

Tender Document

For

**“Supply, Installation, Testing & Commissioning of HVAC Work
of Indoor Sports Complex, CURaj”.**

NIT No. : CURAJ/R/F.177/2026/6231
NIT Issue Date : 14.07.2026
Estimated Cost : Rs. 3,39,44,235/-
Last Date of Submission : 05.08.2026 upto 2.00 PM
Technical Bid Opening : 06.08.2026 at 3.00 PM



CENTRAL UNIVERSITY OF RAJASTHAN
NH-8, Bandarsindri, Kishangarh, Dist.- Ajmer, Rajasthan – 305817
www.curaj.ac.in

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Name of Work: Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.
NIT No. CURAJ/R/F.177/2026/6231 Date 14.07.2026

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CENTRAL UNIVERSITY OF RAJASTHAN NOTICE INVITING TENDER

The Registrar, Central University of Rajasthan, NH-8, Bandarsindri, Kishangarh-305817 invites sealed **Percentage Rate Bids** from approved and eligible contractors of CPWD and those of appropriate list of MES, BRO, BSNL, Railway and State PWD or Public sector undertakings set up by the central or state government for following work(s):

S. No.	Name of Work	NIT No.	Estimated Cost	Earnest money	Stipulated Period of Completion of work (in months)	Last date & time of submission of Bid	Date & Time of Opening of Technical Bid
1	Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.	CURAJ/R/F.177/2026/6231 Date 14.07.2026	33,944,235/-	Rs. 6,78,885/-	05 months	05.08.2026 till 02.00 PM	06.08.2026 at 03.00 PM

Note: The tender should be submitted in two parts i.e. Technical Bid and Financial Bid and both the bids shall be uploaded on the CPP Portal on <https://eprocure.gov.in/cppp/> by the bidders. Any other related document, if required, may be submitted to the Dispatch Section, Room No. - 101, Ground Floor, Administrative Building, Central University of Rajasthan, well in time.

Pre-Bid Meeting: After 07 days from the publishing of the Tender.

**Registrar
Central University of Rajasthan**

PART- A

CHECK LIST FOR CONTRACTORS FOR SUBMISSION OF BIDS

1. The tenderer should read all the instructions, terms & Conditions, contract clause, nomenclature of items, specifications etc. contained in the tender documents very carefully, before quoting the rates. The tenderer should also read the General Conditions of Contract 2023 and amended as on date for construction works in lines with schedule F, with up to date correction slips up to date of submission of bid.
2. The agency shall quote the Percentage Rates for complete scope of work in both words and figures in the financial bid.
3. The bidders shall quote their rates keeping in mind the site conditions, scope of work, specifications, terms & conditions, additional conditions and special conditions etc. and nothing shall be payable extra what so ever unless otherwise specified.
4. In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so. Such power of attorney should be produced with the tender and it must be disclosed that the firm is duly registered under the Indian partnership act, 1952.
5. GST, Labour Cess etc. as applicable shall be paid by the contractor himself. The department shall deduct from the R/A bills, the TDS as applicable. The contractor shall quote his rates considering all such taxes.
6. The bidder shall quote their rates considering all prevalent taxes/ cess like GST, Workers Cess or any other tax on material /work as applicable on the last date of bid submission and nothing extra shall be paid to the contractor on this account.
7. Electricity Connection for construction, testing & commissioning etc. shall be provided to the contractor on payment basis as per the University norms. Water required for testing of equipment is also in the scope of agency.
8. Damages to existing infrastructure/equipment done by executing agency due to carelessness/poor quality work shall be compensated by Contractor to Central University of Rajasthan.

9. Scope of Drawings:

The University will provide the design & drawing along with heat load calculation details for the required work(s). The bidder shall quote their rates considering the above and BoQ. If any modification in design/drawings is needed as per site conditions, or subsequent to proof checking, the contractor shall do/re-do the design without any extra cost. The Contractor shall prepare and supply all the coordinated 'Good for Construction' drawings duly proof checked and approved from authorized structural engineer, if required by EIC. The decision of the Engineer- in-charge in this regard shall be final and binding. No claim whatsoever on this account will be entertained on this account.

The contractor shall prepare & submit three sets of required shop drawings and get them approved from the Engineer-in-charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipment/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.

Note: All medium & major civil structure works shall be in the scope of University.

INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR TENDERING FORMING PART OF BID DOCUMENT

The Registrar, Central University of Rajasthan, NH-8, Bandarsindri, Kishangarh-305817 invites sealed **Percentage Rate bids** from approved and eligible contractors of CPWD and those of appropriate list of MES, BRO, BSNL, Railway and State PWD or Public sector undertakings set up by the central or state government for following work(s):

S. No	Name of Work	NIT No.	Estimated Cost	Earnest money	Stipulated Period of Completion of work (in months)	Last date & time of submission of Bid	Date & Time of Opening of Technical Bid
1	Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.	CURAJ/R/F.177/2026/6231 Date 14.07.2026	33,944,235/-	Rs. 6,78,885/-	05 months	05.08.2026 till 02.00 PM	06.08.2026 at 03.00 PM

- The intending bidder must read the terms and conditions of **CPWD-6** carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required. Information and Instructions for bidders posted on website shall form part of bid document.
- The bid document consisting of plans, specifications, the bill of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from University website www.curaj.ac.in and CPP portal free of cost.
- The contractor of CPWD, MES, BRO, State PWD or Public sector undertakings set up by the central or state government have to submit copy of **enlistment in appropriate class valid up to date**.
- The bidder must ensure to quote rate of each item. Amount should be worked out for all items. Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (ZERO). However, If a tenderer quotes nil rates against each item in Percentage Rate tender or does not quote any percentage above/below on the total amount of the tender or any section / sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
- Tenders with any condition including that of conditional rebates in the tender document shall be rejected forthwith.
- The tenderer should also read the General Conditions of Contract for Construction works 2023 with latest amendments upto date of submission of bid (available on CPWD website), which is available as Govt. of India Publications, which will be a part of the agreement including the special conditions and particular specifications etc.

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LIST OF DOCUMENTS TO BE ATTACHED WITH THE TECHNICAL BID

1. **Earnest Money Deposit of Rs. 6,78,885/-** in the form of ~~Demand Draft/FDR~~/CURAJ Account (drawn in favour of Central University of Rajasthan) of any Scheduled Bank payable at Bandarsindri/Kishangarh, District-Ajmer.
2. Copy of Experience/work completion certificates from the clients regarding the quality and duration of services rendered during last seven years (Form C)
3. Copy of Enlistment Order of the Contractor in appropriate class in CPWD, MES, BRO, State PWD or Public sector undertakings set up by the central or state government having validity at least till last date of bid submission.
4. Copy of GST Registration Certificate.
5. Photo copy of PAN Card.
6. Certificate of Financial Turnover from CA or Copy of audited balance sheets of last three financial years.(Form A)
7. A self-certificate showing the track record of contracting firm/Contractor on the non-judicial stamp paper. (Annexure-III)
8. Undertaking for supply of genuine spare parts (Annexure –IV)
9. Letter of Transmittal (Annexure –I)
10. Documents related to Bidding capacity
11. Solvency Certificate – 40% of the estimated value put to tender.

Note:

- **Tenders received without EMD will not be accepted.**
- Each and every page of all the tender documents, annexures, corrigendum/addendum (**if any**) and their annexures should be duly seal & signed and submitted with technical bid.

Registrar
Central University of Rajasthan

SECTION – I
(Brief Particulars of Work)

1. Salient details of the work for which bids are invited are as under:

Sl. No.	Name of Work	Estimated Cost	Period of Completion
01	Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.	Rs. 3,39,44,235/-	05 months

2. The work shall be executed according to General Conditions of Contract 2023 available separately at printer's outlets and online including amendments issued there in up to last date of bid. The General Conditions of Contract for Central Public Works Department are also available on website www.cpwd.gov.in.
3. The scope of work includes Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj. The scope of work in this contract shall include all Civil, Electrical & Mechanical works including services.
4. General features & major components of the scope of this work to be executed by the contractor are as under:
- i) **Electrical Works :**
 - a) Complete Internal and External Electrical and Mechanical works in the buildings.
 - b) All E&M works including external electric supplies, insulation, etc. as required.
 - c) Any other work as detailed in BOQ, specified elsewhere in tender documents and even incidental works not defined in this document but essential for completion of work.
 - ii) **Civil Works :**
 - a) Scope of work also includes masonry/RCC/false ceiling work, plaster work, all external and internal finishing works, Steel/Iron work in frame as per BOQ.
 - b) Any other work as detailed in BOQ, specified elsewhere in tender documents and even incidental works not defined in this document but essential for completion of work.
 - iii) The work shall be executed according to BOQ items, specifications and conditions specified in tender document, approved architectural, structural and service drawings and directions of Engineer-in-Charge.
 - iv) The above-mentioned scope of work of the contractor which is only indicative and not exhaustive. The contractor shall be responsible for executing all items required for completing the buildings and allied works in all respects to make it habitable and ready for occupation, as per direction of Engineer-in-charge.
 - v) The scope of work includes cost of all materials, manpower, equipment, T&P, fixtures, accessories, royalties, taxes, watch & ward and all other essential elements for completion and maintenance of works whatsoever, under the scope of this contract. Any changes, modifications, revisions etc. required to be done by University, client, local bodies, design consultants etc. in accordance with applicable standards will have to be executed by the contractor as per provisions of the contract specified elsewhere in this bid document.
 - vi) The contractor shall prepare & submit three sets of required shop drawings and get them approved from the Engineer-in-charge before the start of the work. The approval of drawings however does not absolve the contractor not to supply the equipment/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.

SECTION – II

(INFORMATION & INSTRUCTIONS FOR BIDDERS)

1 General :

INFORMATION & INSTRUCTIONS FOR BIDDERS

- 1.1 Letter of transmittal and forms for deciding eligibility are given in Annexure -I.
All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, a "nil" or "no such case" entry should be made in that column. If any particulars/query is not applicable in case of the bidder, it should be stated as "not applicable". The bidders are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the bid being summarily disqualified. Bids made by telegram or e-mailed or telex and those received late will not be entertained.
- 1.2 References, information and certificates from the respective clients certifying suitability, technical knowledge or capability of the bidder should be signed by an officer not below the rank of Executive Engineer or equivalent.
- 1.3 The bidder may furnish any additional information which he thinks necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after submission of eligibility criteria document unless it is called for by the Employer.

2 Definitions:

- 2.1 In this document the following words and expressions have the meaning hereby assigned to them.
- 2.2 Employer: Means the Central University of Rajasthan, acting through the Registrar, Central University of Rajasthan.
- 2.3 Bidder: Means the individual, proprietary firm, firm in partnership, limited company private or public or corporation.
- 2.4 "Year" means "Financial Year" unless stated otherwise.

3 Method of application:

- 3.1 If the bidder is an individual, the application shall be signed by him above his full type written name and current address.
- 3.2 If the bidder is a proprietary firm, the application shall be signed by the proprietor above his full type written name and the full name of his firm with its current address.
- 3.3 If the bidder is a firm in partnership, the application shall be signed by all the partners of the firm above their full type written names and current addresses, or, alternatively, by a partner holding power of attorney for the firm. In the latter case a certified copy of the power of attorney should accompany the application. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.
If the bidder is a limited company or a corporation, the application shall be signed by a duly authorized person holding power of attorney for signing the application accompanied by a copy of the power of attorney. The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary.

4 Final decision making authority

The employer reserves the right to accept or reject any bid and to annul the process and reject all bids at any time, without assigning any reason or incurring any liability to the bidders.

5 Particulars provisional

The particulars of the work given in Section-I are provisional. They are liable to change and must be considered only as advance information to assist the bidder.

6 Site visit

The bidder is advised to visit the site of work, at his own cost, and examine it and its surroundings

to himself collect all information that he considers necessary for proper assessment of the prospective assignment.

7 Minimum Criteria for Technical Eligibility :

7.1 (i) The Contractors have satisfactorily completed the works as mentioned below during the last **Seven** years ending last day of the month previous to the one in which tenders are invited.

- Three similar works each costing not less than **40%** of estimated cost put to tender;
OR
- Two similar works each costing not less than **60%** of estimated cost put to tender;
OR
- One similar work costing not less than **80%** of estimated cost put to tender.

(ii) The bidder should have Average Annual Financial Turnover (gross) of **30% OF THE ESTIMATED COST** of similar works during the immediate last three consecutive financial years balance sheet, ending **31st March 2026**, duly audited by Chartered Accountant. Year in which no turnover is shown would also be considered for working out the average. (Scanned copy of Certificate from CA with Unique Document Identification Number (UDIN) to be attached). The value of annual turnover figures shall be brought to the current value by enhancing the actual turnover figures at simple rate of 7% per annum.

- **Similar work shall mean here – Experience in ‘Supply, Installation, Testing & Commissioning Work of Air Conditioners’.**

7.2 The contractor of CPWD, MES, BRO, State PWD or Public sector undertakings set up by the central or state government have to submit **copy of enlistment in appropriate class** valid up to date. They are also required to submit the authorization letter from the manufacturer whose product is quoted, valid up to date.

OR

The original manufacturer has to submit the upto date valid registration certificate in make of which product is quoted or authorized dealer has to submit the dealership letter from the manufacturer whose product is quoted, valid up to date.

7.3 The bidder should not have incurred any loss (profit after tax should be positive) in more than two years during available last five consecutive balance sheets, duly certified and audited by the Chartered Accountant. (The balance sheet in case of Pvt. / Public Ltd. company means its standalone financial statement and consolidated financial statement both).

7.4 The bidder should have sufficient number of Technical and Administrative employees for the proper execution of the contract. The bidder shall have to submit the details of their site-in-charge and other staff stating clearly how these would be involved in this work within 15 days of award of work.

7.5 **Should have bidding capacity equal to or more than the estimated cost of the work put to tender. The bidding capacity shall be worked out by the following formula:**

$$\text{Bidding Capacity} = \{[A \times N \times 1.5] - B\}$$

Where,

A = Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N = Number of years prescribed for completion of work for which bids have been invited.

B = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited.

- 8 The bidders have to submit a list of jobs in progress. Brief details of the units scope of work, names and address (postal mail) of present clients. (Form C-1 of Annexure-II).
- 9 The track record of the contracting manufacturer/dealer/firm/contractor should be clean and should not be blacklisted or not have any involvement in illegal activities or financial misappropriation / frauds etc. by any Central/State Government/Public Sector Undertaking/Institute on any account. **A self-certificate on the Non-Judicial Stamp paper shall be attached for the purpose.** (Annexure-III)
- 10 **Financial information**
Bidder should furnish the Annual financial statement for the last five years in (Form "A"). Banker's Certificate in (Form "B") or Net worth Certificate in (Form "B-1"). Please refer Annexure- II for forms.
- 11 **Experience of similar works**
Bidder should furnish the List of eligible similar nature of works successfully completed during the last seven years in (Form "C") and ongoing works as well (Form C-1). Please refer Annexure- II for forms.
- 12 **Organization information**
Bidder is required to submit the information in respect of his organization in Forms "E" Please refer APPENDIX- II for forms.
- 13 **Letter of transmittal**
The bidder should submit the Letter of Transmittal attached with the document. Please refer Annexure-I for format of letter.
- 14 **Preparation & Submission of bids :**
The tender should be submitted in two parts i.e. Technical Bid and Financial Bid and both the bids shall be uploaded on the CPP Portal on <https://eprocure.gov.in/cppp/> by the bidders.
Any other related document, if required, may be submitted to the Dispatch Section, Room No. - 101, Ground Floor, Administrative Building, Central University of Rajasthan, well in time.
- 16 **Opening of Price bid**
After evaluation of technical bids, a list of short listed bidders will be prepared. Thereafter the financial bids of only the qualified and technically acceptable bidders shall be opened.
- 17 **Award Criteria**
 - 17.1 The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:
 - (a) Amend the scope of work and value of contract.
 - (b) Reject any or all the applications without assigning any reason.
 - 17.2 Any effort on the part of the bidder or his agent to exercise influence or to pressurize the employer would result in rejection of his bid. Canvassing of any kind is prohibited.

CENTRAL UNIVERSITY OF RAJASTHAN
NOTICE INVITING TENDER

The Registrar, Central University of Rajasthan, NH-8, Bandarsindri, Kishangarh-305817 invites sealed **Percentage Rate Bids** from approved and eligible contractors of CPWD and those of appropriate list of MES, BRO, BSNL, Railway and State PWD or Public sector undertakings set up by the central or state government for following work(s): **Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.**

The Estimated Cost: Rs. 3,39,44,235/- incl. GST. This estimate, however, is given merely as a rough guide.

The contractor of CPWD, MES, BRO, State PWD or Public sector undertakings set up by the central or state government having enlistment in appropriate class valid up to date and fulfilling the eligibility criteria of NIT are invited to apply.

1. Agreement shall be drawn with the successful bidders on prescribed Form No. CPWD-7/8 of GCC 2023 duly amended upto last date of submission of bid, which is available as a Govt. of India Publication and also available on website www.cpwd.gov.in. Bidders shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.
2. The time allowed for carrying out the work will be **05 months** from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the tender documents.
3. The site for the work is mostly available.
4. The bid document consisting of plans, specifications, the bill of quantities of various types of items to be executed and the set of terms & conditions of contract to be complied with and other necessary documents except Standard General Conditions of Contract Form can be seen from website <https://etender.cpwd.gov.in>, from Estate Section of Central University of Rajasthan, free of cost.
5. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of tender as notified. While submitting the revised bid, contractor can revise the quoted percentage rates but before last time and date of submission of tender as notified.
6. The bid submitted shall become invalid, if
 - (i) The bidder is found ineligible.
 - (ii) The bidder does not deposit original EMD with technical bid envelope.
 - (iii) If a tenderer quotes nil rates against each item in Percentage Rate tender or does not quote any percentage above / below on the total amount of the tender or any section/ sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
 - (iv) If any discrepancy is noticed in the documents / details as submitted by bidder.
7. **Earnest Money Deposit:** The bidder shall be required to submit the Earnest Money Deposit (EMD) for an amount of **Rs. 6,78,885/-** by way of ~~demand drafts~~/CURAJ Account only.

The demand drafts shall be drawn in favour of "Central University of Rajasthan" payable at Bandarsindri/Kishangarh. **The demand drafts/deposit receipt for earnest money deposit must be enclosed in the envelope containing the technical bid.** The EMD of the successful bidder shall become part of Performance Guarantee and for unsuccessful bidder(s), it would be returned

(without interest) after award of the contract. Tenders received without EMD shall not be accepted.

Details of University for deposition of EMD: Name: Central University of Rajasthan

Name of Bank: Bank of India

Branch Name: Central University of Rajasthan

Account No. 666110210000003

IFSC: BKID0006667

~~**Note:** Firms which are registered with Medium Small and Micro Enterprise Management (MSME) / Small Scale Industries (SSI) are exempted to submit the EMD (copy of registration must be provided along with technical bid). No other relaxation will be allowed.~~

8. Performance Guarantee :

The contractor whose bid is accepted will be required to furnish **performance guarantee of 05% (Five Percent) of the tender accepted amount** within the period specified in Schedule F. This guarantee shall be in the form of Deposit at Call receipt of any scheduled bank/Banker's cheque of any scheduled bank/Demand Draft of any scheduled bank/ Pay order of any Scheduled Bank of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F', including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor. The earnest money deposited along with bid shall be returned after receiving the aforesaid performance guarantee. The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/ registrations or proof of applying for obtaining labour licenses, registration with EPFO, ESIC and BOCW Welfare Board including Provident Fund Code No, if applicable and also ensure the compliance of aforesaid provisions by the sub-contractors, if any, engaged by the contractor for the said work within the period specified in Schedule F.

9. Security Deposit:

- The contractor whose tender is accepted will also be required to furnish by way of Security Deposit for the fulfillment of his contract, an amount equal to **5% (Five Percent) of the billed amount**. The Security deposit will be collected by deductions from the running bills as well as final bill of the contractor at the rates mentioned above. ~~The Security amount will also be accepted in cash or in the shape of Government Securities. Fixed Deposit Receipt of a Scheduled Bank or will also be accepted for this purpose provided confirmatory advice is enclosed.~~
- The said security deposit shall be returned after satisfactorily completion of defect liability period.
- This security deposit shall be forfeited if he/they fails to comply with any of the conditions of the contract. No interest shall be paid on the security deposit.

10. Payment Clause:

The following percentage of contract rates shall be payable against the stages of work shown herein {Ref.: General Specifications for Heating, Ventilation and Air-Conditioning (HVAC) Works 2024}:

Stages of work

- (i) After initial inspection (wherever specified) & delivery at site in good condition on pro-rata basis: 70%
- (ii) On completion of pro-rata installation: 15 %
- (iii) On commissioning and completion of successful running in period: 10 %
- (iv) On completion of major seasonal test: 5 %

When the major seasonal test (Summer or monsoon for Air Conditioning System) cannot be carried out on commissioning of the installation due to any reason not attributable to the contractor, the installation will be handed over to the Department for beneficial use after completion of successful running in test of 7 days subject to a minimum aggregate of 120 hours as

per para 1.15/CPWD General Specifications for Heating, Ventilation and Air-Conditioning (HVAC) Works 2024. The balance payment shall be released to the contractor on his furnishing a bank guarantee in the specified format from a scheduled bank for an equivalent amount. The bank guarantee shall be valid for a period of 6 months. However, it will be extended till the successful completion of the major seasonal test. This bank guarantee shall be independent of the one furnished for performance guarantee.

11. **The description of the work is as follows:** - Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj (as per BoQ).

Intending Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidder shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidders shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

Equipment data shall be submitted as per format attached. Tenderers not submitting data in full will do so at the risk of the tenders being evaluated with such information as may be available with the client.

Mere becoming the lowest bidder, prior to financial bid scrutiny will not give any right to the lowest bidder to claim that he is successful in the bidding process. The successful bidder (L1) shall be decided only after following due procedure.

The Bidder meeting the minimum eligibility criteria and with the overall lowest bid price shall be deemed as the successful Bidder and shall be considered eligible L-1 Bidder for further processing.

