INDIAN INSTITUTE OF TECHNOLOGY KANPUR

Name of work

Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.

BID DOCUMENT

OFFICE OF SUPERINTENDING ENGINEER,

IWD,

INDIAN INSTITUTE OF TECHNOLOGY KANPUR,

April, 2025

Indian Institute of Technology Kanpur

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Superintending Engineer

1 Notice Inviting e-Tenders

The Superintending Engineer on behalf of Board of Governors of Indian Institute of Technology Kanpur invites online percentage rate tenders from eligible Air conditioning contractor, satisfying the eligibility criteria mentioned in the document.

NIT No: 04/AC/EE/2025

1	Name of work	:	**Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur..**
2	Estimated Cost exclusive of GST	:	Rs. **6,57,36,077/-**
3	Earnest Money Deposit (Rs.)	:	**Rs. 13,14,722/-** (In favour of Director, IIT Kanpur)
4	Duration of contract	:	Six (6) months
5	Last Time & date of submission of bids (Up to)	:	As per CPP portal data (https://eprocure.gov.in/eprocure/app)
6	Opening of bids	:	As per CPP portal data
7	Time allowed for submission of requisite documents by lowest bidder	:	Within One week of opening of financial bids

The bid forms and other details may be downloaded from Central Public Procurement Portal (http://eprocure.gov.in/eprocure/app). Aspiring bidders who have not enrolled / registered in e- procurement should enroll / register themselves before participating through web site http://eprocure.gov.in/eprocure/app. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at "Instructions for online bid submission."

Bidders can access quotation / tender documents on the website (for searching in the NIC site), kindly go to quotation search option and type 'IIT'. Thereafter, click on "GO" button to view all IIT quotations. Select the appropriate quotation / tender and fill them with all relevant information and submit the completed Quotation / Tender document online on the website http://eprocure.gov.in/eprocure/app as per the schedule given in the next page.

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

Applicants are advised to keep visiting the above-mentioned websites from time to time (till the deadline for bid submission) for any updates in respect of the tender documents, if any. Failure to do so shall not absolve the applicant of his liabilities to submit the applications complete in all respect including updates thereof, if any. An incomplete application may be liable for rejection.

Superintending Engineer

2 Information and Instructions for Bidders for E-Tendering

The Executive Engineer on behalf of Board of Governors of Indian Institute ofTechnology Kanpur invites online percentage rate tenders from eligible Air conditioning Contractor, satisfying the eligibility criteria mentioned in the document.

2.1 Schedule

1	Name of organization	:	Indian Institute of Technology Kanpur
2	NIT No:		04/AC/EE/2025
	Location		Indian Institute of Technology Kanpur
3	Tender / Quotation type (open / limited / EOI / auction / single)	:	Open
4	Tender / Quotation category (services / goods /works)	:	Works
5	Type of Contract (work / supply / auction / service / buy / empanelment / sell)	:	Work
6	Form of contract (IITK-7/8)	:	IITK-7
7	Work Category (civil/electrical/AC/fleet management / computer systems)	:	AC
8	Is multi-currency allowed?	:	No
9	Date of publishing / issue / start	:	As per CPPP portal
10	Document download start date	:	As per CPPP portal
11	Document download end date	:	As per CPPP portal
12	Date & time of pre-bid meeting	:	As per CPPP portal
13	Venue of pre-bid meeting	:	As per CPPP portal
14	Last date & time of uploading of bids	:	As per CPPP portal
15	Date & time of opening of Technical bids	:	As per CPPP portal
16	Bid Validity Days	:	90 days after opening of technical bid
17	Earnest Money Deposit (EMD)	:	Rs. 13,14,722/-. Scanned copy of the proof of EMD deposition to be uploaded with the tender. The hardcopy of the EMD receipt shall be submitted in the office of Executive Engineer, IWD IIT Kanpur.

18	Non- Refundable Processing Fee (Inclusive of GST @18%)	NIL
19	No. of Bids / Covers (1 / 2 / 3 / 4)	: 2
20	Address for communication	: Office of Superintending Engineer IWD, Indian Institute of Technology Kanpur, Kanpur, U.P. Pin - 208016, Tel: 0512-259-7059
21	e-mail address	: vktiwari@iitk.ac.in rakeshkv@iitk.ac.in

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.

1. Information and instructions for bidders posted on website shall form part of bid document.
2. The bid document consisting of drawings, specifications, schedule of quantities of items to be executed, schedule of stages for payment as applicable and the set of terms & conditions of the contract to be complied with and other necessary documents can be seen and downloaded free of cost from www.eprocure.gov.in
3. But the bid can only be submitted after deposition of e processing fee and proof of submission of EMD.
4. Those contractors not registered on the website mentioned above, are required to get registered beforehand. Only e-bids shall be accepted in CPPP portal through e-tendering processes.
5. The intending bidder must have valid Class-III digital signature to submit the bid.
6. On opening date, the contractor can login and see the bid opening process. After opening of bids, he will receive the competitor bid sheets.
7. Contractor can upload documents in the form of JPG format and PDF format.

   However, if a tenderer quotes nil rates against each item in item 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.
8. The “Eligibility/technical Bid” shall be opened first on due date and time as per the evaluation scheme. The “Financial Bid” of bidders qualifying the technical bid shall be opened on a later date as to be announced in CPP portal.
9. The bidders are advised to visit the site before submission of bids to have more clarity about the site conditions and availability of space for execution of the work.
10. All modifications/addendums/corrigendum issued regarding this bidding process shall be uploaded on website only.
11. The department reserves the right to reject any or all bids without assigning any reason thereof and may restrict the list of qualified bidders to any number deemed suitable by it,

if too many bids are received satisfying the minimum laid down criteria.

12. The rates for all items of work, shall unless clearly specified otherwise, include cost of all operations and all inputs of labour, material, T&P, wastages, watch and ward, other inputs, all incidental charges, all other taxes (exclusive of GST), cess, duties, levies etc. required for execution of the work.

13. The specialized works shall be in compliance with 3 Star GRIHA rating and as per environmental policies of Institute. Nothing extra shall be payable on this account.

14. If claimed, the enlistment of the contractors should be valid on the last date of submission of bids. In case the last date of submission of bid is extended, the enlistment of contractor should be valid on the original date of submission of bids.

15. The description of the work is as follows: "Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur."

16. The work is estimated to cost Rs. **6,57,36,077/-**. However, this estimate given is mere approximation for guide.

17. Agreement shall be drawn with the successful bidders on prescribed Form No. CPWD7 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.

18. The time allowed for carrying out the entire work will be Six (6) 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 as detailed in special conditions of contract in the bid document.

19. The site for the work will be handed over as per the special terms and conditions of the document.

20. An approved programme of completion submitted by the contractor after award of work based on the milestone given in the tender.

21. The bid document consisting of NIT, the schedule 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 website www.eprocure.gov.infree of cost.

22. 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 bid as notified.

23. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of times (he/she need not re-enter rate of all the items) but before last time and date of submission of bid as notified.

24. Scanned copy of Earnest Money shall be uploaded to the e-Tendering website within period of submission

25. Earnest money can be paid in the form of Treasury Challan or Demand Draft or Pay order or Banker's cheque or Deposit at call receipt or Fixed Deposit Receipt drawn in favor of Director IIT Kanpur along with Bank Guarantee of any Scheduled Bank where applicable.

    A part of earnest money is acceptable in the form of bank guarantee also in such case 50% of earnest money or Rs. 20 lacs, whichever is less, will have to be deposited in shape prescribed

above and balance in shape of Bank Guarantee of any scheduled bank.

26. Copy of documents as specified in the bid shall be scanned and uploaded to the e-tendering website within the period of bid submission.

27. The bid submitted shall be opened at as per the details provided in the CPP portal at IWD office. The date of opening of Financial Bid shall be informed through web site after the opening of financial bid

28. The bid submitted shall become invalid and e- processing fee shall not be refunded if:

    (i) The bidder is found ineligible.

    (ii) The bidder does not upload scanned copies of all the documents stipulated in the bid document.

    (iii) If a tenderer quotes nil rates against each item in item 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.

29. The contractor whose bid is accepted will be required to furnish performance guarantee of 5% of tendered value within the period specified in Schedule F. This guarantee shall be in the form of Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form.

30. 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 contractor shall be suspended for two years and shall not be eligible to bid for IITK tenders from the date of issue of suspension order.

31. The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/ registrations or proof of applying for obtaining licenses, registration with EPFO, ESIC and BOCW Welfare Board including Provident Fund Code No. If applicable and also ensure the compliance of afore said provisions by the sub-contractors, if any engaged by the contractor for the said work and program chart (Time and Progress) within the period specified in Schedule 'F'.

32. Intending Bidders are advised to inspect and examine the sites 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, making proper arrangements to the site for smooth operation, 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. Bidder shall be deemed to have full knowledge of the sites whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed**. The bidder 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 Institute and local conditions and other factors having a bearing on the execution of the work.

33. Intending Bidders are advised to get familiarized with the specifications /rules related (i.e., Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.) to the work as approved by the competent authority and various policies related to C&D waste and other environmental guidelines of the institute pertaining to the. Bidder shall be deemedto have full knowledge of such rules and regulations whether he has read it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. In case of reduction of scope of work or no work is possible to carry out on account of suchissues, no cost shall be payable to them. Submission of a bid by the bidder implies that hehas read this notice and all other documents and has made himself aware of the Institute Regulations and other factors having a bearing on the execution of the work.

34. The competent authority on behalf of the Board of Governors does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without assigning any reason. Bids in which any of the prescribed conditions is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.

35. Canvassing whether directly or indirectly, in connection with bids is strictly prohibited and the bids submitted by the bidders who resort to canvassing will be liable to rejection.

36. The competent authority on behalf of the Board of Governors 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.

37. The contractor shall not be permitted to bid for works in the Office of Infrastructure and Planning / Institute Works Department responsible for award and execution of contracts, in which his near relative is posted as Divisional Accountant or as an officer/ staff in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive) in IWD and Office of Infrastructure and Planning. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and whoare near relatives to any Gazetted officer in the Office of Infrastructure and Planning/ Institute Works Department. Any breach of this condition by the contractor would renderhim liable to be removed from the approved list of contractors of this Department.

38. 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 retirement from Government service, without the prior permission of the Government of India in writing. This contractis liable to be canceled 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.

