cooled scroll chiller. However the condensing unit will not have chiller and it shall have all other components including refrigerant piping accessories required for proper operation of DX condensing unit.

8.1.3 Compressor:

The compressor shall be hermetically sealed having an integral cast iron frame & cast iron scrolls with a sight glass & an oil adjustment port. The compressor shall be internally lubricated with a highly refined, low foaming, white mineral oil and does not normally require a crankcase heater. The compressor motor is hermetic, refrigerant gas cooled with inherent all phase protection and is suitable for 380-420 Volts, 3 Phase, 50 Hz operation.

8.1.4 Condenser:

The condenser comprises fin & tube coils, which use ambient air to condense the refrigerant. The condenser coils are of high efficiency inner grooved copper tubes of 3/8" OD. The condenser coils are arranged in staggered rows and are expanded into super slit aluminum fins to achieve superior heat transfer efficiency.

The condenser fans are of propeller type, directly driven by a motor and positioned for vertical air discharge. The draw-through design provides uniform airflow over the entire condenser coil area, thus ensuring proper condensation throughout the coil. The condenser fan motors are of totally enclosed squirrel cage type with IP-55 type protection and are designed for outdoor operation in high ambient temperatures. They operate on 415 Volts, 3 Phase, 50 Hz supply.

8.1.5 Refrigerant Circuit:

The unit consists of single, dual & triple independent refrigerant circuits. The liquid line includes a hand shut-off valve, thermostatic expansion valve, moisture indicator and filter drier.

8.1.6 Control panel of condensing unit :

The control panel includes a high and low-pressure cut-off & mini circuit breaker for each compressor. The condenser fan motors are also protected by overload protectors and

mini circuit breakers. A contactor is included in the control centre for each compressor and a pair of fan motors.
The AHU starter panel also contains PLC/ electronic step control to stage the condensing units based on the temperature setting . And also to stage the heater banks based on the RH of the return air .

8.1.7 Insulation:

The Suction line shall be insulated by using nitril rubber insulation covered with factory laminated glass cloth and finished with protective coating .

8.1.8 Structure:

Formed & powder coated Galvanized Steel panels are factory assembled.
The unit shall be factory assembled and tested. Provide test certificates for the units.

8.2 AIR HANDLING UNITS

8.2.1 SCOPE

The scope of this section comprises the supply, erection, testing and commissioning of air handling units, conforming to these specifications and in accordance with Schedule of Quantities.

8.2.2 TYPE

The Air Handling units shall be of Thermal break Double skin construction of approved make comprising of Fan Section with spark proof fan and motor, Coil Section comprising of 6 row DX coil , Strip Heaters , Filter Section with pre & fine filters and HEPA filters, (TFA unit shall be fitted with only pre-filters) Mixing Chambers and Insulated drain pan under coil and fan sections. The unit shall be of floor mounted design installed on spring/vibration isolators/mountings for eliminating vibration to the civil structures.

8.2.3 CAPACITY

The air moving capacities and maximum cooling capacity shall be as shown in Schedule of Quantities.

8.2.4 CASING

The casing shall be of sandwich panels fixed on modular frame design. The frame shall be made of non corrosive extruded aluminum channels fitted with extruded Aluminum/PVC(Polyamide) corner pieces and insulated with 43mm PUF injected insulation. Panels shall be 43mm thick sandwich type with injected polyurethane foam insulation for rigid non-vibrating construction. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corners. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall and inner wall of the panels shall be of galvanized sheet chemically treated, pre-coated and plastisol top coat to resist nicks and scratches. The AHU shall be provided with electrical power/control junction box on external side of the unit conveniently mounted for cable connections.

8.2.5 FAN SECTION

Fans shall be backward curved DIDW fan as required for stable operation. The blades shall be made of heavy gauge steel treated and painted after manufacturing. The fans shall be statically & dynamically balanced at the factory as complete fan assembly. The fans shall be equipped with self-aligning bearings. Fan/motor assembly shall be mounted on a common framework entirely isolated from the unit by spring isolators to avoid transmission of vibration. The fan discharge shall be isolated from the casing by a vibration absorbing connection. The access door to the fan section shall be provided with

control interlocks to ensure the fan trips in case the access door is opened. The AHU shall be provided with working light for inspection/working within the AHU.

8.2.6 FILTER SECTION

The filter section shall be same as that of casing and panels of AHU but with an access door for withdrawal/fixing of filters. A channel made of galvanized sheet shall be provided for inserting/withdrawing the filters in the unit.

8.2.7 COOLING COILS

Dx coils shall have 12.7mm dia copper tubes min. 24 gauge thick, with Aluminum fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across each coil shall not exceed 150 meters per minute. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21 Kg / Sq.cm, air pressure while submerged in water. Tubes shall be hydraulically expanded for minimum thermal contact resistance with the fins. Fin spacing shall be 13 fins per inch. (4-5 Fins/CM.). The coil shall be minimum 6 Row cooling coil.

8.2.8 COIL SECTION

The coil boxes housing cooling coils shall be of the same construction of the Fan casing. The casing shall be of sandwich panels fixed on modular frame design. The frame shall be made of non corrosive extruded aluminum channels fitted with extruded Aluminum/PVC(Polyamide) corner pieces and insulated with 43mm PUF injected insulation. Panels shall be 43mm thick sandwich type with injected polyethylene foam insulation for rigid non-vibrating construction. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corner. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall and inner wall of the panels shall be of galvanised sheet chemically treated, pre-coated and plastisol top coat to resist nicks and scratches.

8.2.9 MIXING BOX SECTION

The construction of this section is same as unit but will have Aerfoil blade design opposed blade dampers for Return Air, Fresh Air and Exhaust Air as may be required. The casing shall be of sandwich panels fixed on modular frame design. The frame shall be made of non corrosive extruded aluminum channels fitted with extruded Aluminum/PVC(Polyamide) corner pieces and insulated with 25mm PUF injected insulation. Panels shall be 50mm thick sandwich type with injected polythene foam insulation for rigid non-vibrating construction. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corner. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall beby means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall and inner wall of the panels shall be of galvanized sheet chemically treated, pre-coated and plastisol top coat to resist nicks and scratches.

8.2.10 DAMPER:

Dampers shall be opposed blade type. Blades shall be made of double skinned aeroifoil aluminum sections with integral gasket and assembled within a rigid extruded aluminum alloy frame. All linkages and supporting spindles shall be made of aluminum or nylon, supported in teflon bushes. Spindle shall be provided with a bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for

motorization operation. Damper frames shall be sectionalized to minimize blade wrapping. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure. All the dampers shall be suitable for manual and auto operation.

8.2.11 MOTOR AND DRIVE:

Fan motors shall be suitable for 415V ± 10%, 50 cycles, 3 phase, AC supply. It shall be squirrel cage, totally enclosed fan cooled motors. Motors shall be specially designed for quiet operation and motor speed shall not exceed 1450 RPM. Fan motors shall be mounted inside the AHU on spring mounts with belt drive facility with easy belt tensioning. Drive to fan shall be provided through belt-drive with a standard belt guard housing the bolt and adjustable motor sheave. Belts shall be of the oil-resistant type. The frame for mounting the fan and motor shall be isolated from the double skin casing with spring isolators.

8.3 VARIABLE FREQUENCY DRIVES FOR AIR HANDLING UNITS

8.3.1 This section describes the type of frequency converter to be supplied for fan and pump speed control. The drive shall not be a general purpose product, but a dedicated HVAC engineered design.

8.3.2 The frequency converter shall be supported locally by the manufacturer who will provide full technical support, spares holding and trouble shooting capability from his own local facility. A training course shall be provided by the manufacturer to the consultant / contractor / maintenance engineers.

8.3.3 The manufacturer shall provide full technical detail of the product, with catalogues, dimension drawings, weights etc. and each drive shall be provided with a full technical manual.

8.3.4 Equipment supplied must conform to recognized International Standards and be manufactured to ISO 9001, BS 5750 part 1 & 2 and carry the C.E. Mark on EMC Compliance.

8.3.5 Frequency converters shall be suitable for use in either a ‘Stand Alone’ mode, complete with all necessary protection or as part of centrally controlled system via a serial communication loop to the main Building Management System (B.M.S.) via in-built RS 485 port.

8.3.6 TECHNICAL REQUIREMENTS:

The frequency converter (F.C.) shall convert Local Voltage V +/-10%, 3 Phase, 50/60 Hz utility power supply to an adjustable output voltage and frequency. The FC must be capable of delivering output voltage to the motor equal to the mains input voltage to the FC at full load and speed. In the event the FC cannot meet this requirement a oversized motor at least one frame size higher must be selected. The FC manufacturer must document this capability.

8.3.7 The voltage to frequency ratio shall be suitable for centrifugal pump and fan control. It should not be possible to set a constant V/F ratio, to prevent damage to connected equipment and to optimize energy usage.

8.3.8 The F.C. shall work in conjunction with any I.E.C. standard design motor and shall not require the motor to be derated, or cause the motor temperature to rise above the class ‘B’ rise expected on normal mains operation. The Motor Shall not require an external blower even at slow speed running.

8.3.9 When selecting the FC, care shall be taken to ensure that protection against electro fluting of motor bearings and/or damage to the motor windings shall be provided. This shall be provided by the inclusion of ;

a) Soft switching IGBT's in the FC

8.3.10 The F.C. shall use AMA (Automatic Motor Adaption) techniques so that operators do not have to input motor characteristic and ensuring proper motor operation

8.3.11 The F.C. shall be capable of controlling parallel motors of mixed ratings, and allow disconnection of any machine whilst running without causing tripping. The F.C. shall be capable of running with no motor connected for service functions.

8.3.12 The F.C. shall be fully tested at the converter manufacturers works, including motor loading. Certificates of Compliance should be available on request.

8.3.13 The F.C. shall be of sufficient capacity to provide a quality wave form so as to achieve full output torque of the motor, without causing additional heat rise. The operating conditions shall include:-

a. Minimum efficiency at 100% load - 96% at 20% load- 92%
b. Rated input voltage (local voltage) -10%, 3 phase, 50/60 Hz +/-2 Hz.
c. Working ambient temperature range -10□C to +45□C, humidity to 95% RH, and
d. Output frequency range - 0.5 to 1000 Hz.
e. Output voltage range 0 to full mains input voltage, 3 phase even at full mains voltage -10% input.
f. VFD shall be limited to 110% of rated current for 60 seconds and 160% torque for 5 seconds.
g. The F.C. shall accept 0-10 VDC; 4-20 mA, or resistive inputs as a control signal.
h. The F.C. shall provide two output relays to provide signals including - ready, run, tripped, and be programmable for other selected information. Two analogue outputs of 4-20 mA or 24 VDC shall be programmable to transmit speed or other parameters to the B.M.S. In addition, 2 x digital outputs shall provide 24Vdc to signal choice of 27 conditions to the BMS.
i. The F.C. shall log and display "Total KWhr's consumed" and "Total Hours Run" by the motor without additional instrumentation and the facility to "Reset".
j. 20 preset speeds shall be available (programmable values) for duties such as night setback, smoke extract and morning boost settings.
k. The F.C. shall provide 4 skip frequencies of adjustable bandwidth to overcome mechanical or air resonance.
l. A parameter lock shall be incorporated to prevent unauthorized resetting of parameters.

8.3.14 F.C. DESIGN REQUIREMENTS

8.3.14.1 The F.C. shall contain as standard within it's enclosure D.C. Link filtering with both inductive and capacitive elements to control the mains borne harmonics. The document 'Electrical Supply Industry Recommendation G 5/3 limits for harmonic currents in the U.K.' or IEEE519, 1992 shall be used for the basis of calculation of T.H.D. for the point of common coupling. The F.C. manufacturer shall provide T.H.D. figures for the total connected load. The contractor shall provide details of supply transformer rating, impedance, etc. feeding the F.C.'s to allow this calculation to be made.

8.3.14.2 The F.C. shall comply with E.M.C.(Electromagnetic compatibility) (R.F.I. Control) document EN55011 as an integral part of its design, incorporating EMC Filters to meet both EN55011 Class 1A (150metres) and Class 1B (50 meters). It shall conform to immunity standard IEC 801 parts 2-5. Must carry the C.E. Mark of Compliance. This should be a Built In feature with no requirements of External filters/loose supplies.

8.3.14.3 The drive shall be capable of automatically reconnecting to a spinning fan, forward or reverse running, without tripping, following mains interruption or on transfer from bypass running.

8.3.14.4 The F.C. design shall comprise a diode input bridge, fixed voltage D.C. link section with both inductors and capacitors to form a filter, and inverting bridge comprising I.G.B.T.'s (Insulated Gate Bipolar Transistors) . All equipment must be housed within the F.C. enclosure.

8.3.14.5 The inverting bridge shall be controlled by a 32 bit processor and A.S.I.C.'s(Application Specific Integrated Circuits) to produce a V.V.C. Plus (Voltage Vector Controlled) enhanced P.W.M. waveform naturally resulting in full motor voltage, torque and sinusoidal current of mains supply quality in the motor circuit. Other forms of current source or 6 pulse converters are not accepted.

8.3.14.6 The current limit feature shall be sufficiently fast to allow the F.C. to survive a continuous short circuit on the output terminals without damage to any drive components.

8.3.14.7 The F.C. shall protect itself against input transients to VDE0160 class W2; loss of mains phase (3 phase measurement); loss of motor phase (3 phase measurement); grounding of any output phase; loss of speed reference (runs at last setting/preset speed/close down-programmable).

8.3.14.8 The F.C. shall use overriding frequency fold back control techniques to prevent damage in the event of excessive load during either running or starting.

8.3.14.9 The F.C. shall model the motor in its software to predict motor overheating without the use of thermisters in the motor. When overheat is predicted, an alarm or automatic shutdown shall be initiated.

8.3.14.10 The F.C. shall exhibit near unity fundamental power factor at all loads and speeds, and should not require the addition of external A.C./D.C. line reactors for power factor improvement, harmonic control or prevention of zero voltage notching.

8.3.14.11 The output circuit shall be of such a design, as to allow unlimited switching of the motor circuit, at any load/speed without causing damage to the I.G.B.T. output stage and without needing auxiliary control switching.

8.3.14.12 F.C.'s shall have self adjusting modulation frequency control from 2.0 kHz to 14 kHz. The control form shall be such as to allow the F.C. to deliver full output at all times without derating, by optimizing the switching frequency dependent on the output load.

8.3.14.13 Full galvanic isolation between power and control components shall be incorporated to ensure compliance with VDE 0160 P.E.L.V. (protective Extra Low Voltage) to prevent damage to B.M.S. interface and ensure operator safety. Short circuiting of the control terminals shall not damage the control card

8.3.14.14 The F.C. shall include an A.E.O. (Automatic Energy Optimization) circuit to continuously adjust the voltage to frequency ratio to optimize motor energy consumption.

8.3.14.15 he FC shall have an automatic "sleep" mode function timer c/w boost function, operating when load's are below minimum settings.

8.3.14.16 The design shall include a full 2 zone, 2 set point P.I.D. controller as standard to provide Closed loop control direct from up to 2 signal transmitters

without the need for external signal conditioning. The Power Supply to the transmitter should be through built in 24 V DC Supply. External supply should not be needed.

8.3.14.17 The F.C. shall not exhibit an inrush current when a 'start' signal is given, and current must not exceed 110% at any time to prevent damage to connected equipment.

8.3.14.18 The F.C. design shall include a motor preheat circuit to prevent condensation forming in the motor during shutdown periods.

8.3.14.19 The F.C. shall not be damaged if it is energized with a 'start' signal without a motor connected.

8.3.14.20 The F.C. shall provide as standard:

a. Heat sink over temperature protection.
b. Under voltage protection.
c. Over voltage protection.
d. Multi line LCD Alpha-numeric display with free programmable text array and with all information displayed in clear language, i.e. "Motor Tripped - Earth Fault".
e. Display to be in selectable language.
f. F.C. "On" light.
g. F.C. "Warning" light.
h. F.C. "Alarm" light.
i. Selectable display from 20 readouts including output current, voltage, frequency, speed, power, torque, motor temp %, inverter temp. %, total energy consumed KWhr and total hours run.
j. "Hand" (local) & "Auto" (remote) pushbuttons and raise and lower speed pushbuttons on keypad as standard to allow testing and commissioning of the unit. In the "Hand" (local) mode the automatic speed control signal shall be locked out. FC shall not include any buttons on the keypad allowing the motor direction to be reversed. Auto Reset in event of trip condition.

The drive shall incorporate a fault diagnostic memory storing the last 10 trips and displayed in alphanumeric format. The data immediately proceeding the last fault shall also be stored to assist fault finding. The drive shall provide the following additional features as standard:

Auto ramping shall be employed to ensure "No Trip" ramping if too rapid acceleration/deceleration is called for. It shall be possible to select a "Run Permissive" function without the need for external equipment to operate e.g. a damper to open. The drive shall be capable of "Autoderate" when either the ambient temperature is sustained above +45C or when losing a mains phase. The drive shall have proven serial communication protocol capabilities with BMS Systems to include ; Johnson's N2 Bus & FLN 600 (L&S), built In without any need for external hardware / gateway.

That is to say the Serial Communication capabilities should be seamless.

8.3.14.21 The design technology and operator keypad shall be common through the whole series of drives offered. The F.C. shall be factory pre-commissioned for building services use and require minimal site setting.

8.3.14.22 MECHANICAL REQUIREMENTS AND INSTALLATION

For plant room use the F.C. shall be contained in a single all metal enclosure minimum IP54 rating incorporating EMC Filters, DC Link filters, Galvanic Isolation and Input Surge Suppression up to a maximum of 250Kw and available from the manufacturer as IP 54 without having to use a secondary enclosure. Any Local / Non-proprietary made enclosures will be strictly unacceptable.

8.3.14.23 The F.C.'s shall include load dependant in-built cooling fans.

8.3.14.24 The manufacturer shall provide all sizes, weights, mounting dimensions and wiring details with his offer.

8.3.14.25 The operating keypad shall be detachable to allow upload/download function to copy programming from one drive to another. An optional remote keypad kit shall be available for mounting the keypad in a secondary fascia enclosure maintaining a minimum IP54 rating.

8.3.14.26 No rear access shall be necessary during normal service function.

8.3.14.27 The design of the F.C. shall allow up to at least 100 meters of S.W.A. (Single Wire Armour) cable to be used between the F.C. and the motor and allow the use of M.I.C.S. (Mineral Insulated Copper Sheath) cable in the motor circuit for fire locations.

8.4 AIR DISTRIBUTION SYSTEM

8.5.1 SCOPE

Supply, Factory fabrication, installation and testing of all sheet metal ducts & supply, installation, testing and balancing of all grills, registers and diffusers, in accordance with these specifications.

8.5.2 DUCTING

GENERAL

All ducts shall be factory fabricated from galvanized steel sheets of the following thickness as indicated in schedule of quantities & as described in the IS: 655 with latest edition. The ducting shall be made out of Lock former machine or factory fabricated to avoid site work to the minimum.

8.5.3 RECTANGULAR/ROUND DUCT

Dimensions of Ducts(mm)	Gauge Alumni G.I		Type of Joints	Type of Bracing's
Upto 600	24	22	G.I Flange at 2.5 Center	Cross bracing's
601 to 750	24	22	25 x 25 x 3 mm angle frame with nutsat 1500 mm from and bolts	25 x 25 x 3 mm MS angles bracing 6 mm dia joints
751 to 1000	22	20	25 x 25 x 3mm angle frame with 6mm dia nuts and bolts	25 x 25 x 3 mm MS angle bracing at 1500mm from joints
1001 to 1500	22	20	40x40x5 mm angle frame with 8mm dia nuts and bolts	40 x 40 x 3mm MS angle bracing at 1500mm from joints

1501 to 2250	20	16	50x50x3mm angle to be cross braced diagonally with 10mmdia nuts & bolts at 125 center.	40 x 40 x 3mm MS angle bracing at 1200mmfrom joints or 40x 40 x 3mm MS angle diagonal bracing.

Sheet metal ducts shall be fabricated as per BIS/SMACNA Standards out of galvanized steel sheets. Sheets used shall be produced by hot dip process and galvanizing shall be Class VIII - Light Coating of zinc nominal 120 gm/sq. m.

8.5.4 HANGERS FOR DUCT (as per standards)

Duct Size(mm)	Spacing (Mtr)	Size of MS angle (mm x mm)	Size of rod dia (mm)
Up to 750	2.5	40 x 3	10
751 to 1500	2.0	40 x 3	12
1501 to 2250	2.0	50 x 3	15
2251&above	2.0	50 x 3	15

8.5.5 NSTALLATION

All ducts shall be installed generally as per the drawings prepared by the Contractor.

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

7. All necessary Allowances and Provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawing. Where necessary to avoid beams or other structural work, plumbing or other pipes, and/or conduits, the ducts shall be transformed, divided or curved to one side, the required area being maintained, all as per the 'site requirements.'

iii) If a duct cannot be run as shown on the drawing, the contractor shall install the duct between the required points by any path available, in accordance with other services and as per approval of Owners site representatives.

(IV) All ductwork shall be independently supported from the building structure. All horizontal ducts shall be rigidly and securely supported, in an approved manner with trapeze hangers formed of galvanized MS rods and angle iron under ducts at not greater than 2 meter centers. All vertical duct work shall be supported by structural members at 2 Meters intervals. Air conditioning contractor shall supply and install all supports made of galvanized steel material and shall be of hi-tech supports only. The supports shall be designed to prevent vibration to be transmitted to the building structure by providing vibration isolation. If duct is passing through in such areas where space between ceiling slab to false ceiling is more than 1500 mm than duct should be supported by wall mounted brackets of 40 x 40 x 3mm angle.

v) Where metal ducts or sleeves terminate in woodwork, tight joints shall be made by means of closely fitted heavy flanged collars. Where ducts pass through brick or masonry opening, wooden frame work shall be provided within the opening and crossing ducts provided with heavy flanged collars

on each side of wooden frame work, so that duct crossing is made leak-proof.

vi) All ducts shall be totally free from vibration under all conditions of operation. Whenever duct work is connected to fans, air handling units or blower coil units that may cause vibrations in the ducts, ducts shall be provided of fire retardant rubberized canvas cloth flexible connection. The flexible connections should be located close to the unit, in mutually perpendicular directions. The flexible sleeve should be at least 15cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation.

vii) Air conditioning unit and exhaust fans shall be connected to duct work by inserting at air inlet and air outlet a double canvass sleeve. Each sleeve shal

be minimum 150 mm securely bolted to duct and the connecting ductwork rigidly held in line with unit inlet or outlet.

8.5.6 SPLITTERS AND DAMPERS

Duct / collar dampers shall be opposed blade type of robust construction and tight fitting. They shall be made of G.S. sheet minimum 16swg thick and shall have brass bushes. The design, method of handling and control shall be suitable for the location and service required. Dampers shall be provided with suitable links, levers and quadrants as required for their proper operation. Control or setting devices shall be made robust, easily operate-able and accessible through suitable access doors in the ducts. Every damper shall have an indicating device clearly showing the damper position at all times. Handles will be provided with extended arms to account for insulation thickness. Dampers shall be placed in ducts and at every branch supply or return air duct connection, whether or not indicated on the drawing, for the proper volume control and balancing of the system.