12. The competent authority on behalf of the Central University of Rajasthan does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the tenders received without the assignment of any reason. All bidders in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.
13. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable to rejection.
14. The competent authority on behalf of President of India reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.
15. No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his/her retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the bid or engagement in the contractor's service.
16. The tender for the works shall remain open for acceptance for a period of **One Eighty Days (180) days** from the date of opening of tenders. If any bidder withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall,

without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further, the bidder shall not be allowed to participate in the re-tendering process of the work.

17. Except writing rates and amount, the bidder should not write any conditions or make any changes, additions, alterations and modifications in the printed/downloaded form of tenders. If any changes, additions, alterations, modifications are detected in the submitted bid even at a later date when contract has been awarded, the contract will be liable to be void. The decision of Registrar, Central University of Rajasthan will be final & binding to the Contractor in this regard.
18. The University does not bind itself to accept the lowest or any other tender and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidder shall be summarily rejected.
19. The Specifications to be followed for execution of work: CPWD General specifications for electrical works Part-I (Internal) 2013, General Specifications for Heating, Ventilation and Air-Conditioning (HVAC) Works 2024, Specifications Civil Vol-I & II and DSR Civil Vol-I & II (2019) as modified and Correction Slips/amendments issued upto previous day to last date of bid submission or any other relevant CPWD manual/guideline or IS.

20. Signing of Contract

The successful tenderer/contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of-

- (i) The notice inviting tender, all the documents including drawings, if any, forms the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.
- (ii) Standard C.P.W.D. Form as mentioned in Schedule 'F' consisting of:
 - (a) Various standard clauses with corrections up to the date stipulated in Schedule 'F' along with annexures thereto.
 - (b) C.P.W.D. Safety Code.
 - (c) Model Rules for the protection of health, sanitary arrangements for workers employed by CPWD or its contractors.
 - (d) CPWD Contractor's Labour Regulations.
 - (e) List of Acts and omissions for which fines can be imposed.
 - (f) Integrity Pact
- (iii) No payment for the work done will be made unless contract is signed by the contractor.

21. The bid document will include following two components:-

Part A: CPWD-6, CPWD-8 including schedule A to F for the both the components of the work, Standard General Conditions of Contract for CPWD 2023 as amended/ modified up to last date of submission of bid.

Part B: General/specific conditions, specifications and bill of quantities applicable to the work. In case of any discrepancy between part A and part B of the contract agreement, the provision of Part A shall prevail.

22. Entire work under the scope of composite bid including major and all minor components shall be executed under one agreement.
23. Any dispute unless resolved amicable, shall be settled by a court of law having jurisdiction over Jaipur/Ajmer.

Central University of Rajasthan
STATE RAJASTHAN

BRANCH ESTATE

Percentage Rate Tender & Contract for Works

Tender for the work of: Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.

- (i) Tender to be submitted by **02.00 PM on 05.08.2026** at Room-101, Admin Building, Central University of Rajasthan.
- (ii) To be opened in presence of tenderers/contractors who may be present at **03.00 PM on 06.08.2026** and the authorized representative of Central University of Rajasthan.

Issued to: - M/s _____

Signature of officer issuing the documents

Designation:

Date of Issue:

TENDER

I/We have read and examined the notice inviting tender, schedule, A, B, C, D, E & F. specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, special conditions, Schedule of Rate & other documents and Rules referred to in the condition of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the University within the time specified in Schedule "F", viz., bill of quantities and in accordance with the specifications, designs, drawings and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respects in accordance with, such condition so far as applicable.

I/We agree to keep the tender open for **(180) days** from the due date of opening and not to make any modification in its terms and conditions.

A sum of **Rs. 6,78,885/-** is hereby forwarded in ~~demand draft~~/University Account in favour of Registrar, Central University of Rajasthan as earnest money. If I/We fail to furnish the prescribed performance guarantee of tender form within prescribed period. I/We agree that the University, without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/we fail to commence work as specified, I/we agree that University shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, up to maximum of the percentage mentioned in schedule 'F' and those in excess of that limit at the rates to be determined in accordance with the provision contained in clause 12.2 and 12.3 of the tender form.

Further I/We agree that in case of forfeiture of earnest money or both earnest money and performance guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/We shall be debarred for tendering in Central University of Rajasthan in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-In-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information derived there from to any person

other than a person to whom I/we am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the state.

Dated _____

Signature of Tenderer/Contractors

Postal

Address* _____

Telephone

No.* _____

Fax

E-Mail

Witness**: _____

Address**: _____

Occupation**: _____

(*) To be filled in by the Tenderer/Contractors.

(**) To be filled in by the Witness.

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me on behalf of Central University of Rajasthan for a sum of Rs. _____).

The letter referred to below shall form part of this agreement:-

a)

b)

c)

Signature.....

Dated

Registrar ,
Central University of Rajasthan.

FORM OF AGREEMENT

(To be executed on non-judicial stamp paper of Rs.500/-)

Agreement No: _____

Dated: _____

CONTRACT FOR "Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj".

THIS AGREEMENT is made on _____ day of _____ (month), _____ (year) between **Central University of Rajasthan, NH-8 Bandarsindri, Tehsil-Kishangarh, District- Ajmer , Rajasthan, Pin-305817**, hereinafter called University, (which expression shall, wherever the context so demands or requires, includes their successors in office and assigns) on the one part and hereinafter called the Contractor (which expression shall wherever the context so demands or requires, include his/their successors and assigns) on the other part.

WHEREAS the University is desirous that certain works should be executed viz. and has by Letter of acceptance/award dated accepted the quotation/offer submitted by the contractor for the execution, maintenance and completion of such works at a total contract price of Rs. (Rupees only).

Now THIS AGREEMENT WITNESSETH as follows:

1. In this agreement, words and expressions shall have the same meaning as are respectively assigned to them in the conditions of contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of the agreement viz:
 - a) This Form of Agreement
 - b) The Letter of Award dated _____
 - c) NIT document _____
 - d) Priced Schedule/ Bill of quantities.
 - e) Scope of work and conditions of contract.
 - f) All Annexures to NIT
 - g) CPWD GCC with up-to-date correction slips.

The aforesaid documents shall be taken as complementary and mutually explanatory of one another, but in the case of ambiguities or discrepancies, shall take precedence in the order set out above.

3. In consideration of the payment to be made by the University to the contractor as hereinafter mentioned, the contractor hereby covenants with the University to execute, complete and maintain the works in conformity in all respects within the provisions of the contract.
4. The University thereby covenants to pay to the contractor in consideration of the execution, completion and maintenance of the works at contract price at the time and in the manner prescribed by the contract.

In WITNESS whereof the parties hereto have caused their respective common seals to be here into affixed (or have herewith set their respective hands and seals) the day and year first above written.

Signed, Sealed and Delivered By

Signed, Sealed and Delivered By

For and on behalf of

For and on behalf of

Central University of Rajasthan
Bandarsindri, Kishangarh, Ajmer, Rajasthan

By:

By:

Name

Name

Designation

Designation

In the presence of

In the presence of

WITNESS

WITNESS

1.

1.

2.

2.

PROFORMA OF SCHEDULES A to F

SCHEDULE 'A'

Bill of quantities (Enclosed)

As per Financial Bid

SCHEDULE 'B'

Schedule of materials to be issued to the tenderer/contractor.

Sl. No.	Description of Item	Quantity	Rates in figures & words at which the material will be charged to the contractor	Place of Issue
1	2	3	4	5
1.	NIL	NIL	NIL	NIL

SCHEDULE 'C'

Tools and plants to be hired to the tenderer/contractor

Sl. No.	Description	Hire charges per day	Place of issue
1	2	3	4
	NIL	NIL	NIL

SCHEDULE 'D'

Extra schedule for specific requirements/ documents for the work, if any.

Nil

SCHEDULE 'E'

1. Reference to General Conditions of contract: General Conditions of contract for Central PWD Works: GCC 2023, Form-8 for CPWD works as amended upto last date of submission of bid.
2. **Name of work:-** Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj..
 - (i) **The work is estimated to the cost** : **Rs. 3,39,44,235/-**
 - (ii) **Earnest Money** : **Rs. 6,78,885/-**
(to be returned after receiving performance guarantee without interest)
 - (iii) **Performance guarantee** : **05% (Five percent) of tender accepted amount.**
(to be returned after completion of work without interest)
 - (iv) **Security Deposit** : **5% (Five percent) of the billed amount.**
(to be returned without interest after completion of defect liability/CMC period)

SCHEDULE 'F'

General Rules & Directions

Officer Inviting Tender

Registrar,

Central University of Rajasthan, Bandarsindri

See Below

Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3

Definitions:

2(v) Engineer-in-Charge

Executive Engineer, Central University of Rajasthan, Bandarsindri, NH-8.

2(vii) Accepting Authority

Registrar, Central University of Rajasthan, Bandarsindri, NH-8.

2(x) Percentage on cost of materials and labor to cover all overhead & profits

15%

2(xi) Standard Schedule of Rates

DSR 2025 (E&M), DSR Civil 2023 with correction slips up to last date of submission of bid.

2(xii) Department

Central University of Rajasthan

9(ii) Standard CPWD contract Form GCC 2023, CPWD Form 7/ 8 as modified & corrected upto	GCC 2023 or latest, CPWD Form 7 as modified and Correction Slips/amendments issued upto previous day to last date of bid submission.
Clause 1 (Performance Guarantee)	
i) Time allowed for submission of Performance guarantee, Programme Chart (Time and Progress) and applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board including Provident Fund Code No. or proof of applying thereof from date of issue of letter of acceptance.	15 days
ii) Maximum allowable extension with late fee @ 0.1% per day of performance guarantee amount beyond the period provided in (i) above	05 days
Clause 2 (Compensation for Delay)	GCC 2023 for construction works shall be applicable.
Authority for fixing compensation under clause 2.	Registrar, Central University of Rajasthan.
Clause 2 (A).	
Whether clause 2 (A) shall applicable	Yes
Clause 5	
Number of days from the date of issue of letter of acceptance for reckoning date of start Mile stone(s) as per table given below:-	NA
Time allowed for execution of work	05 months
Authority to decide:	
(i) Extension of time	Registrar, Central University of Rajasthan
(ii) Rescheduling of milestones	Registrar, Central University of Rajasthan
(iii) Shifting of date of start in case of delay in handing over of site	Registrar, Central University of Rajasthan
Clause 6 :	Computerized Measurement Book Applicable
Clause 7 :	As per decision of the University
Clause 7A :	NA
No Running Account Bill shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable are submitted by the contractor to the Engineer-in-Charge.	
Clause 8A	Not Applicable
Clause 10A	
List of testing equipment to be provided by the contractor at site	As per site requirement
Clause 10 B (ii)	Not Applicable
Clause 10 C	NA
Component of labour expressed as percent of value of work:	
Clause 10 CA	NA
Payment due to variation in prices of materials after receipt of tender	
Clause 10 CC	NA
Payment due to Increase / Decrease in Prices/ Wages (excluding materials covered under clause 10 CA) after Receipt of Tender for Works	
Clause 11	CPWD General specifications for electrical works

Specifications to be followed for execution of work

Part-I (Internal) 2013, General Specifications for Heating, Ventilation and Air-Conditioning (HVAC) Works 2024, Specifications Civil and DSR Civil Vol-I &II (2019), other relevant CPWD Manual/guidelines or IS norms as modified and Correction Slips/amendments issued up to previous day to last date of bid submission.

Clause 12

Authority to decide deviation up to 1.5 times of tendered amount

Upto 50 % (Registrar)

12.2 & 12.3: Deviation limit beyond which clauses 12.2 & 12.3 shall apply for building/electrical work.

100% (Hon'ble Vice Chancellor)

12.5 :

(i) Deviation limit beyond which clauses 12.2 & 12.3 shall apply for foundation work (except work).

NA

(ii) Deviation Limit for items in earth work subhead of DSR or related items

NA

Clause 16

Competent Authority for deciding reduced rates

Registrar, Central University of Rajasthan

Clause 18

List of mandatory machinery, tools & plants to be deployed by the contractor at site

As applicable to be arranged by the contractor

Clause 19

Authority to decide penalty for each default

Registrar, Central University of Rajasthan

Clause 25

Constitution of Dispute Redressal Committee (DRC)
DRC shall constitute one Chairman and two members

Competent Authority to appoint DRC
Honorable Vice Chancellor
Central University of Rajasthan

Clause 32

Requirement of Technical Representative(s) and recovery Rate

S. No.	Min Qualification of Technical Representative	Discipline	Designation	Minimum Experience	Number	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36(i)	
						Figures	Words

Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers. Diploma holder with minimum 10 year relevant experience with a reputed construction co. can be treated at par with Graduate Engineers for the purpose of such deployment subject to the condition that such diploma holders should not exceed 50% of requirement of degree engineers.

Clause 38

(i) (a) Schedule/statement for determining theoretical quantity of cement & bitumen on the basis of Delhi Schedule of Rates

(ii) Variations permissible on theoretical quantities:

(a) Cement

For works with estimated cost put to tender not more than Rs. 25 lakh.

3% plus/minus

For works with estimated cost put to tender more than Rs. 25 lakh.

2% plus/minus

(b) Bitumen All Works

2.5% plus & only & nil on minus side

(c) Steel Reinforcement and structural steel sections for each diameter, section and category

2% plus/minus

(d) All other materials

Nil

INTEGRITY PACT

To,
Executive Engineer,

.....

Sub: Submission of Tender for-

Dear Sir,

I/We acknowledge that CPWD is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process.

I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by CPWD. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, CPWD shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/ bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

To be signed by the tenderer and same signatory competent / authorised to sign the relevant contract on behalf of Central University of Rajasthan

INTEGRITY PACT

This Integrity Agreement is made at on thisday of20.....

BETWEEN

Central University of Rajasthan through Registrar, Central University of Rajasthan, Bandarsindri, Dist.-Ajmer. (Hereinafter referred as the 'Principal/Owner', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

.....
(Name and Address of the Individual/firm/Company)

Through
(Details of duly authorized signatory)

Hereinafter referred to as the "Tenderer/Contractor" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal / Owner has floated the Tender (NIT No.)
(hereinafter referred to as "Tender/Bid") and intends toward, under laid down organizational procedure, contract for -
Here in after referred to the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Tenderer(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

- 1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:
 - (a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - (b) The Principal/Owner will, during the Tender process, treat all Tenderer(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Tenderer(s) the same information and will not provide to any Tenderer(s) confidential/ additional information through which the Tenderer(s) could obtain an advantage in relation to the tender process or the contract execution.
 - (c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.
- 2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Tenderer(s)/Contractor(s)

- 1) It is required that each Tenderer/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the Negotiation or award of a contract.
- 2) The Tenderer(s)/Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:
 - a) The Tenderer(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.
 - b) The Tenderer(s)/Contractor(s) will not enter with other Tenderer(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or on-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.
 - c) The Tenderer(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Tenderer(s)/Contractor(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 - d) The Tenderer(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Tenderer(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.
 - e) The Tenderer(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.
- 3) The Tenderer(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 4) The Tenderer(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a wilful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.
- 5) The Tenderer(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Tenderer(s)/Contractor(s) and the Tenderer/ Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

- 1) If the Tenderer(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days' notice to the Contractor shall have powers to disqualify the Tenderer(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Tenderer/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

- 2) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Tenderer(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Tenderer/Contractor.
- 3) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Tenderer or Contractor, or of an employee or a representative or an associate of a Tenderer or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

- 1) The Tenderer declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.
- 2) If the Tenderer makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Tenderer/Contractors deemed fit by the Principal/ Owner.
- 3) If the Tenderer/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Tenderers/Contractors/Subcontractors

- 1) The Tenderer(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Tenderer/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Sub-Contractors/sub-vendors.
- 2) The Principal/Owner will enter into Pacts on identical terms as this one with all Tenderers and Contractors.
- 3) The Principal/Owner will disqualify Tenderers, who do not submit, the duly signed Pact between the Principal/Owner and the tenderer, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other tenderers, till the Contract has been awarded. If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, CPWD.

Article 7- Other Provisions

- 1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Headquarters of the Division of the Principal/Owner, who has floated the Tender.
- 2) Changes and supplements need to be made in writing. Side agreements have not been made.
- 3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.
- 4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....
(For and on behalf of Principal/Owner)

.....
(For and on behalf of Tenderer/Contractor)

WITNESSES:

1.
(Signature, name and address)

2.
(Signature, name and address)

Place:

Date:

PART –B

SPECIAL CONDITIONS OF THE CONTRACT

Name of the Work: Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex, CURaj.

1. The contractor is advised to visit the site(s) of work i.e. “Campus of Central University of Rajasthan, Bandarsindri, Kishangarh, Distt. – Ajmer, Rajasthan.” to get an idea of the work; failure to do so, shall not absolve their responsibility to do the work as specified in agreement and/ tender document.
2. The work shall be executed as per CPWD’s general specification for Electrical Works Part-I Internal 2013 & (HVAC-2017) IE rules, General Specifications for Heating, Ventilation and Air-Conditioning (HVAC) Works 2024, Indian Standards, as per Rules of NBC 2005 & all the amendment issued upto date and as per directions of Engineer-In-Charge. These additional specifications are to be read in conjunction with above and in case of variations; specifications given in this special conditions shall apply. However, nothing extra shall be paid on account of these technical specifications, special conditions and T&C of NIT document as the same are to be read along with bill of quantities for the work.
3. **Assembly and Inspection:**
 - Assembly of all parts shall be made to ensure that the parts are properly fitted to minimize erection problems. The owners or their authorized representatives reserve the right to inspect any machinery, material and equipment (herein after collectively called "apparatus") finished or used by the contractor under this contract and may reject which is defective in workmanship or design or otherwise unsuitable for the use and purpose intended or which is not in accordance with the intent of this contract. The Contractor shall on demand by the owners or their authorized representatives remedy / replace at the contractor’s expenses any such defective or unsuitable apparatus.
 - The owner or their representative shall at all times have access to all parts of shop where apparatus is being manufactured and also shall be provided with all reasonable inspection facilities by the contractor and his sub suppliers / contractors.
 - All apparatus should be accompanied with QAP Certificates of respective Manufacturers except for site fabricated items.
4. On completion of the work, the contractor shall furnish 3 (three) sets of the following documents and drawings.
 - Comprehensive Operation and Maintenance Manuals.
 - As built drawings duly approved.
 - Test Certificates as applicable.
 - Equipment warranties.
 - Signed copies of Testing and Commissioning Reports.
6. **Material Testing:**

The owner or his authorized representative shall have the right to get any materials of work to be tested by an independent agency at contractor's expense in order to prove the soundness and adequacy.
7. **Installation**

The Contractor shall carry out the complete installation, which shall include for transportation of materials from his site store to the site of work. All work shall commence on previously prepared mounting / foundation / supporting hangers / supports. At no time the actual works shall precede the support work. The Contractor shall make his own arrangement to off load equipment/ material received at site.
8. **Testing & commissioning:**

All routine and type tests shall be carried out at the works of the contractor or the manufacturers of the components. The Engineer-In-Charge or authorized representative shall be free to witness any or all tests, if he so desires.

On the completion of the installation, the contractor shall arrange to carry out various initial tests as detailed below, in the presence of, and to the complete satisfaction of the Engineer-In-Charge or authorized representative. Any defects or shortcomings found during the tests, shall be speedily rectified or made good by the contractor at his own expenses. The final test reports shall be submitted to the Engineer-In-Charge.

The initial tests, as applicable shall include but not be limited to the following:

- A: Pressure testing of water conveying and refrigerant lines.
- B: Pre commissioning checks of all equipment and the installation prior to any equipment start.
- C: Flushing and chemical cleaning of pipelines.
- D: Water balancing
- E: Air balancing
- F: Performance testing of equipment installed.
- G: Control checks.
- H: Endurance Test (72Hrs).
- I: Room conditions etc.

On the satisfactory completion of all 'initial' tests the plant shall be deemed to be commissioned.

9. The Contractor shall provide all necessary tools, calibrated instruments, gauges, flow meter, orifice meter/ manometers, tong testers, velometer, anemometer/anemotherm, pitot tubes, tachometer, etc. as may be required for conducting the various tests. All instruments shall accompany a valid calibration certificate. He shall also provide necessary lubricants and the required personnel for the tests. However, the CURaj shall provide water and electricity for the tests free of cost.

10. **Rejection of Defective Plant**

- If on test, any portion of the plant, equipment or component are found defective or not fulfilling the intent or the meaning of the specifications, the same shall be replaced or repaired to the entire satisfaction of the owner or his authorized representative.
- If the contractor fails to rectify the defect or damage within a reasonable period of time the owner or his authorized representative may fix a date on or by which the defect or damage is to be rectified, and give the contractor, reasonable notice of such date. If the contractor fails to remedy the defect or damage by such date, the owner or his authorized representative, at their sole discretion, shall carry out the work themselves or by others, in a reasonable manner at the Contractor's risk and cost and recover the costs so incurred from the contractor.
- If the defect or damage is such that the owners have been deprived substantially the benefit of the works, or parts of the works, they reserve the right to terminate the contract in respect of such parts of the work. The owners then shall be entitled to recover all sums paid for such parts of the works together with the cost of dismantling the same, clearing the site and returning Plant and Materials to the Contractor, or otherwise disposing of them in accordance with Contractor's instructions.
- The owners reserve the right to operate all the equipment and complete system whether or not the plant is taken over after the initial test and commissioning. Any defects found during the initial or running tests shall be removed within a suitable period of time as decided by the owner or his authorized representative.

11. **Maintenance of the Plant and Training of Personnel**

The contractor shall arrange to provide, at no extra cost, necessary personnel and material to carry out all special maintenance of the plant as required regularly for a period of twelve months from the date of commissioning.

12. **Machinery for erection**

- All tools and tackles required for unloading/handling of equipment and materials at site, their assembling, erection, testing and commissioning shall be the responsibility of the contractor.
- No T&P shall be issued by the department and nothing extra shall be paid on account of this.