39. The bids for the work shall remain open for acceptance for a period of Ninety (90) days from the date of opening of bids. If any bidder withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the department, then the Institute shall, without prejudice to any other right or remedy, be at liberty to suspend the bidder for one year.

40. This notice inviting Bid shall form a part of the contract document. The successful bidders/contractor, on acceptance of his bid by the Accepting Authority shall within 7 days from the stipulated date of start of the work, will sign the contract.

41. The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, if any, forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto

42. Standard C.P.W.D. Form 7 or other Standard C.P.W.D. Form as applicable.

43. The bid document will include the following components:

    (a) CPWD-7 and CPWD-6 including Schedule A to F for all the components of the work, Standard General Conditions of Contract for CPWD 2023 as amended/modified up to last date of submission of the bid.

    (b) General / specific conditions, specifications applicable to all components of the work.

44. The eligible bidders shall quote percentage rates after considering all the components of the work.

45. After acceptance of the bid by competent authority, the Superintending Engineer shall issue letter of award on behalf of the Board of Governors to the contractor. After the work is awarded, the contractor will have to enter into one agreement with Superintending Engineer. One such signed set of agreement shall be handed over to Engineer-In-Charge as applicable.

46. Entire work under the scope of bid shall be executed under one agreement.

47. The requirement of technical staff given in various specialized works is as per requirements given in clause 32 of NIT document. The actual deployment of these technical staff will be as per execution of work and direction of the Superintending Engineer, IITK. **In case of non-deployment, a penalty of Rs. 25,000/- per month shall be levied from the** contractor.

48. The bill for the work shall be facilitated by Engineer-in-Charge. The bill must be submitted to the Office of Executive Engineer, IIT Kanpur. Payment shall be based on the milestones as per Schedule F.

49. Payment shall be regulated as under

    (a) 75% of the tendered value on receipt of materials on prorata basis listed in BOQ at site be submitted to claim the payment.

    (b) 15% of the tendered value on installation and connection.

    (c) 10% of the tendered value on testing and commissioning.

    (d) The corresponding deducted security (2.5%) from the total completed cost item wise, shall be retained by IIT Kanpur till the completion of the comprehensive warranty of the major equipment's or it may be released against the Bank Guarantee of same amount for the above said period. However, in addition to the above, during the operation & non-comprehensive maintenance period of the central ac plant, 50% of the Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

50. Running bill and final bill for components shall be facilitated by Engineer-in-Charge to the contractor.

51. Drawings/Data required prior to commencement of electrical/air-conditioning works:-

51.1 The following drawings shall be provided by the Engineer-In-Charge of the work:-

1. Plant room equipment layout, terrace cooling tower layout plan, pumping scheme layout, CPM architecture and chilled water connection drawings showing details of size, type, and mode of installation.

51.2 Following drawings shall be furnished by the contractor for the approval of the Engineer-In-charge after detailed design calculation before execution of the above work.

a. Plant room detailed equipment layout, terrace cooling tower layout plan, pumping scheme layout, CPM architecture, communication SLD drawing and chilled water connection drawings showing details of size, type, and mode of installation.
b. GFC for AC plant showing chilled water pipe header drawing showing details of size, insulation, cladding, type and mode of installation.
c. Detailed GA drawings of Chiller, pumps, PLC, expansion tanks, cooling tower, CPM software specifications with web base energy management software system and architecture. The detailed logic and architecture, integrating the CPM with 2 nos. chillers, primary, secondary and condenser pumps, cooling towers, motorized valves and other field devices for operation of entire AC plant in auto-mode with provision of manual operation and provision for 1 no future chiller.
d. Detailed typical connection drawings of Valves, Y strainers, piping and controls.

52. Completion drawings:

On completion of works and before issuance of completion certificate, the contractor submits completion drawings in the form of four complete set of originals (reproducible) in hardcopy and softcopy.

i) As built GA and schematic layout drawings of the water cooled central AC plant.
ii) Technical literature, test certificates, and operation and maintenance manuals for chillers, pumping system with their pump logic controllers, automatic pressurization system, cooling tower, valves, strainers and CPM system.

53. Works Inspection and Testing of Equipment:

53.1 Prior to dispatch of the Chillers, Pumps, expansion tanks & cooling towers, valves and other equipment's the Institute reserves the right to inspect the same at the manufacturer's works and the contractor shall provide and secure every reasonable access and facility at the manufacturers works for inspection, for witness of all acceptance and routine tests as per relevant Indian/International Standards. Contractor shall give a reasonable notice of about 15 days for the purpose of test, and witness of all major equipment's. The pre-dispatch factory inspection for all major equipment's like chiller's, pumps, cooling tower, expansion tank cum pressurization system & factory manufactured pre-insulated pipe will be through duly constituted committee by the Institute for this inspection. The expenses shall be borne by the Institute and not to be loaded into the contract. The contractor shall only facilitate the inspection at manufacturing

works.

One chiller with VFD will be factory tested at 4 points (100%, 75%, 50% & 25% Load) at constant condenser temperature.

a.) Pre-commissioning test: All routine tests shall be carried out on the electrical & air-conditioning equipment. Protective & measuring devices should be checked for calibration. The checklists and pre-commissioning tests for different equipment's have to be provided by the lowest tenderer at the time of equipment's specification approval.

53.1.1 The work shall be treated as complete when all the components of the work are complete.

53.1.2 It will be obligatory on the part of bidder to sign the contract document for all components before the first payment is released.

53.1.3 In case of reduction in scope of work no claim on account of reduction in value of work, loss of expected profit, consequential overheads etc. shall be entertained.

53.1.4 A team of officers from Indian Institute of Technology Kanpur may visit the office/ site of work of bidders for establishing their credibility and verification of submitted documents

53.1.5 The mentioned work is urgent as requested by client/Institute and to be completed strictly in given time schedule as per special terms and conditions. The contractor has to deploy the labour and supervisory staff in shifts to meet the targeted completion date. The work may be executed in extended shifts or two shifts. The rates quoted by the contractor will be deemed to be inclusive of any extra expenditures on account of this reason. Nothing shall be paid on this account.

53.1.6 The competent authority on behalf of the Board of Governors reserves the right to terminate the contract if,

53.1.7 Any violation of labour law has been observed.

53.1.8 Any of the construction workers engaged in the works under this contract is found also engaged in Service Contracts of the Institute at the same time.

53.1.9 The competent authority on behalf of the Board of Governors reserves the right to disqualify an agency for

53.1.10 Non-compliance of Institute orders

53.1.11 Violation of Institute policies as established by the Competent Authority in the best interests of the Institute.

53.2 Instructions for Online BID Submission

This tender document has been published on the Central Public Procurement Portal (URL: http://eprocure.gov.in/eprocure/app). The bidders are required to submit softcopies of their bids electronically on the CPP portal, using valid Digital Signature Certificates (DSC). The instructions given below are meant to assist the bidders in registering on the CPP portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP portal.

More information useful for submitting online bids on the CPP portal may be obtained at http://eprocure.gov.in/eprocure/app

2.2.1 Registration

1. Bidders are required to enroll on the e-procurement module of the Central Public Procurement portal (URL:http://eprocure.gov.in/eprocure/app) by clicking on the link, "click here to enroll". Enrolment on the CPP portal is free of charge
2. As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for the accounts.
3. Bidders are advised to register their valid e-mail address and mobile number as part of the registration process. These would be used for any communication from the CPPP portal.
4. Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (class 2 or class 3 certificates with signing key usage) issued by any certifying authority recognized by CCA India (e.g. Sify / TCS / nCode/ eMudhra etc.) with their profile.
5. Only one valid DSC should be registered by a bidder. Please note that bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.
6. Bidder then logs in to the site through the secured log-in by entering their user ID Password and the password of the DSC / eToken.

2.2.2 Searching for tender documents

1. There are various search options built in the CPP portal to facilitate bidders to search active tenders by several parameters. These parameters could include tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP portal.
2. Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. The tenders can be moved to the respective "My Tenders" folder. This would enable the CPP portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
3. The bidder should make a note of the unique Tender ID assigned to each other; in case they want to obtain any clarification/help from the Helpdesk.

2.2.3 Preparation of bids

1. Bidder should take into account any corrigendum published on the tender document before submitting their bids.
2. Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bids. Please note the number of covers in which the bid documents have to be submitted. Any deviations from these may lead to rejection of the bids.
3. Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black &white option.
4. To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g., PAN card copy, annual reports, auditor's certificates, etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

2.2.4 Submission of bids

1. Bidder should log into the site well in advance for bid submission so that he / she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible forany delay due to other issues.
2. The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
3. A standard BOQ Format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the white colored [unprotected] cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

   OR

   In some cases, financial bids can be submitted in PDF format as well (in lieu of BOQ).
4. The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
5. All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology. Data storage encryption of sensitive fields is done.

6. The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
7. Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date &time of submission of the bid with all other relevant details.
8. Add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

2.2.5 Assistance to bidders

1. Any queries relating to tender document and the terms and conditions contained therein should be addressed to the tender inviting authority for a tender or the relevant contact person indicated in the tender.
2. Any queries relating to the process of online bid submission or queries relating to CPP portal in general may be directed to the 24 x 7 CPP Portal Help Desk.

2.2.6 General instruction to bidders

1. The tenders will be received online through portal https://eprocure.gov.in/eprocure/app. In the technical bids, the bidders are required to upload all the documents in PDF format.
2. Possession of a valid class II / III Digital Signature Certificate (DSC) in the form of smart card / e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://eprocure.gov.in/eprocure/app. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the websitehttps://eprocure.gov.in/eprocure/appunder the link "Information about DSC".

Tenderers are advised to follow the instructions provided in the "Instructions to the tenderer" for the e-submission of the bids online through the Central Public Procurement Portal for e-procurement athttps://eprocure.gov.in/eprocure/app.