8.5.7 FIRE DAMPERS

All supply / return air ducts of air handling units and return air openings shall be provided with approved fire dampers of at-least 1 1/2 hour fire rating. These shall be of approved make. The damper shall be fabricated of 16gauge GSS housing with blades formed out of 1.6 mm sheets. The damper shall be pivoted on both ends using chrome plated spindles in bronze bushes. The stop seals shall be provided on top and bottom of the damper housing. The damper blades shall be held in horizontal position using spring actuator bimetallic fusible link. The damper blades shall close in the event of fire by motor actuation capable of taking signal from the controller.

8.5.8 SUPPLY AND RETURN AIR GRILLS

Supply and return air grilles shall be of anodized extruded Aluminum construction with adjustable bars. Supply air grills shall be generally double deflection type backed with GI damper. The supply/return air grills being provided with removable key operated volume control dampers. Aluminum supply and return grills shall be powder coated and should have the color of client's choice as per bill of quantities.

8.5.9 SUPPLY AND RETURN AIR DIFFUSERS

The supply air diffuser shall be provided with removable key operative volume control dampers. Aluminum supply and return air diffusers shall be powder coated and should have the colour of client's choice or shall be extruded Aluminum. Supply/return air linear diffuser shall be Extruded Aluminum construction, square,

rectangular, or round diffusers with flush fixed pattern or adjustable flow pattern. Diffusers for different spaces shall be selected in consultation with the Client/Consultants

8.5.10 FRESH AIR INTAKE AND EXTRACT LOUVERS

All the louvers shall be rain protection type and shall be fabricated from galvanised section. The louvers shall additionally be provided with heavy duty expanded metal bird screen and Cowl. They shall be factory made with powder coating finish. The louvers shall be provided with control damper with lever for operation and control of fresh air.

8.6 THERMAL/ACOUSTIC INSULATION

8.6.1 SCOPE

Scope of this specification comprises supplying, installing testing and commissioning of insulation on supply and return air ducts, Fresh air ducting.

8.6.2 DUCT INSULATION

32/23 mm thick Class O – Nitrile Rubber material with Aluminum foil faced

Application :

- Clean the surface of duct and apply one coat of Black Japan paint of approved make @ 7 Sq.m ./Kg.
- Apply a thick layer of Adhesive on duct @ 1 Kg/Sq.m of area.
- Fix the insulation material of 32/23 mm Al foil faced insulation material.

8.7 AIR FILTERS TECHNICAL SPECIFICATIONS:

8.7.1 SCOPE

This specification covers the manufacture, construction feature, erection, testing and commissioning of Air filters at site.

8.7.2 TYPE:

The scope of work will include supplying, installing, testing and commissioning of following type of filters:

Synthetic fiber filters (For AHU's and fresh air intake) (Pre Filter EU4)

Microvee Filters/Fine filters (EU8)

H.E.P.A Filters (Absolute Filters EU 14)

8.7.3 SYNTHETIC FIBRE FILTERS: PREFILTER (EU4):

The filter media shall be constructed of suitable fibrous material (ie. coir extruded of (HDPE) Packaged into frame of Aluminum sheet 18 gauge thickness. Filter element shall be supported by galvanized steel wire mesh of 10 mm square on either side. Filter frame shall be provided with suitable handle. This filter shall be capable of being cleaned off the accumulated dust by ordinary tap water flushing. Filter medium shall be washable high density polythene packed into a frame of Aluminum sheet of 18 gauge thickness and stitched onto a galvanized wire gauge support and crimped to form deep folds. Suitable aluminum spacers shall be provided to ensure uniform distribution of air flow through the filter. Filter casing shall be provided with neoprene sponge rubber sealing. The filter shall be dry type with element in several ply to make up 50 mm thickness. Filter frame shall be provided with suitable handle. This filter shall be capable of being cleaned of their accumulated dust by tap water flushing.

The efficiency and pressure drop of the pre filters shall be as follows:

a. Efficiency — As per EU 4 and / or Average arrestance of 65% - 80% when tested in accordance with BS:6540/ASHRAE-52-76.

b. Initial pressure drop Not to exceed 5.0 mm wc at rated flow.
c. Final pressure drop Up to 10 mm wc at rated flow

8.7.4 MICROVEE FILTER (FINE FILTER EU 8)

Filter shall be constructed by pleating continuous sheet of filter medium into closely spaced plates separated by heavy corrugated aluminum spacers. Filter media shall be constructed out of poly propylene media designed to give high efficiency and long trouble free service. The media shall be supported between non-crackable aluminum wire mesh on air inlet side and 40 sieve HDPE mesh on air outlet side and folded to have minimum 36 folds per meter to form accordion pleats. The accordion plates shall be separated by 16/18 gauge aluminum separators to ensure uniform air flow. The separators shall be carefully rounded to prevent damage to the media by sharp edges. The filter media shall be perfectly sealed with the frame by means of ductile epoxy resin with 16 guage aluminum anodised flanged frame housing to avoid by passing of

a. Efficiency 99.997% down to 0.3 Micron when tested in accordance with BS:3928 (Sodium flame test) / FED 209E.
b. Initial pressure drop Not to exceed 25 mm wc at rated flow.
c. Final pressure drop Upto 50 mm wc at rated flow

8.7.5 H.E.P.A.FILTER

These filters shall remove particles up to 0.3 microns with an efficiency of 99.999%. Filter should comprise of specially treated glass-fiber media, aluminum media separators housed in an aluminum sheet frame provided with double turned flanges and dove tail neoprene gasket. The filter shall be housed in a separate housing of Aluminum housing duly reinforced and compartmental to receive the required number of pleats. The pleats shall be bonded to the casing at the ends using thermo setting adhesive which is inert and food grade type Neoprene gasket 25 x 3 mm thick shall be used for flanges. The efficiency of the filter shall be 99.999% to 0.3 micron when tested in accordance with BS Standard. Absolute filters shall consist of aluminum frame (of minimum 16-guage thickness) with media of 100% sub-microscopic glass fibers. The glass fibers shall be suitable for the conditions of use. Polyurethane / epoxy shall be used between the media and the frame. The filters shall be individually tested, tagged and certified to have an efficiency of not less than the figure specified below. A neoprene sponge rubber sealing shall be provided on either face of the filter frame. The filter shall be capable of being used upto its final pressure drop. Suitable frame for supporting the filters shall be provided.

a. Efficiency : 99.999% down to 0.3 micron when tested in Accordance with BS:3928 (Sodium flame test) / FED 209E.
b. Initial pressure drop. Not to exceed 25 mmwc at rated flow.
c. Final pressure drop Up to 50 mm wc at rated flow

8.8. ELECTRICAL

8.8.1 SCOPE OF WORK:

The scope of work to be carried out by HVAC contractor includes the following:-

a) Supply, installation, testing and commissioning of the items such as AHU MCCs, push button stations etc, as detailed in the BOQ. It shall be the responsibility of the HVAC contractor to incorporate all necessary safety and protection interlocks etc, required for protection and reliable operation of the

equipment covered in his scope of supply. The overall responsibility of providing the guaranteed performance of A.C system in conjunction with above electrical system shall rest with the HVAC contractor. The scope also includes visit to the factory/supplier's works, where above electrical items are being manufactured for inspection/testing. Making inspection reports, pointing out defects, deficiencies etc. Safe storage and insurance till handing over the completed installation shall be the responsibility of the AC contractor.

b) Supply, installation, testing and commissioning of the control cables from the field components e.g. thermostats, pressure cutouts, and other control/protection components provided by him up to the MCC/Panels terminal block including carrying out termination etc. Supplying & installation of cable trays etc. as required meeting the best in engineering practice for such type of works.

c) Supply, installation, testing and commissioning of the integral local control console of the compressor/chillers.

8.8.2 MAIN PANEL

The plant room MCC shall comprise of out goings for Condensing units and AHU panels. The main in-comer along with MCCB shall also be provided. The bus bar shall be electric grade aluminum. The main panel shall be fabricated out of MS sheet on angle frame work and shall be treated with seven tank process before finally painting it with the enamel coat of approved color.

8.8.3 LAYING OF CABLES

a) Scope

This specification is intended to cover the requirements of installation and energizing of PVC/XLPE power cables including joining of cables.

b) Standards

The Power cable and its fixing accessories shall comply with the latest relevant Indian Standards and National Electrical Code.

c) General

i. Before the commencement of cable laying, it shall be ensured by the Engineer-in-Charge that only ISI marked cables are used. It shall be the responsibility of the contractor to check the soundness and correctness of the size of the cable while taking delivery of the cable from stores. Any defect noticed shall be brought to the notice of the issuing authorities immediately. If any defects are noticed after the cable is laid or during the process of laying, the same shall be brought to the notice of the Engineer-in-Charge and upon his satisfaction, that the cable is not damaged due to bad handling, it will be the entire responsibility of the contractor to retrieve the cable already laid and return the defective cable to store and take fresh length of the cable from the store and re laythe same.

ii. The material such as bricks, sand, cable route markers, RCC slab of best quality as approved by the Engineer-in-Charge only shall be used for cable laying works.

iii. The contractor shall provide the necessary labour, tools, plants and other requisites at his own cost for carrying out pumping of water and removing of water from trenches, if any, wherever it is required.

iv. Installation shall be carried out in a neat, workman like manner byskilled, experienced and competent workman in accordance with standard practices.

v. While laying the cable, care shall be taken to avoid formation of kinks and also damage to the cable. In the case of cable bends, it shall not have bent radius lesser than 20 times the overall diameter of the cable.

vi. A cable-loop of about five meters length and as directed by the Engineer-in-Charge shall be provided at the following locations.
- Near the termination points
- Near to the straight through joint

vii. The method of cable laying and routing of cables, shall in every case be as directed by the Engineer-in-Charge / consultant.

viii. Whenever cable passes through Hume pipes/GI pipes embedded across the wall in a building, both the ends of the pipe shall be suitably sealed.

ix. Identification tags indicating the size of the cable and feeder designation shall be securely attached at both ends of the cable. Such tags shall also be attached to the cable at intervals of 250 Meters. The materials of the tag shall be of either 12 SWG GI sheet or plastic. In case of plastic, the details have to be engraved and in case of GI sheet, the details should be punched. Cable route markers shall be provided at the intervals of 200 M with a minimum of one number route marker. The details of the route makers shall be as per the drawing. At the locations of straight through joints, necessary joint-markers shall be provided.

x. When cable runs vertically, it shall be clamped on mild steel flats or angle iron fixed on walls and are spaced at such intervals as to prevent buckling of the cables. All steel work shall be painted with a coat of red oxide and thereafter finished with suitable anti- corrosive paints.

d) <u>Cable laid in ground</u>

i. All MV cables (up to 1.1 KV) shall be laid at a minimum depth of 0.75M laid in ground. When cable pass through roads, nala's etc..they must be protected by either Hume pipe of GI pipe of suitable dimensions.

ii. Excavations of trenches shall be carried out as indicated in the drawing. The width of the trench at the bottom shall be 0.4 M for one cable. In case the total number of cables laid in trenches is more than one, then the width shall be such that the spacing between the cables is maintained as shown in the drawing. Before the cable is laid in the trench the bottom of the trench shall be cleared from stones and other sharp materials and filled with sand layers of 75 mm, as shown in the drawing.

iii. While removing the cable from the drum, it shall be ensured that the cable drum is supported on suitable jacks and the drum is rotated to unwind the cable from the drum. The cable should never be pulled while unwinding from the drum. It shall be ensured that the cables are run over the wooden rollers placed in the trench at intervals not exceeding 2 M.

iv. After placing the cables in the trench shall be filled in layers ensuring that each layer is well rammed by spraying water and consolidated. The extra earth shall

be removed from the place of trench and deposited at a place as directed by the Engineer-in-Charge/consultant.

e) Cables laid in built up trench

Before the commencement of cable laying the cable trench shall be drained properly. Cable shall be laid as explained in item 3.2. Cable shall be properly clamped to the cable supports, which are provided in the cable trench. The method of clamping shall suit the size of the cable and the cable supports, which are provided in the cable trench. The method of clamping shall suit the size of the cable and the cable supports, as directed by the Engineer-in-Charge. Care shall be taken while removing and replacing the trench cover slab. It is the responsibility of the contractor to make good any damaged trench covers.

f) Cable terminations and straight through joints

i. All cable joining materials such as straight through joint boxes, cable compound, cable lugs, insulation tapes etc..shall be of best quality and as approved by the Engineer-in-Charge.

ii. Cable glands for strip / armoured cables shall include a suitable armour clamp for receiving and securely attaching the armouring of the cable in a manner such that no movement of the armour occurs when the assembly is subjected to tension forces. The cable gland shall not impose on the armouring, a bending radiusnot less than the diameter of the cable. The clamping ring shall be solid and of adequate strength. Provision shall be made for attachment of an external earthing bond between the metallic covering of the cable and the metallic structure of the apparatus to which the cable box is attached.

g) Sealing boxes

i. A sealing box, irrespective of the class of insulation of the cable for which it is intended, shall be so designed that it may be filled with compound after connecting the cable specially in flame proof/hazardous areas.

ii. All parts and connection for attaching the armouring, wiping or clamping the metallic sheath in a sealing box, shall be easily accessible. This may be achieved by splitting the box or by providing a suitable cover or other such means.

iii. The joints in the box shall prevent leakage of the compound.

iv. Provision shall be made to ensure that the cores of the cable are efficiently sealed to prevent moisture penetrating along the strands or the cable conductors.

v. The sealing box shall be provided with compound filling orifices with suitable covers or plugs of size that will permit easy pouring of the compound.

vi. In all cases where screwed plugs are used, one or more air vents shall be provided to ensure complete expulsion of air and total filling of the box with compound.

vii. The box shall be of sufficient length to allow for manipulation of the insulated cover without damage to them or to the insulation.

viii. A sealing box intended to be attached directly to the apparatus shall be designed such that the box together with the connected cable may be detached from the apparatus without disturbing the sealing compound.

ix. Cable sealing and dividing boxes intended for use in the flame-proof areas shall comply additionally with the relevant requirements of IS:2148-1968.

h) Testing

Once cable is laid, following tests shall be conducted in the presence of Engineer-in-Charge, before energising the cable:

i. Insulation resistance test (Sectional and Overall).
ii. Sheathing continuity test.
iii. Continuity and conductor resistance test.
iv. Earth test.
v. High voltage test.

Tests conducted shall be as per Indian Standards and National Electrical Code.

8.8.4 EARTHING

a) SCOPE

This specification is intended to cover the requirements of supply, installation, testing and commissioning of the following:

i) Pipe Earthing
ii) Plate Earthing
iii) Strip Earthing

b) Standards

Earthing installations shall conform to the Indian Electricity Rules -1956, as amended from time to time and IS 3043-1989 "Code of practice for Earthing", with latest amendments.

c) Earth electrode arrangement

i. Pipe Electrode

Electrode shall be made of CI pipe having a clean surface and not covered with paint, enamel or poor conducting material. Galvanized pipe shall not be smaller than 100mm ID. Earthing with pipe electrode shall be done as per the details indicated in IS : 3043/87 .

ii. Electrodes shall be embedded below permanent moisture level.

iii. The length of pipe electrodes shall not be less than 2.5m. if rock is encountered, pipes shall be driven to a depth of not less than 2.5 m with suitable inclination. Pipe shall be in one piece and deeply driven.

iv. To reduce the depth of burial of an electrode without increasing the resistance, a number of rods or pipes may have to be connected together in parallel. The distance between two electrodes in such a case shall not be less than twice the length of the electrode. The Earthing lead shall be connected by means of a through bolt, nuts and washers and cable socket.

v. Plate Electrode

For plate electrodes, minimum dimensions of the electrode shall be as under.

* GI plate electrode : 600 x 600x 6 mm thick.
* Copper plate electrode : 600 x 600x 3.15 mm thick

The electrode shall be buried in ground, with its faces vertical and top not less than 2.5 Meters from the surface of the ground.

- Earthing using plate electrode shall be done as per details, indicated in drawing.

- Plate electrodes shall have galvanized iron water pipe, buried vertically and adjacent to the electrode. One end of pipe shall be at-least 5 cm above the surface of the ground and need not be more than 10 cm. The internal diameter of the pipe shall be at least 19mm. The length of pipe under the earth's surface shall be such that it shall be able to earth the centre of the plate. The earthing lead shall be securely bolted the plate with two bolts, nuts, check nuts and washers.

vi. <u>Strip or conductor electrodes</u>

- Strip electrode shall not be smaller than 25 x 1.6 mm, if of copper and 25 x 3 mm, if of galvanized iron and steel. If round conductors are used as earth electrodes, their cross sectional area shall not be smaller than 3 sq.mm, if of copper and 6 sq.mm, if galvanized iron and steel.

- Conductor shall be buried in trenches not less than 0.5 m deep.

vii. <u>General</u>

- All materials used for connecting the earth lead with electrode shall be of GI in case of GI pipe and GI plate electrodes, and of tinned brass in case of copper plate electrode. The earthing lead shall be securely connected at the other end to the main board.
- The earthing lead from electrode onwards shall be suitably protected against mechanical injury by routing the earth wire / strip through a suitable size of GI pipe.
- All medium voltage equipment shall be earthed by two separate and distinct connections with the earth. In the case of high and extra high voltages, the neutral points shall be earthed by not less than two separate and distinct connections with the earth, each having its own electrode at the generating station or substation.
- All materials, fittings etc. used in earthing shall confirm to Indian standard specifications wherever they exist. In the case of materials for which Indian standard specifications do not exist, such materials shall be approved by the Engineer-in-Charge.
- The earth electrode shall be kept free from paint, enamel and grease.
- It shall be ensured that similar materials for respective earth electrodes and earth conductors are used.
- Earth electrode shall not be installed in proximity to a metal fence.
- Copper/GI strip shall be connected to the respective earth electrodes,either by brazing or welding respectively. The Copper/GI strip shall be jointed only either by brazing or by riveting at the end of over lapping portions. The over lap shall not be less than 50 mm.
- Earthing clamps used for supporting earth strips shall be made of such materials so as to avoid bimetallic action between strip and clamps.

viii. <u>Testing</u>

The earth resistance of each electrode shall be measured by using a reliable and caliberated earth megger and the value shall be as per IS/IE rules.

8.8.5 MOTOR CONTROL CENTRE

The medium voltage motor control center shall generally confirm to IS : 8623 -1993 and shall be suitable for operating under conditions indicated in design criteria.

a) <u>Mechanical details</u> :

j. Motor Control Centre shall be dust, damp and vermin proof, sheet steel enclosure with IP-54 degree of protection as per IS:13947-1993 floor mounted, self standing type with single front non-draw out compartmentalized design, sheet steel of 2 mm thick shall be used for load bearing members except for back covers and partitions where it may be 1.6 mm. The MCC shall be extendable at both ends.

k. A base channel/frame of min. 75 mm height and 2.5 mm thickness shall be provided at the bottom.

l. MCC shall be divided into panels, each consists of :-

- Horizontal chamber at top for power and control bus bars.
- Individual feeder modules arranged in multi-tier formation.
- Vertical cable alley to permit cable entry to each module.
- Vertical bus bars (droppers) to feed feeder modules.
- Horizontal cable chamber at bottom (min 250 mm above the base channel).

m. All wiring shall be from front. All components shall, except bus bars, be accessible and capable of being removed from front only.

n. Each compartment and vertical cable alley shall have individual sheet steel hinged door with concealed hinges at the front. The compartment door and cable alley door shall be designed to open in opposite directions.

o. Top bus bar chamber shall have screwed covers at the front and top. Bottom cable chamber shall have cover at the front.

p. Horizontal chamber at top and bottom shall run throughout the length of MCC.

q. Durable resilient neoprene gaskets shall be provided for all doors, covers, cutouts and for all partitions between adjacent units.

r. MCC shall be suitable for cable entry from top. Removable undrilled gland plates shall be provided at the top of the MCC. Double compression type cable glands of required number/type shall be supplied along with MCC.

s. The MCC shall have uniform height and uniform depth throughout its length. Maximum height of MCC shall be 2400 mm. Width of each panel shall be not less than 800 mm with cable alley of 300 mm :

- Minimum compartment size : 300 mm.
- Maximum operating height : < 1900 mm

- Minimum operating height : > 400 mm
- Shipping length : Limited to 2500 mm.

t. The colour shall be Tata grey as per IS:631.

u. All live parts shall be suitable shrouded.

b) <u>Feeder units</u> :

i. The design shall be of non-draw-out type. Each feeder shall be provided with MCCB/MPCB, Contactor, thermal O/L relay, START/STOP Push Buttons, Test Push Button, Local/Remote Selector switch, indicating lamps for On/Off/trip, control circuit MCB and Ammeter.

ii. For the purpose of standardization like components in the MCC shall be identical and inter-changeable.

iii. All elements of functional unit shall be accommodated in one compartment.

iv. Only MCCB operating handle, ON/OFF push buttons and O/L reset buttons shall be available for operation when the door is closed. Test push button shall be accessible only after opening the door.

v. The door shall be interlocked with the associated MCCB so that the door can be opened only when the switch is OFF and the MCCB can not be switched ON when the door is open.

vi. The MCCBs shall have provision for Pad locking in the OFF position.

vii. The compartments shall have nameplate to designate the feeder.

c) <u>Bus bars</u> :

i. MCC shall be provided with 4 power bus bars for 3 phase and neutral and 2 control bus bars at the top in a separate compartment. Bus bar arrangement shall generally conform to IS :375-1963. The bus bars shall run continuously throughout the length of the MCC. Bus bars shall be rated for 1.5 times the ratings of the incoming breaker. Permissible current density shall be 0.6 mA/Sq.mm. for Al.

ii. Both horizontal and vertical bus bars shall be of EC grade Aluminium alloy equivalent to E 63401-WP (E91E) as per IS:5082-1981. The power bus bars shall have a short-circuit withstand capacity of 50 KA rms for 1 sec and dynamic withstand capacity of 105 KA peak. The control bus bars shall be of high conductivity electrolytic grade copper as per IS:613-1984.

iii. The bus bar shall be phase identified by colours Red, Yellow and Blue for phases, black for neutral.

iv. The bus bars shall be rated for 40 Deg C temp rise over an ambient of 45 Deg. C. Cross section of bus bars shall be uniform throughout.

v. The bus bars shall be supported on tough, non-hygroscopic, self extinguishing fire retardant insulators with ribbed construction to prevent tracking due to dust

accumulation and to have larger creepage distance. Bus bars and supports shall withstand maximum stresses due to the short circuit current specified.

vi. The clearance between bare phase power bus bars and between phase and earth bus bars in air shall not be less than 50 mm.

vii. All bus bar joints shall be bolted type, belle ville/spring washers shall be used for joints to prevent loosening of nuts and over heating.

d) <u>Incomer</u> :

i. The incomer MCCB shall be of suitable capacity, 3 pole and neutral arrangement along with voltmeter and CT operated ammeter, indication lamps etc.

ii. The MCCB shall have the following features :

- Suitable for operation to 415 V, 3 Phase, 4 wire system.
- Air break, triple pole, conforming to IS:13947-2-1993.
- Suitably derated for 50 deg C ambient to cater to load.
- Quick make and quick break, manually operated, trip free switching mechanism non-draw out type.
- Adjustable magnetic releases.
- Breaking capacity : 50 kA.
- Clearly identifiable handle position for ON, OFF and trip.
- 2 NO & 2 NC auxiliary contacts wired upto the terminals.
- Long operating handle to be provided for operation of the MCCB.

iii. Incomer module shall also have :-

- One no. Voltmeter (0-500 V) with 4 position selector switch and back up fuses.
- One no. Ammeter(Taut band) as shown in the SLD with 4 position selector switch and back up fuses.

e) <u>Outgoing feeders</u> :

i. MCCB/MPCB shall be provided for all the outgoing feeders of the MCC, as per drawing suitable for motor back up protection and shall have following features:

- Capable of providing protection, coordination in conjunction with suitably rated contactor and over load relay.
- Conform to IS:13947 (Part-2), 1993.
- Quick make, quick break, trip free mechanism.
- Breaking capacity, 50 KA
- Push to trip facility.

f) Outgoing module shall also have :-

- One no. Voltmeter (0-500 V) with 4 position selector switch and back up fuses.
- One no. Ammeter(Taut band) as shown in the SLD with 4 position selector switch and back up fuses.

g) <u>Contactors</u>

- Contactors shall be 3 pole, air break type rated for AC 3 duty.
- Minimum rating of contactor shall be 150% of the motor current.
- Contactor shall have 2 NO + 2 NC auxiliary contacts.

h) Over load relays :

- The thermal O/L relays shall be three element bi-metallic type, manually reset. The reset button shall be available for operation when the door is closed.
- O/L relays shall be directly connected to the contactor.
- O/L relay shall be selected to suit starting time of the drive.
- Relay shall be provided with 1NO+1NC contact.

i) Indicating Instruments :

Ammeters :

- Shall be with Class 1.5 accuracy, 96 mm x 96 mm tout band for all outgoings.
- A red mark shall be provided on the ammeter dial corresponding to full load current of motor.
- Shall have suppressed O/L range (cramped end scale) beyond full load current to read starting current of 600 to 800% of full load current of motor.
- The ammeter shall be provided for all motors and shall be CT operated.