13. **Defects Liability**

All equipment and the entire installation shall be guaranteed against defective/faulty material and workmanship for a period of **12 months reckoned after the plant is commissioned and handed over for beneficial use with the requisite documentation**. In case the testing of plant is delayed

for any reason, beyond 6 months the defects liability shall extend for a minimum period of 6 months from the date the test readings are accepted. During the defect liability period the contractor shall rectify, repair or replace such defective parts and components free of cost except act of god.

14. **Completeness of the Plant**

The contractor shall arrange all the required material, equipment, ancillary items etc., to install and commission a complete and satisfactory air conditioning plant and systems capable of fulfilling the intent and purpose of the contract whether or not each and every item is mentioned in the specifications and/ or drawings. Any shortcoming noticed at any stage shall be made good at no extra cost.

15. **Quantities set in the bill of quantities are the estimated quantities of the work, but they are not to be taken as actual and correct quantities of the work to be executed by the contractor in fulfillment of his obligations under the contract.**

Any increase in quantity due to changes in 'scope of work/drawings/site etc.', shall be brought to the notice of the CURaj authorities and upon written confirmation only, the contractor shall proceed with the works. In the absence of a written permission, the CURaj shall not be liable for any such works carried out.

In case of additional items of work if any, which are not found in the original contract but required on site, the rate for such additional items of work will be arrived at from the basic rates of materials and labour charges or from Rate only items shown in BOQ.

16. **Partial Occupancy or Services**

During progress of the work (installation or rectification works) completed areas will be occupied and will be used by the owners. The contractor shall however remain fully responsible for the maintenance of installation, till the entire work covered under the contract is satisfactorily completed and handed over to the owners for beneficial use.

17. **Indemnity**

The successful bidder shall at all times indemnify the department, consequent on this works contract. The successful bidder shall be liable, in accordance with the Indian law and regulations for any accident occurring due to any cause and the contractor shall be responsible for any accident or damage incurred or claims arising there from during the period of erection, construction and putting into operation the equipment and ancillary equipment under the supervision of the successful bidder in so far as the latter is responsible. The successful bidder shall also provide all insurance including third party insurance as may be necessary to cover the risk in his own interest. No extra payment would be made to the successful bidder on account of the above.

18. **Verification of correctness of equipment at destination**

The contractor shall have to produce all the relevant records to certify that the genuine equipment has been supplied by the OEM.

19. **Care of the building and other structures / installations**

Care shall be taken by the contractor while handling and installing the various equipment and components of the work to avoid damage to the building and it's surrounding roads, pavements, horticulture work, boundary wall, sewer and water lines etc. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of the installation from the site of work.

20. **Structural Alterations to Buildings:**
- No structural member in the building shall be damaged/altered, without prior approval from the competent authority through the Engineer-In-Charge.
 - Structural provisions like openings, cutouts, if any, provided by the department for the work, shall be used. Where these required modifications, or fresh provisions are required to be made, such contingent works shall be carried out by the contract at his cost.
 - All such openings in floors, provided by the department shall be closed by the contractor after installing the cables/conduits/rising mains/GI&MS Pipes etc. as the case may be, by any suitable means as approved by the Engineer-In-Charge without any extra payment.
21. **Painting**
The major equipment shall be factory final finish painted. The agency shall be required to do only touching to the damages caused to the painting during transportation, handling & installation at site, if there is no major damage to the painting. However hangers, supports etc. shall be painted with required shade including painting with two coats of anticorrosive primer paint at site as per the instructions of the Engineer-In-Charge.
22. **Extent of work**
The work shall comprise of entire labour including supervision and all material necessary to make a complete installation and such tests and adjustments and commissioning, as may be required by the department. The term complete installation shall not only mean major items of the plant and equipment covered by specifications but all incidental sundry components necessary for complete execution and satisfactory performance of installation with all layout charts whether or not those have been specifically mentioned in bill of quantity in the tender document. However, major equipment not covered in the scope of work and required subsequently as an additional feature, not covered in the contract specifications, shall be paid extra. The decision of the Engineer-In-Charge in the matter shall be final and binding on the contractor.
23. **Safe Custody**
The contractor shall be responsible for the safe custody of all equipment and material supplied by him till such time the plant is handed over to the owners with proper documentation. He should therefore, employ sufficient staff for watch and ward at his own expense.
24. **Compliance with regulations and Indian Standards**
All works shall be carried out in accordance with relevant regulation, both statutory and specified by the Indian Standards related to the works covered by the specifications. In particular, the equipment and installation will comply with the following:
- Factories Act.
 - Indian Electricity Rules.
 - B.I.S. & other standards as applicable.
 - Workmen's compensation Act.
 - Statutory norms prescribed by local bodies like CEA, Power Supply Co., etc.
25. **Workmanship:**
- Good workmanship is an essential requirement to be complied with. The entire work of manufacturing/fabrication, assembly and installation shall conform to sound engineering practices.
 - Proper supervision/skilled workmen: The contractor shall be a licensed electrical contractor of appropriate class suitable for execution of the electrical work. He shall engage suitable skilled/licensed workmen of various categories for execution of work supervised by their Supervisors, Engineers of appropriate qualification and experience, to ensure proper execution of work. They will carry out instruction of Engineer-In-Charge and other senior officers of the University during the progress of work.
 - Use of quality material: Only quality material of reputed make as specified in the tender document shall be used.

26. **Safety of Workmen:**

- All workmen shall enter into site with leather soled shoes and a suitable helmet as protection from falling debris or injury otherwise. The helmets shall be of a particular color and propriety made to IS/BS standards. Similarly welders are expected to wear goggles during welding/cutting works using either gas or electric welding sets. Insulators shall wear nose masks to prevent inhaling glue and mastics. While moving or handling heavy/sharp objects workmen shall use hand gloves. All workmen, as a good practice, are expected to wear overall of a particular color for identification from a distance. When working at high levels, guard protection rails/scaffolding must be in place before the workman is instructed to start work. Even in such condition safety belts must be worn and anchored to a fixed and secured support.
- The requirement of safety cannot be overemphasized and needs constant attention of the supervisor in charge of the works of the contractor.

The Contractor and his site in charges shall be responsible solely for the safety of his/her workers and negligence in enforcing safety habits can lead to accidents on site, which may result in his replacement.

27. **Penalty Clause:**

- a) In case of minor/medium breakdown/fault in the Air-Conditioning System under DLP/CAMC, the issue must be resolved within 07 days of lodge of complain, failing to which, after that a penalty of Rs. 1000/- per day per unit shall be imposed and recovered from the deposits of the agency/contractor. The detailed report shall also be submitted to the EIC at the earliest.
- b) In case of major breakdown/fault in the Air-Conditioning System under DLP/CAMC, the issue must be resolved within 14 days of lodge of complain, failing to which, after that a penalty of Rs. 1000/- per day per unit shall be imposed and recovered from the deposits of the agency/contractor. The detailed report shall also be submitted to the EIC at the earliest.
- c) If the issue is not resolved under DLP/CAMC as per above by the contractor, then the University may get it done from any other contractor/agency in case of urgency, at the quoted rates of the new contractor/agency without giving any notice to that effect and the expenditure thus made shall be recovered from the contractor's bill/deposit.

SCOPE OF WORK & TECHNICAL SPECIFICATIONS

GENERAL TERMS & CONDITIONS

The work shall be executed as per CPWD's general specification for Electrical Works Part-I Internal 2013 & HVAC-2017, IE rules, Indian Standards, as per Rules of NBC 2016 & all the amendment issued upto date and as per directions of Engineer-in-Charge. These additional specifications are to be read in conjunction with above and in case of variations; specifications given in this Additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications & conditions as the same are to be read along with schedule of quantities for the work.

In the case of discrepancy between the schedule of Quantities, the Specifications and/or the Drawings, the following order of preference shall be observed:

- (a) Description of Schedule of Quantities, if any
 - (b) Particular Specification and Special Condition, if any.
 - (c) Drawings.
 - (d) CPWD Specifications.
 - (e) Bureau of Indian Standard Specifications
 - (f) ECBC 2017,
 - (g) National building code 2016,
- All above mentioned documents amended up to date are applicable.

Basic Design data

All the conditions outside/ inside and other parameters mentioned refer to given below...

A VRF/ VRV system is proposed for Sports complex and Outdoor and Indoor Units (Air handling Units) to be installed as specified in Schedule of work and mentioned in Heat load summary sheet. It may be changed to achieve good cooling, necessary approval shall be accorded based on design analysis and discussion on the subject. In case any deviation from the parameters specified below, the technical issues involved shall be brought to the notice of Engineer in charge at Site.

Air handling to be installed in AHU Rooms and all such AHUs will have ducted supply and return air.

HVAC CONSULTANT : COOL ENGINEERS																																																																				
Project : Indoor Sport Complex in Central University of Rajasthan Ajmer, Rajasthan (India)																																																																				
Prepared by: Muhammad Alan din (Engineer)																																																																				
Checked by: Mr. Saddam Hussain (Sr. Engineer)																																																																				
Site Location : Ajmer, Rajasthan (India)																																																																				
Geographic Location : 26.3° N 77.74.5° E																																																																				
Altitude : 486 Mtrs (1594 Ft)																																																																				
Rev : 0																																																																				
Date : 02-02-26																																																																				
Outside Design :																																																																				
		<table><tr><th></th><th>DBT (°F)</th><th>WBT (°F)</th><th>RH%</th><th>DDP (°F)</th><th>HR (Gr/Ib.)</th></tr><tr><td>Summer</td><td>108</td><td>74</td><td>20</td><td>58.28</td><td>72.9</td></tr><tr><td>Monsoon</td><td>93</td><td>81</td><td>60</td><td>77.06</td><td>141.5</td></tr><tr><td>Winter</td><td>45</td><td>39</td><td>59</td><td></td><td>26</td></tr></table>											DBT (°F)	WBT (°F)	RH%	DDP (°F)	HR (Gr/Ib.)	Summer	108	74	20	58.28	72.9	Monsoon	93	81	60	77.06	141.5	Winter	45	39	59		26	<table><tr><th colspan="2">Data</th></tr><tr><td>U Value for Glass</td><td>0.56 Btu/hr Sqft °F</td></tr><tr><td>U Value for Wall</td><td>0.37 Btu/hr Sqft °F</td></tr><tr><td>U Value for Roof</td><td>0.15 Btu/hr Sqft °F</td></tr><tr><td>U Value for Part. Glass</td><td>0.46 Btu/hr Sqft °F</td></tr><tr><td>U Value for Part. Wall</td><td>0.37 Btu/hr Sqft °F</td></tr><tr><td>U Value for Ceiling/Floor</td><td>0.45 Btu/hr Sqft °F</td></tr></table>										Data		U Value for Glass	0.56 Btu/hr Sqft °F	U Value for Wall	0.37 Btu/hr Sqft °F	U Value for Roof	0.15 Btu/hr Sqft °F	U Value for Part. Glass	0.46 Btu/hr Sqft °F	U Value for Part. Wall	0.37 Btu/hr Sqft °F	U Value for Ceiling/Floor	0.45 Btu/hr Sqft °F	<table><tr><td>Wall Itt (R):</td><td>26</td></tr><tr><td>Window Itt. (R):</td><td>15.41</td></tr></table>					Wall Itt (R):	26	Window Itt. (R):	15.41
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Note: We have considered the roof shade as a 50 mm PUF sandwich panel with MS sheets and a grid ceiling.																																																																				

Inside Design data												Heat load calculation								IDU Selection					ODU SELECTION				
Sr. No.	Location	Area (Sqft)	Height (ft)	Inside DBT (° F)	Inside RH%	(Light Load W/sqft)	Occupancy	Equipment Load (W/sqft)	Floor Area Below in Sqft (Non-A/C)	Grilling Area Above in Sqft (Non-A/C)	Summer TR	Monsoon TR	Summer Dehum. CFM	Monsoon Dehum. CFM	Fresh Air CFM	Winter kW	Max of Summer & Monsoon (TR)	Max. Summer & Monsoon (CFM)	Selected TR each Unit	Selected CFM Each Unit	Type of Unit	Qty	Total Selected TR	Total Selected CFM	Capacity of Each circuit (HP)	Total Qty of Ckt	Total HP	Circuit combination	
	GROUND FLOOR																												
1	SPORT COMPLEX HALL	22331	26.0	72.0	55	1.2	1350	1.0	22331.0	22331.0	208.81	217.97	79421	62427	13470	-151.47	217.97	79421	59.7	20,000	FM-AHU	4	238.8	80000	76		4	304	{ Combination of ODU : 20 x 2 Nos+18 HP- 2nos ODU)
2	DRESSING ROOM-1	107	12.0	72.0	55	0.9	3	1.0	107.0	107.0	1.45	1.21	704	497	28	-1.67	1.45	704	1.5		HV Wall Split AC	1	1.5	0 1.5 Tr-ODU		1			
3	DRESSING ROOM-2	107	12.0	72.0	55	0.9	3	1.0	107.0	107.0	1.45	1.21	704	497	28	-1.67	1.45	704	1.5		HV Wall Split AC	1	1.5	0 1.5 Tr-ODU		1			
TOTAL		22545			3	1356	3				212	220	80829	63421	13527	-155	221	80829				6	242	80000			304		

Ventilation design data

Toilet Ventilation and Smoke extraction work will be carried as per NBC-2016 and CPWD general specification and selection sheet attached

Calculation Sheet of Ventilation Toilets												
S. No	Location	Type of Exhaust	Area		Height	ACPH	Airflow Qty	Selected				Remarks
			in Sqmt	in Sqft	Ft		CFM	CFM of Each Fan	Qty	Total CFM	Fan Type	
1	Public Toilet Male	Normal Exhaust	21.9	235.1	12	10	470	500	1	1200	Inline Fan with 20 mm S.P.	
2	Toilet Male	Normal Exhaust	21.9	235.1	12	10	470	500				
3	Handicapt Toilet Male-1	Normal Exhaust	6.56	70.6	12	10	141	200				
4	Toilet Female	Normal Exhaust	21.9	235.1	12	10	470	500	1	700	Inline Fan with 15 mm S.P.	
5	Handi Toilet Male-2	Normal Exhaust	6.56	70.6	12	10	141	200				
6	Hall	Exhaust Air- In case of Fire		22331.0	26	12	116121	29000	4	116000	Axial Fan with 30 mm S.P.	
7	Hall	Fresh Air- In case of Fire		22331.0	26	12	116121	29000	4	116000	Axial Fan with 30 mm S.P.	

TECHNICAL SPECIFICATIONS

Variable Refrigerant Flow System

➤ **General:**

Unit shall be air cooled, variable refrigerant volume air conditioner consisting of outdoor units and multiple indoor units, each suitable to cool in summer and heat in winter independently as per the requirements, It shall be possible to connect multiple indoor units on one refrigerant circuit as shown in the drawings or as indicated in schedule of prices. The indoor units on any circuit can be of different type and also controlled individually, The refrigerant piping shall be extendable up to 100m with 50m level difference without any oil traps.

Outdoor Unit:

The outdoor unit shall be a factory-assembled unit housed in a sturdy weatherproof casing constructed from rust-proofed mild steel panels coated with a baked enamel finish.

- ☐ The outdoor unit shall have multiple scroll / DC Twin Rotary compressors and be able to operate even in case of breakdown of one of compressors.
- ☐ The Outdoor unit capacity from 16 HP to 26 HP should have minimum two inverter and 6 HP to 14 HP have Single Compressor.
- ☐ The outdoor unit shall be suitable for mix match connection of all types and capacities of Indoor units.
- ☐ The noise level shall not be more than 62 dB(A) at normal operation measured horizontally 1m away and 1.5m above ground.
- ☐ The outdoor unit shall be modular in design and shall be allowed for side-by-side installation.
- ☐ The unit shall be provided with microprocessor control panel
- ☐ The unit shall be suitable for refrigerant R 410a.

Compressor:

The compressor shall be of highly efficient hermetic scroll/DC Twin Rotary type and equipped with inverter control capable of changing the speed /refrigerant mass flow in accordance to the cooling load requirement, The inverter shall be IGBT (Insulated Gate Bipolar Transistor) type to be efficient and quiet, The outdoor unit shall have the multi-step of capacity control to meet cooling load fluctuation and Indoor unit's individual control. All the parts of compressor shall be sufficiently lubricated. Forced lubrication may also be employed.

Heat Exchanger:

The heat exchanger shall be constructed with copper tubes mechanically bonded to aluminium fins to form a cross-fin coil. The aluminium fins shall be covered by anti-corrosion treatment. The treatment shall be suitable for areas of high pollution,

moisture and salt laden air, The casing fans, motor etc. shall also be with anticorrosion treatment as a standard feature. The units shall be provided with necessary number of direct driven low noise level fans arranged for vertically/horizontal discharge. Each fan shall have safety guard.

Refrigerant Circuit:

The refrigerant circuit shall include liquid receiver/ accumulator, liquid and gas shut off valves and a solenoid valve, all necessary safety devices shall be provided to ensure the safety operation of the system.

Accumulator:

The cylindrical accumulator shall be constructed from mild steel plates pressed into shape. The accumulator shall have sufficient capacity to prevent any liquid refrigerant from flowing back into the compressor suction.

Safety Devices:

The following safety devices shall be part of the outdoor unit, High Pressure Switch, Low Pressure Switch, Fan Motor Safety Thermostat, Inverter Overload Protector, Over Current Relay, Fusible Plugs, Fuses, Crank case heater and short recycling guard timer.

Oil Recovery System:

Each unit shall be equipped, with an oil recovery system to ensure stable operation with long refrigerant piping. System shall be designed for proper oil return to compressor along with the distribution of oil to individual compressor.

Indoor Unit:

Ductable type:

Each Indoor unit shall be ceiling mounted ducted type, as specified in scope of work. It shall have electronic control valve to control refrigerant flow rate in response to load variations of the room. The fan shall be of the dual suction multi blade type and statically and dynamically balanced to ensure low noise and vibration free operation, The DX coil shall be of seamless copper tubes, and shall have continuous aluminium fins. The tubes shall be staggered in the direction of airflow. The fins shall be uniformly bonded to the tubes by mechanical expansion of the tubes. The coils shall be tested against leaks, Unit shall have cleanable type filter of resin net (with Mold resistant) fixed to an integrally moulded plastic frame. The filter should be slide away type but neatly inserted, Each unit shall have fresh air intake provision, low gas level detection system etc, All units shall have adequate insulation or lining to avoid condensation, The above indoor unit shall have an electronic expansion valve to control refrigerant flow rate in response to load variations of room. Each unit shall also have a pressure sensor, The computerized PID control shall be used to maintain a correct room temperature. Each unit to be provided with microprocessor thermostat for cooling & heating, Each unit shall be with corded remote controller LCD type. The LCD remote controller shall memorize the latest malfunction code for easy maintenance, The address of the indoor unit shall be set automatically in case of individual and group control. In case of centralized control, it shall be set by liquid crystal remote controller.

Ceiling Mounted Cassette Corner Type (1 Way Cassette):

A ceiling-mounted cassette corner type air conditioning unit is designed to be installed in a corner of a room, typically flush with the ceiling. This configuration allows for effective and even air distribution throughout the space. Its compact, unobtrusive design integrates seamlessly with the ceiling, while its advanced technology ensures efficient cooling or heating. Ideal for rooms with limited wall space or unique layouts, it combines functionality with aesthetic appeal.

High wall type:

Units shall be suitable for high wall mounted arrangement. The unit shall be with pre-filter, fan section & DX coil section. The housing of unit shall be light weight powder coated galvanized steel. Noise level should not be more than 35 dB at low speed.

FACTORY BUILT AIR HANDLING UNIT (AHU)

Type

The air handling unit shall be of double skin construction, draw through type in sectionalized construction consisting of blower section, coil section, Drive Motor with starter and Isolator, humidification section (where specified), filter section, Ultra Violet Germicidal Irradiation system and insulated drain pan. Unless otherwise specified, the unit shall be horizontal type.

Vertical type units are generally used whenever there is a space constraint.

The use of Ceiling Suspended AHUs should be discouraged due to maintenance problems.

Rating

- (a) The capacity of the cooling/heating coil, the air quantity from the blower fan and static pressure of blower fan shall be as laid down in the tender documents. Where these parameters as calculated by the tenderer exceed the specified values, the coils and the blower fan shall satisfy these calculated values.
- (b) The coil shall be designed for a face velocity of air not exceeding 155 m/min.
- (c) The requisite static pressure demanded by the air circuit shall be developed by the fan at the selected operating speed. The static pressure value shall not in any case be less than 40 mm water gauge in normal cases, not less than 65 mm water gauge where microvee filters are also used and not less than 100 mm water gauge where absolute filters are also used. The fan motor HP shall be suitable to satisfy these requirements and the drive losses.
- (d) The air outlet velocity from the blower fan shall not exceed 610 m/min.
- (e) Noise level at a distance of 3M from AHU shall not exceed 70 dBA. However, when requirement of noise level is more stringent than as mentioned above than the requirement shall be mentioned in NIT.
- (f) All AHU shall be AHRI / Eurovent certified.
- (g) All fans shall be certified by Air Movement and Control Association (AMCA) also.

Material and Construction

Housing/ Casing

- (i) The housing/ casing of the air handling unit shall be of double skin construction. The housing shall be so made that it can be delivered at site in total/ semi knocked down conditions depending upon the requirements. The main framework shall be of extruded aluminium hollow structural sections. The entire framework shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. For 100% fresh air application or for unit with mixing box framework shall be made of thermal

break hollow extruded aluminium profile.

- (ii) Double skin panels shall be minimum 25mm thick for units upto 20,000 CFM and for units capacity above 20,000 CFM panel thickness shall be 40 mm, made of minimum 0.8mm pre-plasticized and pre-painted with PVC guard, GSS sheet on outside and minimum 0.8mm galvanized sheet with minimum 275 GSM zinc coating inside with Polyurethane foam insulation of density not less than 38 kg/cu. m injected in between by injection moulding machine. These panels shall be bolted from inside/ screwed from outside on to the framework with soft rubber gasket in between to make the joints airtight. The gaskets shall be inserted within

groove in extruded aluminium profile of the framework. For units installed outdoor, the thickness of double skin panels shall be minimum 40 mm and shall be provided with canopy. All GI components provided shall have minimum 275 GSM zinc coating.