Executive Engineer, IWD
Institute of Technology Kanpur

53.3 List of documents to be scanned and uploaded within the period of bidsubmission

The following mandatory documents to be submitted with online bid submission:

The Online bids (complete in all respect) must be uploaded online in two Envelops as explained here: -

2.3.1 Envelope - 1: Technical Bid

The following mandatory documents to be provided as a single PDF file in the same sequence as listed for evaluation :

1. Scan copy of EMD.
2. GST Registration Certificate or GST Undertaking as per 5.1
3. EPF & ESI Registration
4. Copy of PAN card
5. Affidavit for not being blacklisted/debarred/restrained as per 5.2
6. Performance report of works executed as per 5.3
7. Structure and Organization of the Agency as per 5.4
8. Declaration on Details of the Bidder(s) as per 5.5
9. Details of Similar Nature of Works Completed as per 5.6
10. Declaration about Site Inspection as per 5.7
11. Enlistment Order of the Contractor in appropriate class and category issued by CPWD or others or specialized agencies
12. Tender Certificate as per 5.8
13. Tender Acceptance Letter as per 5.09
14. Letter of Transmittal as per 5.10
15. CPWD- 7 as per 5.11
16. Turnover and Other Financial statement of the Agency as per 5.12
17. Bankers certificate as per 5.13 **Or** Scanned copy of Net Worth Certificate from certified Chartered Accountant as per 5.14.
18. Technical datasheet of 500 TR capacity Water cooled screw Chiller as per 5.15
19. Technical datasheet of Twin Pump Pressurization Unit with Degasser & Air Separator as per 5.16
20. Technical datasheet of Induced Draft Cooling Tower as per 5.17
21. Technical datasheet of Primary Pump as per 5.18
22. Technical Datasheet of Secondary Pump as per 5.19
23. Technical datasheet of Condenser Pump as per 5.20
24. Scanned copy of “A” class Electrical License.

25. Integrity Pact should be signed and scanned copy of the same shall be uploaded along with technical bid. At the time of award of the work the hard copy of the same on a non-judicial Stamp Paper of Rs.100/- shall be submitted which shall be the part of the contract agreement.

The hard copy of earnest money deposit receipt (EMD) shall be submitted in the office of Executive Engineer Elect & AC, Central office IWD IIT Kanpur before the opening of the technical bid on 19.05.2025 till 3:30 PM. In absence of the EMD in hardcopy, the bidder shall be not eligible for opening of their technical bid and shall be rejected.

2.3.2 Envelope - 2: Financial Bid

Price bid should be submitted in BOQ format

3 Eligibility Criteria

3.1 Eligibility criteria for contractors

Contractors who fulfill the following criteria shall be eligible to apply.

Eligible Bidders

Eligible bidders should satisfy the following criteria for an eligible bid:

1. Average annual financial turn over:

   i. Average annual financial turnover of works should be at least 100% of the estimated cost of work put to tender during the last 3 consecutive financial years by the certified Chartered Accountant.

   Audited turnover statements to be furnished as proof of the same duly certified by chartered accountant along with Profit & Loss Statements.

   ii. Bankers Certificate- 40% of the estimated cost put to tender as per 5.14 **Or** Net Worth Certificate from certified Chartered Accountant as per 5.15
   Bankers certificate from a commercial bank or Net-worth certificate:

   Bankers certificate of the amount equal to 40% of the Estimate cost put to tender (ECPT)
   Or
   Net-Worth certificate of minimum 10% of the estimated cost put to tender issued by certified chartered Accountant with UDIN

2. Experience (value of work done shall be within a span of one year):

   Firms/Contractors must have completed satisfactorily
   i) One similar work of 80% value of the estimated cost put to tender
   Or
   ii) Two similar work of 60% value of the estimated cost put to tender
   or
   iii) Three similar work of 40% value of the estimated cost put to tender

   Works completed during last 7 years ending on date 17.05.2025.

   And

   One completed work of similar nature costing not less then the amount equal to 40% of the estimated cost put to tender with Central Government Department / State Government Department / Central Autonomous Body / Central Public Sector Undertakings/State PSU/State

Autonomous Body.

Note: The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to the previous day of last date of submission of tenders.

Definition of similar work: Similar type of work means "Supply, installation, testing & commissioning of water cooled central AC plant with at least 1 no. chiller of minimum capacity 400 TR along with chilled water pumps, condenser pumps, cooling towers, chiller plant manager (Optional) and associated controls in same project of water cooled central AC plant", done with any Central Government Department / Central Autonomous Body / Central Public Sector Undertakings /State Government / Establishment of repute in last 7 years..

3. Technical datasheet: The bidder's proposed equipment's technical parameter/specification shall be matching with the required parameter/specification by IIT Kanpur as per the Technical Datasheet for all major items as specified.
4. Having valid "A" Class Electrical License

5. **The tenderer shall have to furnish an affidavit on non-judicial stamp paper of Rs. 10.00 as under:**

"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 light, then I/We shall be debarred for tendering in IIT Kanpur contracts in future forever. Also, if such a violation comes to light before date start of work, the Superintending Engineer shall be free to forfeit the entire amount of Earnest Money Deposit / Performance Guarantee."

6. **INTEGRITY PACT**

The contractor shall download the Integrity Pact, which is a part of tender document, affix his signature & seal in the presence of a witness and upload the same while submitting the online bids. In absence of duly signed integrity pact the bids shall not be considered for technical evaluation.

7. Eligible bidders must also satisfy the following conditions and ensure submission of all documents mentioned in 2.3

1. Legal: Unregistered Partnership Firm and Joint Venture or Consortium are not eligible.
2. Registration: Bidder should be registered with the Income Tax Department, Employees Provident Fund (EPF) Organization, Employees State Insurance (ESI) Corporation & GST. Bidders are not eligible in absence of these documents.
3. Office: Bidders have to establish its local accessible office registered with local GSTIN at IIT Kanpur to run the awarded work.

4 Bid Evaluation and Award

The following process will be followed for the Technical and Financial Bids Evaluation:

4.1 Technical Bid Evaluation

- Technical bids received complete in all respects covering the entire scope of work, will only be opened
- The technical bid evaluation is done only for bidders who satisfy the minimum criteria by submitting documentary proof supporting eligibility criteria and the bids of agencies who have not submitted these documents are liable to be rejected without notice

4.2 Financial Bid Evaluation

For financial bids, the following points shall be followed:

- After evaluation of Pre-Qualification Documents, a list of short listed agencies will be prepared.
- Thereafter the financial bids of only the qualified and technically acceptable bidders shall be opened at the notified time, date and place in the presence of the qualified bidders or their representatives, if present.
- The bid shall remain valid for Ninety (90) days from date of opening of eligibility bids/Technical bid.

NOTE

The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:

- Amend the scope and value of contract to the bidder.
- Reject any or all the applications without assigning any reason.

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.

5 Various Forms and Formats

5.1 Undertaking regarding obtaining GST registration

Proforma for Undertaking regarding obtaining GST registration Certificate of The State in which work is to be taken up

(Undertaking to be furnished on a 'Non-Judicial' stamp paper worth Rs.100/) (Scanned copy of this notarized undertaking to be uploaded at the time of submission of bid, if required)

If work is awarded to me, I/we shall obtain GST registration Certificate of the State, in which work is to be taken up within one month from the date of receipt of award letter or before release of any payment by IITK, whichever is earlier, failing which I/We shall be responsible for any delay in payments which will be due towards me/us on a/c of the work executed and/or for any action taken by IITK or GST department in this regard.

.....
(Signature of Bidder(s))

Or

.....
(An authorized Officer of the firm with stamp)

.....
(Signature of Notary with seal)

5.2 Affidavit for not being blacklisted/debarred/restrained

Proforma for AFFIDAVIT for not being blacklisted/debarred/restrained
(AFFIDAVIT to be submitted on a 'Non-Judicial' stamp paper worth Rs.100/)
(Scanned copy of this notarized affidavit to be uploaded at the time of submission of bid)

I/we undertake and confirm that our firm/partnership firm has not been blacklisted and/or debarred/restrained by any Central Govt./ State Govt. Agency/ Autonomous body of the Central or State govt./ PSU etc. Further that, if such information comes to the notice of the Institute, then I/we shall be debarred for bidding in the Institute in future forever. Also, if such information comes to the notice of the Institute on any day before date of start of work, the competent authority shall be free to cancel the agreement and to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

.....
(Signature of Bidder(s))

Or

.....
(An authorized Officer of the firm with stamp)

.....
(Signature of Notary with seal)

5.3 Performance report on work executed

Proforma of Performance report on works referred to in Financial Information

(To be printed in Company's Letterhead)

(Scanned copy of the Performance Reports to be uploaded at the time of submission of bid)

1. Name of work/project & location:
2. Agreement no.:
3. Estimated cost:
4. Tendered cost:
5. Date of start:
6. Date of completion:
7. Stipulated date of completion:
8. Actual date of completion:
9. Amount of compensation levied for delayed completion, if any:
10. Amount of reduced rate items, if any:
11. Performance Report:

    (a) Quality of work: Outstanding / Very Good / Good /Poor

    (b) Technical Proficiency: Outstanding / Very Good / Good /Poor

    (c) Resourcefulness: Outstanding / Very Good / Good /Poor

    (d) General Behavior: Outstanding / Very Good / Good /Poor

Date: Signature of Superintending Engineer or Equivalent

5.4 Structure and Organization of the Agency

Proforma of providing Structure and Organization of the Bidding Agency
(To be printed in Company's Letterhead)
(Scanned copy of the Structure and Organization Document to be uploaded at the time of submission of bid)

1. Name & address of the bidder:
2. Telephone no./Telex no./Fax no.:
3. Email address for Communication.:
4. Legal status of the bidder (attach 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:
5. Particulars of registration with various Government Bodies (attach attested photocopy)

   Organization / Place of Registration No.

   1.
   2.
   3.
6. Names and titles of Directors & Officers with designation to be concerned with this work.
7. Designation of individuals authorized to act for the organization
8. Has the bidder, or any constituent partner in case of partnership firm, ever been convicted by the court of law? If so, give details.
9. Any other information considered necessary but not included above.

(Signature of Bidder(s))

5.5 Declaration on Details of the Bidders

Proforma of Declaration on Details of the Bidders

(To be printed in Company's Letterhead)

(Scanned copy of the Performance Reports to be uploaded at the time of submission of bid)

DECLARATION

I/We, ... hereby declare that all the information and data furnished by our organization with regard to this tender specification are true and complete to the best of our knowledge. I/we have gone through the specification, conditions and stipulations in details and agree to comply with the requirements and intent of specification.