Volt meter:

- A taut band voltmeter, 0-500 V AC range, 96 mm x 96 mm size for incomer and 96 mm x 96 mm for outgoing along with selector switch and control fuses shall be provided. Incomer panel shall have a voltmeter of 0-250 V AC range for control supply voltage. Voltmeter shall be industrial Grade B accuracy and shall have suppressed scale for the lower range.
- Selector switches shall have 3-way and off position with black colour knob.

j) Indicating lamps :

28. All indicating lamps shall be Red, Green and Amber colour lenses as required shall be provided. Red for ON and green for OFF and amber for Tripped on over load.

k) Current transformers :

(2) CTs shall be with bar primary, cast resin type. Measuring accuracy shall be Class 1. VA rating not less than 15.

l) Push buttons :

(b) Push buttons shall be heavy duty type with 1NO+1NC contact rated for 10 Amps. The colour code shall be green, red and black for 'Start', 'Stop' and 'Test' respectively.

m) Wiring and Termination :

i) MCC shall be completely factory assembled and wired.
Power connection shall be done by 660/1100 V grade single core PVC insulated copper conductor of min. cross section 4.0 Sq.mm. and control wiring shall be 650 V/1100 V PVC stranded single core copper conductor of minimum cross section 1.5 Sq.mm.

ii) Each wire shall be identified by ferrules at each end in accordance with the schematics. Wiring to the door shall be done by flexible cable and the cables shall be bunched, sleeved and cleated so that no mechanical damage can occur to the cables while opening/closing the door.

iii) Not more than 2 wires shall be terminated at one control terminal to suit individual feeder requirements.

iii) All terminations shall be of adequate current rating and size to suit individual feeder requirements.
iv) Outgoing power terminations shall be designed for connecting PVC aluminium cables. Suitable provision shall be made for termination higher size cables.
v) Each control terminal block shall have 20% spare terminals.
vi) Inter module wiring in the same panel shall be through vertical cable alley.
vii) Inter panel wiring shall be through horizontal cable chamber at bottom.
viii) Separate terminal blocks shall be provided for power and control cables.

n) Earthing

i) A continuous earth bus shall be provided for the MCC at the bottom with an earthing bolt at each end.
ii) The earth bus shall be of Aluminium having the same size as that of neutral bus bar.
iii) The MCC are to be connected with the existing earth grid with the help of 50x6 mm hot dip GI flat/strip.

o) Labels

i) A designation plate for the MCC shall be affixed at approximately the center of the MCC (length wise) with letters not less than 25 mm.
ii) Inscriptions plates shall be provided for all units mounted on the door indicating the purpose with minimum 5 mm high letters.
iii) Each component shall be clearly labelled as per schematics.
iv) All inscription shall be on black traffolite sheets/black anodised aluminium plat with white lettering.
v) Danger notice board as per IS:2551-1982 shall be provided on front and back side of MCC.

p) Painting

The paint of MCC should be as per IS:631 (Tata grey) only.

q) Tests

c. Inspection shall be carried out as per the QAP to be approved by the Owner/Consultant.

d. The MCC shall be routine tested as per IS :8623 - 1993 and IEC:439.

e. The supplier shall furnish test certificates for the type test conducted on similar type of MCC conforming to above standards.

f. All tests shall be conducted in the presence of Engineers.

g. Approval of test certificates shall be obtained from Owner and MCC shall be dispatched only after receipt of Engineer's dispatch clearance.

r) Designation

The MCC shall be provided with designation as shown in the SLDs.

s) Drawings

After the award of the contract the contractor shall submit three copies of the following drawings for approval of the department.

i)Outline dimensional drawing of the MCC showing arrangement indicating the following :

- Power and control cable entry points,
- Bus-bar clearances,
- Details of support insulators and spacing,
- Configuration of bus-bars.
- Outgoing power cable termination arrangements.

ii) Single line diagram of MCC showing protection, metering etc..

8.9 CLEAN ROOM WALKABLE CEILING SYSTEM

8.9.1 GENERAL :

Description of work :

The work in this section includes design, materials, hardware, installation, supervision, and testing complete in all aspects necessary for operation of ceiling system in clean room performance:

Resultant ceiling system shall be capable of providing clean room class conditions indicated for the specific areas.

8.9.2 Factory observation :

a) The owner shall have the right to maintain a quality control representative at the factory to observe fabrication, assembly and testing of all parts of the ceiling system.

b) Owner's representative shall have access to all areas as required for complete observation of manufacturing and testing.

8.9.3 PRODUCTS :

Ceiling system :

a) Provide walkable ceiling panels made up of two 0.8 mm thick powder coated GPSP sheet skins, epoxy polyester coated with minimum paint thickness 60 Microns, fastned to profiles placed in a particle tight frame with caulking silicone sealing. Cutouts for supply/return air outlets and light fixtures etc are to be pre-engineered and factory made. The panel be filled with non-combustible material having density 40+/-2 Kg/m^3.The ceiling system be independent from the partition system.

i. Suspension : Zinc coated threaded hook rods from true ceiling with turnbuckle arrangement as shown in drawing.

ii. Manufacturer/system: I-Clean/ Fabtech/ Aseptic Projects/ SR Prefabs.

iii. Include: Insert springs, perimeter connection with 2 spacers and J channels, corner pieces.

iv. Modular installation system : Hilti, Mupro, Unistrut.

b) The ceiling panels shall be supported from true ceiling by M-8 rods with threaded ends, which shall be connected at one end to turnbuckles. The turnbuckle shall be attached to another M-8 threaded ends and a clip at the bottom of the rod to fit securely on the ceiling system. The turnbuckle assembly in the overhead structure shall permit final leveling of the ceiling panels. Over all ceiling shall be level within $\pm$2.5 mm throughout the room.

c) Perimeter connections: For fixed perimeter where vibration or building movement is not a design criteria, 1" Wide J channel with a chamber shall be used. For perimeter with expansion or vibration joints, Z – spacers shall be used to isolate the ceiling from movement of the adjacent wall.

d) Suspension spacing: Design suspension spacing for dead load of ceiling plus 73 Kg/Sq.m. live load.

e) The suspenders shall be fastened free of vibrations; for this reason no common suspension with media duct and other systems shall be allowed.

Fire rating:

Ceiling panel confirm to minimum one hour fire rating. In case of cutouts, the fire resistance rate is maintained. The contractor to submit proof from reputed / established laboratory like CBRI, Roorkee / UL/ CE for complying minimum one hour fire rating for skin.

8.10 CLEAN ROOM LIGHTING

8.10.1 **General:**

General illumination at 500 lux for clean rooms and 300 lux for corridors / grey area shall be provided by air tight clean room lighting fixture suitable for 240V, single phase, 50Hz power supply. The light fixture to be mounted in ceiling panels in such a manner to create a unitized assembly, free from any possible leaks at assembly locations. The fixture shall be of anodized aluminium / powder coated aluminium. Each lighting fixture shall be effectively earthed and earthing connection shall be taken from respective ballast box.

8.10.2 **Product Features:**

10. Size: 610 mm x 610 mm
11. Walkable ceiling system will have top openable light fixture.
12. The fixture to have epoxy coated, anticorrosive extruded aluminium bottom frame gasketted airtight, bottom frame and housing in integrated construction.
13. Should have parabolic specular finish full reflector required to suite 50W LED.
14. Should have clear PMMA acrylic cover, pre fitted continuous pressure plate for positive sealing of acrylic.
15. Should have screw less housing cover, fully gasketted, self locking HYPLON mechanism light fixture protection.
16. Suitable for 50 Watt LED.
17. The top cover shall have provision for two (2) number of 20 mm dia flexible GI metal conduit entry / knock out holes on sideways.

8.10.3**INSTALLATION :**

f. The light fixture manufacturer to give precise ceiling opening size before placing order to clean room contractor/ ceiling manufacturer.

g. For power supply of lighting fixtures, necessary wiring through flexible GI metal conduit with ball socket coupling from junction box upto terminal block of ballast box shall be done by electrical contractor. Contractor has to take connections from the terminal block.

h. The ballast box shall have provision for earthling by flexible PVC insulated single core (1.0sqmm) stranded copper conductor.

i. Separate circuit wiring (up to 30%) be laid for lighting circuits which will have UPS backing.

8.10.4 **Submittals :**

Product data : Submit manufacturers technical product data with component dimensions, describing components within assembly anchorage and fasteners and substantiating that the products would comply with the requirements.

8.10.5 Shop drawings : Successful bidder to submit the following drawings

a. Ceiling suspension layout.
b. Ceiling panel suspension hookup details showing the locations at which the panels shall be suspended from true ceiling.
c. Showing other systems like HVAC ducts, cable trays, conduits, pipings running between the suspenders.
d. Showing locations of Diffuers, light fixtures in ceiling panels.

8.11 CLEANROOM WALL PANELLING SYSTEM

8.11.1 **DESCRIPTION OF WORK :**

The proposed wall system is non progressive and should be 0.8mm thick powder coated GSPC sheets on both sides and 40 +/-2 kg/cum density puf as infill. All framing members are to be extruded in a designer white finish. The partitioning system must be a non-combustible product.

It is important to note that the thickness of the wall panels for each clean room bay should be based on the clean room design of each room. All wall panels should be non-progressive.

Doors should be satin anodized narrow stile leafs complete with aluminium frames, pivot hinges, concealed door closers, and push/pull hardware set. All doors are to be half glazed with ¼" clear tempered glazing on top and ¼" The walling panels should be constructed to a suitable height as per the design requirements. Windows will be incorporated, wherever indicated on our layout proposal, at a level between 1.5 and 2.2m height and incorporate clear tempered glass in their construction.

All cleanroom surfaces shall be Electro- Static Dissipative, as recommended byANSI/ESD S20.20.

Utilize methods of construction which minimize the generation of contaminants. Partition components shall assemble into a rigid structure with straight joints, capable of supporting panels and equipment utilities as required. Completed installation shall be free of exposed bolts, nuts, rivets and fasteners.

Wall :

a) Demountable, non-progressive module of 48 inch (1220mm) wide capable of four direction lateral expansion with reusable components.
b) Partition of nominal thickness of 44 mm and not more than 50 mm, made up of two 0.8 mm thick zinc steel sheet skins, epoxy polyester coated with minimum paint thickness 60 Microns, fastened to profiles placed in a particle tight frame with caulking silicon ceiling. Cut outs for RA raiser, switch socket outlets, exhaust outlets are to be pre- engineered and factory made. The panels are filled with PUF having density 40+/- Kg/m^3. The wall system be independent from the ceiling system. It should be of fire retardant .
c) Butt vertical joints, snap-in-type with continuous concealed dry gasketing.
d) Snap-on trim accessories.
e) Partition height 13' ^{1}/2" (4000 mm).
f) Utility raceways and piping placed along wall on side.
g) Lateral load: 5 p.f.s. Impact load.

8.11.2Hollow metal flush doors and frames in clean room wall system:

As an integral part of wall system.

8.11.3 Furnish and install door hardware that is not a part of the clean room wall system.

8.11.4 Provide Plexiglas / toughened in wall partition wherever shown in the drawing.

8.11.5 Keep provisions for electrical power sockets, paging system, intercom and LAN systems.

8.11.6 Provision has to be made also for making openings in the partition walls for taking utility pipes, cables, drains, exhaust ducting etc., wherever necessary as per the instructions of the Owner / Consultant.

MANUFACTURER:

8.11.7 Clean room support system consisting primarily of bottom floor track and top runner system.

Partition panel shall be with no exposed fasteners. Finish shall be with epoxy enamels on at 450 deg F having abrasion resistance.

8.11.8 **Accessories :**

Major accessory components as follows:

a) Sealants :
   i. Silicone
   ii. Tape sealant: Continuous extruded closed cell polyethylene tape.

b) Fasteners :

Type recommended by system manufacturer.

Any modification and/or deviation from manufacturer's standard demountable partitions accessories etc. specified herein or shown on the drawing shall be the responsibility of the contractor including any design, additional material etc. necessitated by same.

8.11.9 **INSTALLATION :**

8.11.10 Utilize methods of construction, which minimize the generation of contaminants.

8.11.11 Partition components shall assemble in to a rigid structure with straight joints, capable of supporting panels and equipment utilities as required. Completed installation shall be free of exposed bolts, nuts, rivets and fasteners.

8.11.12 **QUALIFICATIONS OF INSTALLER :**

Installation shall be by material manufacturer or a previously approved, qualified and authorized installer with at least 2 years of experience on similar construction.

8.11.13 **SUBMITTALS :**

Product data: Submit manufacturers technical product data with component dimensions, describing components within assembly anchorage and fasteners, glass and infill and substantiating that the products would comply with the requirements.

8.11.14 Shop drawings:

Submit complete shop drawings and erection diagrams. Shop drawings shall be prepared by the wall system manufacturer incorporating power and utility cutout locations, return air grill and riser locations. Show details of all finished work as indicated on drawings including following items:

Attachments, reinforcement, assemblies and locations of all joints, joinery techniques, and materials, fastening and sealing methods; including metal alloys, fasteners and all shop and field sealants by product name and locate on shop drawings. Shop drawings shall include instructions and explanatory details for sequence of installation of all materials. Show relative lay out of all adjacent construction, all correctly dimensioned. Provide isometric or other drawings, which explain or define certain interconnections when requested by Owner.

Care should be taken so that the wall system do not behave like a medium for transfer of vibrations from elsewhere.

Provide samples of all partition finishes and joint covers. Approved samples shall become the standard for acceptance of all installed work

8.11.15**MANUFACTURER's TEST DATA:**

Provide necessary test results for structural requirements and outlined in the following:

8.11.16**Uniform Load test :**

Calculate or test partitions to prove they will resist 35 lbs/square foot in bending, and that deflection will not exceed L/360 with 10# per square foot load will not more than 11" permanent set.

8.11.17**Air and light seal – Bright light test:**

All panel joints, ceiling joints and sill joints shall be tested for air and light leaks in the following manner; Darken room (clean area side of partition) to a state of less than 0.5' candles general illumination. On opposite side of wall shine 100 watt floor light at all vertical and horizontal joints. Light source shall not be greater than 30' from perpendicular. Observe corresponding joints from darkened side of all. Any visible light through joint shall constitute a leak and shall be sealed. Repair gasket seal as required to achieve proper seal. No liquid sealants are to be used.

8.11.18**PRODUCT DELIVERY, HANDLING AND STORAGE:**

Delivery: Deliver materials in their original unopened packages.

Handling: Exercise care in handling partition components to prevent damage.

Storage: Storage materials in an enclosed shelter, protected from damage and from the elements.

8.11.19**FINISH :**

a. For ISO class 7 clean rooms, provide uniform colour factory applied on both faces of all panels. Minimum paint thickness be 60 Microns.

b. Fire Rating.

Wall panels confirm to minimum one hour fire rating. In case of cutouts, the fire resistance rate is maintained. The contractor to submit proof from reputed / established laboratory like CBRI, Roorkee / UL/ CE for complying minimum one hour fire rating for skin.

8.11.20 **Acceptance**

Materials found to be defective or improperly installed shall be replaced.

8.11.21**Cleaning :**

Periodically during work and after completion of work, clean up and remove all debris from job site. Remove all rubbish and cartons and leave job site broom clean.

8.11.22**Protection and repair :**Protect the work of other during execution of work, and repair any damages caused.

8.12 STATIC CONDUCTIVE VINYL FLOORS

8.12.1 **GENERAL:**

a)The static conductive vinyl floor shall be seamless type and shall be homogenous vinyl tile of solid unlaminated construction manufactured from highest grade materials with the surface smooth and free from foreign matters. Tiles shall be micro–squared to ensure tight joints. Tiles shall be installed in clean room and its grey area wherever required.

b) The work shall be executed as per the following specification.

c) All static conductive vinyl flooring required in the project is covered by this section.

8.12.2 **Quality Assurance :**

a) **Conductive vinyl tile** :

i. Size : 610 mm x 610 mm

ii. Thickness : 1.8 mm

iii. Dimensional stability: Length wise/Cross wise 0.05%.

iv. Electrical resistance: Based on an average of five measurements per 100 sq. ft of floor area.

- Point to point (between 2 electrodes): $5x10^4 \leq R \leq 1x10^6$ ohms.
- Point to ground : > $2.5x10^4$ ohms

v. Static (body voltage) generation: Less than 100 volts with conductive footwear per AATCC – 134 at 20% relative humidity.

vi Fire resistance:
B1/Q1
Difficult to ignite /Low smoke development
- Critical radiant flux: ASTM E648 or NEPA 253; 1.08 W/Sq.cm. or greater.
- Flame spread: ASTM E84 or NEPA 255; 75 or less.
- Smoke density: ASTM E622; 450 or less.

vii. Chemical resistance: Resistant to splash or spills of:

Name of the chemical	1minute	24 hours
Hydrochloric acid concentrated	No effect	No effect
Hydrofluoric acid concentrated	No effect	No effect
Sulphuric acid	No effect	No effect
Sodium Hydroxide	No effect	No effect

viii. Compressive strength : 250 psi
ix. Heat resistance : 0.011 Sq.m.KW
x. Wear resistance : 0.17 mm

b) **Accessories :**
i. 4 inch rubber base with pre – molded end stops and external corners.
ii. Copper grounding strips 1" wide.

8.12.3 **Product and installation :**

8.12.4 **Static conductive seamless vinyl floor :**

a)Install static conductive seamless vinyl flooring system under super vision of manufacturer's authorized representative at site to ensure rigid adherence to manufacturer's recommended procedure. Install flooring on concrete, under movable partitions, and maintain consistent floor patterns.

b)Concrete floor must be dry, clean and free from dust, paint, oil, grease and all other extraneous materials. New concrete must be cured and a minimum drying time of 3 months allowed before installation of floor. Floor surface must be smooth and flat with a maximum variation of 1/8" in 10' (1.04 mm in 1meter) cracks on irregular surfaces shall be patched and leveled, using an approved grade of rubber latex underlayments.

c)Flooring shall be laid with 610 mm x 610 mm sections, square edged or seamless. The tittle shall be laid with conductive epoxy adhesive, with in one hour after mixing of adhesive. Roll and cross roll tiles with 150 lbs sectional roller immediately after laying and again after an hour. Any adhesive seepage at seams are finish surface must be removed while adhesive is still wet using a cloth dampened with water.

d)For seamless installation, allow the adhesive to dry over night, then use router to cut a groove in square edged tiles - up to half the thickness of tiles. Use chamfering plane to open each cross seam.

e)Use poly vinyl chloride (PVC) bead of approved colour with a hot air welding to heat weld bead in to routed groove. After weld is cooled, shave off excess bead with a spatula.

f)Prior to installation of floor, the electrical contractor shall drop a wire (#10 or #12 stranded) from many convenient ground bus and a small hole chipped out rom the concrete floor, copper grounding strip provided by the floor contractor shall be intertweened with the copper and the connection is pushed in the hold and complete buried in the adhesive and the hole is filled to the level of the floor. The balance part of the conductive strip is laid flat on the floor and covered with adhesive before tile is laid on top.

8.12.5 **Cleaning, Protection and final adjustment :**

After completion of installation, vacuum clean the entire floor system and cover with continuous sheets of reinforced paper or plastic. Maintain and repair damages to protective covering.

8.12.6 **Resistance tests :**

The complete installation shall be tested by a factory representative in conjunction with a designated representative of the Owner / Consultant. Test shall be made as prescribed by NFPA, standard 99.

8.13 GLASS AND GLAZING

8.13.1 **GENERAL :**

Related documents :

Drawings and general conditions of contract including general specifications and specification sections in this document apply to work of this section.

8.13.2 **Description of work :**

The work in general shall consist of supplying and fixing all glass and glazing wherever required as shown on drawings and specifications supply of metal glazing beads and neoprene gaskets shall not be included in this scope.

8.13.3 **Submittal:**

Provide samples for approval. Approved samples shall become the standard for acceptance of all installed work.

8.13.4 **INSTALLATION :**

General :

The contractor shall supply cleanroom glazed wall panels, glazed doors, vision panels and install all glass and glazing as required for various doors and partitions, unless otherwise stated from approved manufacturer like Indo – Ashai or equivalent, having uniform refractive index and free from flaws, specks and bubbles. The glass shall be brought to site in the original packing from the manufacturer and cut to size at site.

Materials :

Clear glass shall be float glass of minimum 5.0 mm thick.

8.13.5 **Glazing, Setting and Finish :**

All glass shall be thoroughly cleaned before putting in position. All holes that may be necessary for holding the clips, glazing heads and all other attachments shall be drilled by the Contractor.