- (iii) Frame work for each section shall also be bolted together with soft rubber gasket in between to make the joints air tight. Suitable doors with nylon handles, aluminium die-cast powder coated hinges & latches shall be provided for access to various panels for maintenance. However, AHU in the form of complete single unit shall also be acceptable with access door(s) for maintenance to various sections. The entire housing shall be mounted on galvanised steel channel frame work made out of G.I. sheet of thickness not less than 2mm. For higher capacity above 30000 CFM AHUs hot dip galvanized steel channel framework made of minimum 3 mm thick G.S. sheet shall be used. All GI components provided shall have minimum 275 GSM zinc coating.

6.2.3.2 Drain Pan

Drain pan shall be made out of minimum 1.25 mm **stainless steel grade SS 304** sheet externally insulated with minimum 10mm thick closed cell Polyethylene foam insulation **or nitrile rubber or PUF** with necessary dual slope to facilitate fast removal of condensate. Necessary supports will be provided to slide the coil in the drain pan. For stacked coil, additional drip pan or intermediate drain pan fabricated from same material as main drain pan will be installed at back between two coils.

6.2.3.3 Cooling / Heating coil

- (i) The coil shall be made from seamless solid drawn copper tubes ASTM E -75. The minimum thickness of tube shall be 0.5 mm for cooling / heating / heating-cum-cooling coils. AHUs shall be selected for a maximum face velocity of 500 FPM (2.54 MPS) for cooling coils. The Coil Casing shall be of SS-304 & fins shall be hydrophilic coated type.
- (ii) The depth of the coil shall be such as to suit the requirements, viz. re-circulated air applications, or 100 % fresh air applications and the bypass factor required shall be specified in the tender specifications. The coil shall be 4 or 6 rows deep for normal re-circulated air application and 8 rows deep for all outdoor air application, unless otherwise specified in the tender specifications. In case of 8 rows deep coils, it shall be made of 2x4 rows deep coils with a spacing of 200mm between the two coils, access door and independent drain pan.
- (iii) U bends shall be of copper, jointed to the tubes by brazing, soft soldering shall not be used.
- (iv) Each section of the coil shall be fitted with flow and return headers to feed all the passes of the coil properly. The headers shall be of copper and shall be complete with water in/out connections, vent plug on top and drain at the bottom. The coil shall be designed to provide water velocity between 0.6 to 1.8 m/s in the tubes.
- (v) The fins shall be of aluminium. The minimum thickness of the fins shall be 0.15 mm

nominal. The no. of fins shall not be less than 12 Nos per inch length of coil. Fins may be of either spiral, Sinewave, corrugated or plate type. The tubes shall be mechanically expanded to ensure proper thermal contact between fins and tubes. The fins shall be evenly spaced and upright. The fins bent during installation shall be carefully realigned. For coastal areas complete coil i/c fins shall be treated with Anticorrosive Coating and for 100% F.A. application fins shall be hydrophilic type.

- (vi) The coil shall be suitable for use with the refrigerant specified or with water as the case may be. Refrigerating coils shall be designed for the maximum working pressure under the operating conditions. Water coils shall be designed for a maximum working pressure of 10 kg./sq.cm.
- (vii) Shut off and regulating valves at the inlet and outlet of water shall be provided. In the case of DX coils, solenoid valve and expansion valves shall be provided at the inlet of coil.
- (viii) Chilled water/ Hot water coils shall be (AHRI Certified).

Supply Air Fan and Drive

- (i) The supply air fan shall be AMCA certified centrifugal type with DIDW forward/ DIDW Aerofoil backward curved/Plug Fan/Plenum fan / EC fan motor blades double inlet double width(DIDW) type. For static pressure upto 50mm forward curved blades shall be used and for higher sizes backward curved blades shall be used. Minimum efficiency of forward curved fans shall be 60%, for backward curved fans shall be 74%, & for EC-Fan motor, system efficiency shall be minimum 68% or above. The fan housing of Galvanised sheet steel and the impellers shall be fabricated from heavy gauge steel sheet as per approved manufacturers standard. The side plates shall be die formed for efficient, smooth airflow and minimum losses. Fan impeller shall be mounted on solid shaft supported to housing using heavy duty ball bearings (self aligning type) Inlet cone must be Spun GSS.. Fan housing and motor shall be mounted on a common extruded aluminium base mounted inside the fan section on anti-vibration spring mounts or cushy- foot mount. The fan outlet shall be connected to casing with the help of fire retardant fabric. The spring or rubber isolator is mounted between the fan compartment and the rest of the AHU to prevent the transmission of noise and vibration into panels.
- (ii) The fan impeller assembly shall be statically and dynamically balanced.
- (iii) In case of belt driven system, The fan shall be fitted with vee belt drive arrangement consisting of not less than two evenly matched belts. Belts shall be of oil resistant type. Adequate adjustments shall be provided to facilitate belt installation and subsequent belt tensioning by movement of the motor on the slide rails. A readily removable door guard shall be provided.
- (iv) The fan motor shall be totally enclosed fan cooled squirrel cage induction motor with IP-55 protection & selected for quiet running. The motor shall be suitable for operation on $415 \pm 10\%V$, 3 phase, 50 Hz., A.C. supply. The fan motor shall be premium efficiency IE3 class, as per IS 12615. Motors shall be selected considering 10 % over the maximum possible power absorbed by the fan operating at a maximum face velocity of 3.25 mps. The natural frequency of the fan assembly shall not fall within 30% of its operating speed. For 24 Hour operating systems, there shall be an extended shaft with two drive systems and two motors The motor shall be suitably designed for use with variable frequency drive.

Refrigerant Piping:

All refrigerant piping for the air conditioning system shall be constructed from hard drawn seamless copper refrigerant pipes with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and are to include expansion valves, charging connections, suction line insulation and all other items normally for Ming part of

proper refrigerant circuits, The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturer's specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, slotted angle tray, anchors, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon, The outdoor piping shall be covered with UV coating to withstand outside ambient conditions and UV Radiation,

The OD & wall thickness of copper refrigerant piping shall be as follows:

S.N.	Tube OD		Wall Thickness	Temper	Working Pressure (kg/cm2 or Bar)
	Inch	mm			
1	1/4"	6.40	1.2	Soft	132.60
2	3/8"	9.50	1.2	Soft	84.30
3	1/2"	12.70	1.2	Soft	61.80
4	5/8"	15.86	1.2	Soft	61.20
5	3/4"	19.00	1.2	Hard	51.00
8	7/8"	22.20	1.2	Hard	54.20
9	1"	25.40	1.2	Hard	52.00
10	1 1/8"	28.58	1.2	Hard	52.00
11	1 1/4"	31.75	1.62	Hard	52.00
12	1 3/8"	34.93	1.62	Hard	52.00
13	1 1/2"	38.10	1.62	Hard	52.00
14	1 5/8"	41.27	1.62	Hard	52.00

Drain Piping:

All pipes to be used for condensate drain shall be PVC pipe conforming to IS: 4985 - Class I & all joints should be Gluing or solvent cementing as per manufacturer recommendation.

Refrigerant Pipe Insulation:

The whole of the liquid and suction refrigerant lines including all fittings, valves and strainer bodies, etc. shall be insulated with 19mm thick Nitrile close cell rubber. So that condensation does not occur, The joints shall be properly sealed with synthetic glue to ensure proper bonding of the ends.

VENTILATION FANS/ UNITS

➤ Scope

Scope of this section comprises the supply, erection commissioning and testing of the ventilation and exhaust fans of the capacities set forth in the schedule of equipment.

AXIAL FLOW FANS

- (i) Casing shall be constructed of heavy gauge sheet steel with minimum 220 GSM zinc coating. Casing shall be provided with hinged door enabling easy replacement of wheel, shaft and bearings. A small inspection door with handle and neoprene gasket shall also be provided. Casing shall have flanged connection on both ends for ducted applications. Support brackets for ceiling suspension shall be welded to the casing for connection to hanger bolts.
- (ii) Straightening vanes shall be aerodynamically designed for maximum efficiency by converting velocity pressure to static pressure potential and minimizing turbulence. Casing shall be de-rusted, cleaned, primed and finish coated with enamel paint.
- (iii) Rotor hub and blades shall be of cast aluminium, or cast steel construction. Blades shall be die-formed aero foil shaped for maximum efficiency and shall vary in twist and width from hub to tip to effect equal air distribution along the blade length. Fan blade mounting on the hub shall be statically and dynamically balanced. Extended grease leads for external lubrication shall be provided. The fan pitch control maybe manually readjusts able at site, upon installation, for obtaining actual airflow values, as specified.
- (iv) Motor shall be of 3 phase squirrel-cage totally enclosed, fan cooled type suitable for $415 \pm 10\%$ volts, 50 cycles, 3 phase AC power supply, provided with class 'F' or class 'H' insulation. Motor and starter shall be in accordance. Motors should be in conformity to IS:12615 of Bureau of Indian Standards and shall have BIS / ISI mark. Motor name plate shall bear the BIS marked. The fan speed shall be as per OEM best selection ensuring compliance to key critical parameters like airflow, Static pressure, noise level & fan total efficiency as required in the NIT and this specification.
 - (a) Drive :
For Duct/Wall Mounted Fan:
For duct/wall mounted fans the impeller shall be mounted directly on the motor. Drive unit and impeller shall be totally enclosed inside the duct.
For Floor/Ceiling Mounted Fan:
For floor/ceiling mounted fans the impeller shall be mounted directly on the motor. Drive unit and impeller shall be totally enclosed inside the duct.
 - (b) **Vibration Isolation**
Base shall be provided for each fan. Base for both fan and motor shall be built as an integral part and shall be mounted on a concrete foundation through cushy foot vibration isolators. The concrete foundations shall be at least 15 cm above the finished floor level and shall be further isolated from the structural floor through 5 cm. Thick layers of sand all around, topped with bitumen. In case ceiling hung fan within the ceiling shall be provided Vibration Isolation Suspension (VIS) shall be provided in each of string.
- (v) Axial Flow Fan shall be AMCA certified for Air and Sound performance in accordance with AMCA 210 and AMCA 300. Fan shall be suitable for both indoor and outdoor application with all accessories.
- (vi) All High temperature axial fans complete with IS 12615 licensed motor & the complete fan assembly should be certified for a temperature rating for at least 250 deg C for 2 hours, either CE certified as per EN 12101-3: 2015 from an independent accredited European laboratory or UL listed for "Power Ventilators for Smoke Control". Fans should be UL or CE labeled. Motor make shall be the same as mentioned on the fire certificate.

PROPELLER FANS

- (i) Propeller fans shall be direct-driven, three or four blade type, mounted on a steel mounting plate with orifice ring.

- (ii) Mounting plate shall be of heavy gauge sheet steel/galvanized steel construction, streamlined venture inlet (reversed) for supply applications. The size shall suit the fan size.
- (iii) Fan blades shall be constructed of aluminium or steel. Fan hub/blade shall be of heavy welded/fabricated or bolted steel construction with blades bolted to the hub. Fan blades and hub assembly shall be statically and dynamically balanced at the factory.
- (iv) Motor shall be standard (easily replaceable) single phase, permanent split capacitor or shaded pole for small sizes, totally enclosed with pre-lubricated sleeves or ball bearings, designed for quiet operation with a maximum speed of 1000 RPM for fans of 3 cm. dia or larger and 1440 rpm for fans of 31 cm. dia and smaller. Motors for larger fans shall be suitable for 415 $\pm$ 10% volts, 50 cycles, 3 phase, power supply. Motors shall be suitable for either horizontal or vertical services, as indicated in drawing/schedule of quantities.
- (v) The following accessories may be required and provided with propeller fans, as indicated in the tender specifications.
 - (a) Wire guard on inlet side and bird screen at the outlet.
 - (b) Gravity operated louver shutters built into a steel frame.
 - (c) Regulators for controlling fan speed for single phase fan motors.
- (vi) Fan shall be AMCA certified for Air and Sound performance in accordance with AMCA 210 and AMCA 300.
- (vii) Motors should be in conformity to IS:12615 of Bureau of Indian Standards and shall have BIS / ISI mark. Motor name plate shall bear the BIS marked. The fan speed shall be as per OEM best selection ensuring compliance to key critical parameters like airflow, Static pressure, noise level & fan total efficiency as required in the NIT and this specification.

➤ **In-Line Exhaust Fans**

An inline exhaust fan with a capacity of 300/200 CFM (cubic feet per minute) is designed to efficiently ventilate spaces by moving 300/200 cubic feet of air per minute. Key technical details typically include:

- **Airflow Capacity:** 300/200 CFM, indicating the fan's ability to move a substantial volume of air.
- **Static Pressure Handling:** Capable of managing the resistance within the ductwork, which affects overall efficiency.
- **Noise Level:** Generally low, making it suitable for residential and commercial applications where quiet operation is important.
- **Power Consumption:** Often efficient, consuming less energy relative to its performance.
- **Size and Installation:** Compact design fits within duct systems, with various sizes to accommodate different duct diameters.

➤ **Propeller Type Wall Exhaust Fans**

Propeller type of fans shall be of good quality. Fan shall be of the broad type, ring or diaphragm mounted and the capacity shown in the schedule of equipment. Fans shall be provided with gravity type louvers unless otherwise stated.

Fan drive shall be single phase, or three phase motors as indicated in the schedule of equipment and shall be complete with starter.

The following accessories shall be provided with propeller fans:

- i. Wire guard on inlet side and bird-screen at the outlet.
- ii. Fixed or gravity louvers built into a steel frame at the outlet.

iii. Regulator for controlling fan speed for single phase fan motor.

iv. Single phase preventers for 3 phase fans.

➤ **Vibration Isolation:**

The Fan assembly shall be installed on floor vibration isolation system of heavy-duty spring isolators.

➤ **Air Washers (Packaged Type)**

The packaged air washers shall be of G.I. Sheet metal and Stainless-Steel sectionalized constructions and shall include fan section, cooling pad section, motor drive etc.

➤ **Enclosure/Housing**

The enclosure shall be double skin design with the main frame work made of extruded aluminum structural section.

The housing / casing of air washer shall be of double skin construction. The frame work shall be of extruded aluminum hollow section. All the frame work shall be assembled using high pressure aluminum / nylon plastic joints to make a sturdy, strong and self-supporting frame work for various sections.

The panels shall be of double skin sandwich type with 0.80 mm pre-coated galvanized sheet on the outer side and 0.80 mm galvanized sheet on the Inside with CFC / HCFC – FREE Poly Urethane Foam insulation of 42 (+/- 5%) kg/Cu M, injected in between. Thickness of panels shall be 45 mm.

The front panels shall be easily openable for servicing the fan and motor.

The opening for access doors and gaps between sections shall be provided with the neoprene rubber gaskets fixed in grooves in the extruded sections.

The sandwich panels shall be fixed to the framework with self-tapping stainless-steel screws, and both ends of the screw shall be provided with rubber caps.

Suitable air tight access doors / panels with high quality nylon hinges and locks shall be provided for access to various sections for maintenance. The access door to fan section is to be provided with a switch to shut the fan when the door is open. The access doors shall further have wire mesh screen as an added safety feature bolted to unit frame.

➤ **Wet Section**

Spray section and tank shall be fabricated from 18 G 304 A stainless steel sheets with bolted construction having suitable stiffeners.

The section shall be complete with SS 304 water distribution header having ports and sized for uniform and adequate water flow through perforated SS 304 pipes. The spray nozzles shall be of brass construction.

The tank shall be fitted 3/4" (20 MM) float valve of commercial grade brass.

The spray section shall have provision for fixing one or two sets of air filters as specified later.

➤ **Water Sump**

The water sump below the spray section shall be of 18G SS304A. The tank shall be complete with makeup, overflow and drain connections. A float valve shall be provided for makeup water line. The tank shall be given 2 coats of corrosion resistance paint and final coat of black enamel paint.

➤ **Drift Eliminators**

Drift eliminators shall be of PVC supported at the top and bottom fixed to the spray section by means of GI notched bars. Eliminators shall be a set of vertical plates with a series of bends and deflections to give large surface area on which water drops and dust shall be impinged. Eliminators shall be properly stiffened at the sides.

➤ **Distribution Plate**

Distribution plate shall be GI 18G with sufficient number of circular opening uniformly spaced for even distribution of air for spray type air washer.

➤ **Pumps**

The water distribution pumps shall be of heavy duty, vertical type mounted inside the tank. It shall be complete with adjustable bleed of arrangement to prevent concentration of undesirable salts

Pump specifications:

Casing	–	CI
Impeller	–	Bronze
Shaft	–	High tensile steel
Shaft Sleeve	–	MS/ Bronze
Bearing	–	Heavy Duty ball / roller
Base Plate	–	Fabricated MS

The pump capacity shall be adequate for the intended duty.

➤ **Blower (DIDW Type)**

The fan shall be Imported forward curved, double inlet double width type.

The wheel & housing shall be fabricated from heavy gauge galvanized steel.

The fan impeller shall be mounted on a solid carbon steel shaft supported to housing with angle iron frame & pillow block heavy duty ball.

The fan shall be selected for a speed as follows:

Maximum fan outlet velocity for fan up to ø 450 mm shall not exceed 1800 FPM.

Maximum fan outlet velocity for fan above ø 450 mm shall not exceed 2400 FPM.

Maximum fan speed for fan up to ø 450 mm shall not exceed 1450 RPM.

Maximum fan speed for fan above ø 450 mm shall not exceed 1000 RPM.

Fan housing with motor shall be mounted on a common aluminum base mounted inside the air handling housing on antivibration springs mounts or cushy foot mount.

The fan outlet shall be connected to casing with the help of fire-retardant flexible canvas.

The Fan shall be complete with multi 'V' belt drive and adjustable motor mounting base.

Inspection door shall be installed with microswitch arrangement with lighting within the fan section. Microswitch shall be interlocked with blower & light with resetting arrangement.

Unless specified, Fan shall be backward curved if total SP $\geq$ 50 mm and forward curved if total SP $<$ 50 mm.

➤ **Motors and Starters**

The motor for each blower, shall be totally enclosed, fan cooled, squirrel cage induction type and conform to min IE-2 rating.

The starters shall be “direct online” type up to 7.5 H.P. All larger starters shall be of fully automatic star delta type.

The pumps shall be provided with single phase, self-tripping starter of suitable make.

➤ **Miscellaneous**

Necessary accessories shall be provided wherever necessary for proper operation and shall also include. (As part of unit price)

Z/W type 4 Bend PVC eliminator to avoid water drift fixed to the cooling pad housing and tank. Necessary PVC piping for water circulation.

Vibration isolators for the pumps.

Nuts, bolts, shims etc., as required for the equipment.

Float valve in the water tank, along with quick fill connection.

Gate valves in drain; make up, quick fill line etc., as required.

Built in isolator switches for the fan and pump motor and wiring from the isolator's up to the respective motors.

Units shall be installed on sandwich type 12 mm thick neoprene pads.

➤ **Limitation**

The air velocity limits are as follows: -

Velocity across cooling pads shall not exceed 2.54 M/s (500 FPM).

Velocity at blower outlet shall be as specified in blower details

DUCTING (FACTORY/ SITE FABRICATED)

➤ **Scope**

The scope of this section comprises supply fabrication, installation and testing of all sheet metal ducts, supply, installation, testing and balancing of all grilles, registers and diffusers. All to be in accordance with these specifications and the general arrangement shown on the Drawings.

The work under this part shall consist of furnishing labour materials, equipment and appliances as specified necessary and required to install all sheet metal and other allied work to make the air conditioning supply, ventilating, and exhaust system ready for operation as per drawings.

Except as otherwise specified all duct work and related items shall be in accordance with these specifications. Ductwork shall mean all ducts, casings, dampers, access doors, joints, stiffeners and hangers.

➤ **Duct Materials**

All ducts shall be fabricated either from Galvanised Sheet Steel (GSS) conforming to IS: 277 or aluminium sheets conforming to IS:737. The steel sheets shall be hot dip galvanized with MAT finish with coating of minimum 120 grams per square meter (GSM) of Zinc, GI sheets shall be lead free, eco-friendly and RoHS compliant.

The thickness of sheets for fabrication of rectangular ductwork shall be as under. The thickness required corresponding to the longest side of the rectangular section shall be applicable for all the four sides of the ductwork as described in CPWD norms (2017 edition).

Longest side (mm)	Minimum sheet thickness	
	For GSS	For Aluminium
750 mm and below	0.63	0.80
751 mm to 1500 mm	0.80	1.00
1501 mm to 2250 mm	1.00	1.50
2251 mm & above	1.25	1.80

All sheet metal connections, partitions and plenums required for flow of air through the filters, fans etc. shall be at least 1.25 mm thick.

- **Flanges** for matching duct sections, stiffening angles (braces) and supporting angles shall be of rolled steel sections, and shall be of the following sizes.

Application	Duct Width	Angle size/ Hanging rod
Flanges	Up to 1000 mm	35 mm x 35 mm x 3 mm (/ 8 mm Dia
-do-	1001 mm to 2250 mm	40 mm x 40 mm x 3 mm/ 10 mm Dia
-do-	More than 2250 mm	50 mm x 50 mm x 3 mm/ 10 mm Dia
Bracings	Up to 1000 mm	25 mm x 25 mm x 3 mm
-do-	More than 1000 mm	40 mm x 40 mm x 3 mm
Support angle	Up to 1000 mm	40 mm x 40 mm x 3 mm
-do-	1001 mm to 2250 mm	40 mm x 40 mm x 3 mm

-do-	More than 2250 mm	Size and type of RS section 102 shall be decided in individual cases
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All nuts, bolts and washers shall be zinc plated steel. All rivets shall be galvanised or shall be made of magnesium - aluminium alloy. Self-tapping screws shall not be used.

➤ CONSTRUCTION

Ducts shall be fabricated at site or factory fabricated and shall be generally as per IS: 655 "Specifications for metal air ducts", unless otherwise deviated in these General Specifications.

The interior surfaces of the ducting shall be smooth.

All the ducts upto 600 mm longest side shall be cross broken between flanges by a single continuous breaking. Ducts of size 600 mm and above shall be cross broken by single continuous breaking between flanges and bracings. Alternatively, beading at 300 mm centres for ducts upto 600 mm longest side, and 300 mm centres for ducts above 600 mm size shall be provided for stiffening.