Particulars of the bidder as per following details:

1	Name of the firm / organization	:	
2	Type of the firm / organization: Public Ltd. / Private Ltd. / Registered firm	:	
3	Registered address	:	
4	Address of office	:	
5	Contact people	:	
6	Name & Designation	:	
7	Landline & Mobile numbers	:	
8	E-mail IDs	:	
9	PAN No.	:	
10	GST No.	:	
11	EPFO Reg. No.	:	
12	ESIC Reg. No.	:	
13	Copy EMD receipt with signature	:	Yes/ No
14	Has the applicant ever been required to suspend any project for a period of more than six months continuously after Commencement of work?	:	If so, give the name of the project and reasons of suspension of project
15	Has the applicant ever been convicted by a court of law?	:	YES / NO,If yes, give details of the case
16	Details of any litigation in which the applicant is/was involved.	:	
17	All forms submitted as desired in the bid	:	Yes / No

18	Undertaking regarding no subletting of work	:

We further declare that our organization has not been blacklisted /delisted or put to any holiday by any Institutional agency / Govt. Department / Public Sector Undertaking in the last three years.

Date: Signature of Bidder(s) with seal

5.6 Details of Similar Nature of Works Completed

Proforma for submission of Details of Eligible Similar Nature of Works Completed* during the Last Seven Years ending previous day of the last date of submission of tenders

The contractor needs to submit the supporting documents in the following tabular format:

Sl. 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	Name and address/telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10

*Indicate gross amount claimed and amount awarded by the Arbitrator.

Date: Signature(s) of Bidder with seal

5.7 Declaration About Site Inspection

Declaration about Site Inspection

(By Bidder)

To

The Superintending Engineer

Subject: Submission of Tender for the work of "Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.."

Dear Sir/Madam,

It is hereby declared that as per terms and conditions of this tender document, **I**/ We the bidder inspected and examined the subject site and its surrounding and satisfy myself / ourselves as to the nature of the ground and sub-soil (so far as is practicable), the forms and nature of the site./ ourselves before submitting the bid, the accommodation which may require and all necessary information as to risks, contingencies and other circumstances which may influence or affect our bid have been obtained. I/We the bidder shall have full knowledge of the site and no extra charge consequent upon any misunderstanding or otherwise shall be claimed in later date. I /We bidder shall be responsible for arranging and maintaining at 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 me/us implies that I / We have read this notice and all other contract documents and has made myself /ourselves aware of the scope and specifications of the work to be done and local conditions and other factors having a bearing on the execution of the work.

Sincerely

(Duly authorized signatory of the Bidder)

5.8 Certificate for Tender

(To be given on Company Letter Head)

Date: .....

To,
Superintending Engineer
IIT Kanpur-208016

Sub: Certificate of compliance as per Rule 144 (xi) GFR's 2017

Tender Reference No: .....

Name of Tender / Work: .....

1. "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"
2. "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all the requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Yours Faithfully,

(Signature of the Bidder, with Official Seal)

5.9 Tender Acceptance Letter

(To be given on Company Letter Head)

To,
Superintending Engineer
IIT Kanpur-208016

Date: .....

Sub: Acceptance of Terms & Conditions of Tender.

Tender Reference No: .....

Name of Tender / Work: .....

Dear Sir,

5.9.1 I/ We have downloaded / obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s) namely: .....as per your advertisement, given in the above mentioned website(s).

5.9.2 I / We hereby certify that I / we have read the entire terms and conditions of the tender documents from Page No..... to ..... (including all documents like annexure(s), schedule(s), etc .,), which form part of the contract agreement and I / we shall abide hereby by the terms / conditions / clauses contained therein.

5.9.3 The corrigendum(s) issued from time to time by your department/ organisation too have also been taken into consideration, while submitting this acceptance letter.

5.9.4 I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.

5.9.5 I / We do hereby declare that our Firm has not been blacklisted/ debarred/ terminated/ banned by any Govt. Department/Public sector undertaking.

5.9.6 I / We certify that all information furnished by our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then your department/ organization shall without giving any notice or reason therefore or summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.

(Signature of the Bidder, with Official Seal)

5.10 Letter of Transmittal

To

The Superintending Engineer
Indian Institute of Technology Kanpur
Kanpur, UP - 208016

Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur...

Dear Sir/Madam

Having examined details given in Notice and bid document for the above work, I/we hereby submit the relevant information.

5.10.1 I/We hereby certify that all the statements made and information supplied in the enclosed forms and accompanying statement are true and correct.

5.10.2 I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.

5.10.3 I/We also authorize the Executive Engineer, Indian Institute of Technology Kanpur or his representative(s) to approach individuals, employers, firms and corporation to verify our competence, work experience, and general reputation.

5.10.4 I/we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following eligible completed works:

Sl. No.	Name of work	Amount	Certificate issued by
1.			
2.			
3.			
4.			

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/ cancelation of enlistment in case any information furnished by me/us found to be incorrect.

Enclosures:

Date of submission: Signature(s) of Bidder with seal

5.11 CPWD-7

CPWD-7

PERCENTAGE RATE TENDER & CONTRACT FOR WORKS

Tender for the "Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.."

5.11.1 To be uploaded as per details uploaded in CPP portal at www.eprocure.gov

5.11.2 To be opened in the presence of tenderers who may be present at the time of opening inthe office of Executive Engineer, Institute Works Department IIT Kanpur.

5.11.3 The pre-qualification/Technical bid shall be opened first on due date and time as mentionedabove. The time and date of opening of financial bid of contractors qualifying the technical bid shall be communicated to them at a later date.

TENDER

((To be signed in Company's Letterhead)

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, General Conditions of Contract (For construction works) 2023, CPWD SOP 2024 corrected up to the last date of bid submission, CPWD works manual 2024 corrected up to the last date of bid submission and clauses of contract, Special conditions, Schedule of Rate & other documents and Rules referred to in the conditions 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 Board of Governors within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing 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 respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for Ninety (90) days from the due date of its opening and not to make any modification in its terms and conditions.

A sum of Rs. 13,14,722/- is here by forwarded in receipt treasury challan/ Deposit as call receipt of a scheduled bank / Fixed deposit receipt of scheduled bank/ Demand draft of a scheduled bank/ bank guarantee issued by scheduled bank as earnest money deposit. If I/we, fail to furnish the prescribed performance guarantee or fail to commence the work within prescribed period, I/ we agree that the said Board of Governors, IIT Kanpur or his successors in office shall without prejudice to any other right or remedy to be at liberty to forfeit the said earnest money absolutely. Further, if I/we fail of commence the work as specified , I/we agree that Board of Governors , IIT Kanpur or his successor in office 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 the tender documents upon the terms & condition 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, If I/we, withdraws tender or makes any modification in the terms & conditions of the tender which is not acceptable to the department after the last date of submission of bids, then the Institute shall without prejudice to any other right or remedy, be at liberty to forfeit 100% of the earnest money

absolutely irrespective of letter of acceptance for the work is issued or not.
Further, I/we agree that in case of forfeiture of earnest money or both earnest money & performance guarantee as aforesaid, I/we shall be debarred for participation in the retendering 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 Indian Institute of Technology Kanpur in future forever. Also, if such a violation comes to the notice of Indian Institute of Technology Kanpur before date of start of work, the **Superintending Engineer** shall be free to forfeit the entire amount of 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 & integrity of IIT Kanpur

Date: Signature(s) of Contractor(s) with seal

Address:

Occupation:

Yours Faithfully,

5.12 Financial Information

Proforma for providing Financial Information

(Scanned copy of the completed information sheet to be uploaded at the time of submission ofbid)

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

Financial Years	2021-22	2022-23	2023-24
Gross Annual turnover			
Profit/Loss			

.....
Signature of Chartered Accountant with Seal

.....
Signature of the bidders(s)

5.13 **Banker's** Certificate from a scheduled Bank

Proforma of Banker's Certificate from a Scheduled Bank

(To be printed in Bank's Letterhead)
(Scanned copy of the Certificate to be uploaded at the time of submission of bid)

This is to certify that to the best of our knowledge and information that M/s./Sh..... having marginally noted address, a customer of our bank are/is respectable and can be treated as good for any engagement up to 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. Bankers 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.

5.14 Net Worth Certificate by certified Chartered Accountant

Proforma of Net Worth Certificate by certified Chartered Accountant

(To be printed in Letterhead of Chartered Accountant)
(Scanned copy of the Certificate to be uploaded at the time of submission of bid)

This is to certify that as per the audited Balance Sheet and Profit & Loss state- ment of the account during the financial year ....., the net worth of M/s./Sh.....(Name & Registered Address of individual/firm/company) as on 31.3.2024 is Rs. .....(Rupees. .....) 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 31.3.2024.

.....
(Signature of the Chartered Accountant)

.....
(Name of the Chartered Accountant)

.....
(Membership No. of ICAI)

.....
(Date & Seal)

5.15 TECHNICAL DATASHEET

500 TR CAPACITY WATER COOLED SCREW CHILLER

Sr. No.	TECHNICAL PARTICULARS	REQUIRED	AS PER TENDERER
01	(i) Chiller (i) Type (ii) Make	i) Water Cooled Screw with Semi-Hermetic, Mono/Twin Compressor, Factory fitted Chiller with Micro-processor based Controller and VFD ii) As per approved make list	
02	Compressor	Screw	
03	Minimum capacity of chiller at duty condition	Minimum 500 TR	
04	Operating Voltage	415V +/- 10%, 3 phase, 50Hz	
05	Refrigerant	R-134a/HFO (Hydrofluoro-olefin) Based Refrigerant	
06	Efficiency	Chiller should be either 4 or higher star labeled as per latest BEE standard	
07	CHILLED WATER CIRCULATION RATE	1200 USGPM	
08	DUTY:- CONTINUOUS	(24 HRS/DAY) (APPROXIMATE)	
09	Maximum noise level at a distance of 1 meter	84dBA	
CONDENSER			
01	Type	ASME-U Stamped condenser	
02	No of Passes	02 (both inlet & out let shall be from same side)	
03	Flow	1500 USGPM	
04	Pressure Drop	Max. 25 FT OF WATER	
05	Fouling factor	0.001 (British Unit)	
06	In let water temp	90 Deg F	
07	Out let water temp	< 100 Deg F	
EVAPORATOR			
01	Type	ASME-U Stamped Evaporator	
02	No of Passes	02 (both inlet & out let shall be from same side)	
03	Flow	1200 GPM	
04	Pressure Drop	Max. 20 FT OF WATER	
05	Fouling factor	0.0005 (British Unit)	

06	In let water temp	54 Deg F	
07	Out let water temp (at full load)	44 Deg F or below	
COMPRESSOR WITH VARIABLE FREQUENCY DRIVE			
01	Type	Squirrel cage Induction Motor With factory fitted VFD	
02	Make	Chiller OEM Make	
03	Voltage	415V +/- 10%, 3 phase, 50Hz	
04	Lubrication	Forced feed	
05	Full refrigerant charge quantity	In Kg	