After completion of glazing work, the Contractor shall remove all dirt stains, clean the glass panel as per procedure suitable for cleanroom and leave the work in perfectly acceptable condition. All broken cracked or damaged glass shall be replaced by new ones at the Contractor’s own cost.

8.13.6 **ACCEPTANCE CRITERIA :**

a) All installation shall be free from cracked, broken or damaged glass. Edges of large panes of thicker glass and heat absorbing glass shall be inspected carefully for chipped, cracked edges or edges not ground properly.
b) Glazing shall be carefully done to avoid direct contact with metal frames.
c) All glass shall be fixed by neoprene gaskets to give a leak proof installation.
d) At completion, the panes shall be free from duct, stains, etc. to the complete satisfaction of the engineer in charge.
e) Glass shall be tested for antistatic properties after chemical spray etc…

8.14 Nitrogen Gases:

8.14.1 ALL SS-304 connections/joints shall be Orbital Welded (wherever required) as per the required international standards to maintain the integrity/ purity of the joints, piping and other fittings. All necessary piping connection, fittings, valves, regulators and filters are of SS 304 and shall have orbital welded joints fitting connections (wherever applicable) compatible to Nitrogen gas piping.

8.14.2 The HN_2 nitrogen distribution piping system shall be leak testedwith pressurized dry nitrogen gas and He leak tested as per the standard approved procedures.

8.14.3 Provision of supply of Purge nitrogen gas ($HN_{2)}$ from the Four cylinder gas bank (2) manifold shall also be provided. The gas manifold shall have a two stage gas regulator (Input cylinder pressure of 2000 psi with regulated output pressure of 0 to 200 psi, including input and output pressure gauges), flexible piping with pigtails connections to connect four nitrogen gas cylinders, necessary ON/OFF valves, non-return valve, 0.3 micron bulk filter and all other necessary fittings for smooth connection and operation of the manifold.

8.15 Argon Gases:

8.15.1 Manual Valve Manifold Box capable of providing gas supply and distribution to the equipments / tools. It should be capable of providing following features:

i. Manual Gas Manifold with 2 outlets
ii. Primary Pressure Regulator with inlet and outlet pressure gauges and isolation valves, and capable of providing flow rates upto5slpm and pressure of 90 psig
iii. Check valves for each outlet
iv. Necessary isolation valves (Diaphragm type) for each outlet
v. Point of use In-line filters at each outlet to ensure particle free gas supply to equipments / tools

8.15.2 All components used are with either orbital welded end or VCR end connections (face seal fittings)

8.15.3 The Gas Supply panel should be tested for Pressure decay test, Helium leak test with leak integrity of 1×10^{-9} mbar lit/sec He with third party certified using Oil Free Alcatel Helium Leak Detector

8.15.4 SS 316 L Seamless Tube & Fittings:

i) Material Type: 304 Stainless steel tube seamless
ii) Material Types: Shall meet ASTM standards A269 - Single Melt Seamless
iii) Weld Ends: Suitable for orbital welding
iv)Tube Clamps: SS clamps with PP inserts fixed firmly on Unistrut type support.

8.15.5. Distribution pipeline network :

i) Vendor to build distribution pipeline network from each panel and gas distribution panels to various process tools with appropriate components like Valve Manifold Boxes and valves, regulators, non-return valves etc, as required.

ii) Vendor to use Seamless Stainless Steel pipes/tubes of grade 304.

8.16. Vertical Laminar Air Flow Biological Safety Cabinet

Operational Requirements	Protect both product, personnel & environment
Internal Dimension in feet(W x D x H)	6'x2.5'x2.5' (tolerable variation in size ±25%)
Total bench height	Should be less than 8 feet
Body Construction	• Sturdy support structure and side panels made of electro galvanized steel with white oven baked epoxy powder coated finish (abrasive resistant). • Front face designed for ~ 10 degree slant for operator's comfort • Double wall construction-compartment should be under constant negative pressure. All necessary fittings through the double wall.
Work surface	• Removable thick non-sagging stainless steel work surface • Removable SS spill trough plenum (taper type) with drain (For spill over material/liquid) under the work surface • Interior side walls and back wall are to be made from single piece stainless steel sheet with no welding joints
Front facing panel	• Front panel made up of toughened glass/Lexan polycarbonate sheet smooth top sliding with safe counterbalance sash. • View screen with ~20" max. opening to fully closed.
Base Stand/Cabinet	Powder coated very sturdy base stand below the working bench
Vertical flow Filter system	Mini pleat separator less ULPA filter (efficiency ~99.995% at particle size between 0.1 to 0.3 microns with minimum dead space
Filter Blower Assembly	• Corrosion resistant motor blower assembly, statically and dynamically balanced with thermal over-load protection and speed control. • Top exhaust opening with suitable exhaust collar for connecting to the existing exhaust pipe
Air Flow velocity	Down flow air velocity of 0.3-0.4 m/s and inflow air velocity of 0.5 to 0.7 m/s. 60-70% inflow and 30-40% exhaust flow to be provided
Noise & Vibration level	Noise level less than 65 dB & extremely low vibration level
Illumination	Light source with suitable fixtures for

	florescent lighting (≥1000 Lux) to be provided
Electrical control panel & Electronic Air flow control	• Electrical control panel for ON/OFF switches & lighting • Microprocessor based electronic Airflow control system to maintain the optimum balance between supply and exhaust air system through controlled monitoring of air flow using air sensors • System should also incorporate audible & visual alarm for any unsafe condition • Air flow set point low/high for error conditions and power supply • Microprocessor controller shall also control all lights and electrical sockets and 24 hours clock with special timer function to be provided • Life span display of the ULPA/HEPA filter **or** indicator showing the saturation of filter to be provided
Electrical outlets	Two numbers of 5/15 Amps. Electrical sockets (Universal type) with splash proof cover
Operating voltage	220-230 Volts, 50 Hz, Single phase
Add on features	• One Gas line cock and one water cock (Stainless steel/PVDF/Polypropylene/PFA) • one N_2 spray gun (Teflon/PVDF/Polypropylene/PFA/PTFE) • Arm Rest to be provided for operator's comfort without disturbing the Air flow.
Front maintenance	• All filters should be easily removed from the cabinet without disassembly of the control panel • All controls and adjustments should be accessible from the front of the cabinet
Warranty	One year after installation and acceptance
Acceptance Criteria	• Unloading of the safety cabinet to be done by the vendor free of cost. • The safety cabinet should be installed at C-MET, the cost to be borne by the vendor • System should come along with the entire necessary accessory and should be ready to work.

8.17 Polypropylene Vertical Laminar Air Flow Fume Hood

Operational Requirements	Protect both product and personnel
Internal Dimension in feet(W x D x H)	6'x2.5'x2.5' (tolerable variation in size ±15%)
Total bench height	Should be less than 8 feet
Body Construction	• Stress relieved all seam welded polypropylene outer shell, inner work space, walls, work surface and access panel. • Hinges, screws, bolts are constructed of polypropylene • Double wall construction-Compartment should be under constant negative pressure and the pressure drop is more than 20 mm. All necessary fittings through the double wall. • Zero leak Air Flow System.
Work surface	Removable thick non sagging polypropylene work surface and spill trough plenum under the work surface
Front facing panel	Sliding thick Lexan polycarbonate/toughened glass view screen with at least ~ 20" opening to fully closed.
Fume Hood Base Cabinet	Base cabinet with covered storage space below the working table
Sink	• One standard size Polypropylene sink (preferably ~ 16"x16"x8")with drain, one Normal and DI Water Faucets (PVDF/Polypropylene)
Filter	Metal free separator less HEPA filters (~99.95% efficiency) with minimum dead space + Standard washable pre-filters
Filter Blower Assembly	Standard assembly with Statically and dynamically balanced
Down Air flow velocity	0.3-0.5 m/s, Unidirectional with minimum air turbulence
Noise & Vibration level	Noise ≤ 65 dB & extremely low vibration level
Exhaust volume & Exhaust opening	~800 CFM, Top exhaust opening with suitable exhaust collar
Illumination	Light source with suitable fixtures for florescent lighting (≥ 900 Lux) to be provided
Nominal voltage	220-230 Volts, 50 Hz, Single phase
Electrical control Panel & Electrical outlets	• Modular Electrical Component Constructions Sealed in Polypropylene Case with Access Panel for ON/OFF switches, lighting, necessary alarms & interlocks. • Two nos. of 5/15 Amps electrical sockets (Universal type)
Add on	• One Gas line cock (PVDF/Polypropylene/PFA/PTFE)

features	• One DI and one nitrogen spray guns (PVDF/Polypropylene/PFA/PTFE)
Front Maintenance	• All filters should be easily removed without disassembly of the control panel • All controls and adjustments should be accessible from the front of the cabinet
Warranty	One year
Acceptance criteria	The Fume hood should be installed at C-MET& the cost to be borne by the vendor

8.18 TECHNICAL DATA(To be Filled By Contractor)

8.18.1 AIR COOLED CONDENSING UNITS:

Capacity :
Model No :
Make
IKW /TR at 100% full load :
Compressor type :
Refrigerant used :
Type & No. of capacity control steps :
Starting current Amps. :
Locked Rotor Amps :
Current at operating Conditions (Amps) :
Over all Dimension (M) :
Length (mm) :
Width (mm) :
Height (mm) :
Operating Weight (Kg) :
Service Clearance Required (mm) :
Noise Level of one Machine (db) :

8.18.2 HANDLING UNITS(FLOOR MOUNTED):

Manufacturer :
Type :
Air Quantity :
Capacity (TR) :
Static Pressure :
Operating weight (Kg) :
Overall dimensions (mm) :
Noise Level (db) :
Material and thickness of casing (gauge) :
Material and thickness of drain pan (gauge):
Manufacturer of coil :
Type of coil :
No. of rows (No.) :
Water flow rate (USGPM) :
Water pressure drop (Ft) :
Fan section manufacturer :
Type of fan :
Fan speed (RPM) :
Motor rating (HP) :
Type of air filters :

Size of air filter and Quantity :
Velocity at filter face (FPM) :
Pressure drop across filter (mm WG) :
Heaters capacity &number (KW/No.) :
Contractor rating (Amps) :
Humidification arrangement if provided : (Yes/No)
Spray water rate (USGPM) :

Rating of spray pump (kW) :
Number of nozzles (No.) :

8.18.3 REF.PIPING INSULATION

Manufacturer :
Materials :
Density :

8.18.4 INSULATION:

DuctingAcoustic LiningManufacturer :

Materials :
Density :

8.18.5 THERMOSTATS PLC controller:

Manufacturer/Model :
Type (Snap acting, etc..) :
Electrical Characteristics :
Range :
Differential/throttling range :

8.18.6 DAMPERS: (Make, Material & Gauge)

Fire Dampers :
Volume Control Dampers :

8.18.7 GRILLES/DIFFUSERS: (Make, Material & Gauge)

Louvers :
Grill's :
Diffusers

9 APPROVED MAKESOF MATERIALS

The CONTRACTOR shall quote the rates on the basis of the price of the brand / make stipulated in the item of works as described in BOQ, Specifications and furnished in Technical data.

Note: Before use of any of the Below brands for the Project, Prior Written permission shall be taken from client/Consultant. The Client shall have choice to select any of the above approved brands.

9.1 HVAC

HVAC WORKS		
1.	A/C Scroll Condensing Unit	Daikin/LG/Bluestar/Voltas
2.	Air Handling Units	System air /Zeco/ Edgetech

3.	Aluminum antismudge Diffusers/ Grills / Dampers	AirMaster/System Air /Air breeze
4.	Fire Damper	AirMaster/System Air /Air breeze
5.	Nitrile rubber Insulation	Armacell /K Flex
6.	Cooling Coils / Heating Coils	System air /Zeco/ Edgetech
7.	SDIDW Centrifugal Fans	Kruger/ Nicotra/ Comefri
8.	V Belts/Pulleys	Fenner/ Dunlop
9.	Factory Fabricated ducting	Vishaka Profile /Zeco/ Radiant/Rolastar
10.	Electric Motors	Siemens/ Kirloskar/ ABB/Cromton/Grundfos
11.	Filters(Pre , Fine)	Klenzaids/Spectrum/Pyramid/ EMW
12.	Fire retardant canvas cloth	Mysore Nandi
13.	HEPA Filters	AFF/ Camfil / Fruden berg .
14.	Digital Display units	Styrax / Radix
15.	Clean room wall panels	I Clean / Ahlada/fabtech
16.	Clean room ceiling panels	I Clean / Ahlada/fabtech
17.	Clean room doors/View panels	I Clean / Ahlada/fabtech
18.	Air shower	I Clean / Ahlada/fabtech
19.	Cross Over Bench	I Clean / Ahlada/fabtech
20.	Garment Cubicle	I Clean / Ahlada/fabtech
21.	Clean room work benches	I Clean / Ahlada/fabtech

9.2 ELECTRICAL:

ELECTRICAL WORKS		
22.	Main Electrical Panel/ LT Panel	Manufacturer with CPRI Certificate for short circuit and temp. rise not earlier than two years
23.	MCBs/MCB Distribution boards	Legrand/ Siemens/Crompton/ Havells
24.	Metal clad sockets	BCH/Crompton/ Legrand / Havells
25.	MV Switchgear	L&T/ Schneider / Siemens/ ABB
26.	LT Cables, 1.1 KV grade XLPE insulated AL Conductor AR Cable	NICCO/Universal/ Finolex
27.	Cable glands	HMI/ Comet/ Braco/Jainson
28.	Cable Lugs	Dowell's/3D/ Hex
29.	Cable Trays	Fedders Llyods Corp. Ltd./ Slotco/ Pilco
30.	Voltmeter, Ammeter, Selector switch & indicating lamp	Elemesure/ Meco/ AE/ Kappa
31.	Miniature Circuit Breaker	L&T/ Schneider/Siemens/ Legrand
32.	Contactors, Timers	L & T/ Schneider Electric/ Siemens/ ABB
33.	Copper conductor wires of 1100V Grade (FRLS)	Finolex/ RR Kabels/ Gloster/ KEI
34.	PVC Conduits (FRLS)	BEC/ AKG/ Precision/ Polypack/ Sudhakar
35.	Light Fixtures and Lamps	Philips/ Crompton/ Bajaj / Wipro
36.	Maintenance Free Earth station	Galaxy/ Ashok/Ereeco/ Universal

GASES WORKS		
37.	Pipes/Tubes	Valex / Docweiler / Swagelok / Sandwik
38.	Valves	Cajon / Valex / Docweiler / Swagelok / Tescom
39.	Gas Manifolds	Messer / Tescom / Spectron / Carten

LIST OF DRAWINGS

LIST OF DRAWINGS		
S.NO	**DRAWING NAME**	**DRAWING NO**
	HVAC DRAWINGS	
1	CMET CLEAN ROOM LAYOUT	SICPL/CMET/HVAC/01
2	CMET CEILING LAYOUT	SICPL/CMET/HVAC/02
3	CMET HVAC DUCTING LAYOUT	SICPL/CMET/HVAC/03
4	CMET PRESSURE ZONING LAYOUT	SICPL/CMET/HVAC/04
5	CMET CLASS ZONING LAYOUT	SICPL/CMET/HVAC/05
6	CMET AHU ZONING LAYOUT	SICPL/CMET/HVAC/06
	ELECTRICAL DRAWINGS	
1	CMET LIGHTING LAYOUT	SICPL/CMET/ELE/01
2	CMET POWER SOCKET LAYOUT	SICPL/CMET/ELE/02
3	CMET HVAC PANEL LAYOUT	SICPL/CMET/ELE/03
4	CMET UPS PANEL	SICPL/CMET/ELE/04
	GASES DRAWINGS	
1	CMET GAS PIPING ROUTING LAYOUT	SICPL/CMET/GAS/01
1	ROOM BOOK	-

SECTION – VII

BID FORM AND PRICE SCHEDULE

Ref. No. HD/PUR/SP-35/CR/21/2017-18

(Bidders are requested to furnish the Form of Bid and appropriate Price Schedule in the Format given in this Section and filling all the blank spaces.)

FORM OF TENDER

(To be submitted by the Tenderer in letter head).

TO:

The Director,
C-MET,
HYDERABAD

Sir,

Having examined the Tender documents consisting of the Tender notice, General Instructions to Tenderers, General Conditions of Contract, Special Conditions of Contract, specifications, plans, Drawings, Time Schedules, Form of Contract , form of tender, form of schedule Rates, Bill of Material etc., and having understood the provisions of the said tender documents and also having thoroughly studied the requirements of Centre for Materials for Electronics Technology (C-MET) related to the work tendered for in connection with design, supply, erection, installation, testing, commissioning & validation of **Clean Room works including airconditioning, electrical & gase lines system at SiC laboratory** (Clean Room of 100000 class) of C-MET Hyderabad. and having conducted a thorough study of the job site involved, the site conditions, power, water, material and equipment availability, the transport and communication facility and the availability and suitability of borrow areas etc., we hereby submit our tender offer for the performance of proposed work in accordance with the terms and conditions and within the time mentioned in the tender documents at the rates included within the tender documents and based on application of the rates tendered in the accompanying schedule of rates to the relative quantities indicated in the form of schedule rates forming part of the tender documents.

Our acceptance to all the conditions of the Bidding Document in this bid form shall persist over any other terms and conditions, if any, given in our bid.

If the work or any part thereof is awarded to me/us, I/we undertake to perform the work in accordance with the contract documents as defined in the form of contract forming part of the tender documents and accept the terms and conditions of contract as laid down therein and undertake that on receipt of acceptance of tender and on confirmation. I/We will deposit such sums as may be necessary under the terms of contract and abide by the terms of the tender. I/We will also sign the necessary contract and other documents to commence the work and execute the work as per the terms and conditions contained in the tender documents failing which Centre for Materials for Electronics Technology (C-MET) shall be at liberty, without further reference to me/us and without prejudice to any of its rights to terminate the contract and or to forfeit the earnest money deposit and take further course of action.

I/We undertake, if our bid is accepted, to commence and complete delivery of all the goods and Services including installation and commissioning as specified in the Bid Document, from the date of receipt of your Purchase Order / Notification of Award / Letter of Credit.

If our bid is accepted we will obtain the bank guarantees as per the conditions of the Contract for the due performance of the Contract.

I/We agree to abide by this bid for the period of 120 days from the date fixed for bid opening as per the Instruction to Bidders and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal contract is prepared and executed, this bid, together with your written acceptance thereof and your Purchase Order / notification of award, shall constitute a binding Contract between us. I/We understand that you are not bound to accept the lowest or any bid you may receive.

I/We hereby undertake that the statements made herein/information above are true in all respects and that in the event of any such statement or information being found to be incorrect in particular, the same may be construed to be a misrepresentation entitling Centre for Materials for Electronics Technology (C-MET), Hyderabad to avoid any resultant contract and take further action as may be justified. I/We confirm having deposited EMD of Rs. …… in the form of …….

Dated this _____ day of _____ 2018

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

Name of Witness : _____

Signature : _____ Address : _____

SECTION - VII (A)
Bid form and price schedule

CONSOLIDATED SUMMARY OF PRICE BREAK UP SCHEDULE

Ref No. **Date:**_____

DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING, COMMISSIONING & VALIDATION OF

Clean Room works including airconditioning, electrical & gase lines system at SiC laboratory (Clean Room of 100000 class)

(CONSOLIDATED SUMMARY OF BOQ)

Sl No	Nomenclature	Sub-Total			Sub-Total			Total amount (5+8)
		Basic Cost	GST	Amount	Installation charges	GST	Amount	
1	2	3	4	5	6	7	8	9
A	AIR CONDITIONING WORKS							
B	ELECTRICAL WORKS							
C	GASES LINE							
	Total							

(Rupees .....)