As far as possible, long radius elbows and gradual changes in shape shall be used to maintain uniform velocity accompanied by decreased turbulence, lower resistance and minimum noise. The ratio of the size of the duct to the radius of the elbow shall be normally not less than 1:1.5.

Flanged joints shall be used at intervals not exceeding 2500 mm.

Flanges shall be welded at corners first and then riveted to the duct.

Stiffening angles shall be fixed to the sides of the ducts by riveting at 1.25 meters from joints for ducts of size 600 mm to 1500 mm, and 0.6 mm from joints for ducts of size larger than 1500 mm. Bracings for ducts larger than 1500 mm can alternatively be by diagonal angles.

Plenums for filters shall be complete with suitable access door of size 450 mm x 450 mm.

All factory fabricated duct shall be supplied in L sections, the length of any piece shall not be more than 1800 mm for duct with longest side of cross section as 600 mm and above and 3000 mm for rest.

All the ducting work shall be carried as described above or in CPWD norms (2017 edition).

TECHNICAL SPECIFICATIONS: AIR DISTRIBUTION PRODUCTS

➤ **Dampers**

1.1 Splitter Dampers

At the junction of each branch duct with main duct and split of main duct, volume dampers must be provided. Dampers shall be two gauges heavier than the gauge of the large duct and shall be rigid in construction.

The dampers shall be of an approved type, lever operated and complete with locking devices which will permit the dampers to be adjusted and locked in any positions and clearly indicating the damper position.

The dampers shall be of splitter, butterfly or louver type. The damper blade shall not be less than 1.25 MM (18) Gauge, reinforced with 25 MM angles 3 MM thick along any unsupported side longer than 250 MM. Angles shall not interfere with the operation of dampers, nor cause any turbulence.

➤ **Opposed Blade Dampers (Duct)**

Automatic and manual volume opposed blade dampers shall be complete with frames and nylon bush as per drawings. Dampers and frames shall be constructed of 1.6 MM steel sheets and blades shall be of extruded aluminium of aero foil design. The dampers for fresh air inlet shall additionally be provided with fly mesh screen, on the outside, of 0.8 MM thickness with fine mesh.

Wherever required for system balancing, a balancing opposed blade damper with quadrant and thumb screw lock shall be provided.

After completion of the duct work, dampers are to be adjusted and set to deliver air flow as specified on the drawings.

➤ **Miscellaneous**

All duct work joints are to be true right angle and with all sharp edges removed.

Sponge rubber gaskets also to be provided behind the flange of all grilles.

Each chute from the duct, leading to a grille, shall be provided with an air deflector to divert the air into the grille through the shoot.

Diverting vanes must be provided at the bends exceeding 600 MM and at branches connected into the main duct without a neck.

Proper hangers and supports should be provided to hold the duct rigidly, to keep them straight and to avoid vibrations. Additional supports are to be provided where required for rigidity or as directed by Engineer-In-Charge.

The ducts should be routed directly with a minimum of directional change.

All angle iron flanges to be welded electrically and holes to be drilled.

All the angle iron flanges to be connected to the GSS ducts by rivets at 100 MM centers.

The G.S.S. ducts should be lapped 6 MM across the flanges.

The ducts should be supported by approved type supports at a distance not exceeding 2.0

➤ **Standard Grilles**

The supply and return air grilles shall be fabricated from extruded aluminium sections.

The supply air grilles shall have single/double louvers as specified in BOQ.

The front horizontal louvers shall be of extruded section, fixed/adjustable type. The rear vertical louvers where required shall of aluminium extruded sections and adjustable type.

The return air grille shall have single horizontal extruded section fixed louvers. The grilles shall have an outer frame on all four sides.

The grilles shall be suitable for fixing arrangement having concealed screws as approved by Architect. Linear continuous supply cum return air grilles shall be extruded aluminium

construction with fixed horizontal bars at 15 Deg. inclination & flange on both sides only (one on top & bottom).

The thickness of the fixed bar louvers shall be minimum 5.5 mm in front and 3.8 mm in rear with rounded edges. Flanges on the two sides shall be 20 mm/30 mm wide as approved by Architect.

The grilles shall be suitable for concealed fixing.

Volume control dampers of extruded aluminium anodized in black color shall be provided in supply air duct collars. For fan coil units horizontal fixed bar grilles as described above shall be provided with flanges on four sides, and the core shall be & suitable for clip fixing, permitting its removal without disturbing the flanges.

Grilles longer than 450 MM shall have intermediate supports of black color for the horizontal louvers. Registers specified with individually adjustable bars shall have adjustable pattern as each grille bar shall be pivotable to provide pattern with 0-to-+45-degree horizontal arc and up to 30-degree deflection downwards. Bars shall hold deflection settings under all conditions of velocity and pressure.

➤ **Diffusers**

The ceiling type square diffusers shall be of aluminium extruded sections with flush face with fixed pattern and neck. The diffusers shall be provided with blank plate suitable of grid ceiling (T-Bar) of size 600 mm x 600 mm.

All supply diffusers shall be provided with extruded aluminium dampers, with arrangement for adjustment from the bottom. Supply air diffusers shall be equipped with fixed air distribution grids, removable keyoperated volume control dampers, and anti-smudge rings as required in specific applications and as per requirements of schedule of quantities.

All extruded aluminium diffusers shall be provided with removable central core and concealed key operation for volume control damper.

Acoustically lined G.I. plenum, perforated diffusion plate and circular spigot shall be provided as per requirement of Schedule of Quantities.

Slot Diffuser shall be extruded aluminium construction multi slot type with air pattern controller provided in each slot. Supply air diffusers shall be provided with Hit & Miss volume control dampers in each slot of the supply air diffusers. It shall be provided with acoustically lined G.I. plenum box with circular spigot.

The acoustic lining shall be done with 12mm thick glass wool of 32 Kg/cu.m. density with rubberized lining on one face. The acoustic lining shall be fixed with self-adhesive stick pins.

➤ **Linear Diffusers/Grilles**

The linear diffusers/grilles shall be fabricated from aluminium extruded sections.

The diffusion blades shall be extruded, flush mounted type with single or double direction air flow.

The frame shall be of aluminium extruded section and shall hold the louvers tightly in fixed position. The frame shall be provided on all four sides.

The frame shall be of aluminium extruded section and shall hold the louvers tightly in fixed position. The frame shall be provided on all four sides.

➤ **Perforated Diffusers**

The perforated diffusers shall be fabricated from aluminium sheet.

The sheet shall have uniform perforations to allow minimum 50% free area.

The supply air diffusers shall be provided with fully adjustable air pattern deflectors.

The frame shall be of extruded aluminium sections with blanking plate bonded to frame for grid ceiling (T-bar) application.

➤ **Exhaust Grilles**

The exhaust grilles shall be fabricated from aluminium extruded sections.
The exhaust grilles shall be horizontal fixed bar grilles with 150 blade inclination.

➤ **Exhaust / Fresh Air Louvers**

The louvers shall be fabricated from aluminium extruded sections.
The blades shall be extruded flush mounted type with single horizontal throw. The depth of blades shall be 75 mm for Basement Ventilation and 35 mm for AHU fresh air.
The frame shall be of aluminium extruded section and shall hold the louvers tightly in fixed position.

➤ **Painting and Vision Barrier**

All grilles, and diffusers shall be powder coated, before installation, in approved color.
All ducts immediately behind the grilles/diffusers etc. are to be given two coats of black paint in matt finish.
The return air and dummy portion of all linear grilles shall be provided with a vision barrier made of 24- gauge galvanized sheets. The vision barrier shall be fixed to the false ceiling frame with self-tapping screws and shall be given two coats of black paint in matt finish. Care shall be taken to ensure that the return air path is not obstructed.

➤ **Documentation to Measurements**

For each drawing, all supply of ductwork must be accompanied by computer-generated detailed bill of material indicating all relevant duct sizes, dimensions, and quantities. In addition, summary sheets are also to be provided showing duct areas by gauge and duct size range as applicable.

Measurement sheet covering each fabricated duct piece showing dimensions and external surface area along with summary of external surface area of duct gauge-wise.

All duct pieces to have a part number, which should correspond to the serial number, assigned to it in the measurement sheet. The above system will ensure speedy and proper site measurement, verification and approvals.

➤ **Testing**

After duct installation, a part of duct section (approximately 5% of total ductwork) may be selected at random and tested for leakage. The procedure for leak testing should be followed as per SMACNA- "HVAC Air Duct Leakage Test Manual: (First Edition).

TECHNICAL SPECIFICATIONS:

INSULATION WORK

➤ SCOPE

This chapter covers the requirements of thermal insulation for chilled water /hot water piping, pumps and tanks, duct work, and acoustic lining in duct work and weather maker rooms. This does not cover exposed roof insulation and under deck insulation work.

The insulation material shall be Closed Cell/ Open cell Elastomeric Nitrile Rubber or any other as defined in schedule of quantities.

➤ Thermal Insulation

➤ Material Specifications

The insulation material shall satisfy the following requirements: -

➤ Thermal Insulation on Ducts

➤ Material (closed cell Nitrile rubber):

Thermal insulation material for Duct insulation shall be with factory laminated aluminium foil closed cell Nitrile rubber. Density of the nitrile rubber shall be 40-60 Kg/m³.

Thermal conductivity as per BS 874 part 2 – 86 (DIN 52613, 52612) /DIN EN 12667/ EN ISO8497 of the insulation material shall not exceed 0.038 W/m-K or 0.212 BTU / (Hr-ft²-oF/inch) at an average temperature of 30oC. The product shall have temperature range of –40 oC to 105 oC. The insulation material shall be fire rated for Class 0 as per BS 476 Part 6: 1989 for fire propagation test and for Class 1 as per BS 476 Part 7, 1987 for surface spread of flame test. Water vapor permeability shall be not less than 0.024 per inch (2.48 x 10⁻¹³ Kg/m.s. Pa i.e., $\mu > 7000$: Water vapor diffusion resistance) as per DIN 53122 part 2, DIN 52615 / EN 12086 & EN13469.

In addition to above properties the insulation material for ducts shall be antimicrobial.

Microbiological growth on insulation surface shall be in accordance with ASTM G-21 and bacterial resistance to ASTM2180/ ISO22196. The Material shall comply to ISO 5659 / BS 6853 / ABD 0031 for smoke density and toxicity values. The thermal conductivity of insulation material shall not be affected by aging as per DIN 52616 standard.

Thickness of the insulation shall be as specified for the individual application. Each lot of insulation material delivered at site shall be accompanied with manufacturer's test certificate for density and thickness.

Adhesive used for sealing the insulation shall be non-flammable and with low VOC content (maximum 850 gm/l less water) as per IGBC guide lines) strictly as per manufacturer's recommendations. Adhesive shall be externally applied by contractor on site.

Ducting insulation thickness shall be as per table below.

Ducting position	Thickness for non-coastal places
SA duct in RA path	19 mm
Ducted return air system	19 mm
Both SA & RA exposed	Both 25 mm

➤ Refrigerant and Drain Pipe Insulation

➤ Refrigerant Pipe Insulation (Closed Cell Elastomeric Insulation)

Base insulation material for Refrigerant pipe shall be same as that of CHW pipe.

Thickness of refrigerant piping insulation shall be 13mm and 19mm if not specified separately.

➤ **Drain Pipe Insulation (Closed Cell Elastomeric Insulation)**

Base insulation material for drain pipe shall be same as that of CHW pipe.

Thickness of drain piping insulation shall be 9 mm if not specified separately.

➤ **Duct Acoustic Lining**

➤ **Open Cell Nitrile Rubber**

Duct acoustic lining material shall be Nitrile Rubber open cell foam. Thermal conductivity of the insulation material shall not exceed 0.047 W/m-K at an average temperature of 20 deg.C. Density of the nitrile rubber shall be 140 – 180 Kg/m³.

The material should withstand maximum surface temperature of +85 Deg.C and minimum surface temperature of -20 deg. C. The material should conform to Class 1 rating for surface spread of Flame in accordance with BS 476 Part 7 & HBF, HF 1 & HF 2 in accordance to UL 94, 1996.

Insulation should have antimicrobial product protection and should pass Fungi Resistance as per ASTM G 21 and Bacterial Resistance as per ASTM E 2180. The insulation should pass Air Erosion Resistance Test in accordance with ASTM Standard C 1071-05 (section 12.7).

Thickness of the material shall be 15 mm thick specified for the individual application and with noise absorption properties as per IS: 8225 / ISO 354 / ASTM423C. The insulation should be installed as per manufacturer's recommendation.

➤ **Room Acoustic**

➤ **Open Cell Nitrile Rubber**

Walls and ceiling of air conditioning plant room and air handling unit / fan rooms/ Ventilation Rooms may be provided with acoustic lining. The material shall be Nitrile Rubber open cell foam.

Thermal conductivity of the insulation material shall not exceed 0.047 W/m-K at an average temperature of 20 deg.C. Density of the nitrile rubber shall be 140 – 180 Kg/m³.

The material should withstand maximum surface temperature of +85 deg. C and minimum surface temperature of -20 deg. C.

The material should conform to Class 1 rating for surface spread of Flame in accordance to BS 476 Part 7 & HBF, HF 1 & HF 2 in accordance to UL 94, 1996.

Insulation should have antimicrobial product protection, and should pass Fungi and Bacterial Resistance as per DIN EN ISO 846 Method A and Method C. The insulation should pass Air Erosion Resistance Test in accordance with ASTM Standard C 1071-05 (section 12.7).

Thickness of the material shall be 25mm if not specified separately.

Measurement of Insulation

Pipe insulation shall be measured in units of length along the centre line of the insulated pipe.

The linear measurements shall be taken before the application of the insulation.

For piping measurements, all valves, orifice plates and strainers shall be considered strictly by linear measurement along the center line of the pipes, and no special rate shall be applicable for insulation of any accessories, fixtures or fittings whatsoever.

Duct insulation and acoustic lining shall be measured based on surface area along the outer surface (ref IS14164 of 2008) of insulation thickness.

Thus, the surface area of externally thermal insulated or acoustically lined duct shall be based on the perimeter at the center of thickness of insulation, multiplied by the center-

line length of ducting including tapered pieces, bends, tees, branches etc. as measured for bare ducting. In the case of tapering pieces, their average perimeter shall be considered.

Painting and Identification:

Thermal Insulation exposed to view (including that within plant rooms) shall be painted except where the insulation is protected by aluminium foil or sheet, plastics film or a weather-proof finish/ equivalent material as per the specifications. An undercoat and not less than two finishing coats shall be applied. Absorbent surfaces shall also receive an initial coat of priming paint. All paints shall be compatible with the surfaces to which they are applied and shall be approved by the owner.

The color (s) of paint (s) shall be to the instruction of the owner and shall be selected from the range contained in I.S. 4800.

All distribution services shall be color coded and provided with symbols for identification purposes. Identification coding for ductwork, including thermal insulation, shall be in accordance with I.S. codes for pipe work, including thermal insulation, the basic color and color coding shall be in accordance with I.S. codes.

Uninsulated pipe work or duct work and thermal insulation which is painted or unpainted shall be identified by bands at least 25 mm wide color triangles or at least 150 mm side. The bands or triangles shall be spaced and located to permit ready identification of the services particularly adjacent to equipment's positions, at service junctions and wall penetrations.

CONTROL PANELS, MOTORS, AND SWITCHGEARS

➤ **General**

The switch gears required for various items shall generally be as per specifications given below. All electric motors shall be suitable for 3 phase, 50 Hz, 415 + 10% - 15% Volts A.C. supply.

➤ **L.T. Electric Panel Boards (with multiple switch (150 Amps each)**

The main L.T. Panel board shall be extendible type on both sides, having in it all switches, starters & accessories and shall be completely factory prewired. It shall be suitable for voltage systems up to 500 Volts, 3 phase, 50 Hz, 4 wire supply capable of functioning satisfactorily in temperatures of 450C and rupturing capacity not below 31 mVA at 415 Volts.

The Panel boards shall be fabricated from 2.0 mm thick, cold rolled M.S. Sheets. The front opening door panels shall be from 2 mm thick, cold rolled M.S. Sheets. Suitable stiffeners shall be used in fabricating the housing. All steel members shall first be degreased, and then descaled using dilute sulphuric acid and a suitable phosphating process then the boards shall be given powder coated finish in suitable grey color. The switch board shall be dust proof and vermin proof. The panel shall generally conform to IS 8623 (full conformity not called for). It shall be flush in front and back. The panel shall have front and rear access.

Cable compartment of adequate size shall be provided in the main distribution board for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate support shall be provided in cable compartment to support cables. All incoming and outgoing switch terminals shall be brought out to terminal blocks in cable compartments.

Items such as ammeters, switches etc. shall be located close to the corresponding switchgear and otherwise all items shall be arranged in a neat symmetrical pattern.

The doors of the switch compartments and cable access shall be hinged type and that of bus bars shall be fixed type.

The panel mounted lock shall be provided with a locking arrangement to prevent them from falling down when they are unscrewed for opening the doors.

All panel doors shall have synthetic rubber gaskets with good ageing, compression, and resistance characteristics.

All the breakers shall be interlocked with door so that the unit cannot be closed unless the unit door is closed. The interlock shall also prevent opening the unit door unless the switch/breaker is in OFF position.

Defeat arrangement shall be provided for deliberate inspection of switch/ breaker without having to switch OFF the unit.

All the items pertaining to a motor shall be incorporated in one cabin i.e. switch, starter, CTS ammeter, current operated MPRD-2 single phasing preventor, indicating lamps etc.

A danger notices plate of 200 mm x 150 mm of mild steel at least 2 mm thick vitreous enamelled white on both sides and with inscriptions in signal red colour on front side shall be provided on the panel board.

Every contactor etc. shall be controlled by an isolating device of adequate rating as listed later.

A voltmeter and ammeter shall be provided to indicate incoming voltage and along with rotary phase selection switches.

LED type indicating lamps in approved colors shall be provided for the 3 phases and for status of all controlled devices.

All the switchgear shall be earthed to the earth bus.

Earth shall be extended for each compartment to the door by means of a flexible, insulated copper conductor with crimped legs on either side.

Each panel shall be provided with suitable size of earth bus at the rear of the panel and two earth terminals on either side.

Suitable printed PVC ferrules shall be provided for all the conductors for easy identification.

Etched plastic name plates shall be provided for all the incoming, outgoing switchgears, ammeter, voltmeter etc.

All the control and auxiliary wiring shall be carried out with PVC insulated copper conductor of proper color code.

The power wiring from the circuit/air breakers to the starters shall be carried out using color coded, PVC insulated copper conductors crimped with lugs.

The outgoing wires of starters shall also be PVC insulated color-coded copper conductor crimped with lugs and terminated on a terminal block of proper rating.

Important Note

All Panel fabrication drawings shall be got approved before the start of the fabrication work.

➤ **Bus Bars**

The Bus Bar shall be mounted in a separate compartment in the Panel Board.

The Bus Bars and interconnections shall be of aluminum strips unless otherwise specified.

The Bus Bar shall have rectangular cross - section of (1) mm² per Amp. rating for full load current in the 3 phases as well as for neutral and should be extendable, if mounted horizontally.

The Bus Bars shall be insulated with heat shrink sleeves and color coated. They should be supported on supports made of glass fiber reinforced thermosetting compound at regular intervals sufficient to withstand the force of any short circuit.

➤ **Circuit Breakers**

The panel and the bus bars plus outgoing of all devices shall be protected by different types of circuit breakers as described below and conforming to specification as given later on:

S.No.	Type	Upto 40 Amp.	63 A	80 to 200 A	Above 200 to 630A	Above 630 A
1	Incoming	MCB	MCCB	MCCB	MCCB	ACB
2	Outgoing	MCB	MCCB	MCCB	MCCB	ACB

➤ **Air Circuit Breaker (ACB)**

The air Circuit Breakers shall be Draw out type conforming to I.S: 13947 (Part 2) 1993.

The ACB shall be complete with solid state overload, short circuit, and earth fault protection with adjustable settings.

The current breaking capacity of the ACB shall not be less than 50 kA at 415 Volts, 50 Hz A.C.

Each ACB shall have 4 'NO' and 4 'NC' potential free auxiliary contacts, in addition to those required for its internal operating mechanisms.

There shall be suitable indicators for OPEN/CLOSE/SERVICE/TEST and spring charged positions.

It shall be possible to close the door in Test position.

Castle Key and/or other interlocking devices shall be provided as required.

➤ **Molded Case Circuit Breakers (MCCB)**

The MCCB shall have TP + NL and be suitable for simultaneous manual opening and closing with rotary operating handle.

The ON/OFF/TRIP positions shall be clearly marked and easily visible to an operator and confirm to latest IS: 13947 (Part 2)-1993.

There shall be fixed/adjustable tripping devices with inverse time characteristics for overload and short circuit protection.

The current breaking capacity of the MCCB shall not be less than 35 kA at 415 Volts, 50 Hz, A.C.

Suitable Interlocking mechanism shall be provided, where required.

All MCCB shall have phase barrier & extension terminals as required.

➤ **Miniature Circuit Breakers (MCB)**

The MCB shall have quick make/break contacts with a heat-resistant housing, having high Impact strength and confirm to IS 8828-1996.

The contacts shall be of silver nickel alloy.

The MCB shall permit overload for short duration, as required for Inductive loads and the breaking capacity shall not be less than 10 kA at 415 Volt A.C.

It shall be equipped with overload and short circuit protection devices and shall be suitable for DIN mounting.

➤ **Isolator Switches**

Isolator switches are to be provided for equipment located outdoors or for those located in separate enclosure, other than those Nos. having the Electric Panel.

The Isolator Switch should be of Rotary Load Break type with a weatherproof sheet steel enclosure. Its rating shall be same as the outgoing device in the Electric Panel.

➤ **Panel Accessories**

All Voltmeters and Ammeters as specified shall be square of 96 mm x 96 mm, flush mounting type.

The Indicating Lamps shall be of LED type with Low Watt Power. The Lamps shall have translucent covers of following colours.