5.16 TWIN PUMP PRESSURIZATION UNIT WITH BUILT IN DEGASSER AND AIR SEPARATOR

Sr.N	TECHNICAL PARTICULARS	REQUIRED	AS PER TENDERER
1	Twin Pump Control Unit Make/Model	As per approved make list	
i)	Permissible operating over pressure	10 bar	
ii)	set pressure expansion vessel	5 bar	
iii)	Permissible op. temp. range	> 0 deg c to 70 deg c	
iv)	Max Operating Temp	105 Deg C	
v)	Noise Level	< 55 dB	
vi)	Power Supply	As per OEM	
vii)	Degree of Protection	IP 54	
viii)	Communication	RS 485	
2	Unpressurized Tank Capacity	2000 liters	
i)	Tank Material	Heavy Duty Steel tank with external anti corrosion painting	
ii)	Bladder Material	Replaceable Butyl Bladder as per DIN EN 13831	
iii)	Design Pressure	Min 6 bar	
3	Built in Degasser & Air Separator	Yes	
4	Voltage	230 V/ 50 Hz	
5	Permanent Display of system pressure and tank volume level	Yes	
6	Water make-up connection	As per OEM	

7	Pump/overflow valve connection	As per OEM	
8	Max. System Temperature	120 C	
9	Max. Operating Temperature	70 C	
10	Control Unit Connection	As per OEM	
11	Basic Vessel diaphragm Material	Butyl/As per OEM	
12	Basic Vessel Connection	As per OEM	
13	Connection set	Included	
14	Water Make up - Fillset	Included	
15	Pressure Accumulating Vessel	Included, Capacity as per	
16	Lock Shield Valve	Included	
17	BMS Compatibility	Yes	

5.17 INDUCED DRAFT COUNTER FLOW COOLING TOWER

Sr. No.	TECHNICAL PARTICULARS	REQUIRED	AS PER TENDERER
1	**Make**	As per approved make list	
2	Total Cooling Capacity Required	650TR	
4	Water Flow Rate	1500 USGPM	
5	Water Inlet Temperature	100 F (37.7 C)	
6	Water Outlet Temperature	90 F (32.2 C)	
7	No. of Cells	2	
8	Type of Fill	PVC/ As per OEM	
9	Fan & Motor drive	Direct/Belt drive	
10	Motor Type	IE3 or Above	
11	Motor Capacity	As per OEM	
12	Motor RPM	Max. 1450	
14	Fan blade Material	FRP	
15	Noise level	85 dB	

5.18 PRIMARY PUMPS

Sr.No.	TECHNICAL PARTICULARS	REQUIRED	AS PER TENDERER
1	**Type**	**Horizontal End Suction, Centrifugal single stage**	
2	**Make**	As per approved make list	
3	Temperature of operation	5-60 Celsius	
4	Pressure Rating	PN16	
5	Flow rate	1200 GPM	
6	Head	15M	
7	Over pump Efficiency	>75%	
8	Impeller material	Bronze	
9	Shaft Material	Stainless Steel	
10	Seal type	Mechanical	
11	Motor type	3 Phase, factory fitted	
12	IP protection	55	
13	Motor efficiency	IE3	
14	Motor Capacity	18.5 KW	

5.19 Secondary PUMPS

Sr.No.	TECHNICAL PARTICULARS	REQUIRED	AS PER TENDERER
1	**Type**	**Horizontal End Suction, Centrifugal single stage**	
2	**No. of pumps**	**3 (2W+1SB)**	
2	**Make**	As per approved make list	
3	Temperature of operation	5-60 Celsius	
4	Pressure Rating	PN16	
5	Flow rate (Each Pump)	1200 GPM	
6	Head (Each Pump)	25 M	
7	Efficiency (Each Pump)	>75%	
8	Impeller material	Bronze	
9	Shaft Material	Stainless Steel	
10	Seal type	Mechanical	
11	Motor type	3 Phase, factory fitted	
12	IP protection	55	
13	Motor efficiency	IE3	
14	Motor Capacity	30KW, 4P	
15	**Motor Drive**		
i.	Motor Drive	VFD	
ii.	Mounting	Motor/Standalone mounted	
iii.	Capacity	As per motor capacity	
16	**Pump logic controller (PLC)**		
a	**Make**	OEM	
b	**Operation**	a)Microprocessor base, Parallel Pumping system (2W+1SB) b) Programmable display	
c	**BMS Compatible**	Yes	

5.20 Condenser Pump

Sr.No.	TECHNICAL PARTICULARS	REQUIRED	AS PER TENDERER
1	**Type**	**Horizontal End Suction, Centrifugal single stage**	
2	**Make**	As per approved make list	
3	Temperature of operation	5-60 Celsius	
4	Pressure Rating	PN16	
5	Flow rate	1500 GPM	
6	Head	22M	
7	Over pump Efficiency	>75%	
8	Impeller material	Bronze	
9	Shaft Material	Stainless Steel	
10	Seal type	Mechanical	
11	Motor type	3 Phase, factory fitted	
12	IP protection	55	
13	Motor efficiency	IE3	
14	Motor Capacity	30 KW	

6 Proforma of Schedules

PROFORMA OF SCHEDULES
(Tender)

6.1 SCHEDULE 'A': Schedule of Quantities

Schedule of Quantities : BOQ uploaded separately

6.2 SCHEDULE 'B': Schedule of materials to be issued to the contractor

Schedule of materials to be issued to the contractor: NIL

6.3 SCHEDULE 'C': Tools and plants to be hired to the contractor

Tools and plants to be hired to the contractor: NIL

6.4 SCHEDULE 'D': Extra schedule for specific requirements/document for the work, if any

Extra schedule for specific requirements/document for the work, if any: NIL

6.5 SCHEDULE 'E': Reference to General Conditions of Contract

Reference to General Conditions of Contract	:	General Conditions of Contract 2023 for Construction Works & Maintenance work and as amended / modified up to the last date of submission of Bid.
Name of Work	:	"Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur..
Total Estimated cost of work	:	Rs. 6,57,36,077/-
Earnest Money	:	EMD Rs. 13,14,722/-
Performance Guarantee	:	5% of tendered value
Security Deposit	:	2.5% of tendered value will be deducted from bill. Same would be released after successful completion of Two year defect liability period and as mentioned in special conditions of the contract.

6.6 SCHEDULE 'F': General Rules and Directions

GENERAL RULES & DIRECTIONS:

Officer Inviting tender: Superintending Engineer, IWD

6.6.1 Definitions

1 Inviting Authority	:	Superintending Engineer, IWD
2(v) Engineer-in-Charge	:	Executive Engineer
2(viii) Accepting Authority	:	SE/DOIP/DD
2(x) Percentage on cost of materials and Labour to cover all overheads and profits	:	15%
2(xi) Standard Schedule of Rates	:	DSR E & M, 2023 & MR with correction slips up to the last date of Bid
2(xii) Department	:	Institute Works Department, IITKanpur
9(ii) Standard CPWD Contract Form	:	General Conditions of Contract 2023, SOPs 2024, CPWD Form 7 as amended / modified up to the last date of submission of Bid.

6.6.2 Clauses

Clause 1		
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 or proof of applying thereof from the date of issue of the letter of acceptance	:	7 days
ii. Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the Period provided in (i) above	:	7 days
Clause 1A	:	Applicable. The Defect liabilityperiod shall be Two year from the date of handing over of the assigned works to the user/Institute
Clause 2 Authority for fixing compensation under Clause 2	:	Superintending Engineer, IIT Kanpur
Clause 2A Whether Clause 2A shall be applicable	:	YES

Clause 5	:	
(i): Number of days from the date of issue of letter of acceptance for reckoning date of start	:	15 Days
ii: Milestones	:	Time allowed for execution of work alongwith the amount to be withheld in case of non-achievement of milestone are shown in Tables 6
Clause 6: Computerized Measurement Bill	:	*Applicable*
Clause 7	:	Applicable
Clause 10A	:	Applicable
Clause 10B (ii)	:	Not Applicable
Clause 10B (iii)	:	Not Applicable
Clause 10C	:	Not Applicable
Clause 10CA	:	Not Applicable
Clause 10CC	:	Not applicable
Clause 11	:	CPWD Specifications of all items(CPWD specification vol.1 and vol.2, 2019), with correction Slips issued up to the last date of receipt of tenders and as per NIT for the Works.
Clause 12: Type of work	:	Original Work
Clause 12.2 & 12.3: Deviation limit beyond which clause 12.2 & 12.3 shall apply for Building work	:	NA
Clause 16 Competent Authority for deciding reduced rates: For Civil items and For Electrical items of work	:	As per Table 7
Clause 17 - Defect liability period completion of contract whichever is later	:	Two year and those listed in Special Conditions of Contract
Clause 18 - List of mandatory machinery, tools & plants to be deployed by the contractor at site	:	As per the scope of the work
Clause 32 - Requirement of Technical Representative(s)	:	As per Table 9

If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited.

Table 6: Major milestones of the project

Sl. No.	**Description of mile stone**	**Period for completion from date of start**	**Withheld amount for non achievement of mile stone.**
1	AC plant Layouts , SLD and other shop/GFC drawings submission by contractor	1 months	1 % of the accepted tendered value
2	Technical data sheet submission of equipment's i.e. Chiller, Pumps, cooling Tower, CPM, Expansion Tank, pipe etc.		
3	Submission of Piping, cable schedule by contractor		
4	Chilled water pipe delivery	3 months	0.5 % of the accepted tendered value
5	Chilled water piping laying completion		
6	Delivery of Chiller, Pumps, cooling tower etc	4 months	1 % of the accepted tendered value
7	Installation and Commissioning of Chillers, pumps and cooling tower and AC plant	6 months	0.5 % of the accepted tendered value

The detailed program chart approved by the engineer-in-charge shall indicate how the resources will be deployed by the contractor to maintain desired progress and for the completion of the work within the specified period. If the submitted program is approved, the milestone shall be redefined accordingly by the Superintending Engineer, IWD Indian Institute of Technology Kanpur. The amount to be withheld in such a case, for non-achievement of milestone(s), shall remain unaltered i.e., 1% of tendered amount.