Signature_____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder WITH STAMP : _____

SECTION - VII (B)
Bid form and price schedule

BILL OF QUANTITIES (BOQ)
DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING, COMMISSIONING & VALIDATION OF

Clean Room works including airconditioning, electrical & gase lines system at SiC laboratory (Clean Room of 100000 class)

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(A) AIR CONDITIONING WORKS																
1	Supply, installation, testing, commissioning and handing over of following capacity floor mounted Thermal Break Double skin construction Air Handling units with 1.0 mm pre coated GI outside and 1.0 mm plain GI sheet inside, Air handling unit made out of extruded aluminium structural frame work and															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	castedpolyemide/Aluminium corner/ intermediate connecting pieces.The unit shall be provided with canopy. Panels shall be made of 50 mm thick PUF injected panels having density 38 +/- 2 Kg/m^3.															
	i) The Air handling unit shall comprise of fan section with Backward curved fan with limit load characteristics , spark proof fan and the fan mounted on the scroll and not on the casing, coil section with 6 row INTERLACED/INTERWINTED design DX Cooling coil to make multi															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	distributers for multiple circuits as per requirement,Heater bank with high efficiency finned heater mounting on insulated porceline supports with fire retaurded cabling, Insulated stainless steel drain pan under coil section, filter section comprising of 10 & 5 microns combination prefilter at suction side on universal frame and and 3 micron & 0.3 HEPA filters at discharge side,mixing box along with RA and FA , Blead off dampers with handles suitable for manual and auto operation etc.															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	complete in all respect whether specifically specified or not but required to complete the system works. Scope includes required capacity Thermostatic Expansion valve one per each circuit,															
a)	**AHU 1** - 44 TR capacity, dehumidifier air qty 11000cfm, 2600 cfm fresh Air qty, 150mm Static pressure with suitable High efficency motor, 6R Dx Coil (2 nos 22TR each one after the other). Heater Capacity 18Kw		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	Supply,Installation, testing, commissioning Air cooled condensing unit with energy efficient of Scroll type compressor of following capacity. This includes required HP/LP cutouts, sinlge phase, under/over voltage relay, phase sequncing . Trip proviion to receive the control command form temerature controller . Compressor crank case heater . inter connected control / power cables and other accessories etc. The unit shall be precharged With R410a refrigerant (to include with any top up charging at the															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	time of commisioning) .the controls , Required isolation valves, filter drier and accessories															
a)	11TR Capaity - Nominal		Nos	4												
3	Supply, Installation, testing, commissioning and handing over of following capacity Pan type Humidifier with 2mm thick MS sheet duly painted. The pan will also be complete with overflow connection, drain, ball float, Low water safety switch. The heating element shall be multiple and suitable for 415V ,3															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Phase supply.															
a)	3 kW		Nos	1												
4	Supply, Installation, Testing and commissioning of folloiwng hard copper piping for Condenser units with insulation of 13mm thick Nitrile Rubber pre formed sections including supporting fixtures and accessories etc., complete. The sizes shall be designed to suit the above condenser units.															
a)	Liquid line with fittings		Rmt	60												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
b)	Suction Line with fittings		Rmt	60												
5	Supply,Erection,Testing and Commissioning of Drain piping with HDPE PVC Pipe 1 1/2" dia as per specification.		Rmt	10												
6	Supply, Erection,testing and commissioning of Soldered G.I. Ducting for clean room as per the standard specifications and practice.															
a)	24 Gauge		SM	225												
b)	22 Gauge		SM	190												
c)	20 Gauge		SM	50												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
7	Supply and fixing of volume control dampers with chrome plated spindles, self lubricated bushes, full enclosure for blade linkages, operating hanle equiped with position indicator. 18g GI for frame,20g for Blades		SM	2												
8	Supply and fixing of Aluminum flexible duct with 25mm thick glass wool insulation covered with black LDPE sheet / aluminum foil suitable to connect the Supply and Return air Diffuser spillair boxes including necessary clamps at both ends															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	of size:															
a)	250mm dia		Rmt	20												
b)	300 mm dia		Rmt	5												
9	Supply and fixing of 22G circular butterfly damper with provision to fix to the rectangular duct with GI painted circular flanges.															
a)	250mm dia		Nos	20												
b)	300mm dia		Nos	4												
10	Supply and Fixing of Fresh Air / Exhaust air Louvers with brass wire mesh backing with Pre filter		SM	2												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	for all AHU room fresh air wall openings.															
11	Supply, Installation and testing of Extruded Aluminium Anti smudgering Removable core type diffusers for supply and return air		SM	10												
12	Supply, Installation and testing of Extruded Aluminium grilles for supply and return air		SM	1												
13	Supply, Installation and Testing of GI collar dampers for supply air / return air diffsers/grilles		SM	1												
14	Supply, installation, testing and commissioning of															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
14.1	Fire damper as per specification.		Sq. Mt	3												
14.2	Supply, installation and testing of Motorized type actuator for Fire/Smoke dampers. The actuator to be fire rated for 90 minutes. Actuators to be internally mounted. Actuators should be suitable for BMS connectivity with necessary accessories. The actuator torque shall be within a range of Minimum of 5 N-m to 16 N-m.		Nos	2												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
14.3	Supply, installation and testing of Fire damper control panel. The price shall include control cabling inter-locking / wiring / connection for tripping of AHU fan motor. Complete control & power wiring for fire dampers & it's inter-locking with fire alarm panel shall be included in the scope of work including necessary step down transformers etc. as may be required. Electrical contractor will only provide 230V, AC / single phase UPS power sockets for fire dampers.		Nos	2												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
15	Supply and fixing of Thermal Insulation with of following thick Class O aluminum foil faced Nitrile rubber with Al cladding of 24G sheet as per the Technical specifications .															
a)	32 mm thick for supply air ducting		SM	35												
b)	23 mm thick for Return air ducting		SM	50												
16	Supply and fixing of Thermal Insulation with of following thick Class O aluminum foil faced Nitrile rubber material as per the Technical specifications .															
a)	32 mm thick for		SM	200												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	supply air ducting															
b)	23 mm thick for Return air ducting		SM	180												
17	Supply, installation, testing and commissioning of Control panel comprising of PLC based step controller for staging the heater elements in Pan humidifier based on the inside humidity the scope shall include all the required sensors, control cables & terminations etc complete.		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	Supply, installation, testing and commissioning of Control panel comprising of PLC based step controller for staging the condensing units based on the return air temperature. Heater banks based on the return air humidity of the AHU and the scope shall include required Humidity and Temp sensors and all the required control cables & terminations etc complete. This also include the required starters for the heater banks		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
19	Supply, installation, testing and commissioning of safety thermostat (geasure stat) for the heaters to cut off the heater banks if the temerature near heatrs goes beyond 50 Deg.C the scope includes required control cables etc complete.		sets	3												
	CLEAN ROOM ITEMS															
21	Supply,installation,testing and commisioning of GI powder coated Three persons entry air shower minimum size of air shower 2.0mt X 1.72mt, including SS304 nozzles,grated floor,Pre and HEPA filters, Blower for		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	recirculation,Flourscent lamp,Door closer along with interlocking facility to ensure both doors do not open simultaneously,2 sets of doors suitable to the air shower with necessary hinges and joinery material deemed required for making the unit complete in all aspects. with air shower panels powder coating to matching the clean room partition panel.															
22	Supply, errection & testing of 50mm thick double skin semi walkable ceiling system made of 0.8 mm thick powdercoated GPSP sheets on both sides, 40 ± 2 kg/m3 density		SM	120												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	PUF as infill, GI profiles all along the periphery, panels flush towards room side with maximum allowable gap of 3-4mm at panel to panel joints filled with silicon sealant. Ceiling panels are suspended from the RCC slab by using concealed AL ceiling grid with tie rod and adjustable turn buckle arrangement. The panels shoud be suitable to made cuouts for Diffusers, lights etc															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
23	Supply, installation of Modular Non-Progressive wall panels of 50mm thick double skin modular wall Panels made of 0.8 mm thick powdercoated GPSP sheets on both sides, 40 ± 2 kg/m3 density PUF as infill, GI profiles all along the periphery, flush on both sides with maximum allowable gap of 3- 4mm filled with food grade silicon sealant and placed on cold rolled galvanised bottom tracks with a recess to provide floor to wall coving flush with the wall panel. Panels to be covered with a protective film to avoid any damages during		SM	200												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	transportation & installation - For cleanroom areas. The scope includes the R70 Coving for wall to wall, wall to ceiling, wall to flooring & 3D corners etc and also include the necessary pvc conduits for elecrical systems where ever required.															
24	Supply, errection and testing of 46mm thick flush doors made of 0.8mm thick PU painted / powdercoated GPSP sheets on both sides, 40 ± 2 kg/m3 density PUF 1.2 mm thick GPSP powder coated door frames, double glazed vision panel with necessary adhesive															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	tapes & silicon sealant, necessary hardware like SS304 ball bearing butt hinges, D- handles, push plates, Dorma make door closure, concealed tower bolt for the double leaf door and provision for fixing striker type door interlocking system and automatic door bottoms.															
a)	Single leaf door of size 1000 mm x 2400 mm		Nos	3												
b)	Double leaf door of size 1500 mm x 2400 mm		Nos	3												
c)	Double leaf door of size 1500 mm x 2400 mm Suitabke for Civil Wall		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25	Supply , Installation , testing and commissioning of electromagnetic door interlocking for Air locks and change room areas including electro magnets, sensors, control wiring etc complete of the following															
a)	2 Door interlocking		Nos	1												
26	Supply and erection of Anti static ESD 3 mm Vinyl flooring as follows :		SM	125												
	Screeding with Self leveling compound on cement floor to cover the undulations of floor up to 3-4mm															
	Before fixing the tiles, the filler material has to be applied for leveling															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	on cement flooring.															
	Antistatic ESD vinyl floor tiles with welded joints for monolithic construction for all clean rooms															
27	Supply and apply of PU Wall painting of approved colour for outer corridor with antistatic & ESD property.		SM	150												
28	Supply, installation and testing of double glazed windows of size 1000 mm x 1000 mm in the wall partitions with 6 mm thick tempered glass on both sides fully glued fit alongwith dessicants to avoid condensate as per technical		SM	8												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	specifications.															
29	Design, engineering, fabrication, supply, erection and testing of Cross over bench made up of SS 304 of size 250mm W X400mm H X 2000mm L so has to fully fixed in the designated place in the changeroom, with ARC welding and buffing.The bench will have pegion holes for keeping dayshoes/CR sleepers of equal size 250mmX182mm in two rows complete in all respects.		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
30	Supply,installation,testing and commisioning of fully polypropelene vertcal laminar air flow **FUME HOOD** of size 6' X 2.5' X 2.5' with fan & HEPA filters, polypropelene work surface with standard size sink, normal water & DI water faucets. fume hood shalll also be provided with modular electrical switches and sockest etc complete as per specifications. The all filters shall be easily removable with out diassemble the control panel, and all controls and adjustments should be accessable from front panel of the unit.		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
31	Supply,installation,testing and commisioning of electro galvanized steel with white oven baked epoxy powder coated finish vertical laminar air flow **BIO SAFETY CABINET** of size 6' X 2.5' X 2.5' with fan & ULPA filters, SS work surface, cabinet shalll also be provided with modular electrical switches and sockest etc complete as per specifications.		Nos	1												
32	Design,engineering, fabrication, supply, erection,testing and commissioning of garment cubicle for keeping maximum 15		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	cleanroom garments, sliding doors, glazing , UV light,pre filter, HEPA filter and blower for recirculation of air, complete ready to use complete in all respects.															
33	Supply and errection of Epoxy flooring for the service corridor areas including self leveling screed and non igniting adhesive complete as per specifications.		SM	30												
34	Making the Factory Cutout in the Ceiling and Wall panels for the following Items															
a)	Supply and return air diffusers or grilles 455 mm x 455 mm		Nos	30												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
b)	Clean room light fixture of size 610mm x 610mm		Nos	30												
c)	Wall cutouts for Electrical and other services related works as per the site requirements.		Nos	60												
35	Validation and Documentation (DQ,IQ,OQ,PQ) as per ISO 14644 / EU GMP Annexure I Standareds Filter integrity with PAO, Air Velocity , Room Air changes , Particulate count , Temperature , RH , Air balaning and Room Pressure balancing, to be carried out at site , for all the material		LS	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	test certificates and operation/ Maintance manuals to be provided as part of documentation. Vendor has to bring all required Instruments / material to carriy out the above tests.															
36	Supply, Installation, testing of clean room work benches of the following sizes with stiff ribbed SS 304 - 16 Gauge top & legs															
a)	1200mm (L) X 600mm (W) X 900mm (H)		Nos	6												
b)	1200mm (L) X 600mm (W) X 900mm (H) with Sink		Nos	1												
37	Supply, Installation, testing of 2mm Thick FRP lined ducting															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	complete required fittings & flanges, including required chemical resistant bolts, nuts, Gaskets and supprts etc complete															
a)	300 mm Dia		RMT	20												
b)	200 mm Dia		RMT	10												
38	Dismantling of exisiting brick wall , shifting of debries , smooth finishing as per clean room requirement . This at clean room entry door proposed in the layout so as to install the air shower and connected doors		Cum	12												
39	Providing of stand alone automated modular ceiling		nos	2												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	suspended fire suppression system for chemical lab and UPS rooms. Clean agent / ABC powder based.															
40	UPVC Windows with fixed glass doors of size 1500 x 1500 mm and suitbale to fix in civil brick wall.		nos	6												
41	Supply, Installation, Testing and Commissioning of Net workable DDC Controllers with supply, relays, wiring trays, wiring in an enclosure with display and self operable buttons for control setting.															
i)	DDC 1 of Required points as per		Set	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	minimum data of points given in I/o summary 50 points controller.															
ii)	Temperature and Relative humidity sensors suitable for duct mounting type		Nos	1												
iii)	Ambient temperature & Humidity sensor		Nos	1												
iv)	Magnehelic Guages		Nos	4												
v)	pressure sensors		Nos	3												
vi)	Filter DP switches with NO/NC contacts adjustable with range 0 - 50 mm WC		Nos	1												
42	**Cabling & Conduiting :** Supply and laying of PVC insulated copper															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	conductor screened cable in existing conduit of following sizes.															
a)	2C x 1.0 Sqmm screened unarmoured cable.		Rmt	50												
b)	4C x 1.0 Sqmm screened unarmoured cable.		Rmt	40												
c)	8C optical cable		Rmt	20												
d)	Cat 6 cable		Rmt	20												
e)	Supply and fixing of 25 mm dia GI conduit, 16 G ISI Marked complete with all accessories like bends, tees, junction boxes, clamps, screws etc.		Rmt	150												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
f)	Supply and laying of 32 mm dia GI conduit, 16 G ISI Marked complete with all accessories like bends, tees, junction boxes, clamps, screws etc.		Rmt	50												
g)	Supply , Installation, testing and commissioning D-Link Media convertor		Nos	1												
h)	Supply , Installation, testing and commissioning of fibre to UPT converter		Nos	2												
i)	Supply, Installation, Testing and Commissioning UPS 500 va capacity suitable for online switching and operation with		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Battery backup for 30 minutes comprising of SMF batteries of reputed make.															
43	Supply, installation, testing and commissioning of digital display units comrising of temeprature, RH, pressure and Time along with required sensors. And also this should includes the universal communication port to hook up with the environmental monitoring system.		Nos	2												
	AIR CONDITIONING & CLEAN ROOM SUB TOTAL															
(B) ELECTRICAL																

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	INTERNAL ELECTRIFICATION															
44	**Lights Points**															
	Point Wiring for Light/ Fan/ exhaust fan/ 6 A Plug and socket with 2 runs of 1100V grade 1.5 Sq.mm & 1 run of 1.5 Sq.mm FRLS insulated multistranded Copper wires run in & including 25mm dia heavy duty FRLS PVC conduits concealed in wall after necessary chase cutting with finishing/surface on wall / ceiling conforming to IS 732 including all accessories such as junction boxes, conduit bends,															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	elbows and ceiling rose, anodised GI Switch box with modular switch and the box covered with front plate and with all accessories etc., complete.															
i)	One Light point controlled by one 6A switch.		Nos	6												
ii)	Two Lights point controlled by one 6A switch.		Nos	11												
iii)	Three Lights point controlled by one 6A switch.		Nos	3												
45	Supply and Wiring with the following size 1100V grade FRLS PVC insulated Copper conductor															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	multi strand wires in & including heavy duty FRLS PVC conduit concealed in wall / ceiling/above false ceiling , including junction boxes, bends, elbows including and terminated with suitable lugs. with all accessories etc., complete.															
i)	2runs of 2.5Sq.mm wires with 1run of 1.5 Sq.mm wires in 25mm dia PVC conduit		Rmt	550												
46	Light Fixtures															
	Supply, Installation, Testing & Commissioning of the following LED Light Fixtures with driver , heat															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	dissipating element all necessary accessories.															
a)	50W LED Clean Room Compatable (CROMPTON CAT NO: LTRP50CL22CD)		Nos	34												
47	Supply ,Installation ,Testing and commissioning of TPN MCB Double door Distribution boards dust and vermin protected and rated for 415V Three Phase AC supply operation including incoming MCB /ELCB as per specifications and required capacity Neutral bar and Earth terminal complete as required															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	and installed in concealed in wall after necessary chase cutting with finishing/surface in wall including all fixing materials required. MCBs shall conform to IS : 8828 and ELCB shall conform to IS :12640. All MCBs shall be 'C' Curve. DBs shall be provided along with required wire adopter boxes around the DB as required and dummys for spare ways in the DB (No claim shall be allowed for the same).															
a)	8 Way TPN MCB DB (Horizontal type) with 63A, 100mA 4Pole RCCB as		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	incomer and 24 nos 6-32A SPMCBs as outgoings.															
48	DOMESTIC TYPE MODULAR AND INDUSTRIAL SOCKETS															
a)	Supply and fixing of modular type single phase 6A 5pin Socket with 6A switch with front S S plate and anodized GI box including all fixing accessories.		Nos	2												
b)	Supply and fixing of modular type single phase 16A 5pin Socket with 16A switch with front S S plate and anodized GI box including all fixing accessories.		Nos	8												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
c)	Supply and fixing of factory made 3-PHASE 32A TPN Metalclad socket with 32A TP MCB in MS box including all fixing accessories.		Nos	2												
49	Supply and Wiring with the following size 1100V grade FRLS PVC insulated Multistrand Copper conductor wires laid in & including suitable size heavy duty FRLS PVC conduit concealed in wall / above false cceiling junction boxes, bends, elbows including junction boxes, bends, elbows including and terminated with suitable lugs,including all															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	accessories complete etc.,															
a)	2runs of 2.5Sq.mm wires with 1run of 1.5 Sq.mm wire in 25mm dia conduit (6A Sockets)		Rmt	100												
b)	2runs of 4Sq.mm wires with 1run of 2.5 Sq.mm wire in 25mm dia conduit (16A Sockets)		Rmt	250												
c)	2 runs of 6 Sq.mm wires with 1 run of 4Sq.mm wire in 32mm dia conduit. (32 A sockets)		Rmt	125												
50	MV Panels															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Supply, installation, testing and commissioning of 3 phase 415V 4 wire Free Standing Floor mounted MCC made out of 14 SWG MS Sheet after seven tank process and painting with epoxy powder coating including all switchgear as detailed below. The MCC shall consist of suitable rating TPN aluminium bus bar (at the rating of 0.8A/ Sqmm) supported with DMC/ SMC barriers and color coded with heat shrinkable sleeves. The metering shall be provided as specified. The MCC shall have short circuit withstanding															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	capacity of minimum 50 KA and consist of the switchgear as mentioned below. The MCC shall be mounted on channels including supply of the same. The MCC shall be got fabricated from manufacturers with CPRI test certificate only.															
	The MCC shall have at least two spare cubicles of maximum ratings. The size of all panel mounting meters shall be 96 x 96 mm. The panels shall be mounted on U channels including supply and fixing of the same. Every ACB shall be provided with ON/OFF /Trip Indication lamps of															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	LED type. For all Electrically operated Breakers, Local Remote Selector switches shall be provided for controlling the Breakers remotely.															
a)	HVAC PANEL		Nos	1												
	EB Incoming :															
	250A,36KA TP+N MCCB with O/C, S/C,E/L Termal Magnetic Based Release – 1 no															
	Busbars :															
	250A TP+N Aluminum Bus bar – 1 Set															
	EB Meterings :															
	0-500V Digital Voltmeter with selector switch and															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	MCB control- 1set															
	0-250A Digital Ammeter with resin cast CTs of ratio 250/5A Class 1Accuracy and 10VA burden with selector switch-1 set															
	LED Phase indication lamps with individuals MCBs and control with toggle switches- 1 set															
	Outgoings :															
	80A,25KA 4P MCCB – 1 Nos															
	63A,25KA 4P MCCB –6 Nos															
	Spares :															
	80A,25KA 4P MCCB – 2 Nos															
	63A,25KA 4P MCCB –2 Nos															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
51	MV Cables															
	Supply, laying and commissioning of following size 1.1KVgrade XLPE insulated armoured aluminium conductor underground cable, in built up cable trench/ already laid RCChume pipe or on cable tray with all installation materials. The cable shall conform to IS 7098															
a)	3.5C X 120 Sq.mm		Rmt	100												
b)	4C X 16 Sq.mm		Rmt	75												
c)	4C X 10 Sq.mm		Rmt	50												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
52	Providing Indoor ordinary end terminations for the cable specified below with compression type steel gland,Bi-metallic lugs using crimping tool,Insulation tape,Identification tags etc., including end termination.															
a)	3.5C X 120 Sq.mm		Nos	2												
b)	4C X 16 Sq.mm		Nos	12												
c)	4C X 10 Sq.mm		Nos	2												
53	Earthing															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
a)	Supply, erection, testing and commissioning of maintenance free earth station with consisting of 40 mm dia 3m long Copper electrode capsule field with earth enhancing compound sealed at both ends and brazed lead for connection at one end, suitable for direct installation at site with brass bolt at the top end with nuts & washers including masonary enclosure, CI cover with frame and interconnection alongwith earth pit identification MS board and as required spreading of earth enhancing chemical compound		Nos	4												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	etc. complete . Scope also includes excavation in all type of soil, back filling and making the area neat etc. complete.															
b)	Supply and laying of following size strips including all necessary inter connections with earth station and equipments including excavation and back filling etc complete.															
i)	50mmx6 mm GI Strip		Rmt	125												
ii)	25mmx5 mm GI Strip		Rmt	75												
iii)	8SWG GI Wire		Rmt	75												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
54	Supply and fixing of following size GI Perforated type cable tray made out of 2mm thick sheet with GI Covers including MS supports for fixing the tray, anchor fasteners etc complete as required.															
a)	100mm wide x 50 mm depth		Rmt	30												
b)	50mm wide x 50 mm depth		Rmt	50												
	UPS WIRING		-													
55	DOMESTIC TYPE MODULAR AND INDUSTRIAL SOCKETS															
a)	Supply and fixing of modular type single phase 6A 5pin		Nos	4												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Socket with 6A switch with front S S plate and anodized GI box including all fixing accessories.															
b)	Supply and fixing of modular type single phase 16A 5pin Socket with 16A switch with front S S plate and anodized GI box including all fixing accessories.		Nos	9												
c)	Supply and fixing of factory made 3-PHASE 32A TPN Metalclad socket with 32A TP MCB in MS box including all fixing accessories.		Nos	4												
56	SUBMAINS/CIRCUIT MAINS/POWER WIRING :															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Supply and Wiring with the following size 1100V grade FRLS PVC insulated Copper conductor wires laid in & including suitable size heavy duty FRLS PVC conduit concealed in wall / above false ceiling junction boxes, bends, elbows including junction boxes, bends, elbows including and terminated with suitable lugs.															
a)	2runs of 2.5Sq.mm wires with 1run of 1.5Sq.mm wires in 25mm dia conduit(6A Sockets)		Rmt	250												
b)	2runs of 4Sq.mm wires with 1run of		Rmt	550												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2.5Sq.mm wires in 25 mm dia conduit(16A Sockets)															
c)	2runs of 6Sq.mm wires with 1run of 4 Sq.mm wires in 32 mm dia conduit (32A Sockets)		Rmt	250												
57	Supply ,Installation, Testing and commissioning of TPN MCB Double door Distribution boards dust and vermin protected and rated for 415V Three Phase AC supply operation including incoming MCB /ELCB as per specifications and required capacity Neutral bar and Earth terminal complete as required															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	and installed in flush with wall including all fixing materials required. MCBs shall conform : 8828 and ELCB /RCCB shall conform to IS : 12640															
a)	8Way TPN MCB DB(Horizontal type)with 63A,100 mA 4P RCCB as incomer and 24 nos 6-16A SPMCBs as outgoings		Nos	1												
58	Supply, installation, Testing and Commissioning of 3 phase and Neutral 415V 4 wire Free Standing Floor mounted Indoor MV panel made out of 14 SWG MS sheet after seven tank process															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	and painting with Epoxy powder coating. The panel shall consist of suitable rating TPN Aluminium busbar (at the rating of 0.8A/Sq.mm) supported with DMC/ SMC insulators and color coded with Heat shrinkable sleeves.The Metering shall be provided as specified. The panel shall have Short circuit withstanding capacity of minimum 50KA and consist of the switchgear as mentioned below.															
	The panel shall be got fabricated from manufacturers with CPRI Test certificate only. The PCC shall															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	have atleast two spare cubicles of the maximum rating. The size of all Panel Mounting Meters shall be 96X96mm. The Panels shall be mounted on U channels including supply and fixing of the same.															
a)	UPS OUTPUT Panel		Nos	1												
	Incoming -1: 100A,25 kA 4P MCCB with micro processor release - 1 No.															
	Busbars :100A TPN Aluminium Busbars - 1 set															
	Metering For Incomer :															
	0-500V Digital															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Voltmeter with selector switch and MCB Control-1 set															
	100A Digital ammeter with resin cast CTs of ratio 100/5A, Class 1Accuracy and 15VA burden and selector switch -1 set															
	LED Phase indication lamps with individuals MCBs and control with toggle switches- 1 set															
	Outgoings :															
	63A 25kA 4P MCCBs - 2 Nos															
	32A 25kA 4P MCCBs - 1 Nos															
	Spares :															
	63A 25kA 4P MCCBs - 1 Nos															
	32A 25kA 4P															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	MCCBs - 1 Nos															
59	Supply, laying and commissioning of following size 1.1KVgrade XLPE insulated armoured multistrand Aluminium/copper conductor cable in existing cable tray with all installation materials.The cable shall conform to IS 7098															
a)	4C X 25 Sq.mm		Rmt	50												
b)	4C X 16 Sq.mm		Rmt	80												
c)	4C X 4 Sq.mm Copper		Rmt	50												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
60	Providing Indoor ordinary end terminations for the cable specified below with compression type steel gland,Bi-metallic lugs using crimping tool,Insulation tape,Identification tags etc., including end termination and Earthing of Gland with 8 SWG 'GI Wire															
a)	4C X 25 Sq.mm		Nos	2												
b)	4C X 16 Sq.mm		Nos	4												
c)	4C X 4 Sq.mm Copper		Nos	2												
61	Earthing															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
a)	Supply, erection, testing and commissioning of maintenance free earth station with consisting of 40 mm dia 3m long Copper electrode capsule field with earth enhancing compound sealed at both ends and brazed lead for connection at one end, suitable for direct installation at site with brass bolt at the top end with nuts & washers including masonary enclosure, CI cover with frame and interconnection alongwith earth pit identification MS board and as required spreading of earth enhancing chemical compound		Nos	2												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	etc. complete . Scope also includes excavation in all type of soil, back filling and making the area neat etc. complete.															
b)	Supply and laying of following size strips including all necessary inter connections with earth station and equipments including excavation and back filling etc complete.															
i)	50mmx6 mm GI Strip		Rmt	75												
	ELECTRICAL SUB TOTAL															