Red/Yellow/Blue for phase light.

Green/Amber for ON/OFF indication.

Concealed door lock.

➤ **Squirrel Cage Motors**

The squirrel cage motors shall be either screen protected, or totally enclosed fan cooled, depending on the application and as stand in "Schedule of Equipment". All motors shall conform to IS 325/1978, IS: 1231 for foot mounted motors and IS: 2223 for flange mounted motors.

The stator windings shall be with class 'F' insulation.

Motors shall be provided with ball/roller bearings. Bearings shall have ample capacity to deal with any axial thrust. Suitable grease nipple shall be provided for re-greasing the bearings.

Motors shall be provided with a cable box for terminating the PVC insulated, PVC sheathed armoured aluminium cables.

➤ **Installation of Motor**

Installation of the motor shall be in accordance with IS-900.

The motor along with its driven machine or equipment shall be provided with vibration isolation arrangement motors shall generally be provided with slide rails fixed to the base units nuts and bolts to facilitate belt installation and subsequent belt tension.

Motors shall be wired as per the detailed specifications and drawings all the motor frame shall be earthed with 2 Nos. of earthing conductors.

Motors shall be tested at works in accordance with the relevant Indian standard specifications and test certificates shall be furnished in triplicate.

Note: *Rubber mats of 1100 volts capacity shall be laid in front of panel as per site requirement and no extra shall be paid.*

➤ **Painting**

All sheet steel work shall undergo a multi tank process of degreasing, pickling in acid, cold rinsing, phosphating, passivating and then sprayed with a high corrosion resistant primer. The primer shall be baked in oven. The finishing treatment shall be by application of powder coated paint of approved shade and stoved.

ELECTRICAL CABLING

➤ **General**

The electric cable connections of motors and earthing of all equipment's shall be carried out, as per specifications, given hereunder.

➤ **Cabling**

The cabling of various equipment shall be carried using PVC Insulated and armoured cables.

The PVC armoured power cable for use on 415 volts system shall be 3 or 3.5 Core with aluminium/ Copper conductors and be of 660/1100 volts grade, as per IS 1554 (Part I) 1964. The cross section of the cable shall be to suit the load and rating of the equipment. The cables shall be of aluminium/ Copper conductor, PVC insulated, strip armoured with overall PVC sheathing.

The cables shall be laid as per IS-1255/1967, Indian standard code of practice. The cables shall be laid, as per drawings in the ducts/pipes/trays etc. along a short and convenient route between switch board and the equipment, (either in trenches, on wall or on hangers, supported from the slab). Cable routing shall be checked at the site of work to avoid interference with structure, equipment etc. Where more than one cables are running close to each other, proper spacing should be provided between them.

The radius of bends of the cable should not be less than 12 times the overall dia. of cable in order to prevent undue stress and damage at the bends, the cables should be supported with wooden cleats on M.S. Supports, when laid in trenches, or wall/ceiling suspended hangers. When laid underground the cables should be covered with fine soft earth and protected with 2nd Class bricks. Suitable G.I. Pipe shall be used wherever cables are laid under the roads etc.

Wooden bushes shall be provided at the ends of pipes through which cables are connected through.

➤ **Control Cabling/wiring**

Control cables shall be 1100 volts grade, as per IS 1554, made from copper conductor of 1.5 Sq mm PVC insulated single (as required) Core, flexible with an overall PVC sheathing.

The cables and conduits wiring shall be carried out as per details given under 2.2 and 2.3 above.

Starter Type	Rating in KW	Minimum Cable Size
DOL	Single Phase Eqpt.	1 x 2C x 4 Sqmm Cu
VFD	Up to 5.50	1 x 3C x 4 Sqmm Al or 1 x 3C x 2.5 Sqmm Cu
VFD	7.5	1 x 3C x 6 Sqmm Al or 1 x 3C x 4 Sqmm Cu
VFD	9.3	1 x 3C x 10 Sqmm Al or 1 x 3C x 6 Sqmm Cu
VFD	11	1 x 3C x 10 Sqmm Al or 1 x 3C x 10 Sqmm Cu

Note: Cable Sizes for VFD with Bypass Starter shall be as per Sizes of DOL / Star Delta Starters mentioned above.

For Equipment, the Cable Sizes shall be as per the equipment manufacturer's recommendations or these shall be calculated as per the current ratings of the equipment & Voltage Drop Calculations.



➤ **Miscellaneous**

The final connections to the equipment shall be through Flexible connections in case of conduit wiring and also where the equipment is likely to be moved back and forth, such as on slide rails.

An isolator switch shall be provided at any motor which is separated from the main switch panel by a wall or partition or other barrier or is more than 15 meters away from the main panel.

Two separate and distinct earthing conductors shall be connected from the equipment up to the main switch board panel.

The branch lines from the main panel to each equipment shall be separated and should not Criss cross other lines.

The entire installation shall be tested as per electricity rules and I.S.S. 732-1973 with amendments 1, 2&3 prior to the commissioning of the plant and a suitable test report furnished by a competent and authorized person. The test report will be obtained by contractor himself at his own expenses.

All exposed switch board panels, conduits; hangers etc. shall be given 2 coats of suitable paint of approved colour, when all work has been completed.

MODE OF MEASUREMENTS

➤ **Unit Prices in the Schedule of Quantities**

The Item description in the schedule of quantities is in the form of a condensed resume. The unit price shall be held to include everything necessary to complete the work covered by this item in accordance with the specifications and drawings. The sum total of all the individual item prices shall represent the total price of the installation ready to be handed over.

The unit price of the various items shall include the following:

All equipment, machinery, apparatus and materials required as well as the cost of any tests which the consultant may request in addition to the tests generally required to prove quality and performance of equipment.

All the labor required to supply and install the complete installation in accordance with the specifications.

Use of any tools, equipment, machinery, lifting tackle, scaffolding, ladders etc. required by the contractor to carry out his work.

All the necessary measures to prevent the transmission of vibration.

The necessary material to isolate equipment foundations from the building structure, wherever necessary.

Storage all equipment apparatus and materials.

Insurance of all equipment during Transit, storage, installation and up until handing over to the owner.

The contractor's unit price shall include all equipment, apparatus, material and labor indicated in the drawings and/or specifications in conjunction with the item in question, as well as all additional equipment, apparatus, material and labor usual and necessary to make in question on its own (and within the system as a whole) complete even though not specifically shown, described or otherwise referred to.

➤ **Measurements of Sheet Metal Ducts, Grilles/Diffusers etc.**

➤ **Sheet Metal Ducts**

All duct measurements shall be taken as per actual outer duct surface area including bends, tees, reducers, vanes & other fittings. Gaskets, nuts, bolts, vibration rotation pads are included in the basic duct items of the BOQ.

The unit of measurements shall be the finished sheet metal surface area in square meters. No extra shall be allowed for lapse and wastages.

All the guide vanes, deflectors in duct elbows, branches, grille collars quadrant dampers etc. shall be measured for actual sheet metal surface and paid for at the same rate as duct of same thickness.

The unit duct price shall include all the duct hangers and supports, exposing of concrete reinforcement for supports and making good of the same as well as any materials and labor required to complete the duct frame.

➤ **Grilles/Diffusers**

Grilles / Diffusers should be measured as follows:

All measurements of grilles/diffusers shall be of the actual outlet size excluding the outer flanges.

The square or rectangular grilles/diffusers shall be measured in plain SQ.M.

All round diffusers shall be measured by their diameters in CM.

All linear diffusers shall be measured as per actual length in meters.

➤ **Measurements of Piping, Fittings, Valves, Fabricated items.**

➤ **Pipe**

(Including water piping, steam piping, oil piping, LP gas piping, air piping, vacuum piping) etc.

All pipes shall be measured in linear meter (to the nearest CM) along the axis of the pipes and rates shall be inclusive of all fittings e.g., Tees, bends, reducers, elbows etc. Deduction shall be made for valves in the line.

Exposing reinforcement in wall and ceiling and floors if possible and making good the same or installing anchor fasteners and inclusive of all items as specified in specifications and schedule of quantities.

Rates quoted shall be inclusive of providing and fixing vibration pads and wooden pieces, wherever specified or required by the project coordinator.

Flexible connections, wherever required or specified shall be measured as part of straight length of same diameter, with no additional allowance being made for providing the same.

The length of the pipe for the purpose of payment will be taken through the centreline of the pipe and all fittings (e.g. Tees, bends, reducers, elbows, hangers, structural supports etc.) as through the fittings are also presumed to be pipe lengths. Nothing extra whatsoever will be paid for over and above for the fittings for valves and flanges, section 3.2 below applies. Rate quoted shall be inclusive of all supports, hangers etc. and no additional measurement would be taken.

➤ **Valves and Flanges**

All the extra CI & CM flanged valves shall be measured according to the nominal size in MM and shall be measured by number. Such valves shall not be counted as part of pipe length hence deduction in pipe length will be made, wherever valves occur.

All gun metal (gate & globe) valves shall include 2 Nos. of flanges and 2 Nos. 150 MM long M.S. nipples, with one side threaded matching one of the valves, and other welded to the M.S. Slip-on-flange. Rate shall also include the necessary number of bolts, nuts and washers, 3 MM thick insertion gasket of required temp. grade and all items specified in the specifications.

The rates quoted shall be inclusive of making connection to the equipment, tanks, pumps etc. and the connection made with an installed pipe line shall be included in the rates as per the B.O.Q.

Rates shall be inclusive of insulation, if required.

➤ **Insulation**

The measurement for vessels, piping, and ducts shall be made over the bare uninsulated surface area of the metal.

➤ **Pipes, Ducts & Vessels**

➤ **Pipes**

The measurements for installation of piping shall be made in linear meters through all valves, flanges, and fittings. Pipes/bends shall be measured along the center line radius between tangent points. If the outer radius is R1 and the inner radius is R2. The centerline radius shall be measured as $(R1+R2)/2$. Measurement of all valves, flanges and fittings shall be measured with the running meter of pipe line as if they are also pipe lengths. Nothing extra over the above shall be payable for insulation over valves, flanges and fittings in pipe line/routings. Fittings that connect two or more different sizes of pipe shall be measured as part of the larger size.

➤ **Ducts**

The measurements for insulation of ducts shall be made in actual square meters of bare uninsulated duct surface through all dampers, flanges and fittings. In case of bends the area shall be worked out by taking an average of inner and outer lengths of the bends. Measurements for the dampers, flanges, fittings shall be for the surface dimension for the connecting duct, nothing extra over the above shall be payable for insulation over dampers, flanges and fittings in duct routing.

➤ **Vessels**

The area of standard dished and flat ends of vessels shall be the square of the diameter of the un-insulated body of the shell. Areas for other shapes shall be the actual calculated area. There shall be no deduction or additions for nozzles, handles ribs, dampers, expansion joints etc. All projections on vessels or tanks shall be measured separately as pipe/duct.

➤ **Accessories Insulation**

The unit of measurement for accessories such as expansion tank, pumps, chiller heads etc. shall be un-insulated are in square meters.

In case of curved or irregular surfaces, measurements shall be taken along the curves. The unit insulation price shall include all necessary adhesives, vapor proofing and finishing materials as well as additional labor and material required for fixing the insulation.

➤ **Acoustic Duct Lining**

In case of acoustic lining of air ducts, measurements of the bare inside duct surface in square meters, shall be final for billing purposes.

In case of acoustic lining of air ducts, measurements of the bare inside duct surface in square meters, shall be final for billing purposes.

➤ **Roof and Wall Insulation & Acoustic Treatment**

The unit of measurement for all under deck roof insulation, wall insulation, wall/roof acoustic panel shall be the un-insulated area of walls, roofs, to be treated, in square meters.

The insulation, acoustic panels shall include cost of battens, supports, adhesives, vapor proofing, finished tiles/boards/sheets as well as additional labor and materials required for completion of the work.

CODES AND STANDARDS

S. No.	Description
1.	Indian Society of Heating, Refrigeration and Air-conditioning Engineers (ISHRAE). i) Ventilation (Fresh Air) as per ISHRAE Table 1-T-53 ii) Lighting power densities as per ISHRAE Table 1-T-38 iii) Occupancy as per Actual
2.	Colour Code for Identifications of pipes (IS: 2379-1963)
3.	Ventilation of Car parking/ Toilet/Utility Areas and Pressurization of Lift lobby/ Lift Well/ Stair case as per National Building code of India 2016.
4.	Safety code for air-conditioning (IS: 660)
5.	Safety code for air-conditioning (IS: 659)
6.	Safety code for scaffolding and ladders (IS: 3696)
7.	Code for practice for safety and health Requirements in electrical and gas Welding &
8.	National Building Codes of India with latest amendments Indian Electricity Rules
9.	AMCA-Air Movement and Control Association International, Inc.
10.	ASHRAE Handbook
12.	IS Standards
13.	UL-Underwriters' Laboratories, Inc.

ANNEXURE – I
(to be submitted with technical bid)

**INFORMATION REGARDING ELIGIBILITY
LETTER OF TRANSMITTAL**

From:

To
The Executive Engineer
.....

Subject: Submission of bids for the work of

Sir,

I/we have examined the details given in the bid document for the above work, I/we hereby submit the relevant information:

1. I/we hereby certify that all the statement made and information supplied in the enclosed forms A to E and accompanying statement are true and correct.
2. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/we submit the requisite certified solvency certificate and authorize the Executive Engineerto approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/we also authorize Executive Engineer to approach individuals, employers, firms and corporation to verify our competence and general reputation.
4. I/we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following eligible similar works:

Name of work	Certificate from

Certificate: It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that, I/We shall be liable to be debarred, disqualified/cancellation of enlistment in case any information furnished by me/us is found to be incorrect.

Enclosures:

Date of submission:

Seal of bidder

Signature(s) of Bidder(s)

ANNEXURE-II
(to be submitted with technical bid)

FORM 'A'
FINANCIAL INFORMATION

- I. Financial Analysis - Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last five financial years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached).

Financial years					
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- (i) Gross Annual Turn Over on construction works.
(ii) Profit/Loss (standalone financial statement and consolidated financial statement both).

- II. Financial arrangements for carrying out the proposed work.

Signature of Chartered Accountant with Seal

Signature of Bidder(s)

ANNEXURE-II
(to be submitted with technical bid)

FORM "B"
BANKER'S CERTIFICATE FROM A COMMERCIAL BANK
(OM No. DG/SOP 2022/07 dated 09.11.2022)

This is to certify that to the best of our knowledge and information that M/s./ Sh..... having marginally noted address,as a Customer of our bank are/ is respectable and can be treated as good for any engagement upto a limit of Rs..... (Rupees.....)

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature) For the Bank

NOTE

1. Banker's Certificates should be on letter head of the Bank, addressed to tendering authority.
2. In case of Partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM "B-1"
FORM FOR CERTIFICATE OF NET WORTH FROM CHARTERED ACCOUNTANT

It is to certify that as per the audited balance sheet and profit & loss account during the financial year, the Net Worth of M/s (Name & Registered Address of individual/firm/ company), as on (the relevant date) is Rs. after considering all liabilities. It is further certified that the Net Worth of the company has not eroded by more than 30 % in the last three years ending on (the relevant date)." Unique Document Identification Number (UDIN)

Signature of Chartered Accountant
Name of Chartered Accountant
Membership No. of ICAI
Date and Seal

ANNEXURE-II*(to be submitted with technical bid)***FORM 'C'****DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED DURING THE LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST DAY OF SUBMISSION OF TENDERS**

S. No.	Name of work/ project and location	Owner or sponsoring organization	Cost of work in crores of rupees	Date of commencement as per contract	Stipulated date of completion	Actual date of completion	Litigation/ arbitration cases pending/ in progress with details*	Name and address/ telephone number of officer to whom reference may be made	Whether the work was done on back to back basis Yes/ No
1	2	3	4	5	6	7	8	9	10

* Indicate gross amount claimed and amount awarded by the Arbitration Tribunal.

Signature of Bidder(s)

FORM 'C'-1**PROJECTS UNDER EXECUTION**

S. No.	Name of work/ project and location	Owner or sponsoring organization	Cost of work in crores of rupees	Date of commencement as per contract	Stipulated date of completion	Upto date percentage progress of work	Slow progress if any and reasons thereof	Name and address/ telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10

Signature of Bidder(s)

ANNEXURE-II

(to be submitted with technical bid)

FORM "E"

STRUCTURE & ORGANISATION

1. Name & address of the bidder
2. Telephone no./Telex no./Fax no.
3. Legal status of the bidder (Scan & upload copies of original document defining the legal status)
 - (a) An Individual
 - (b) A proprietary firm
 - (c) A firm in partnership
 - (d) A limited Company or Corporation

4. Particulars of registration with various Government Bodies (Scan & upload attested photocopy)

Organization/Place of registration	Registration No
1.	
2.	
3.	

5. Names and titles of Directors & Officers with designation to be concerned with this work
6. Designation of individuals authorized to act for the organization
7. Has the bidder, or any constituent partner in case of partnership firm, limited company / Joint Venture, ever been convicted by the court of Law? If so, give details
8. In which field of Civil Engineering construction the bidder has specialization and interest?
9. Any other information considered necessary but not included above.

Signature of Bidder(s)

ANNEXURE-III
(to be submitted with technical bid)

SELF DECLARATION CERTIFICATE
(To be submitted on Non-Judicial Stamp Paper of Rs. 100/-)

I hereby certify that the firm has not been ever blacklisted by any Central / State Government / Public Undertaking / Institute on any account.

I also certify that firm will execute the work as per the specification given by Institute and also abide all the terms and conditions stipulated in tender.

I also certify that the information given in the bid is true and correct in all aspects and if in any case at a later date it is found that any detail/s provided are false and incorrect, any contract given to the concern firm or participation may be summarily terminated at any stage, the firm will be blacklisted and Institute may imposed any action as per rules.

Date:

Name :

Place:

Business Address :

Signature of Bidder :

Seal of the Bidder :

ANNEXURE-IV
(to be submitted with technical bid)

UNDERTAKING FOR SUPPLY OF GENUINE PARTS
(On letter head of firm)

I hereby certify that the firm will supply genuine spare parts of the said work required during defect liability period/AMC period, etc. or as and when required or as per directions of the Engineer-In-Charge.

I also certify that the firm will execute the work as per the standards of manufacturer and specification given by department and also abide all the terms and conditions stipulated in NIT document.

Date:

Name :

Place:

Business Address :

Signature of Bidder :

Seal of the Bidder :

ANNEXURE-V
(to be submitted with technical bid)

FORM OF PERFORMANCE SECURITY (GUARANTEE)
BANK GUARANTEE BOND

In consideration of the President of India (hereinafter called " The Government") having offered to accept the terms and conditions of the proposed agreement between.....and(hereinafter called "the said Contractor(s)") for the work.....(hereafter called "the said agreement") having agreed to production of a irrevocable Bank Guarantee for Rs.....(Rupees.....only) as a security/guarantee from the Contractor(s) for compliance of this obligations in accordance with the terms and conditions in the said agreement.

We..... (Hereinafter referred to as "the Bank") hereby (indicate the name of the Bank) undertake to pay to the Government in amount not exceeding Rs.....(Rupees.....Only) on demand by the Government.

2) We do hereby undertake to pay the amounts due and payable (indicate the name of the Bank) under this Guarantee without any demure, merely on a demand from the Government stating that the amount claimed is required to meet the recoveries due or likely to be due from the said Contractor(s). Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.....
.....(Rupees.....only).

3) We, the said bank further undertake to pay to the Government any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.

4). We further agree that the guarantee herein contained(indicate the name of the Bank) shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-Charge on behalf of the government certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5) We further agree with the Government that(indicate the name of the Bank) the Government shall have the fullest liberty without our consent and without effecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said Contractor (s) and to for bear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Government or any indulgence by the Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6) This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7) We lastly undertake not to revoke this (indicate the name of the Bank) guarantee except with the previous consent of the Government in writing.