Time allowed for execution of work: Six (6) months

Table 7: Authority to decide

(i)	Extension of time (EOT)	:	SE, IIT Kanpur
(ii)	Rescheduling of milestones	:	Superintending Engineer, IWD, IIT Kanpur
(iii)	Shifting of date of start in case of delay in handing over of site	:	Superintending Engineer, IWD, IIT Kanpur

Table 8: Materials for which all India Wholesale Price Index to be followed

Sl.No	Material covered under this clause	Nearest Materials (other than cement, reinforcement bars and the structural steel) for which All India Wholesale Price Index to be followed	Base Price (without GST) of Materials, covered under clause 10 CA
1	Portland Pozzolana Cement (PPC)/ Ordinary Pozzolana Cement	Nil	Nil
2	Steel for Reinforcement TMT Fe 500D Primary	Nil	
3	Manufacturer Structural Steel (Primary producers)	Nil	Nil

Table 9: Requirement of Technical staff as per Clause 32

Table 9: Requirement of Technical staff, Clause 32						
Sl No.	**Requirement of Technical staff *Qualification* (Of Major + Minor component)**	***Number***	**Minimum experience in Year**	**Minimum experience in Year**	**Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of Clause 32**	
					Figures	**Words**
1	Graduate Engineer/Diploma Engineer (ElectricalMechanical)	1	10/20	Project Manager	Rs. 60000/- PM	Rs. Sixty Thousand Only.
2	Diploma Engineer (Electrical/Mechanical)	2	5 & 10	Project Planning/ quality/ billing Engineer (Electrical/Mechanical)	Rs. 15,000/- pm per month per person	Rs. Fifteen Thousand only per month per person

Note: Project/Site Engineer for Electrical/AC work mentioned must be required from the beginning of the work to meet the date of handover of site as per special terms and conditions.The details of the appointed site engineers have to be verified and approved by Engineer-in- Charge.

7 Scope of work

7.1 Brief of the works

Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.. In BOQ.

Note: The scope of the works listed above is indicative only. For the details of the works, please refer to the BoQ and the work has to be done strictly as per thespecifications in the BoQ.

7.2 Materials Verification

The contractor shall inform the Engineer in charge in advance, for verifying the measurement of the concealed items like pipes, pipes laying, cable laying etc., done by the contractor on the very day of the above said events.

7.3 TECHNICAL SPECIFICATION

Section 1: Chillers with CPM
Section 2: Pumps
Section 3: Cooling Tower
Section 4: Expansion Tank System
Section 5: Dirt Separator
Section 6: Piping
Section 7: Insulation
Section 8: Valves, strainers & Associated Controls
Section 9: Electrical Works
Section 10: Inspection, testing & commissioning

Section-1. Chiller with CPM Specification:

1 Type - Shell and tube type water cooled screw chillers, Flooded type with ASME- U Stamped Shell and Tube, Unit mounted VFD

a) Rating

- The Chiller shall have minimum capacity of 500 TR with mono/ twin screw compressors at duty condition of chilled water inlet at 12.2 Deg.C, Outlet at 6.6 Deg.C, Condenser water inlet at 32 Deg.C and out let at 37 Deg.C. & compressor motor suitable for 415 +/- 10% volts, 50 +/- 5% cycle. The fouling factor for evaporator shall be 0.0005 (British Unit) & for condenser 0.001 (British Unit) as specified in the tender specifications.

b) Refrigerant R-134A (Environment friendly refrigerant with CFC free)

c) Material and Construction

- The water chiller shall be horizontal, shell and tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.
- The chiller shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg./sq.cm. gauge.
- The end plates of chiller shall be made of MS of thickness not less than 25mm.
- The shell of the chiller shall be made of MS of thickness not less than 8mm with electric fusion welded seams.
- The tubes shall be of seamless, hard drawn copper with a minimum tube wall thickness of 0.71 mm for plain tubes & minimum 0.63mm at the root of fins.

- The tubes shall be rolled into grooves in the tube sheets and flared at ends.

- Intermediate tube supports of steel or polypropylene shall be provided at spacing not less than 1250 mm for flooded type chiller to prevent sagging / vibration of tubes.

- The flooded chillers shall have water boxes designed for multi pass flow. The DX type chillers shall be provided with adequate number of properly spaced baffles so that the water passes through the tube bundle many times.

- The chiller shall be smooth finished with one coat of zinc chromate primer before the insulation is applied.

- The chiller shall be sand blasted from both inside (before insertion of tubes) & outside.

d) Motor starter

i) For variable speed compressor

a) In Case of VSD starter, it will vary the compressor motor speed by controlling the frequency and voltage of the electrical power to the motor. The adaptive capacity control logic shall automatically adjust motor speed and compressor pre-rotation vane position independently for maximum part-load efficiency by analyzing information fed to it by sensors located throughout the chiller

b) Make of VSD shall be exactly same as per OEM/approved make list. The variable speed drive shall be with all power and control wiring between the drive and chiller factory installed and unit mounted, including power to the chiller oil pump. The VFD of chiller will be unit mounted. It should be factory fitted. The chiller and its VFD should be integrated at the chiller OEMs factory, and the VFD coupled chillers performance demonstrated at 4 points (100%, 75%, 50% & 25% of load) prior to dispatch of the chillers and shall be verified during inspection at the factory end.

c) Field power wiring shall be a single point connection and electrical lugs for incoming power wiring will be provided.

ii) The following features will be provided:

(a) Door interlocked circuit breaker capable of being padlocked.

(b) UL listed ground fault protection.

(c) Over voltage and under voltage protection.

(d) 3-phase sensing motor over current protection.

Sensing thermostat in each room. It shall sense room temperature and vary the supply

e) For Flooded Type Chiller The flooded type chiller shall be provided with the following connections and accessories and conforming to section ―Refrigeration Piping where applicable:

a) Refrigeration inlet and outlet connections.

b) Liquid refrigerant float for level control/ expansion valve/ fixed or variable orifice.

c) Pressure relief device.

d) Charging connection with valve.

e) Eliminator plate.

f) Drain and vent connections with valves

g) Water inlet and outlet connections

h) Proper oil return system.

i) Flow switch/pressure switch/differential flow switch/ flow sensor in the water line

Pressure Testing

a) The chiller shall be tested in the works to 1.5 times the maximum working pressure for the refrigerant specified in the tender specifications, or 21 kg./sq.cm. (Pneumatic) (for high pressure refrigerant) & 45 PSIG (3.16kg/Cm2) (Pneumatic) (for low pressure refrigerant) chiller's, whichever is higher.

b) The water side of the chiller shall also be tested to a hydraulic pressure of 10 kg./sq.cm. at the works.

c) Pressure test certificates shall be produced in respect of each chiller.

Insulation

The evaporator, expansion valve and compressor shall be insulated with minimum

25 mm thick closed cell nitrile insulation as per specification as section 7.

Equipment Class	Maximum IkW/TR at ARI conditions	Minimum COP * at ARI conditions	Minim - um IPLV	Test Standard
Air Cooled Chiller <530 kW (<150tons)	1.21	2.9	3.16	ARI 550/590-1998
Air Cooled Chiller ≥530 kW (≥150 tons)	1.15	3.05	3.32	ARI 550/590-1998
Centrifugal Water Cooled Chiller <530 kW (<150tons)	0.61	5.8	6.09	ARI 550/590-1998
Centrifugal Water Cooled Chiller ≥530 kW and <1050 kW (≥ 150 tons and <300 tons)	0.61	5.8	6.17	ARI 550/590-1998
Centrifugal Water Cooled Chiller ≥1050 kW (≥300 tons)	0.56	6.3	6.61	ARI 550/590-1998
Reciprocating Compressor, Water Cooled Chiller all sizes	0.84	4.2	5.05	ARI 550/590-1998
Rotary Screw and Scroll Compressor, Water cooled chiller <530 kW (<150 tons)	0.75	4.7	5.49	ARI 550/590-1998
Rotary Screw and Scroll Compressor, Water cooled chiller ≥530 kW and <1050 kW (≥ 150 tons and <300 tons)	0.65	5.4	6.17	ARI 550/590-1998
Rotary, Screw and Scroll Compressor, Water cooled chiller ≥1050 kW (≥300 tons)	**0.61**	**5.75**	**6.43**	**ARI 550/590-1998**

f) **Chiller Plant Manager:** Chiller Plant Manager shall be provided in the plant room for Chilling Unit (s), Chilled Water Pumps /Primary Chilled Water Pumps, secondary chilled water pumps, Condenser Water Pumps and Cooling Towers. The Chiller Plant Optimizer shall be of the same manufacturer/ OEM as that of the Chilling Unit.

g) REFRIGERANT PLUMBING Design aspects of Refrigerant Plumbing

i) Refrigerant piping shall be designed and installed so as to:

a) ensure circulation of adequate refrigerant at all loads.

b) ensure oil return to crank case of compressor positively and continuously.

c) keep pressure losses within limits, especially in suction lines.

h) The MICROPROCESSOR CONTROLLER: Each chilling unit shall be complete with a microprocessor based interactive control console in a locked enclosure factory mounted (directly on the unit), prewired with all operating and safety controls and tested. It will provide start, stop, safety, interlock, capacity control and indications for operation of the chiller units through a alphanumeric / graphical display. Controls shall provide to view and change digital programmable essential set points, cause of shutdown and type of restart required. a)Leaving chilled water temperature, b)Percent current limit.c)Remote reset temperature range. All safety and cycling shutdowns shall be enunciated through the alphanumeric/ graphical display and consist of day, time, cause of shutdown and type of restart required. Cycling shutdown shall include low leaving chilled water temperature, chiller/ condenser water flow interruption, power fault, internal time clock and anti-recycle. Safety shutdowns shall include low oil pressure, high compressor discharge temperature, low evaporator pressure, motor controller fault and sensor malfunction.

The default display screen shall indicate the following minimum information

i) date and time

ii) return and leaving chilled water temperatures

iii) return and leaving condenser water temperatures

iv) differential oil pressure

v) percent motor rated current

vi) evaporator & condenser refrigerant saturation temperatures

vii) chiller operating hours (hour run) and

viii) number of compressor starts

ix) oil sump temperature (not required for reciprocating compressor)

x) status message

Security access shall be provided to prevent unauthorized change of set points, to allow local or remote control of the chiller and to allow manual operation of the peroration. The chiller shall be provided with ports compatible with open protocol building management system offered, to output all system operating information, shutdown/ cycling message and a record of last four cycling or safety shutdowns to a remote printer (option). The control centre shall be programmable to provide data logs to the printer at a set time interval. Control centre shall be able to interface with an automatic controls system to provide remote chiller start/ stop; reset of chilled water temperature, reset of current limit, and status messages indicating chiller is ready to start, chiller is operating, chiller is

shut down on a safety requiring reset and chiller is shut down on a recycling safety.