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(C)	**GASES**															
	UHP Piping for Nitrogen gas															
62	Supply , Installation , testing and commissioning of Nitrogen Supply panel comprising of 4 Valve panel,4 Regulator, Inlet and outlet Pressure gauges, safety Relief valve, Vent and Purge port, 0.5 Micron Filter all inclusive in module (which includes 4 cylinder manifold, isolation valve, NRV and 4 pig tail) in the module located in the clean room/adjacent area. The material of construction shall be SS 304. The end connections shall be compression type.		Nos	1												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
63	Design, Supply, Installation, Commissioning and Testing of Nitrogen Gas distribution system. The ultra high purity (99.999%) gases in cylinders/ thru compressor supplied in seamless Orbital welded SS-304 piping system along with all necessary Unistruts, supporting plates, special supports, Base plates and Anchor fastners made of SS 304 and superior as per the pipe routing all inclusive.															
a)	Supply, installation, testing and commissioning of SS 304 tubing of 1/2" OD on		Rmt	10												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	internal/external walls.															
b)	Supply, installation, testing and commissioning of SS 304 tubing of 1/4" OD on internal/external walls.		Rmt	25												
c)	Supply, installation, testing and commissioning of SS 304 tubing elbow along with required fixing arrangement and sealing of 1/2" dia.		Nos	4												
d)	Supply, installation, testing and commissioning of SS 304 tubing Tees along with required fixing arrangement and sealing of 1/2"		Nos	4												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	dia.															
e)	Supply, installation, testing and commissioning of SS 304 tubing elbow along with required fixing arrangement and sealing of 1/4" dia.		Nos	15												
f)	Supply, installation, testing and commissioning of SS 304 tubing Tees along with required fixing arrangement and sealing of 1/4" dia.		Nos	10												
g)	SS 304 Ball valves 1/2" dia.		Nos	6												
h)	SS 304 Non Return valves 1/2" dia.		Nos	6												

S. NO	DESCRIPTION OF WORK	Make & Model	UNIT	QTY	Rate	Total	HSN CODE	% OF GST	GST	Total	Installation charges	SN CODE	% OF GST	GST	Total	Grand Total (11+16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
64	Supply of 0.5 micron inline main filter for nitrogen piping all complete.		Nos	1												
65	Supply of POU stick (Ball valve,Regulator,outlet gauge,NRV) for SS304 BA tubing		Nos	1												
	GASES SUB TOTAL															
	GRAND TOTAL (A+B+C)															

Signature

_____

(In the Capacity of)

Duly Authorized to sign bid for and on behalf of

(Name & Address of Bidder) : _____

SECTION - VII (C)
(Part of Price Bid)

PRICE SCHEDULE FOR AMC AFTER WARRANTY PERIOD

(Amount in INR)

1	2	3				4
Nomenclature	**Brief description of Services**	**Annual Service/ Maintenance Contract year wise after warranty period (Exclusive of GST)**				**Applicable GST %**
		2nd	3rd	4th	5th	
		A	**B**	**C**	**D**	
Design, supply, erection, installation, testing, commissioning & validation of **Clean Room works including airconditioning, electrical & gase lin system at SiC laboratory** (Clean Room of 10000	**Non comprehensive AMC**					

After completion of Warranty period

NOTE: -

1. A Non comprehensive Annual Maintenance Contract (AMC) shall include preventive maintenance including testing & calibration as per technical/ service /operational manual, labour & parts, for complete equipment and its allied items.
2. The tenderer must indicate separately the component of taxes in the cost of AMC as applicable on the date of Tender. The taxes to be paid extra, to be specifically stated. In the absence of any such stipulation the price will be taken inclusive of such taxes and no claim for the same will be entertained later.
3. All software updates should be provided free of cost during AMC period.
4. The supplier shall keep sufficient stock of spares required during AMC period.
5. In case the spares are required to be imported, it would be the responsibility of the supplier to import and get them custom cleared and pay all necessary duties.
6. A M C **charges (2nd to 5th year) will be added to the price at the time of evaluation of tender but exclusive of GST.**

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

SECTION VIII

BANK GUARANTEE FORM FOR BID SECURITY

Whereas _____ (hereinafter called the "Tenderer") has submitted its quotation dated _____ for the supply of _____
(hereinafter called the "tender") against the purchaser's tender enquiry No._____ Know all persons by these presents that we_____ of _____
(Hereinafter called the "Bank") having our registered office at _____ are bound unto _____ (hereinafter called the "Purchaser) in the sum of _____ for which payment will and truly to be made to the said Purchaser, the Bank binds itself, its successors and assigns by these presents. Sealed with the Common Seal of the said Bank this _____ day of _____ 20____. The conditions of this obligation are:

(1) If the Tenderer withdraws or amends, impairs or derogates from the tender in any respect within the period of validity of this tender.

(2) If the Tenderer having been notified of the acceptance of his tender by the Purchaser during the period of its validity:-
a) fails or refuses to furnish the performance security for the due performance of the contract.
or
b) fails or refuses to accept/execute the contract.
or
c) if it comes to notice that the information/documents furnished in its tender is incorrect, false, misleading or forged

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

This guarantee will remain in force for a period of forty-five days after the period of tender validity and any demand in respect thereof should reach the Bank not later than the above date.

(Signature of the authorized officer of the Bank)
Name and designation of the officer
Seal, name & address of the Bank and address of the Branch

SECTION IX

CONTRACT FORM

(On a Non-Judicial Stamp Paper of Rs.100.00)

Made at …… This ……..…….. day of …….. 2016. Between …… …… (hereinafter referred to as the Owner which expression shall include its heirs, Executors, Administrators & Assignees) of the one part and …… …….. ……..……. (Hereinafter referred to as the Contractor which expression shall include his heirs, Executors, Administrators & Assignees) of the other part

WHEREAS the Owner is desirous of carrying out TENDER FOR **design, supply, erection, installation, testing, commissioning & validation of Clean Room works including airconditioning, electrical & gase lines system at SiC laboratory** (Clean Room of 100000 class)**, C-MET** HYDERABAD, and has prepared drawings and specifications describing the work to be done prepared by its Consultants (hereinafter referred to as the Consultants) and WHEREAS the said drawings and the specifications and the priced Schedule of quantities have been signed by or on behalf of the parties hereto and WHEREAS the Contractor has agreed to execute upto and subject to the conditions set forth herein (hereinafter referred to as "the work shown upon the said Drawings" and described in "the said Specifications" and the said "Priced Schedule of Quantities at the respective Rates mentioned in the Priced Schedule/ Purchase Order of Quantities attached.

And WHEREAS the Contractor has agreed to the submit the performance guarantee to C-MET for Rs. …… (Rupees.……. ……..……Only) by him as performance guarantee for the due fulfillment of the contract to the satisfaction of the owner (C-MET)

NOW IT IS HEREBY AGREED AS FOLLOWS:

(1) In consideration of the payments to be made to the Contractor as hereinafter provided he shall upon and subject to the conditions of contract execute and complete the works shown upon the said drawings and such further detailed drawings as may be furnished to him by the said Consultants/Owner and described in the Specifications and the said Priced Schedule of Quantities.

(2) The Owner shall pay the Contractor such sums as shall become due and payable hereunder at the times and in the manner specified in the said conditions.

(3) The term the "Consultants" in the said conditions shall mean the Consultant of C-MET or in the event of their winding-up or ceasing to be Consultants for the purpose of this contract, such other person or shall be nominated for that by the Owner, not being a person to whom the Contractor shall object for reasons

considered to be sufficient by the Owner. Provided always that no persons subsequently appointed to be Consultants under this contract shall be entitled to disregard or overrule any decision or approval or direction given or expressed in writing by the Consultants for the time being unless specifically approved by the owner.

c) The tender drawings, agreement, documents and terms and conditions of NIT above mentioned shall form the basis of this Contract and the decision of the said Consultants or the other Consultants for the time being as mentioned in the Conditions of the Contract in reference to all matters of dispute as to the material, workmanship or account and as to the intended interpretation of the clauses of this agreement or any other document attached hereto shall be final and binding on both parties.

d) The Owner through the Consultants reserves the right of altering the drawing and nature of work and of adding to or omitting any items of work and of having portions of the same carried out departmentally or otherwise and such alterations or variations shall be carried out without prejudice of this contract.

e) The said Contract comprises the work above mentioned and all subsidiary works connected there to within the same site as may be ordered to be done from time to time by the said Consultants/Owner or the other Consultants for the time being even though such works may not be shown on the drawings or described in the said specifications or the Priced Schedule of Quantities.

f) Time shall be considered as essence of the agreement and the contractor hereby agrees to commence to work as soon as his tender is accepted by C-MET by issuing LOI/WO/PO and the site is handed over to him as provided in the said conditions and agrees to complete the work within the period 5 months from the date of such handing over the site.

g) The said conditions shall be read and construed to be forming part of this agreement and the Parties hereto will respectively abide by and submit themselves to the conditions and stipulations and perform the agreement on their parts respectively in such conditions contained.

h) All disputes arising out of or in any way connected with this agreement shall be deemed to have arisen in Hyderabad and only the courts in Hyderabad alone shall have jurisdiction to determine the same.

i) The arbitrator for fulfilling the duties set forth in the arbitration clauses as defined with tender conditions of contract.

j) Arbitration: The Contract shall be governed by, and construed in accordance with the laws of India. Any dispute which cannot be amicably settled by the parties may be submitted, by the owners, to the International Center for Alternate Dispute Resolution (ICADR), Hyderabad. The dispute will be settled following the provisions of Arbitration and Conciliation Act, 2015. Both Parties agree that the results and awards of any such arbitration shall be binding on both Parties. Venue of Arbitration shall be Hyderabad.

(12) The several parts of this contract have been read to us and fully

understood by us.

IN WITNESS whereof the parties hereto have caused this agreement to be executed in accordance with their respective laws the day and year first above written. Signed, Sealed and Delivered by the said

Centre for Materials for Electronics Technology (C-MET),
Hyderabad (For and on behalf of the Purchaser) in the presence of:
1)

2)

Signed, Sealed and Delivered by the said M/s._____
(For the Supplier) in the presence of:

1)

2)

SECTION-X

BANK GUARANTEE FORM FOR PERFORMANCE SECURITY DEPOSIT

To
The Director
C-MET, IDA Phase-III
Cherlapally, HCL Post
Hyderabad – 500 051
Telangana State, India

WHEREAS _____ (Name and address of the supplier) (Hereinafter called "the supplier") has undertaken, in pursuance of contract no_____ dated _____ to supply (description of goods and services) (herein after called "the contract").

AND WHEREAS it has been stipulated by you in the said contract that the supplier shall furnish you with a bank guarantee by a scheduled commercial bank recognized by you for the sum specified therein as security for compliance with its obligations in accordance with the contract @ 10% of the PO/WO value.

AND WHEREAS we have agreed to give the supplier such a bank guarantee;

NOW THEREFORE we hereby affirm that we are guarantors and responsible to you, on behalf of the supplier, up to a total of. _____ (Amount of the guarantee in words and figures), and we undertake to pay you, upon your first written demand declaring the supplier to be in default under the contract and without cavil or argument, any sum or sums within the limits of (amount of guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the supplier before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contract to be performed there under or of any of the contract documents which may be made between you and the supplier shall in any way release us from any liability under this guarantee and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid up to 24 (twenty four) months from the date of Notification of Award i.e up to ---------- (indicate date)

…….
(Signature with date of the authorized officer of the Bank)
…….
Name and designation of the officer
…….
Seal, name & address of the Bank and address of the Branch

SECTION – XI
DEVIATION STATEMENT

Technical Deviation Statement
FORM PART-A

(1) The following are the particulars of deviations from the requirements of the tender specifications:

CLAUSE	DEVIATION	REMARKS (Reasons/including justification)
1	2	3

The technical specifications furnished in the bidding document shall prevail over those of any other document forming a part of our bid, except only to the extent of deviations furnished in this statement.

Dated:

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

Bidding Terms Deviation Statement
FORM PART-B

(2) The following are the particulars of deviations from the requirements of the bidding conditions / terms:

CLAUSE	DEVIATION	REMARKS (Reasons/including justification)
1	2	3

Signature _____
(In the Capacity of)
Duly Authorized to sign bid for and on behalf of
(Name & Address of Bidder with stamp)

NOTE:
(1) Where there is no deviation, the statement should be returned duly signed with an endorsement indication **"NO DEVIATIONS"**

SECTION – XI

PROFORMA OF CERTIFICATE FOR ISSUE BY THE C-MET/PURCHASER AFTER SUCCESSFUL DESIGN, SUPPLY, ERECTION, INSTALLATION, TESTING, COMMISSIONING & VALIDATION OF

Clean Room works including airconditioning, electrical & gase lines system at SiC laboratory (Clean Room of 100000 class)

No. Date:

M/s.

Sub: Certificate of Commissioning and Handing over of Air Conditioning & Clean Room Works including Electrical & Gases

1. This is to certify that the plant/s as detailed below has been received in good condition along with all the standard and special accessories (subject to remarks in para No. 2) in accordance with the Contract/Specifications. The same has been installed and commissioned.

2. Details of Accessories/Spares not yet supplied and recoveries to be made on that account.

S.No.	Description	Amount to be recovered

3. The proving test has been done to our entire satisfaction and operators have been trained to operate the plant.

4. The supplier has fulfilled his contractual obligations satisfactorily. **

Or The Supplier has failed to fulfill his contractual obligations with regard to the following:

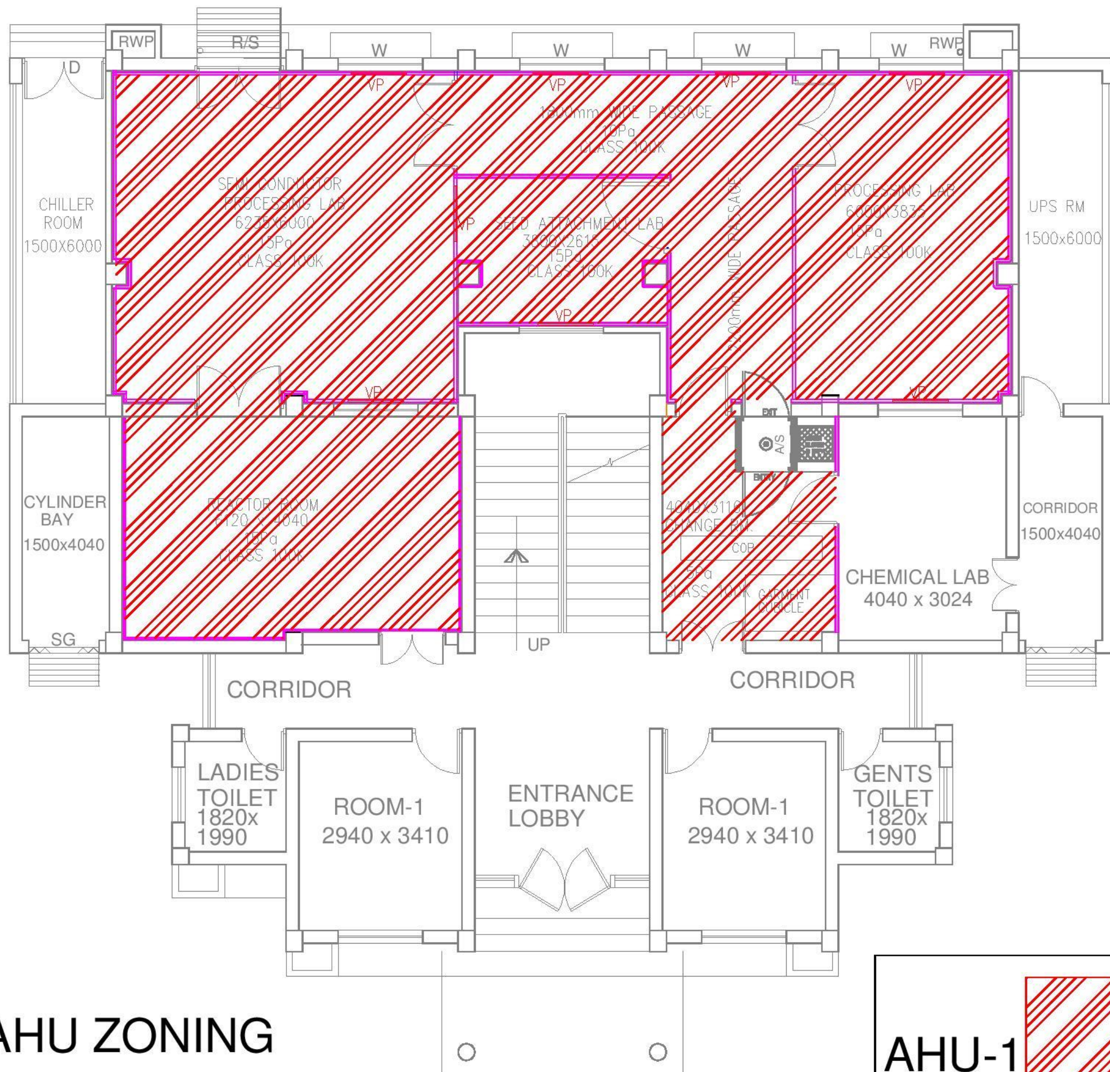
a)
b)
c)

5. The amount of recovery on account of non-supply of accessories and spares is given under para No. 2.

6. The amount of recovery on account of failure of the supplier to meet his contractual obligations is as indicated in endorsement of the letter.

Signature
Name
Designation with Stamp

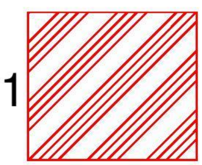
DRAWINGS



AHU ZONING

GROUND FLOOR PLAN

AHU-1



TENDER DRAWINGS

PROJECT:

CMET

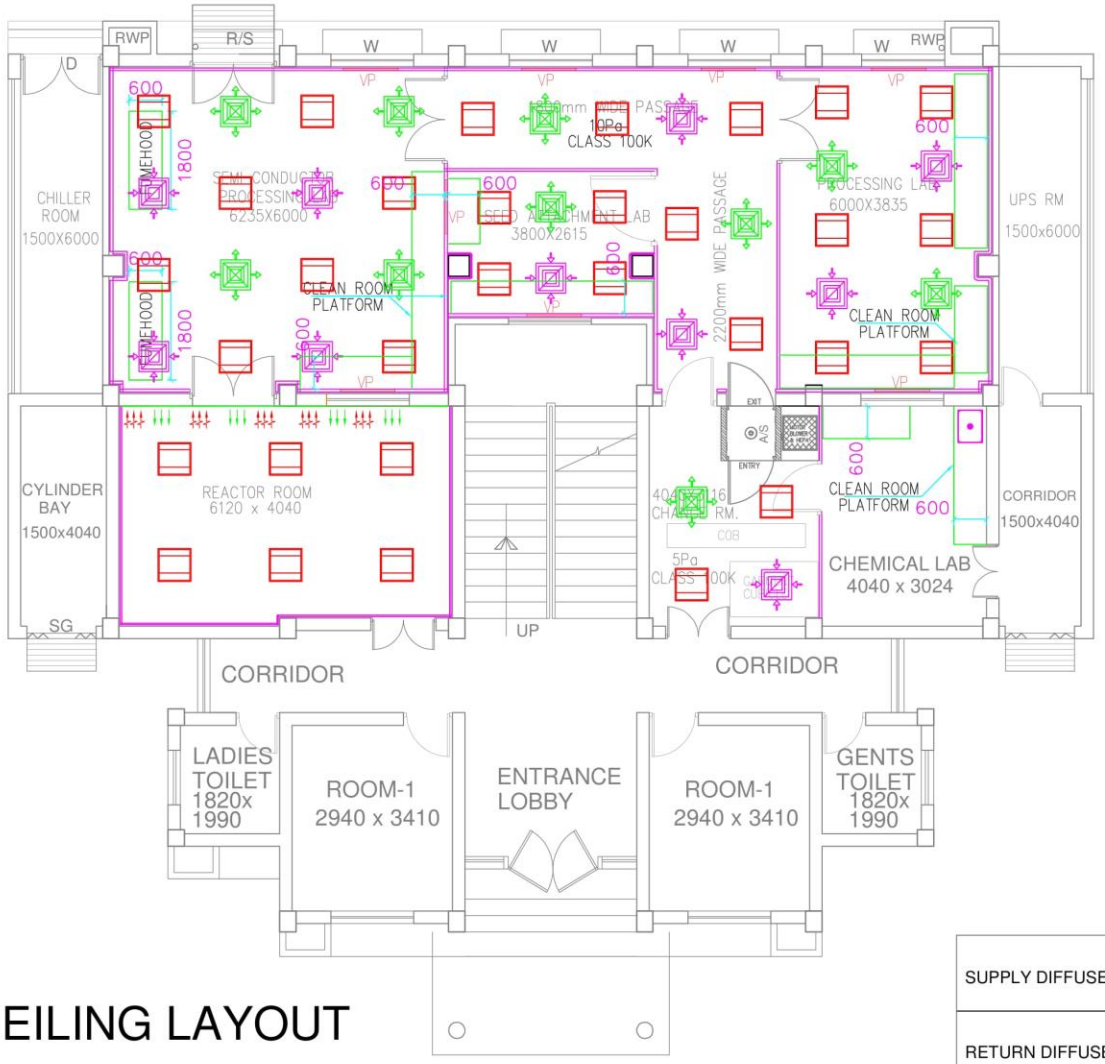
DRAWING TITTLE:

HVAC AHU ZONING LAYOUT

SERVICES CONSULTANT

SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
738, 6-3-596/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23393861,23302694 FAX: 040-23393861.
email: services@srinfra.com, web: www.srinfra.com
prasanna@srinfra.com,

DATE	SCALE	STATUS	
16.06.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
MANIKARAN	SAIKRISHNA	SAIKRISHNA	PRASANNA
PROJ.NO.	DRAWING NO.		
	SICPL/CMET/HVAC/05		
FILE NAME			A1



CEILING LAYOUT
GROUND FLOOR PLAN

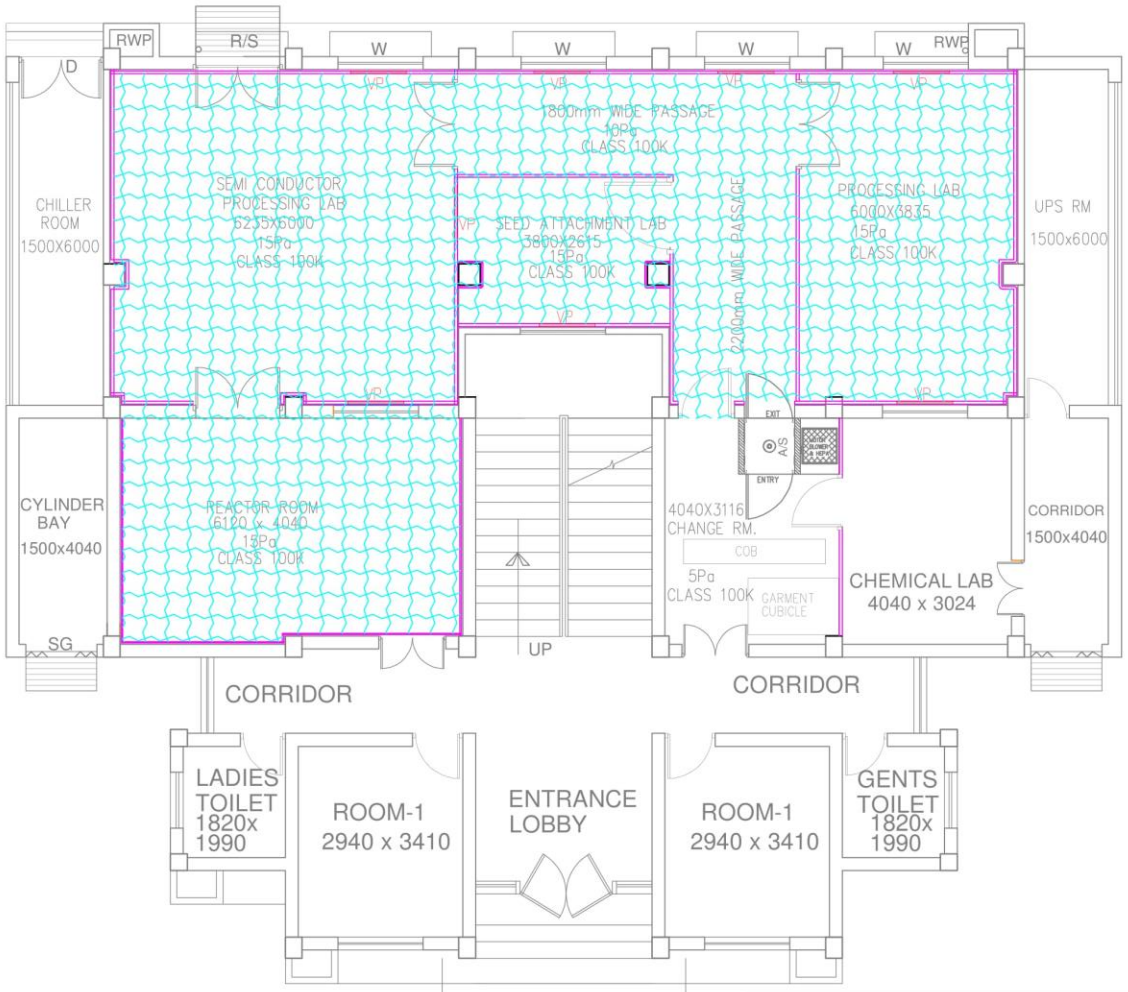
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITTLE:
HVAC CEILING LAYOUT

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHS & Firefighting)
736, 8-3-595/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23383961,23302584 FAX: 040-23383961.
email: services@srinfra.com, web: www.srinfra.com
prasanna@srinfra.com.

DATE	SCALE	STATUS	
16.05.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
MANIKARAN	SAIKRISHNA	SAIKRISHNA	PRASANNA
PROJ NO	DRAWING NO.		
	SICPL/CMET/HVAC/02		
FILE NAME			A1



GROUND FLOOR PLAN

CLASSIFICATION ZONING

CLASS 100K

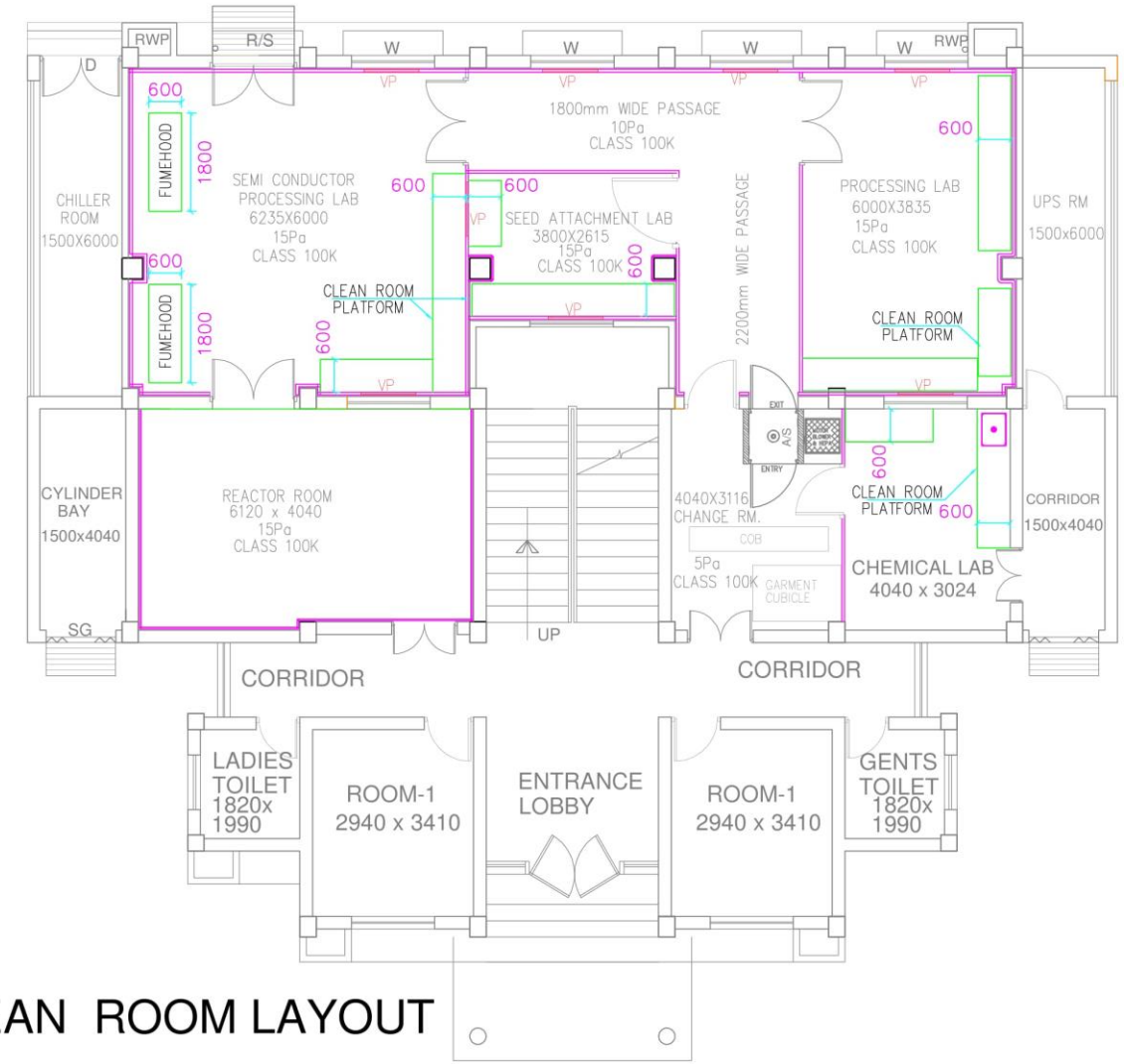
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITTLE:
HVAC CLASS ZONING LAYOUT

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
736, 6-3-599/77/SA,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23393961,23302984 FAX: 040-23393961.
email: services@srinfra.com, web: www.srinfra.com
prasanna@srinfra.com,

DATE	SCALE	STATUS	
16.08.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
MANIKARAN	SAIKRISHNA	SAIKRISHNA	PRASANNA
PROJ.NO.	DRAWING NO.		
	SICPL/CMET/HVAC/05		
FILE NAME		A1	



CLEAN ROOM LAYOUT

GROUND FLOOR PLAN

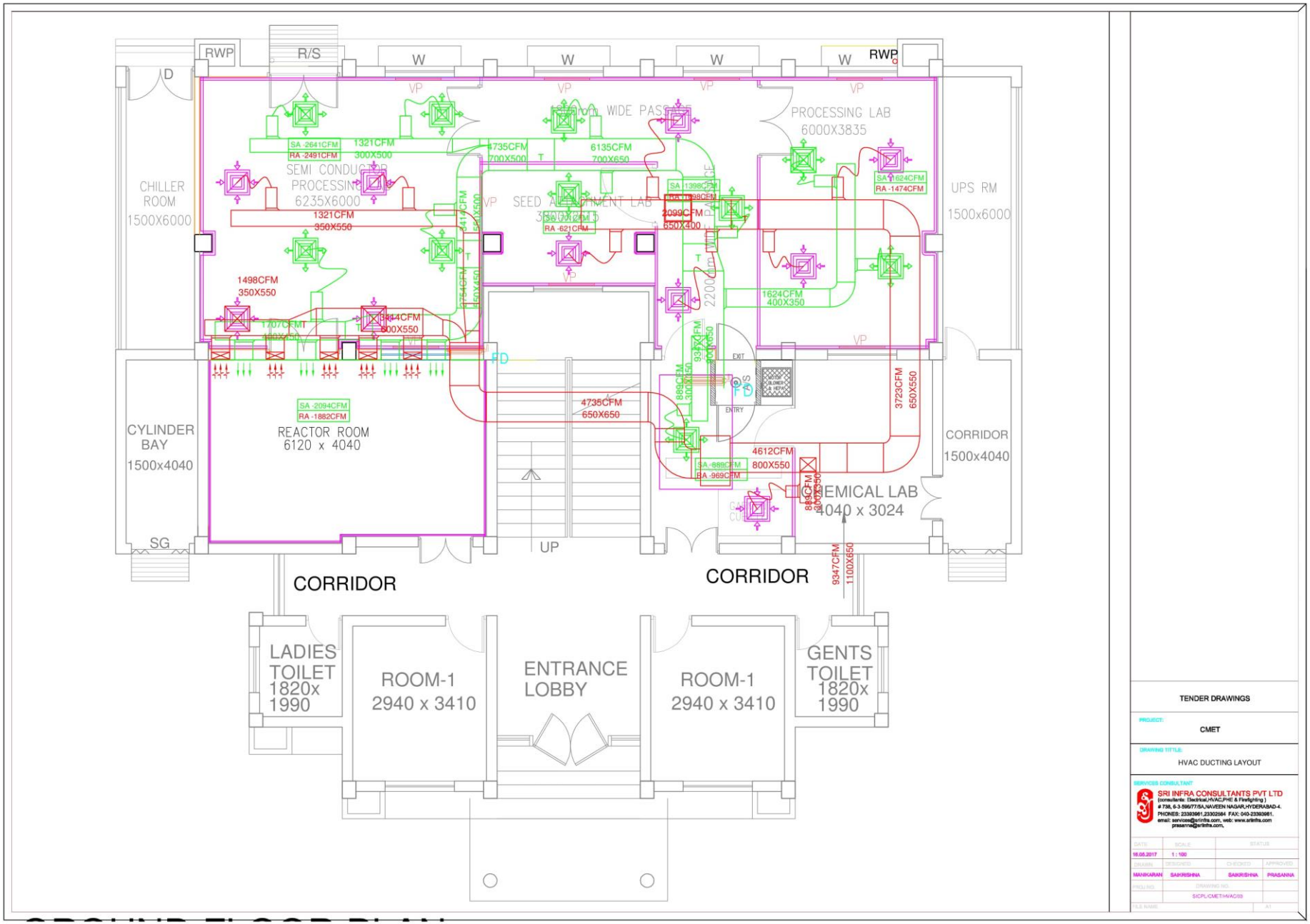
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITTLE:
CLEAN ROOM LAYOUT

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
736, 6-3-596/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONE0: 23309961,23302584 FAX: 040-23309961.
email: services@srilnfra.com, web: www.srilnfra.com
prasanna@srilnfra.com,

DATE	SCALE	STATUS	
16.05.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
MANIKARAN	SAIKRISHNA	SAIKRISHNA	PRASANNA
PROJ NO.	DRAWING NO.		
	SICPL/CMET/HVAC/01		
FILE NAME			A1



TENDER DRAWINGS

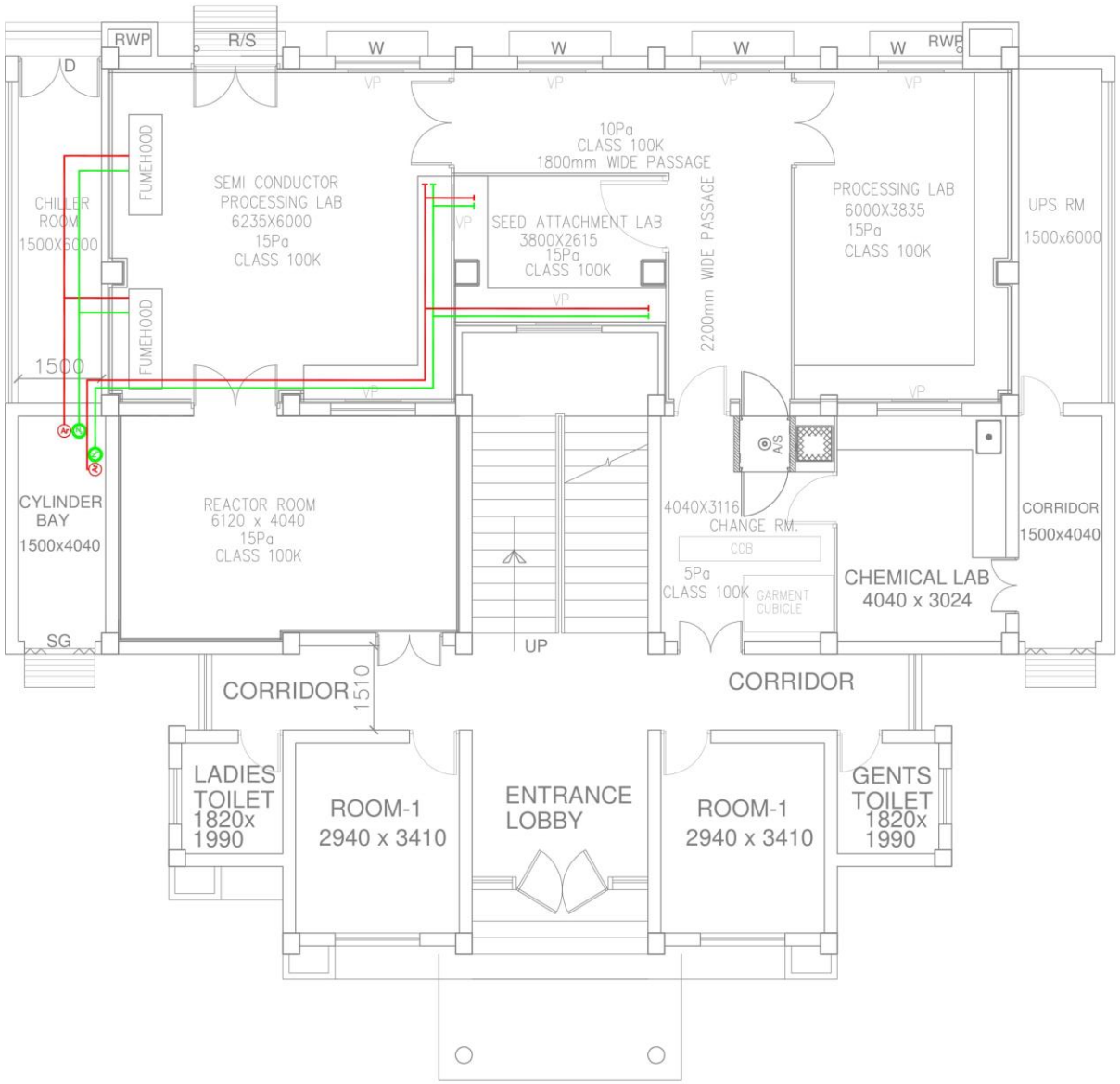
PROJECT: CMET

DRAWING TITLE: HVAC DUCTING LAYOUT

SERVICES CONSULTANT

SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
738, 6-3-595/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23303981,23302584 FAX: 040-23303981,
email: services@srlinfra.com, web: www.srlinfra.com
prasanna@srlinfra.com,

DATE	SCALE	STATUS	
16.05.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
MANIKARAN	SAIKRISHNA	SAIKRISHNA	PRASANNA
PROJ NO.	DRAWING NO.		
	SICPL/CMET/HVAC/03		
FILE NAME			A1



SL NO	SYMBOL	DESCRIPTION
1	Ar	ARGON CYLINDER
2	N	NITROGEN CYLINDER
3		ARGON GAS PIPING
4		NITROGEN GAS PIPING

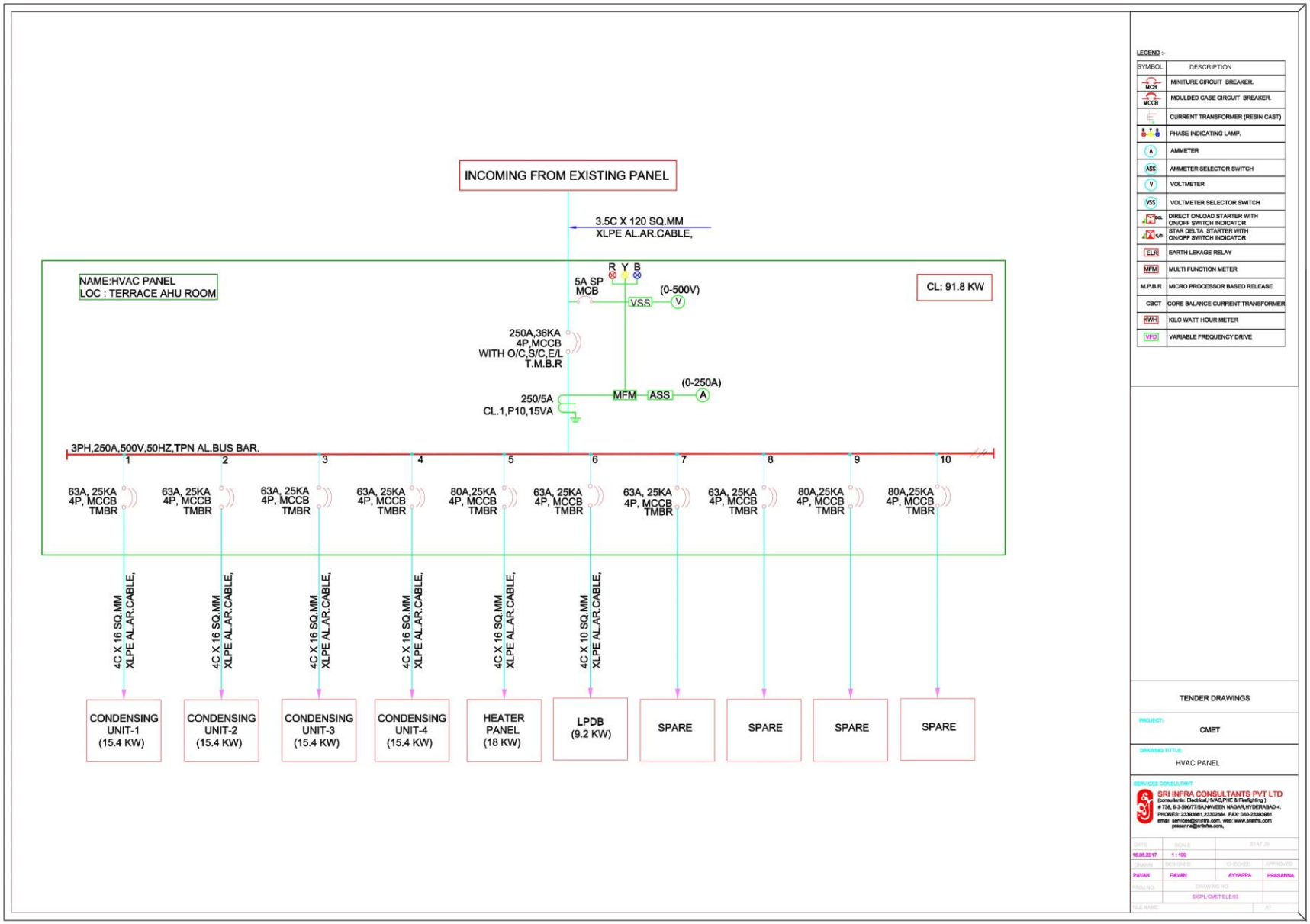
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITTLE:
GAS LAYOUT

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
738, 6-3-550/77/8/A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23383961,23302684 FAX: 040-23383961.
email: services@srinfra.com, web: www.srinfra.com
prasanna@srinfra.com,

DATE	SCALE	STATUS	
16.08.2017	1:100		
DRAWN	DESIGNED	CHECKED	APPROVED
PAVAN	PAVAN	AYYAPPA	PRASANNA
PROJ NO	DRAWING NO		
	SICPL/CMET/GAS/01		
FILE NAME		A1	



LEGEND :-

SYMBOL	DESCRIPTION
MCB	MINITURE CIRCUIT BREAKER.
MCCB	MOULDED CASE CIRCUIT BREAKER.
CT	CURRENT TRANSFORMER (RESIN CAST)
R Y B	PHASE INDICATING LAMP.
A	AMMETER
ASS	AMMETER SELECTOR SWITCH
V	VOLTMETER
VSS	VOLTMETER SELECTOR SWITCH
DOL	DIRECT ONLOAD STARTER WITH ON/OFF SWITCH INDICATOR
S/D	STAR DELTA STARTER WITH ON/OFF SWITCH INDICATOR
ELR	EARTH LEKAGE RELAY
MFM	MULTI FUNCTION METER
M.P.B.R	MICRO PROCESSOR BASED RELEASE
CBCT	CORE BALANCE CURRENT TRANSFORMER
KWH	KILO WATT HOUR METER
VFD	VARIABLE FREQUENCY DRIVE