8) This guarantee shall be valid upto Unless extended on demand by Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs. (Rs. only) and unless a claim in writing is lodged with us within 05 months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged. Dated the day of for (indicate the name of Bank)

ANNEXURE-VI

PREFERRED MAKES OF EQUIPMENT & MATERIALS

S. No.	Details of Materials / Equipment	Manufacturer's Name / Make
A.	Internal EI	
1.	MCB, Isolator, Industrial Plug Socket, RCCB, RCBO's	Schneider Electric ACTI-9 (N) / Legrand (DX3) / Hager/ L&T (Exora) / C&S (Win Trip 1/2) / ABB (S200M) / Siemens (Betaguard) /MK(Honeywell)
2.	MCBDB & Loose Wire Box	Legrand (EKINOX-3) / L&T (EXORA) / C&S (Win Class)/ Hager (Novello) / Schneider (ACTI-9) / ABB (Elegance) / Siemens / MK(Honeywell) (Note : MCBs Make shall be same as DBs Make)
3.	Change Over Switches	L&T / Havells / HPL / Hager / C&S / Socomac / ABB / ASCO
4.	Automatic Transfer Switch (ATS)	Asco (Schneider) / Russel / Socomac / Hager / ABB / Legrand / L&T / Havells
5.	FRLS PVC insulated copper conductor single core cable for wiring. (ISI marked)	Finolex / RR Kabel / KEI /Havells / Polycab / Bonton / Grandlay
6.	Armoured/Unarmoured telephone cable, Coaxial Cable/LAN Cable	Delton / Finolex / RR Kabel / Polycab/Havells / Bonton / Grandlay / KEI
7.	MS Conduit (ISI Marked) with heavy duty MS conduit pipe accessories	BEC / NIC / AKG / RMCON (Note : The make of accessories will be same that of conduit pipe & will comply to IS / 4768 part 2 2003)
8.	PVC Conduit (ISI Marked) with heavy duty PVC conduit pipe accessories	AKG / Norpack / BEC / Polycab / Precision / Astral / Finolex / Pressfit
9.	Modular Switch, Socket/Telephone Socket/ Cable TV Socket/ Data outlet Socket / Fan Regulator/ G.I. Boxes Etc.	Legrand (Arteor) / Schneider Electric (Zencelo) / Honeywell- MK (Elements)
10.	Modular MCB	Legrand / Schneider Electric /MK-Honeywell
11.	Selector Switch & Toggle switch	Salzer (Larsen & Toubro) / Siemens / Kaycee / C&S /Schneider
12.	PVC Trunking	Mk (Honeywell)/ Legrand / Schneider
13.	GI pipe (ISI Marked)	Tata / Jindal (Hissar) / SAIL
14.	Paints	Asian / Berger /Dulux
15.	Terminal Blocks and Connectors	Elmax / Wago / Hensel / Connectwell
16.	Phenolic Laminated Sheet / Bakelite Sheet	Hylam / Formica (P-I Grade) / Mylam / Greenlam
17.	Cat-6 /Cat-6A Cable, Wires & Fiber Optic Cable	Amp / Beldon / Legrand / Krone Communication / Molex
18.	Indoor and Outdoor LED fittings /LED Lamp/ LED Tube	Wipro / Philips / Trilux / Regent / Osram / Lighting Technology (LT)
19.	Decorative Indoor/Outdoor LED fitting	Wipro / Philips / Trilux / Regent / Osram / Lighting Technology (LT)/Bajaj/Havells/Crompton
20.	Exhaust Fan/Fresher Fan	Havells / Crompton Greaves / USHA / Almonard / Alstom

21.	BLDC Ceiling Fan	Havells / Crompton Greaves / Atombarg Gorilla / Superfan / Usha
22.	Wall Bracket Fitting	Havells / Wipro / Decon / Jaquar / Philips / Bajaj / Trilux
23.	Geysers	Racold / CG / Havells / Jaquar / AOSmith / Usha / Venus
24.	Air circulator / Wall Fan	Havells / Usha / Almonard / Crompton / Orient
25.	LED Street Lights with inbuilt Solar Panel & Controller	Havells / Crompton / Philips / Wipro / Bajaj
26.	Ornamental Pole (Factory Finish)/ Hot Dipped Galvanized Octagonal Pole /High Mast	Valmont / Philips / Crompton / Wipro / Bajaj / Keselec / Singh profile /Transrail
27.	Hot Dipped Galvanized Octagonal Pole /High Mast	Valmont / Philips / Crompton / Wipro / Bajaj / Keselec / Singh profile /Transrail/Utkarsh
28.	Polycarbonate Junction Box / Enclosure / Pole box	Hensel / Spelsberg / Naptune-Bals / Sintex/Standard
B.	POWER CABLE	
1.	XLPE insulated PVC sheathed Alum. / Copper Conductor Armored cable of 1.1 KV grade	Finolex / Polycab / KEI / Havells / Grandlay / RR Kabel /Bonton/LAPP/RPG
C.	HT Cable	
1.	H.T. cable (ISI marked)	Finolex / CCI / Polycab / KEI / Havells / RR Kabel / Grandlay / LAPP/RPG
D.	Sub Station Equipment	
1.	LT Panel / Meter Panel Board/Outdoor Feeder Pillar / APFC Panels (Above 200 Amp Incomer)	Tricolite Electrical Industries / Control & Switchgears Electrical Ltd. / Sterling & Wilson / Milestone / Adlec Control System Pvt. Ltd. / Advance Panels & Switchgear Pvt. Ltd. Haridwar / BSPL (Bhopal)/ Engineers & Engineers (Electricals) Pvt. Ltd. / Peaton Electrical Co. Ltd. /Dynamic Electropower Pvt. Ltd./ Pristine/ Neptune /Pyrotech India Electronic pvt Ltd.Udaipur
2.	LT Panel / Meter Panel Board/Outdoor Feeder Pillar / APFC Panels (Upto 200 Amp Incomer)	Tricolite Electrical Industries / Control & Switchgears Electrical Ltd. / Sterling & Wilson / Milestone / Adlec Control System Pvt. Ltd. / Advance Panels & Switchgear Pvt. Ltd. Haridwar / BSPL (Bhopal)/ Engineers & Engineers (Electricals) Pvt. Ltd. / Peaton Electrical Co. Ltd. /Dynamic Electropower Pvt. Ltd./ ASPL (Associated Switchgears & Projects Ltd.) / Pristine / Neptune /Allied engineers/ Pyrotech India Electronic pvt Ltd.Udaipur/Johns electric co.pvt Ltd Jaipur
3.	Rising main / Bus Trunking	C&S / L&T / Schneider / Legrand / Godrej
4.	Moulded Case Circuit Breaker (MCCB) Thermal Release / Microprocessor based (Ics=Icu=100%)	Schneider Electric (CVS Series) / Siemens (VL Series) / L&T (D-Sine) / Legrand (DPX3) / C&S (Winbreak 1/2) / ABB (TMax) / Hager
5.	Contactors/Relay/Timer	Schneider Electric / L&T / BCH / Siemens / Legrand / ABB / C&S / Hager/
6.	Potential Transformers / Current Transformer	Automatic Electric / Matrix / Precise / L&T / Kappa /Procom

7.	LED type indicating lamps / Push Button	Schneider Electric / L&T / Siemens / Vaishno
8.	Digital Meters (A/V/PF/Hz/KW/KWH)	Conzerv / Larsen & Toubro / Secure / AE / Socomac / Neptune /Hager
9.	Fasteners / GI Clamps	Hilti / Fisher / Chilli /OBO
10.	D.W. Corrugated HDPE Pipe (ISI marked)	REX / Dura plast / Zenduct / Gemini(Tripiti)/ Duraline / Keshav Kripa Polyplast (LLP)
11.	Transformer (Oil / Dry type) Upto 250 KVA	Crompton / ABB / Raychem / Schneider / Voltamp / Uttam Bharat / United / Bharat Bijlee/RTS-Jaipur
12.	Transformer (Oil / Dry type) Above 250 KVA	Crompton / ABB / Schneider / Sterling & Wilson / Raychem / Bharat Bijlee /Voltamp
13.	HT Panel / Ring Main Unit	Siemens / ABB / L&T / Schneider / C&S
14.	HT End Termination / Cable Jointing Kit	Reychem / Denson / Cap Seal / Safekei / 3M
15.	ACBs	Siemens (3WL-ETU45B) / L&T (U-Power-OMEGA MTX 4.0) / ABB (Emax)PR122 / Legrand (DMX ³ MP4) / Schneider (MVS Series) / C&S (Winmaster 2/3)
16.	Rubber Mat (MV / HT)	Jyoti / Deep Jyoti / Premier (duly ISI marked)
17.	Fire Extinguishers	Minimax / Safex / Life Guard / Kanex / Omex / Firequip (ISI Mark)
18.	Capacitors & Reactors / APFC Relay	EPCOS/ L&T / DUCATI / ABB / Siemens / Schneider / Neptune
19.	Cable Glands /lugs .	Baliga lighting / Comet / Cosmos / Dowells / Lapp / Gripwell
20.	Perforated Cable Tray	Pilco / Slotco /RMCON/ BEC / Steelways / OBO
21.	SS Wire mesh cable Tray /Raceways	Legrand / OBO / MK
22.	Programmable Logic Controller (PLC)	Siemens / Woodward / Allen / Bradley/ Legrand / OBO / MK-Honeywell
E.	DG Set	
1.	Diesel operated Power Generating Engine Upto 200 KVA	Cummins India / Caterpillar / Ashok Leyland / KOEL
2.	Diesel operated Power Generating Engine Above 200 KVA	Cummins India / Caterpillar / KOEL / Volvo Penta
3.	Alternator	Stamford / Lerroy Sommer / Kirloskar Electric / Caterpillar / Crompton Greaves
4.	DG Set Canopy / Enclosure & AMF Panel	As per OEM / OEA of respective DG Set manufacturer
5.	Alarm Annunciator	Advani Oralikon / Larsen & Toubro / Minilec
F.	Fire Fighting Equipment	
1.	MS Pipe/GI Pipe	Tata / Jindal Hisar / SAIL
2.	Forged Steel Fittings / Flanges	Johnson Industries / VS Forge / JK Forging / Trueforge
3.	Pipe Hangers	Chilli / Hilti / OBO / Fisher
4.	Gun Metal / Brass / NRV/ Gate Valve/Check Valve/Foot Valve (ISI marked)	Sant / Leader / Advance / Audco / Zoloto/Honeywell

5.	CI Sluice Valve/ Butterfly Valve/ NRV/ Y - Stainer (ISI marked)	Audco / Advance / Kirloskar / Zoloto/Honeywell/Kartar/Kalpna
6.	Fire pump/Jockey pump	Kirloskar/KSB/Matherplatt(Wilo)/Crompton
7.	Electrical Motor	ABB / Siemens / Kirloskar / Grundfos / Crompton / Bharat Bijli/ Matherplatt(Wilo)
8.	Diesel Engine for Fire Pump	KOEL / Ashok Leyland / Cummins
9.	Couplings (Tyre – Type)	Lovejoy / Fenner
10.	Anti-Vibration Mountings / Neoprene Gasket	Kanwal Industrial Corporation / Dunlop / GERB / Resistoflex
11.	Pressure Switch (ISI marked)	System Sensor / Indfoss / Danfoss / Switzer
12.	Pressure Gauge (ISI marked)	H Guru / Fiebig / Dwyer/ Hebig/Honeywell
13.	Landing Valve/Fire Hose coupling /First Aid Hose Reel and Drum /Shut of Nozzle /Branch Pipe/Fire Brigade inlet / RRL Hose Pipe / Thermoplastic Pipe (ISI marked)	New Age / Safeguard / Lifeguard / Padmini / Omex / Minimax/Safex
14.	Water Flow Switch (FM / UL listed)	System Sensor / Switzer / Rapid Control / Honeywell/ Danfoss
15.	Pipe coat	Pypcoat / Makphalt / Rustech
16.	Level Controller & Indicator (Water) (ISI Marked)	Auto Pump / Cirrus Engineering / Techtrol
17.	Fire Sealent	Promat / Birla / 3M / Hilti
18.	Single Phase Preventer / Water level guard	Schneider Electric / L&T / Siemens / ABB / Minilec
19.	LT Jointing Kit / Termination	Reychem / Denson / Cap Seal / Safekei / 3M
20.	Batteries	Exide / Rocket / HBL / Pulse / Amco / Amaraja
21.	Battery Charger	Statcon / Amaraja / CDC / AE / Expofyn / Thycon India/ Procom/Microtek
22.	Epoxy Paint	Dulux / Berger / Asian / Nerolac
23.	Air Release Valve	Rb / Tbs / Cimbrio / Zoloto
24.	Solenoid Valve / Spray Nozzle	Parker / HD / Tyco / Emersion / Honey Well
25.	Sprinkler Head	HD / Tyco / Viking / Omex / Easy Flex
26.	SS Flexible Drop	HD / Omex / Newage / Tyco / Lifeguard / Easy Flex
27.	Deluge Valve	Tyco / Viking / HD
G.	Fire Alarm System	
1.	Addressable Fire alarm control panel / Repeater panel / multi sensing detector / Fault isolator / Strobe light / Hooter / Manual call box / Response indicator	Johnson Control / Notifier / Siemens / Bosch make
2.	Cat-6 /Cat-6A Cable, Wires & Fiber Optic Cable	Amp / Beldon / Legrand / Krone Communication / Molex
3.	HDMI cable	Lightware/AMx/crestron/Extron
4.	Fire retardant cable	Finolex / Polycab / KEI / Havells / Grandlay/ RR Kabel //Bonton/RPG/LAPP
5.	Amplifire/Speaker	Bosch/Honeywell/Yamaha/JBL/Shure
H.	Water Supply Pump Sets	
1.	Mono Submersible/ Submersible pump Set	KSB / CG / Kirloskar / Grundfos / Mather & Platt (Wilo)
2.	DOL / Star Delta Starter	L&T / BCH / Havells / C&S / Siemens / Schneider

3.	Submersible Cable	Finolex / RR kabel / Polycab / Havells / KEI/ Bonton
I.	EPABX System	
1.	EPABX System / Master Console Phone/	Siemens / Cisco / Alcatel / Coral / Panasonic / AVAYA/ Matrix
2.	Analog Telephone instrument	Beetal / Tata / Panasonic/ Seimens
3.	18 SWG Sheet (Chrono Box)	Topaz / Coral / Crown
4.	Constant Voltage Transformer	Topaz / Bhurji / Delta / Servokon
J.	Water Purifier	
1.	Voltage Stabilizer	V Guard / Blue Bird / Voltas / Servocon
2.	RO / Water Purifier	Kent / Aquaguard (Eureka Forbes)
3.	Drinking Water cooler	Voltas / Blue Star / Usha/ Sidwal
K.	Solar Water Heating System	
	Solar Water Heating System	Inter solar / Racold / BHEL / Electrotherm / Rashmi/V-guard/Emmvee Solar
L.	CCTV System	
1.	IP based Camera (All type) / NVR / Server	Bosch / Pelco / Axis / Sony / Tyco / Honeywell
2.	Conventional Camera/Connect (Dome / PTZ / Bullet / C-mount type)	Bosch / Honeywell / Pelco / Axis / Tyco / Sony
3.	Managed Networking layer Switch	Cisco / DLink / Extreme / Fortinet / Ruckus/HP/Netgear
4.	U Rack	Valrack(LeGrand) / EOM Rack / Belchem /Comrack/ Vertiv
M.	Uninterrupted Power Supply (UPS)	
1.	Online / Offline UPS	Vertiv / Numeric / Peaguses (Auto Meter)/ Socomac/Eaton/Schneider
2.	SMF Batteries	Exide/Amron/Rocket/HBL/Pulse/Amco/ Amaraja
N.	Solar Power Generation System	
1	Solar Power Generation System	REIL / BHEL / BEL / CEL / REC / SOLON / VIKRAM / ABB / Havells
2	Junction Box	VNT / SUN GARNER / OEM of SPV Modules
3	SPV Inverter	Sungrow / Delta / SMA / ABB
4	Module Mounting Structure	As per MNRE / Manufactures Standards
5	XLPE Aluminium / Copper Cable	Finolex / Universal / Nicco / RPG Cables / KEI / Grandlay/LAPP / Polycab
6	Solar Cable XLPO Insulated (DC)	RR Kabel / Polycab / Havells / Finolex / Lapp
O.	LED TV	LG / Samsung / Panasonic / Toshiba / Sony
P.	Air Conditioning System	
1.	Split Air Conditioner	Hitachi/ Daikin/ O-General/ Mitshubshi / Carrier/ Bluestar
2.	Window Type Air Conditioner	Hitachi/ Daikin/ O-General/ Mitshubshi / Carrier/ Bluestar
3	VRV/VRF	Hitachi/ Daikin/ O-General/ Mitshubshi / Carrier/ Bluestar

4	Copper Pipe	OEM or Daikin/Total line/Maxflow/ Papriwal/
5	CPVC pipe	Ashirwad/Supreme/Astral/Prayag
6	GSS Sheet (For site fabricated duct)	SAIL/Jindal/Tata
7	Aluminium Sheet	Hindalco/Balco/Nalco/Tata/Aditya Birla
8	Flexible duct/Company fabricated duct	Waves/Zeco/Ductofab/Airflow/Caryaire/ Atco
9	Supply/Return Grill/diffuser	Airflow/Trox/Dynacraft/ Caryaire/Matejoints
	False Ceiling	Armstrong
	LED Signage Board & associated items	
A	ACP board	ALUDECOR/ALSTRONG/ALUCOBOND
B	MS channel, Angle , GI sheet	SAIL/JINDAL/TATA
C	LED Chips	SAMSUNG/CREE/NICHIA/OSRAM/GE

Note- All the material other than the BoQ and Preferred Makes of Equipment & Materials as in Annexure-VI, are to get approved from the Engineer-In-Charge before using the same in the work.

Bill of Quantity
of
Supply, Installation, Testing & Commissioning
of HVAC Work of Indoor Sports Complex, CURaj

BOQ of Supply, Installation, Testing & Commissioning of HVAC Work of Indoor Sports Complex,**CURaj**

S. No.	Item discription	Qty.	Unit	Rate	Amount
A	HVAC Work				
1.0	VRV/ VRF Outdoor Unit (Heat Pump)				
	Supplying, Installation, Testing & Commissioning of Modular type Variable Refrigerant Flow/Variable Refrigerant Volume air cooled Outdoor units suitable for cooling/heating having 100% hermetically sealed inverter type twin Rotary/Scroll Compressor(s), minimum two compressors (with individual separate PCB) for above 14HP modules, microprocessor based Controller, top discharge type condensing unit(s), with R-410-A Refrigerant or equivalent, vibration Isolators with suitable foundation etc. complete as required. To have better efficiency condenser fan shall be capable to operate at different speed with respect to load. The unit shall deliver the rated capacity and in confirmation as per IS 18728:2024 and CPWD Specifications and work even at 50°C ambient temperature without tripping. The system shall be able to deliver 100% of the rated capacity upto 39 0C. The unit shall be suitable to work on 400V +/- 10%, 3 Phase, 50Hz AC power supply and BMS compatible. The unit shall be filled with first charge of the refrigerant and ready for use as required. The condenser should be coated with a hydrophilic film to prevent water accumulation on the surface of the heat exchanger, enhance water dispersion, and reduce the risk of degradation, thereby improving overall performance and durability. The Indian Seasonal Energy Efficiency Ratio (ISEER) of the unit shall be as per Energy Conservation and Sustainable Building Code (ECSBC) 2024 as below and complete as per CPWD specification, connections, inter connections etc. as required. (For capacity <40 kWr ISEER 5.4, Capacity > 40 and <70 ISEER 5.5, Capacity > 70 ISEER 5.6 for ECSBC Building) For				

	Cooling or Heating or Both				
1.1	14 HP to 22 HP	304	Per HP	19,111.00	5,809,744.00
2.0	Split AC (Non VRV)				
	Supply , Installation, Testing and Commissioning of Air Cooled Hi Wall split type Air conditioners complete with Indoor unit(IDU), Outdoor unit (ODU), surface / concealed copper Refrigerant piping with insulation (closed cell elastomeric nitrile rubber tubular pipe section) upto 3 Mtr (IDU to ODU), copper power cable upto 3.5 Mtr (IDU to ODU) i/c drain pipe R-32/R-410/ R407 Green Refrigerant, wireless Remote control, suitable for working between 180-260V with low & high voltage cutoff and 50 hz ,1 phase AC supply capable of performing cooling, dehumidification, air circulation of following capacity with Scroll / rotary compressor. The system shall be able to deliver 100% of the rated capacity upto 42 Degree Celsius. Min 5 year Original Equipment Manufacturer (OEM) warranty both compressor and Printed Circuit Board (PCB). Must comply : Electrical cable IS 694 or IS 9968 temperature sensing control IS /International Electro technical Commission (IEC) 60730, hermetic compressor IS 10617, heat exchanger IS 11329, capacitor IS 2993 and motor IS 12615. Complete as per CPWD specification and IS : 1391 Part II 2023. The system shall be able to operate up to 50 0C (out door ambient temperature).				
2.1	1.5 TR with 5 Star BEE Rating	2.00	Nos.	43,539.00	87,078.00
3.0	Air handling Unit				

	Supply, installation, testing and commissioning of Floor mounted, factory built Air handling units in Double skin type with 46+-2 mm thick panels G.I casing of thickness 0.8 mm outside layer powder coated and 0.8 mm inside layer plain GI and polyurethane foam(PUF) insulation having density of 42 kg/m3,complete with DIDW backward curved Blower with suitable Belt and pully and fan suitable for static pressure as detailed below, 6 Row deep DX cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick pre filters, 2 Bend PVC Eleminator, TEFC motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply, drain connections with stainless steel drain pan and necessary vibration isolation arrangement to avoid any vibration etc. DB level of complete should be below 70 db@3mtr. Motor shall confirm to IE3 series of energy efficient motors with IP55 degree of protection etc. required to complete the Unit.				
3.1	20000 CFM X 70 mm WG Static Pressure with twin circuit	Nos.	4.00	1,145,427.58	4,581,710.30
4.0	SITC of EVV and communication kit with Wired Remote.	Set	8.00	74,042.54	592,340.34
5.0	Supply, fixing and commissioning of refrigerant joint / Branch distributors between Outdoors complete with nitrile rubber insulation, supporting etc.,as required.	Nos.	8.00	8,098.00	64,784.00
6.0	Supply, fixing and commissioning of refrigerant joint / Branch distributors indoor to outdoor complete with nitrile rubber insulation, supporting etc.,as required.	Nos.	5.00	4,535.00	22,675.00
7.0	SITC of Copper Refrigerant piping for VRV / VRF System complete with fittings, supports, jointing, insulation with Nitrile rubber, gas charging & commissioning as per specifications, all accessories as per specifications and any other item required to make the system complete. Nominal Dia in mm OD x Insulation Thickness as indicated below:				
7.1	41.3 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19mm thick insulation	Mtr	325.00	1,368.00	444,600.00

7.2	28.58 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19mm thick insulation	Mtr	20.00	1,157.00	23,140.00
7.3	19 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19mm thick insulation	Mtr	325.00	739.00	240,175.00
7.4	15.86 mm dia (OD) (soft drawn) with tube thickness 1.2 mm with 19mm thick insulation	Mtr	20.00	615.00	12,300.00
7.5	12.7 mm dia (OD) (soft drawn) with tube thickness 1.2 mm with 19mm thick insulation	Mtr	15.00	487.00	7,305.00
7.6	9.5 mm dia (OD) (soft drawn) with tube thickness 1.2 mm with 19mm thick insulation	Mtr	15.00	346.00	5,190.00
8.0	Supply, installation, testing and commissioning of Rigid heavy class u PVC piping with minimum 6 mm class O nitrile rubber insulation over the pipes ,complete with fittings, support etc. as required.				
8.1	25 mm dia .	Mtr	20.00	374.00	7,480.00
8.2	32 mm dia	Mtr	20.00	563.00	11,260.00
9.0	Supply, installation, balancing and commissioning of Factory fabricated GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.				
9.1	Thickness 0.63 mm sheet	Sqmtr	250.00	1,191.00	297,750.00
9.2	Thickness 0.80 mm sheet	Sqmtr	450.00	1,382.00	621,900.00
9.3	Thickness 1.00 mm sheet	Sqmtr	10.00	1,488.00	14,880.00
10.0	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.				
10.1	Thickness 0.63 mm sheet	Sqmtr	50.00	1,213.00	60,650.00
10.2	Thickness 0.80 mm sheet	Sqmtr	100.00	1,415.00	141,500.00
10.3	Thickness 1.00 mm sheet	Sqmtr	100.00	1,851.00	185,100.00
10.4	Thickness 1.25 mm sheet	Sqmtr	50.00	2,063.00	103,150.00