The microprocessor control system shall include the interlocking of compressor motor with chilled and condenser water flows, guide vane position of compressor in case of centrifugal units and lubricating oil pump pressure. On initiation of start, the microprocessor control system shall check all pre-start safeties to verify that all prestart safeties are within limits. (If one is not, an indication of the fault will be displayed and the start aborted).

i) INSTALLATION: The complete chilling unit shall be installed over a RCC foundation and shall be adequately isolated against transmission of vibrations to the building structure. Special attention shall be paid to the alignment of the driving and driven shaft. Final alignment shall be checked at site in presence of the Engineer-in-charge using a dial indicator. Necessary foundation bolts, nuts, leveling screws etc wherever required for mounting the unit shall be provided by the contractor.

PAINTING: The equipment shall be supplied as per manufacturer‘s standard finish painting

Section 2- Pumps

1 TYPE: Horizontal end suction, centrifugal single stage top discharged type

The pumps shall be horizontal end suction, centrifugal single stage top discharged type, mechanical seal, direct driven with a 3 phase, 415 + 10%volts, 50 Hz., A.C. motor. The motor shall be fan cooled or TEFC type. The efficiency class of motors shall be IE 3 class as per IS 12615, operating speed not exceeding 1500 rpm, Efficiency of the pumps at selection should be 75 % or above.

2

RATING

The pumps shall be suitable for continuous operation in the system. The head and discharge requirements shall be as specified in the BOQ. The discharge rating shall not be less than the flow rate requirement of the respective equipments through which the water is pumped. The head shall be suitable for the system and shall take into consideration the pressure drops across the various equipments and components in the water circuit as well as the frictional losses.

3. **Features of Construction:**

Pump Casing:

Pump spiral volute casing shall be of in-line design robust construction with integrally-cast base at bottom in order to transmit pipe load to the base and foundation (Small pumps can be without base). Liquid passages in the casing shall be smooth finish to ensure high Efficiency. Pump casing shall capable of withstanding 1.5 times the design pressure.

Pump casing shall be EN-GJL-250/HI/ISO STANDARD Grey Cast Iron and capable of withstanding to the maximum pressure developed by the pump. Flange dimensions are in accordance with EN 1092-2 or ISO 7005-2. Pump casing shall be fitted with bronze wear ring.

- **Impeller:**

The impeller shall be cast bronze enclosed type with smooth surface finish for minimum frictional loss. This ensures high Efficiency. Impeller shall be keyed to the shaft and secured by impeller lock nut.All impellers are dynamically balanced to ISO 1940-1: Grade G6.3. The thrust balancing can be of balancing holes or back vanes.

The direction of rotation of the impeller is clockwise when viewed from the drive end.

- **Shaft:**

Pump shaft shall be Austenitic stainless steels according to EN 1.4301 / AISI 304 stub shaft and the same shall be, ground and polished to final dimensions and be adequately sized to with stand all stresses, hydraulic loads, vibrations and torques coming in during operation.

Shaft run-out shall be limited at the seal face and at the impeller to 0.05 mm.

Shaft shall be provided with Mechanical seal as default fitment to provide leak free operation.

- **Wear Rings:**

A renewable type bronze wearing ring shall be provided in the pump casing to maintain close running clearance and to minimize leakage and recirculation losses and to ensure high pump efficiency.

- **Mechanical Seals:**

The stuffing box cavity shall be sealed off at the pump shaft by an internally or externally-flushed mechanical seal with carbon / Silicon carbide face material, suitable for continuous operation up to 121 Deg C.

- **Bearings:**

As radial and axial forces are absorbed by the fixed bearing in the motor drive-end, the pump requires no bearing.

Bearing shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

- **Coupling:**

The pump coupling should be of close-coupled type with stub shaft. And in case of Split coupled, it should be Long coupled.

- **Motors:**

Motor shall be a flange mounted, totally enclosed fan-cooled motors with main dimensions

according to IEC standards. Electrical tolerances are to IEC 60034. Motor shall be high-efficient type.

Motor shall be to with IP 55 enclosure. The class of insulation shall be F with temperature rise limited to Class B.

Motor shall be suitable for operation on a 415 V (± 10% variation), 50Hz ± 5%, 3phase, or 240V-1phase AC supply. Motor shall be suitable for both DOL and / or STAR/DELTA starting Pump and motor shall be factory aligned and shall be realigned by the contractor as per factory recommendations after installation.

- **Name plates:**

Each pump shall be provided with a name plate indicating the following details:

1. Pump type designation
2. Pump Model
3. Rated flow
4. Rated head
5. Pressure rating/max temperature
6. Rated speed

- **Working pressure:**

Maximum allowable working pressure (MAWP) for all the pressure containing parts shall in no case be less than the maximum discharge pressure produced by the pump at shut off (including tolerances), at the max suction pressure, for the maximum impeller diameter and the maximum continuous speed.

Pump shall be rated for minimum of 10 bar working pressure.

- **Vibration:**

The pump(s) vibration limits shall conform to Hydraulic Institute ANSI/HI 1.1-1.5-1994; section 1.4.6.1.1 or ISO 10816 for recommend acceptable unfiltered field vibration limits (as measured per HI 1.4.6.5.2) for pumps with rolling contact bearings.

- **Sound Level:**

Sound pressure level of the pump driver shall be max 78 dbA* measured at 1.8m distance from pump for the duty points.

(* Note: Based on the motor kW and speed according to ISO 3743)

- **Painting:**

The equipment shall be thoroughly cleaned and greased. All rust sharp edges and scales shall be removed. All external and exposed cast iron parts of pumps have an epoxy- based coating made in a cathodic electro-deposition (CED) process which is high-quality dip-painting process and which would prevent rusting and corrosion. The colour code for the finished product is NCS 9000/RAL 9005.
The pump shaft shall not be painted.

4. **PUMP & MOTOR SELECTION:**

The pump(s) selected shall for Preferred Operating Region (POR) unless otherwise approved by the engineer.
The pumps shall be factory manufactured, assembled and hydrostatically tested as per Hydraulic Institute standards in an ISO 9001 approved facility.

Motor should be of variable frequency drive compatible.

Motor should be selected as non-over-loading type.
Note: The motor nameplate rating for pumps under parallel operation shall not be less than the max BKW indicated on the pump data sheet (the power at the END of the curve for the rated impeller) or shall have the specified margin as per this clause whichever is greater. The pump motors shall also be suitable for Start-up under open discharge valve condition.

5. **Inspection & Testing of Various Items:**

Before effecting delivery of the equipment, following inspections and tests as per relevant
ISO/IS/HI standards shall be carried out.
For Pumps:
1. Hydrostatic Testing
2. Performance Test (Single point / Duty point or 5 point / 7 point)
3. Dynamic balancing for pump impeller.

6. **Tender Drawings:**

The following drawings shall be submitted by the Contractor / Vendor along with their Bids.
1. Preliminary outline dimensional drawing of pump and motor (Suction and discharge connections and foundation details shall also be indicated).
2. Performance curves (capacity Vs total head, efficiency, NPSH and KW requirement) ranging from zero to maximum capacity.
3. Technical Data sheet for Pumps

7. VARIABLE SPEED PUMPING SYSTEM-(FOR SECONDARY PUMP)

1. General

1.1 Variable Speed Pumping System

a. Individual system components
b. Pump logic control panel
c. Variable frequency drive (VFD)
d. Differential pressure transmitters (DPT)
e. Method of operation

1.2 Submittals shall consist of the following

a. Pump data sheets
b. System summary sheet
c. General arrangement drawing of the control panel indicating dimensions, required clearances and location of the field connection Submittals must be project specific. General submittals will not be accepted.

1.3 Vendor prerequisites:

a) A system integrator/representative/agent not actively engaged in the design and manufacturing of centrifugal pumps shall not be considered as the pump manufacturer. The pump manufacturer shall assume "Unit Responsibility" for the complete VSPS. Unit responsibility is defined as the responsibility to interface and commission all system components supplied to meet tender requirement

b) The pump manufacturer shall have a minimum of 20 year's experience in the design and construction of Variable Speed Pumping Systems (VSPS)
c) The pump manufacturer who is the supplier of VSPS system must have relevant expertise in all aspects of pre-sales activities like system design, application
engineers and post sales activities like installation, commissioning and after sales service. VSPS supplier must have commissioned minimum 200 such projects of
Secondary chilled water VSPS in India
d) The manufacturer should have ISO (International Standards Organization) per ISO 9001:2000. Proof of this certification shall be furnished during the time of submittal
e) Bidders shall comply with all sections of this specification relating to variable speed pumping system. Any deviation from this specification shall be mentioned clearly in writing. If no deviations for the specifications are noted, it is construed that the supplier shall bound by these specifications.

8.Pump Logic Controller Package

a) *Approved Manufacturers*

The manufacturers shall be acceptable as per Approved Make list.

b) *Components of Pump Logic Control Panel*

a) To supply and install Multi Pump Controller as per the design
b) The control system should include the Pump logic controller, Variable frequency drive(s) and Differential pressure transmitters as indicated in the design
c) Pump logic control panel should house dedicated Multi Pump Controller, Variable frequency drive(s) and associated switchgears
d) Pump logic controller, Variable frequency drive(s), Differential pressure transmitters and related equipment shall be installed by the mechanical contractor as shown in the design
e) Input power wiring to the pump logic control panel and the output wiring to the motors shall be the scope of electrical contractor and to be done as indicated in the electrical drawings submitted for the specific project
f) Low voltage wiring for the Building Management System to be done by the BMS contractor from the pump logic control panel to the IBMS system

c) *Specifications Pump Logic Controller*

a) Multi Pump Controller shall be listed by and bear the label of Underwriter's Laboratory Inc (UL). The controller shall be specifically designed for variable speed pumping applications

b) Pump logic controller in built in Variable frequency drives are not accepted.