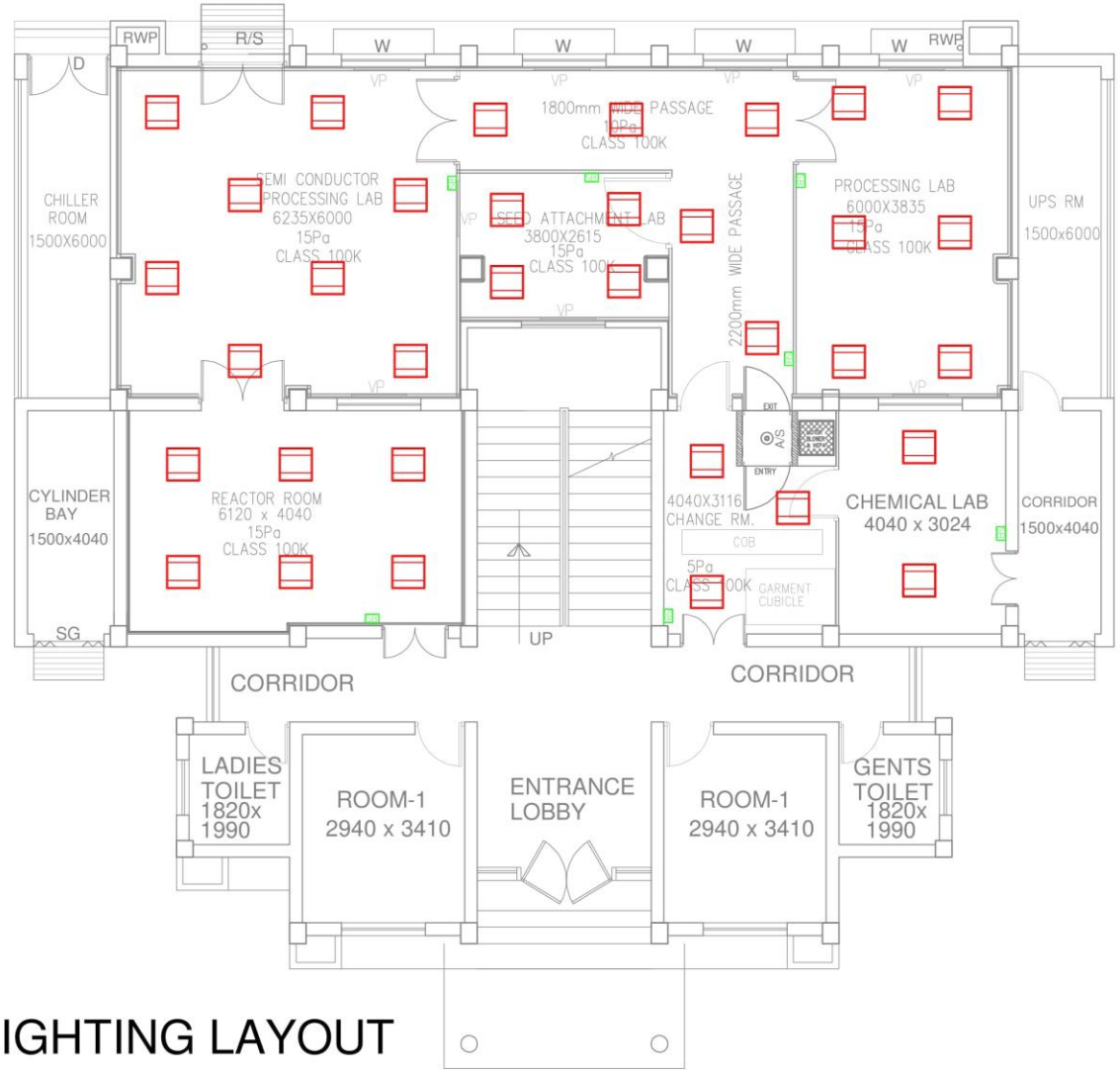
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITLE:
HVAC PANEL

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
[consultants: Electrical,HVAC,PHE & Firefighting]
736, 6-3-596/77/SA,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23393981,23302984 FAX: 040-23393981.
email: services@srlinfra.com, web: www.srlinfra.com
prasanna@srlinfra.com,

DATE	SCALE	STATUS	
16.06.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
PAVAN	PAVAN	AYYAPPA	PRASANNA
PROJ.NO.	DRAWING NO.		
	SICPL/CMET/ELE/03		
FILE NAME			A1



LIGHTING LAYOUT
GROUND FLOOR PLAN

S.NO	SYMBOL	DESCRIPTION	QTY
1		50W LED CLEAN ROOM LIGHT	34
2		SWITCH BOARD	07

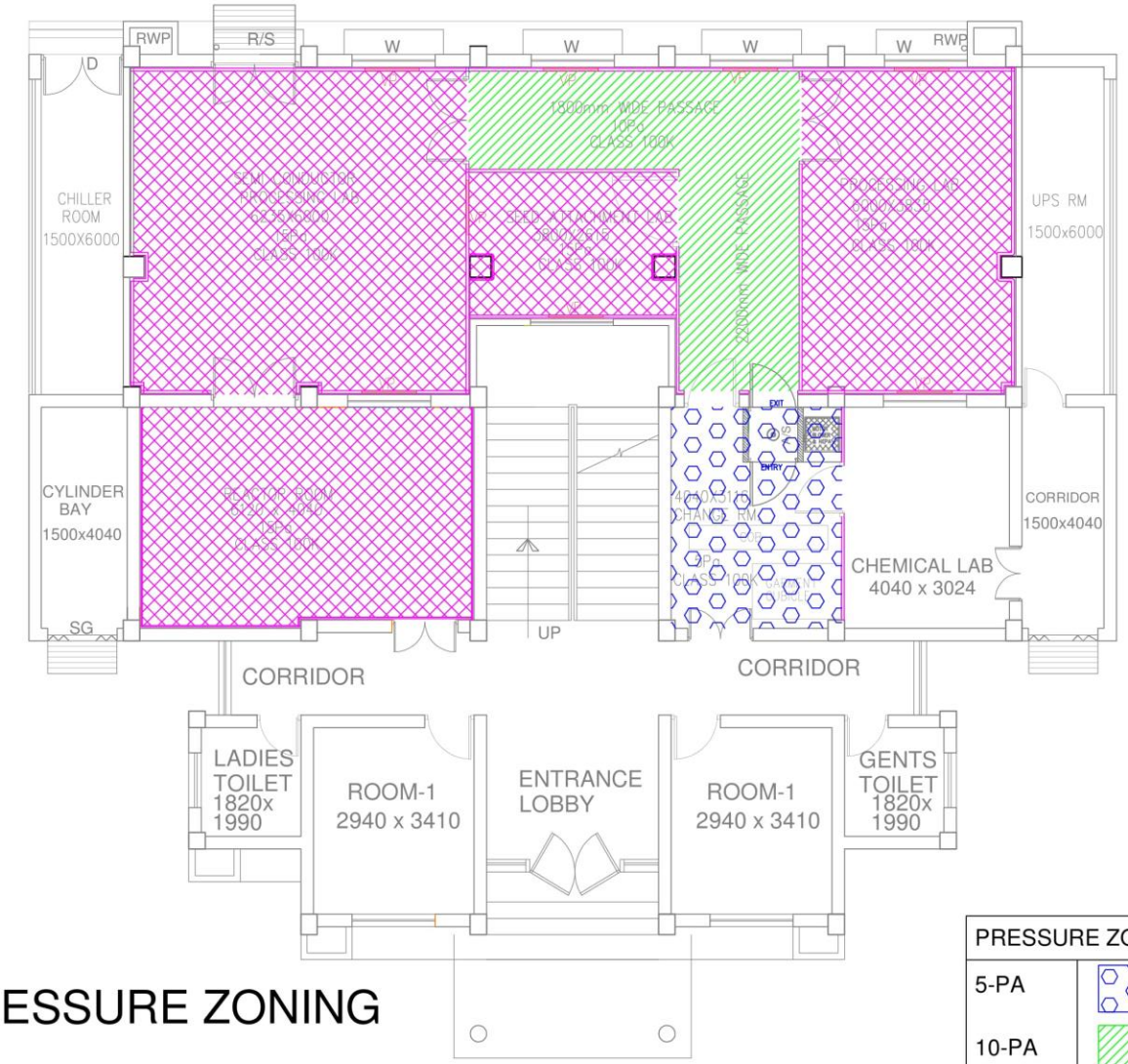
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITLE:
LIGHTING LAYOUT

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Fireflighting)
736, 6-3-595/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23393961,23302564 FAX: 040-23393961.
email: services@srilnfra.com, web: www.srilnfra.com
prasanna@srilnfra.com,

DATE	SCALE	STATUS	
16.05.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
PAVAN	PAVAN	AYYAPPA	PRASANNA
PROJ NO.	DRAWING NO.		
	SIOPL/CMET/ELE/01		
FILE NAME		A1	



PRESSURE ZONING

5-PA	
10-PA	
15-PA	

PRESSURE ZONING

GROUND FLOOR PLAN

TENDER DRAWINGS

PROJECT: CMET

DRAWING TITTLE: HVAC PRESSURE ZONING LAYOUT

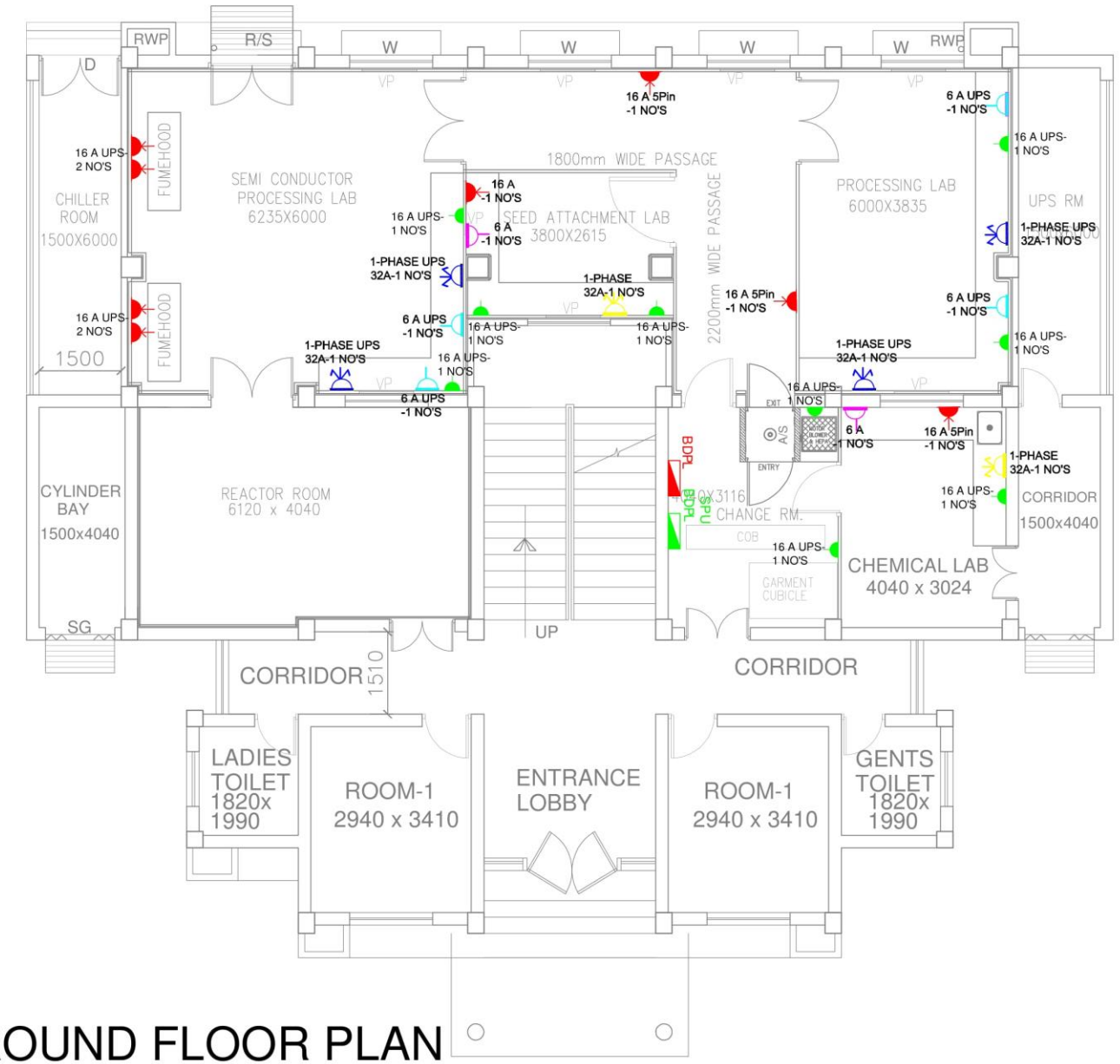
SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
738, 6-3-596/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23393961,23302584 FAX: 040-23393961,
email: services@srinfra.com, web: www.srinfra.com
prasanna@srinfra.com,

DATE	SCALE	STATUS
16.05.2017	1 : 100	

DRAWN	DESIGNED	CHECKED	APPROVED
MANIKARAN	SAIKRISHNA	SAIKRISHNA	PRASANNA

PROJ NO. | DRAWING NO. SICPL/CMET/HVAC/04

FILE NAME | AT



GROUND FLOOR PLAN

OVER ALL ELECTRICAL SOCKETS LEGEND:

S.NO	SYMBOL	DESCRIPTION	QTY
1.		16A SOCKET	08
2.		16A UPS SOCKET	09
3.		1-PHASE 32A SOCKET	02
4.		1-PHASE 32A UPS SOCKET	04
5.		6A SOCKET	02
6.		6A UPS SOCKET	04
7.	LPDB	LIGHTING & POWER DISTRIBUTION BOARD	01
8.	UPS LPDB	UPS LIGHTING & POWER DISTRIBUTION BOARD	01

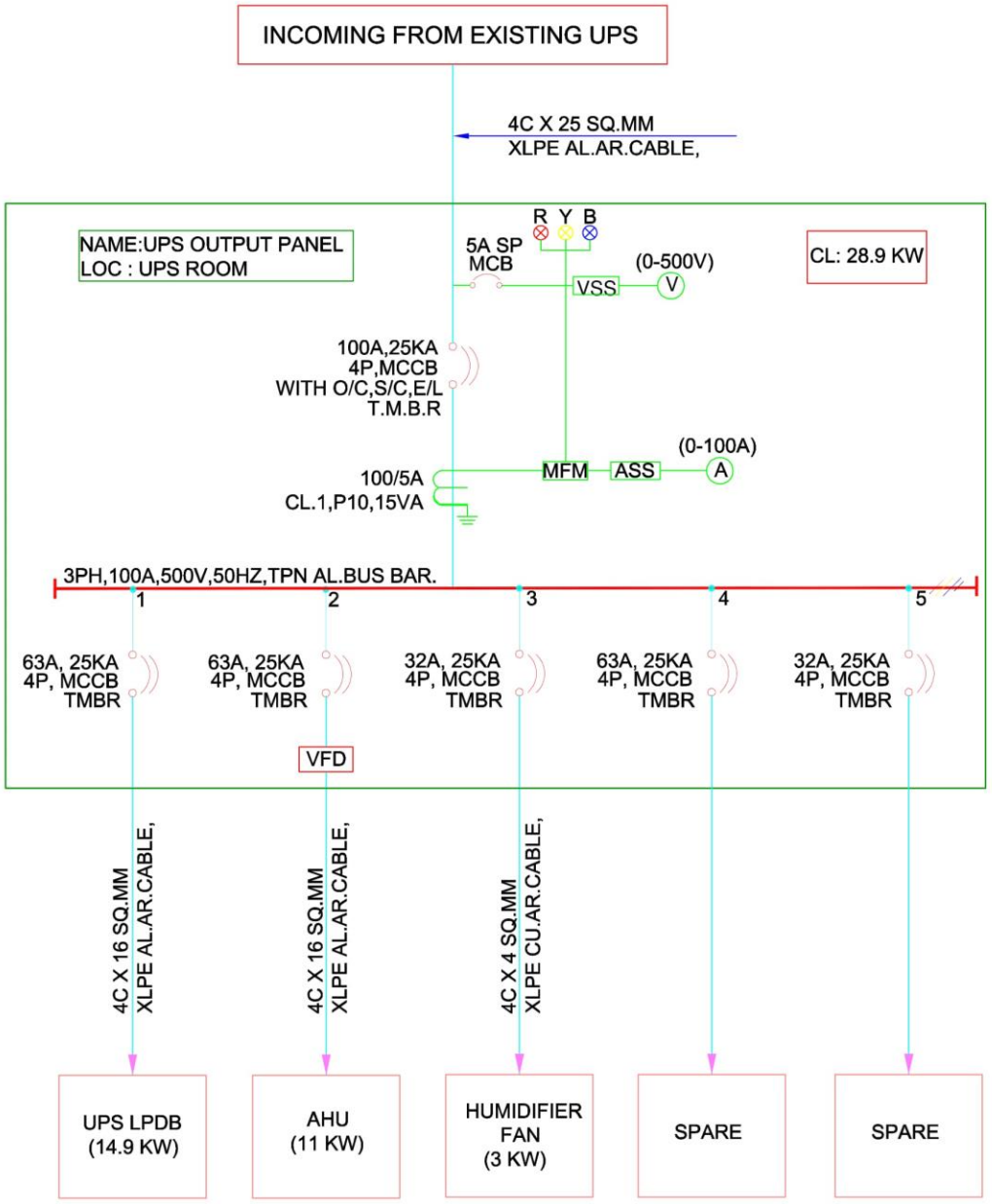
TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITLE:
ELECTRICAL SOCKETS LAYOUT

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
738, 6-3-596/77/5A,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23302661,23302684 FAX: 040-23303661.
email: services@srilnfra.com, web: www.srilnfra.com
prasanna@srilnfra.com,

DATE	SCALE	STATUS	
16.05.2017	1 : 100		
DRAWN	DESIGNED	CHECKED	APPROVED
PAVAN	PAVAN	AYYAPPA	PRASANNA
PROJ.NO.	DRAWING NO.		
	SICPL/CMETELE/02		
FILE NAME		A1	



LEGEND :-

SYMBOL	DESCRIPTION
MCB	MINITURE CIRCUIT BREAKER.
MCCB	MOULDED CASE CIRCUIT BREAKER.
	CURRENT TRANSFORMER (RESIN CAST)
	PHASE INDICATING LAMP.
A	AMMETER
ASS	AMMETER SELECTOR SWITCH
V	VOLTMETER
VSS	VOLTMETER SELECTOR SWITCH
DOL	DIRECT ON-LOAD STARTER WITH ON/OFF SWITCH INDICATOR
S/D	STAR DELTA STARTER WITH ON/OFF SWITCH INDICATOR
ELR	EARTH LEKAGE RELAY
MFM	MULTI FUNCTION METER
M.P.B.R	MICRO PROCESSOR BASED RELEASE
CBCT	CORE BALANCE CURRENT TRANSFORMER
KWH	KILO WATT HOUR METER
VFD	VARIABLE FREQUENCY DRIVE

TENDER DRAWINGS

PROJECT:
CMET

DRAWING TITTLE:
UPS OUTPUT PANEL

SERVICES CONSULTANT
SRI INFRA CONSULTANTS PVT LTD
(consultants: Electrical,HVAC,PHE & Firefighting)
738, 8-3-595/77/SA,NAVEEN NAGAR,HYDERABAD-4.
PHONES: 23393961,23302584 FAX: 040-23393961,
email: services@srilnfra.com, web: www.srilnfra.com
prasanna@srilnfra.com,

DATE	SCALE	STATUS	
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PAVAN	PAVAN	AYYAPPA	PRASANNA
PROJ.NO.	DRAWING NO.		
	SICPL/CMET/ELE/04		
FILE NAME		A1	

ROOM BOOK

ROOM BOOK

Project: PROPOSED SEMI CONDUCTOR LAB BUILDING

S. No	AHU tag number	Room No.	Room description	Room Dimensions (m)				Room area (m^2)	Room area(ft^2)	Room volume (m^3)	Cleanliness class	Room Pressure (Pa)	Temperature Deg.C	Relative Humidity (%)	No.of air changes	Equipment Load (KW)	Occupancy (Nos)	Air Qty Based on Air changes(CMH)	AHU Motor kw	Cooling cap (TR)			Reheat (KW)	Dehumid. air qty.cfm	Dehumid. air qty. (cmh)	Selected supply air qty. (cmh)	Exhaust air qty (cmh)	Return air qty (cmh)	Fresh air qty (cmh)
				Length	Width	Height	Room height in feets													summer	monsoon	selected							
1		1	Change Room	4.04	3.12	3.00	9.84	12.6	135.6	37.8	Class 100000	5	23±1	NMT50%	40	1	2	1513	0.42	1.2	1.6	1.6	0.66	276	469	1513		1513	151
2		2	Passage	2.20	4.05	3.00	9.84	22.3	240.3	67.0	Class 100000	10	23±1	NMT50%	40	0	2	2680	0.74	1.54	2.05	2.05	1.02	214	364	2680		2680	268
				6.10	2.20	3.00	9.84				Class 100000	10	23±1	NMT50%	40														
3		3	Processing lab	3.20	6.00	3.00	9.84	19.2	206.6	57.6	Class 100000	15	23±1	NMT50%	40	5	6	2304	0.64	3.21	3.94	3.94	1.54	960	1632	2304			230
4	AHU-1	4	Seed Attachment Lab	3.50	4.60	3.00	9.84	16.1	173.2	48.3	Class 100000	15	23±1	NMT50%	40	3	4	1932	0.54	2.24	2.82	2.82	1.13	620	1054	1932		1932	193
5		5	Semi Conductor Processing Lab	6.25	6.00	3.00	9.84	37.5	403.5	112.5	Class 100000	15	23±1	NMT50%	40	10	10	4500	1.25	17.90	24.8	24.8	9.93	2157	3667	4500	3400	4500	3400
6		6	Reactor Room	6.25	4.00	3.60	11.81	25.0	269.0	90.0	Class 100000	15	23±1	NMT50%	40	5	4	3600	1.00	6.35	8.94	8.94	3.17	1054	1792	3600	1000	3600	1000
									1428.2							**24**	**28**					**44.15**	**17.45**			**16529**			

SELECTED AHU - 11000 CFM @150mm SP, 44TR Capacity with 18kW heater banks, 2600 CFM Fresh Air

Note :
Pre filters 10&5 Micron , Coil Section, DIDW Fan section, Tubular heater section & Fine filters up to 3 & Hepa 0.3 Microns