11.0	SITC of 18 G GI Flanged Frame / 20 G GI blades type Volume Control Duct Dampers complete with linkages, levers, fittings, supports, all accessories as per specifications and any other item required to make the system complete.	Sqmtr	3.00	7,580.00	22,740.00
12.0	Supply, installation, testing and commissioning of Aluminium Eyeball Jet Diffuser of approved make, powder-coated finish, complete with adjustable nozzle for horizontal and vertical air throw, mounting ring, fixing accessories, with Butterfly damper, and all necessary hardware. Diffuser shall be suitable for long throw air distribution applications and shall be installed complete as required at site.	Nos.	72.00	6,308.00	454,176.00
13.0	Supplying & fixing of return Air Diffuser of powder coated extruded aluminium but without volume control dampers with anti smudge ring and removal core complete as required.	Sqmtr	R/O	8,595.00	
14.0	Supplying & fixing of powder coated extruded aluminium supply Air Grills but with volume control dampers complete as required.	Sqmtr	3.00	9,623.00	28,869.00
15.0	Supplying, Fixing, testing and commissioning of fire dampers in supply air duct/ main branch and return air path as and where required of required sizes i/c control wiring, the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed in the event of fire signal complete as required and as per specifications.				
15.1	Fire damper	Sqmtr	15.00	11,355.00	170,325.00
15.2	Actuator	Nos.	20.00	10,645.00	212,900.00
16.0	Supply, erection testing and commissioning of Aluminium flexible duct of 350/400 mm dia with insulation, supports, clamps, gaskets, nuts, bolts etc., all as specified and/or directed etc., complete	Mtr	20.00	822.00	16,440.00
17.0	Supply, Fabrication and fixing of Canvas connection with fire retardent PVC fabric.	Nos.	14.00	4,418.00	61,852.00

18.0	Supplying and fixing of following thickness duly laminated aluminum foil of mat finish dosed cell Nitrile rubber (Class "O") insulation on existing duct after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required above. Valves should have pressure rating of 25 Bar minimum.				
18.1	19 mm- Inside of Building	Sqm	800.00	810.00	648,000.00
18.2	25 mm- Outside Building	Sqm	250.00	1,033.00	258,250.00
19.0	Supplying and fixing of Acoustic lining on wall and ceiling of AHU rooms/ in ducting with following thick, density 140-210 kg/cu.m Open cell Nitrile Rubber with the help of Adhesive SR998 Mtr and Rawal Plug & Screw etc. complete as required and as per specifications.				
19.1	25 mm thick in AHU Room	Sqmtr	275.00	2,606.00	716,650.00
19.2	15 mm thick in ducting	Sqmtr	100.00	2,024.00	202,400.00
20.0	Supply and Installation, testing and commissioning of following capacity cabinet type direct driven inline centrifugal Fan Unit AMCA certified with DIDW forward curved centrifugal fan having single skin cabinet panels made from Galvanised sheet steel with IP-21 protection and direct drive motor with Class F insulation, fan shafts and wiring junction box for operation on 230V/415V 50Hz AC supply etc complete .				
20.1	1200 CFM	Nos.	1.00	22,844.00	22,844.00
20.2	700 CFM	Nos.	1.00	18,275.00	18,275.00
21.0	Axial Fan_ Fire rated				

	Supplying, installation, testing and commissioning of AMCA certified ceiling hung/ floor mounted Direct driven Tube Axial Flow fan of following capacity with double flanged powder coated M.S./GI casing and aluminium alloy impellers with high efficiency aero-foil section blades, the impeller directly driven by TEFC induction motor(motor should be of high efficiency (IE 2) suitable for 3 phase 50 Hz 415 V , 1440+-30 RPM of class 'H' insulation, efficiency not less than 70%, Noise level < 75dBA @ 3mtr and as per specifications complete with mounting arrangement etc as required.				
21.1	29000 CFM Static pressure-40 mm WG	Nos.	4.00	335,063.00	1,340,252.00
22.0	Axial Fan_ Non Fire rated				
	Supplying, installation, testing and commissioning of AMCA certified ceiling hung / floor mounted Direct driven Tube Axial Flow fan of following capacity with double flanged powder coated M.S./GI casing and aluminium alloy impellers with high efficiency aero-foil section blades, the impeller directly driven by TEFC induction motor(motor should be of high efficiency (IE 2) suitable for 3 phase 50 Hz 415 V , 1440+-30 RPM of class 'F' insulation, efficiency not less than 70%, Noise level < 75dBA @ 3mtr and as per specifications complete with mounting arrangement etc as required.				
22.1	29000 CFM Static pressure-40 mm WG	Nos.	4.00	313,676.00	1,254,704.00
B	Electrical Works				
	Electrical Works:				-
1.0	Feeder Panel				

	Supplying , installation, testing , commissioning of Outdoor type cubical panel , floor mounted class of protection IP-65 construction, compartmentalized cubical type panel board suitable for 415V, 3 phase, 4 Wire, 50 Hz AC supply system, fabricated in compartmentalized design from 2 mm thick CRCA sheet steel, 3mm thick passivated gland plates, cleaning, processing & finishing complete with 7 tank process for powder coating in approved shade, 2 no.copper earthing studs, connections from main bus bar to switchgears, control wiring with 1.5 sq.mm. FRLS insulated multistranded copper conductor single core cable, cable alley i/c providing and fixing following switchgear etc with MS base frame of size 75x75x5 mm complete as required.				-
	All incoming /outgoing MCCBs shall be with thermo - magnetic based release with overload, short circuit and with adjustable settings. All MCCB 's shall have Ics=100%Icu and with front Operating Handle. Measuring instruments shall be digital type of accuracy class 1.0) .				-
	Incoming:a. 320 A, TPN, 36KA thermomagnetic releasesetting MCCB -2 Nos and 2 Nos 400 Amp. Bus bar				-
	Digital Ammeter-1 nos				-
	Digital Voltmeter-1 nos				-
	Outgoing				-
	16 Nos -63 Amp. RCBO for VRV Outdoor Unit				
	63 A TPN MCCB 25 kA (ICU=100% ICS) (With Ext. ROM & Spreader) - 4 Nos. for AHUs and Axial Fans				-
	63 A TPN MCCB 25 kA (ICU=100% ICS) (With Ext. ROM & Spreader) - 2 Nos. Spare	Set	1.00	569,418.82	569,418.82
2.0	Starter Panel				

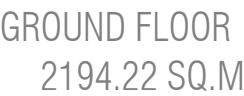
Supplying , installation, testing , commissioning of Indoor type cubical panel , Wall/floor mounted class of protection IP-54 construction, compartmentalized cubical type panel board suitable for 415V, 3 phase, 4 Wire, 50 Hz AC supply system, fabricated in compartmentalized design from 2 mm thick CRCA sheet steel, 3mm thick passivated gland plates, cleaning, processing & finishing complete with 7 tank process for powder coating in approved shade, 2 no.copper earthing studs, connections from main bus bar to switchgears, control wiring with 1.5 sq.mm. FRLS insulated multistranded copper conductor single core cable, cable alley i/c providing and fixing following switchgear etc with MS base frame of size 75x75x5 mm if required complete as required.				
All incoming /outgoing MCCBs shall be with thermo - magnetic based release with overload, short circuit and with adjustable settings. All MCCB 's shall have Ics=100%Icu and with front Operating Handle. Measuring instruments shall be digital type of accuracy class 1.0) .				
Incoming: a. 63 A, TPN, 25KA thermomagnetic release setting MCCB, 200 Amp. Bus bar				
Digital Ammeter-1 nos with metering				
Digital Voltmeter-1 nos				
Outgoing				
Bypass Star delta starter incussive indicating lights for selector switch, incoming/outgoing feeders CTS contactors, fire relay, NO/NC contacts on all outgoing as per motor rating etc. as required and complete as per specifications and required for 1 Nos AHU				
Star delta starter incussive indicating lights for selector switch, incoming/outgoing feeders CTS contactors, Fire relay, NO/NC contacts on all outgoing as per motor rating etc. as required and complete as per specifications and required for 2 Nos Axial Fans	Set	4.00	236,378.18	945,512.71

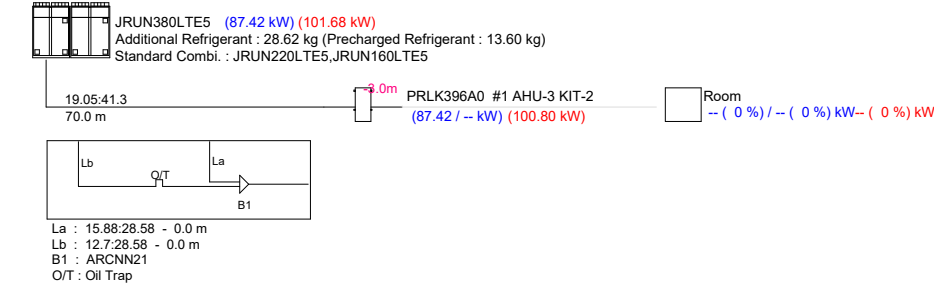
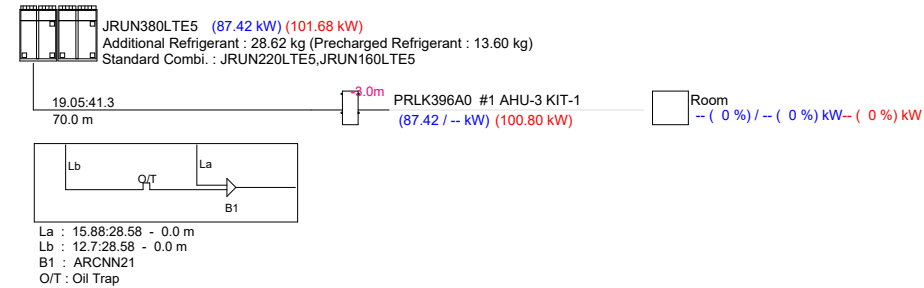
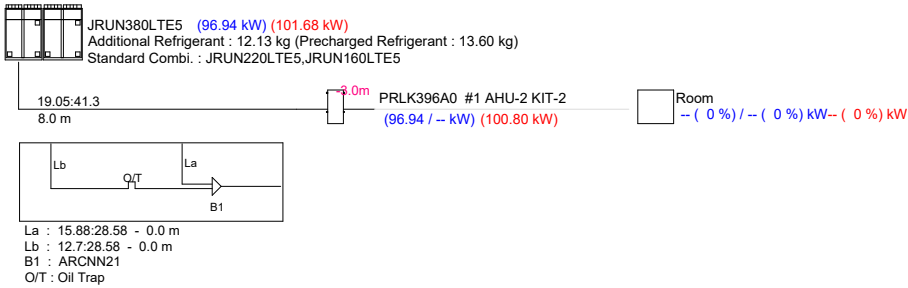
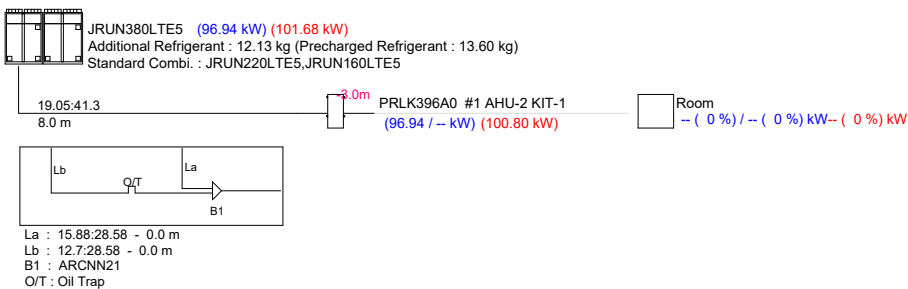
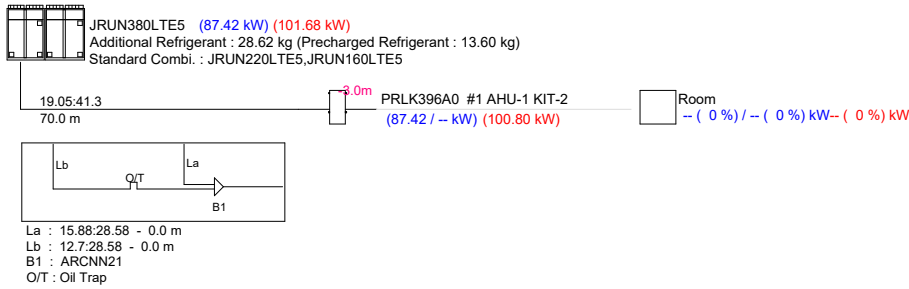
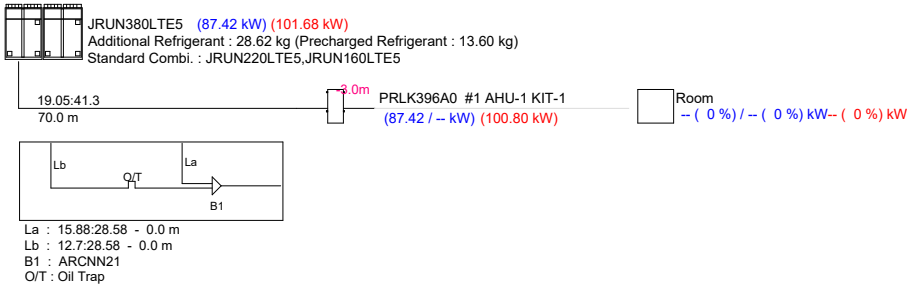
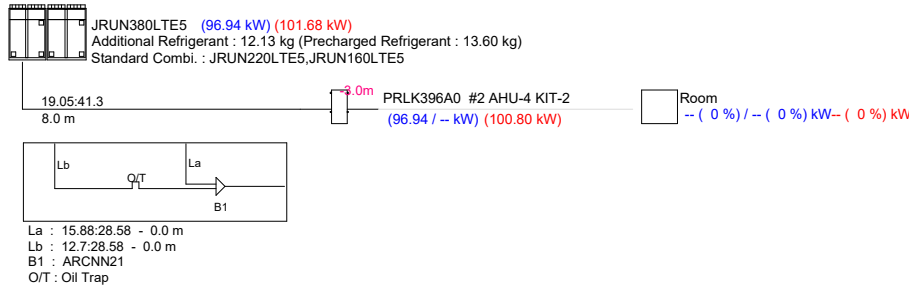
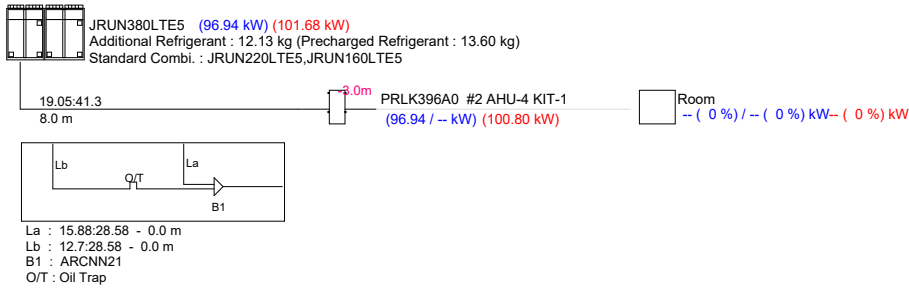
3.0	Supply, installation, testing and commissioning of following variable frequency drive with IP 55 rated VFD operating with fan of AHU'S. The VFD shall be suitable for operation on a 3 phase, 415 V, 50Hz, input power supply.				
3.1	15 KW	Nos	4.00	248,819.13	995,276.54
4.0	Power & Control Wiring for Single Phase / Low Voltage Equipment & Controls:				
	SITC of Control cum Transmission wiring in suitable conduits between indoor & outdoor units of VRV Units.				
4.1	3 C x 1.5 Sqmm Copper in PVC conduit.	Mtr	850.00	330.22	280,687.00
5.0	Power Cabling (Copper Conductor):				
	Supply and laying of Armoured Power Cables with High Conductivity Copper/ Al. Conductor (Solid Conductor for Cables of size up to 6 Sqmm & Stranded Conductor for Cables of size 16 Sqmm & above), XLPE insulated, Cores Laid Up, PVC Inner Sheathed, Armouring (Galvanized Wires / Strips) & Extruded PVC (FRLS) Outer Sheathed, 650 / 1100 V Grade as per IS 7098 (Part 1) - with ISI Marking including supply of saddles, ties, tags, ferrules, terminations, lugs, nuts/bolts/hardware etc. complete in all respects.				
5.1	4C X10 sqmm- Copper conductor (Feeder Panel to ODU)	Mtr	450.00	1,930.84	868,878.00
5.2	3C X6 sqmm- Copper conductor (Starter panel to AHU)	Mtr	60.00	962.74	57,764.40
5.3	3C X6 sqmm- Aluminium conductor (Starter panel to Axial Fan)	Mtr	100.00	346.04	34,604.00
5.4	3½ X 25 sq. mm Aluminium conductor- (Feeder Panel to Starter Panel)	Mtr	250.00	653.58	163,395.00
6.0	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.				
6.1	6 SWG Wire	Mtr	500.00	42.00	84.00

7.0	Supplying and installing following size of perforated Hot Dipped Galvanised Iron cable tray (Galvanisation thickness not less than 50 microns) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with two numbers GI Suspenders i/c base of suitable size GI angle, GI bolts & nuts, fastner etc as required.				
7.1	150 mm width X 50 mm depth X 1.6 mm thickness	Mtr	100.00	803.00	80,300.00
7.2	300 mm width X 50 mm depth X 1.6 mm thickness	Mtr	250.00	1,062.00	265,500.00
8.0	Supply of PVC sheathed / XLPE, stranded aluminium conductor, armoured power cable of 1.1 KV grade of following size:				
8.1	3½ X 300 sq. mm	Mtr	1,600.00	2,582.08	4,131,328.00
9.0	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required.				
9.1	Above 185 sq. mm and upto 400 sq. mm	Mtr	775.00	564.00	437,100.00
10.0	Laying of one number additional PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground in the same trench in one tier horizontal formation including excavation, sand cushioning, protective covering and refilling the trench etc as required.				
10.1	Above 185 sq. mm and upto 400 sq. mm	Mtr	775.00	423.00	327,825.00
11.0	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size in the existing RCC/ HUME/ METAL pipe as required.				
11.1	Above 185 sq. mm and upto 400 sq. mm	Mtr	50.00	170.00	8,500.00
12.0	Supplying and making cable route marker with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded 60 cm at the bottom and 50 cm X 50 cm at the top with a thickness of 10cm including inscription duly engraved as required.	Nos	10.00	683.00	6,830.00

13.0	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				-
13.1	3½ X 300 sq. mm (70mm)	Nos	4.00	1,336.00	5,344.00
14.0	Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreaders in existing cubicle panel board including drilling holes in cubicle panel, making connections, Ics=100% Icu and Operational Voltage 690V etc. as required.				
14.1	400 A,50KA,FPMCCB	Nos	2.00	44,663.00	89,326.00
15.0	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete.				
15.1	450 mm dia. R.C.C. pipe	Mtr	50.00	1,620.95	81,047.50
C	CAMC				
1.0	Providing Comprehensive Maintenance of above system after 1 year defect liability period including quarterly servicing, attending all breakdown calls and repair/replacement of all spare parts etc. as required on site.				
1.1	1st Year after DLP	Per Year	1.00	1,850,000.00	1,850,000.00
1.2	2nd Year	Per Year	1.00	1,942,500.00	1,942,500.00
1.3	3rd Year	Per Year	1.00	2,039,625.00	2,039,625.00
	Total Value with GST				33,944,234.61
	Say Rs.				3,39,44,235.00

DATE :	REV :
DRAWING TITLE :	
HVAC CONCEPTUAL DRAWING GROUND FLOOR PLAN	
PROJECT NAME :	
INDOOR SPORT COMPLEX IN CENTRAL UNIVERSITY OF KALAMANGGI (AMRUTE)	
<u>HVAC CONSULTANT :</u>	
COOL ENGINEERS B-114, LOWER GROUND FLOOR, SECTOR- 108, NOKIA (E/9 - 20/30)	
SHEET NO. :HVAC-01	Drawn : GUFRAN
	Checked: MR.SADDAM
REV : 01	Approved: ANILU G.
SCALE : 1:200	DATE : 17-06-2026
DWG NO. : 001/23	
SHEET : A1	





DATE :	REV :

DRAWING TITLE:-
SCHEMATIC LAYOUT PLAN

PROJECT NAME:-
INDOOR SPORT COMPLEX IN CENTRAL
UNIVERSITY OF RAJASTHAN (AJMER)

HVAC CONSULTANT:

COOL ENGINEERS
B-181, LOWER GROUND FLOOR, SECTOR- 108,
NOIDA (UP) - 201301

SHEET NO. :HVAC-01	Drawn : GUFRAN
	Checked: MR.SADDAM
REV : 0	Approved : ANUJ G.
SCALE : 1:200	DATE : 21-02-2026

DWG. NO . AMC-01
SHEET : A1

DATE :	REV :
DRAWING TITLE :	
HVAC CONCEPTUAL DRAWING TERRACE FLOOR PLAN	
PROJECT NAME :	
INDOOR SPORT COMPLEX IN CENTRAL UNIVERSITY OF RAJASTHAN (AMER)	
HVAC CONSULTANT :	
COOL ENGINEERS	
B-181, LOWER GROUND FLOOR, SECTOR- 108, NOIDA (UP) - 201301	
SHEET NO. HVAC-01	Drawn : GUFFRAN
	Checked : MR.SADDAM
	REV : 01
	Approved : ANUJ G.
SCALE : 1:200	DATE : 17-06-2026
DWG. NO. : RC172-05	
SHEET : A1	