Logic controller should be external to the drives used in the system

c) Multi Pump Controller shall have programs to safeguard the system against the following conditions Pump flow surges, System Hunting, End of curve protection

m) Multi Pump Controller shall have an installation wizard to enable the user to configure the system with minimum assistance

n) Multi Pump Controller shall have minimum 2 level password protection to safeguard the settings against unwanted / unauthorized changes

o) Display should have menu driven function for the operation easiness

p) Multi Pump Controller shall be capable of performing the following pressure boosting function:

Low suction pressure cut out to protect the pumps against operating with insufficient suction pressure

High system pressure cutout to protect the piping system against high-pressure conditions

q) The following communication features shall be provided to the BMS Remote start/stop of the VSPS through potential free contact from BMS Individual pump start/stop/trip status from VSPS through potential free contact to BMS

r) The following communication features shall be provided to BMS system via

RS-485 port utilizing Modbus protocol

Individual analog input

Individual pump/VFD on/off status

System percent reference

System start/stop command

System operating mode

Individual pump kW consumption

Individual pump operating hours

Individual pump running speed in Hz/percentage reference

System flow, when optional flow sensor is provided

s) Multi Pump Controller shall have on board Ethernet port for connecting the VSPS to BMS. If given static IP address, Multi Pump Controller should be accessible over Intranet or Internet.

t) The pump logic controller shall be Multi Pump Controller or approved equal housed in a NEMA 1 enclosure

9.Variable Frequency Drive:

a) The variable frequency drive(s) shall be pulse width modulation (PWM) type, microprocessor controlled design

b) VFD, including all factory-installed options, is tested to UL standard 508. VFD shall also meet C-UL and be CE marked and built to ISO 9001:2000 standards

c) VFD shall comply EMC directives as per IEC 61800-3:2004, category C1 with 50 meter motor cable (for power less than or equal to 90 Kw) & category C2 with 50 meter motor cable (for power more than 90 Kw)

d) VFD shall be housed in IP21 enclosures for indoor applications. Wall mounted/VFDs with plastic enclosures shall not be acceptable. For out door applications, VFDs shall be housed in IP 54 enclosure.

e) VFD shall employ an advanced sine wave approximation and voltage vector control to allow operation at rated motor shaft output speed with no derating. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life. Power factor shall be near unity regardless of speed or load.

10. Differential Pressure Transmitters

Differential pressure transmitters shall be field mounted and shall transmit an isolated 4-20mA DC signal indicative of process variable to the pump logic controller via standard three wire 24 DC system with Emission/Immunity confirming to EN61000-6-2/3. Unit shall have stainless steel wetted parts with two 7/16" process connections. It shall be protected against radio frequency interference and shall have water tight, IP 55 electrical enclosure. Sensor should be capable of withstanding a burst pressure of 25 bar. Accuracy shall be within 2.5% BFSL (Best Fit Straight Line) Differential pressure transmitters shall be of approved make or approved Equivalent

11. Control System for Variable Speed Secondary Water Distribution:

Variable Speed control system will have the following as minimum: (See details below)

1. Dedicated Pump Logic Controller (DPLC).
2. VFD – One VFD per pump
3. DPT .
4. Enclosure to house VFD's and other required electrical components as per below specification.
4. Necessary software duly downloaded.

Section-3 Cooling Tower

COOLING TOWERS

SCOPE

This chapter covers the general requirements of cooling towers central air-conditioning plants.

TYPE

The cooling tower shall be of FRP type, induced draft, CTI certified, twin cell type of capacity as specified in BOQ. The Fan shall be direct driven, IE-03 High efficiency motor with all S.S fan hubs and nut bolts. In fiber glass reinforced plastic (FRP) construction with PVC fill and FRP basin,

DESIGN

i) Rating :The cooling tower shall be rated for the heat rejection capacity specified in the BOQ specifications. All cooling towers shall be certified by CTI (Cooling Tower Institute).

ii) Range: The Cooling tower shall be designed to cool the requisite quantity of water through 7.0 degree C or as specified in the tender specifications, against the prevailing wet bulb temperature.

iii) Wet Bulb approach: The cooling tower shall be selected for a wet bulb approach of not more than 2.77 degree C.

iv) Outlet temperature: The cold water temperature from the cooling tower shall match the entering temperature for which the condenser selection is made.

v) Flow rate: The water flow rate through the cooling tower shall match that through the condenser.

vi) Multi cell design :The induced draft cooling tower shall be of two cells.

vii) Drive Motor : The fan motor shall be premium efficiency IE3 class , as per IS 12615.7.4

MATERIAL AND CONSTRUCTION : Fibre glass Reinforced Plastic (FRP) Cooling tower

of minimum thickness 5 mm.

i) The structural framework of the cooling tower including all members shall be designed for the load encountered during the normal operation of the cooling tower and its maintenance. The structure shall be rugged and rigid to prevent distortion and shall include tie arrangements as may be necessary.

ii) The cooling tower shall be induced draft type, with FRP casing insquare/ rectangular/ octagonal/ circular shape, and with an FRP bas into match the shape of the casing.

iii) The basin shall have a holding capacity adequate for operation for atleast 30 minutes without addition of make-up water to the basin. The construction should be such as to eliminate the danger of drawing air into the pump when operating with minimum water in the basin.

iv) The basin fittings shall include the following: -

a) Bottom /side outlet,

b) Drain connection with valve,

c) Ball type automatic make-up connection with valve,

d) Overflow connection,

e) Bleed off with valve, from inlet header to overflow pipe.

v) The supporting framework for the tower casing and the water basin shall be made of hot dip galvanized steel and it shall be further protected with epoxy painting.

vi) The filling shall be of PVC. Thickness of PVC fills shall not be less than 0.2mm. These shall be of such construction as to provide low air resistance, large wetted surface for a high heat transfer efficiency, and easy replace ability.

vii) The water distribution may be either through self-rotating or fixed type sprinklers or through balancing, sub balancing and spreader

viii) Fresh Air Intakes

ix) Louvers made from FRP section shall be in modular panel form for ease of handling. These shall be free from waves and buckles.

x) Additional intermediate equally spaced supports and stiffeners shall be provided to prevent sagging/ vibrating of the louvers, at not more than 750mm centres where the louver's length is longer than 750mm ensuring uniform water loading and distribution of water over the fill. All pipes and fittings shall be of PVC. The sprinklers shall operate from the residual velocity head at the headers. Due care shall be taken with regard to corrosive effects and maintainability in the design of the water distribution system.

xi) Drift eliminators of PVC shall be provided for maximum removal of entrained water droplets. The spacers and tie rods used shall be of plastic material.

xii) The fan shall be multi-blade axial flow type, made of aluminium alloy or FRP. The fan assembly shall be statically and dynamically balanced.

xiii) The fan drive shall be from a three phase induction motor of efficiency class IE3as per IS 12615, either direct or through a spiral gear work. The entire drive arrangement shall be designed for a minimum noise and it shall be rigidly supported to the tower structure.

xiv) To ensure safety of personnel at the time of working on cooling tower a steel ladder shall be provided in such a manner and location as necessary to give safe and complete access to all the parts of the cooling tower requiring inspection or adjustments. The ladder shall be bolted to the tower at the top and grouted in masonry at the bottom end.

INSTALLATION : The cooling tower shall be installed on pre FRP coated M.S. girders fixed in masonry foundations with cement concrete footing. Second class brick work and cement mortar having one part cement & six parts sand shall be used for the masonry work. 12mm sand cement plaster shall be provided over the brick work. These may be located at a well-ventilated place either at ground level and contiguous to the plant room, or on the terrace of the building in consultation with the Architect. In case the cooling towers are located on the terrace of the building, the structural loading of the terrace shall be considered. For this respective columns are to be raised by two feet at the terrace. Cooling towers shall be installed in such a way that their load is transferred directly to the columns for which necessary Mild steel-I sections shall be provided by the air-conditioning contractor. The cooling towers shall be rested on Mild Steel-I sections & not on terrace slab. Sufficient free space shall be left all around for efficient operation of the cooling tower. Cooling tower shall be not less than 75cm above the ground/ floor level unless otherwise stated in the tender specifications. 6mm neoprene pads shall be placed between the tower and the girder for vibration isolation whereas directed by the Engineer-in-charge. Guy-wires of suitable sized shall be used to secure firmly to its base wherever necessary.

PAINTING: The cooling towers shall be supplied with the manufacturer‘s standard finish painting.

Section-4 EXPANSION TANKS

i) Expansion tanks for chilled water and hot water shall be of M.S. construction and of adequate capacity, to contain 200% of the maximum expansion likely to take place in the system. The tank shall be insulated and be complete with float valve, gauge glass, drain, overflow and make up connections, with gate valves and vent piping wherever required.

ii) The piping shall be enlarged at the connection to the expansion tank to permit entrained air to separate and to be vented through the tank. The expansion tank should be located at the pump suction side at the highest point of the system.

iii) Valves, strainers and traps must be omitted from the expansion line since these may be accidentally turned off or become plugged.

iv) Pressurized expansion tank with air separator, have to be used.

- Expansion, pressurization and de-aeration of the chilled water system to be provided by an integrated unit comprising of Pressure-less expansion tank, coalescing pall rings, Pressurization unit c/w Pump fittings and state of the art digital controller & with twin pumping system.
- Vessel volume shall be calculated according to the system expansion volume. Every vessel in the unit shall have the same size. Levelling of the vessel shall be facilitated by adjustable feet. Condensate drain cock shall be installed within the base of the vessel. Efficiency of the vessel volume shall be minimum 80%. A coalescing (PALL RINGS) de-aerator shall be installed within the inlet of the expansion vessel providing removal of micro-bubbles >15 µm. An automatic air vent with air intake preventer must installed on the top of the vessel. The expansion vessel(s) shall be fitted with a replaceable butyl rubber bladder with rupture sensor in accordance with DIN 4807-3. As unit is subject to atmospheric pressure, tank pressure rating should be 6 Bar. Maximum continual working temperature of the bladder shall be 70 °C (158 °F). Main vessel must have a weight sensor and therefore must be connected to the Pressurization unit using flexible hoses. RAL 3002 epoxy powder coating. The use of secondary vessel & level sensor is not necessary.
- The pressure-less expansion vessel(s) shall be cylindrical, welded and comply to EN 13831:2007.
- Manufactured and designed in accordance with European Pressure Equipment Directive PED 2014/68/EC.
- The pressurization unit shall be sized appropriate to the total system expansion volume and maximum operating pressure.
- System pressure shall be regulated within ± 0.2 bar (2.9 psi) of the set pressure. High and low pressure alarm setting shall be selectable by the user.

- Top-up function shall be programmed according to system requirements. The unit shall be fitted with an integral, adjustable flood limiter to shut down the system in the event of a serious leak. Water level in the expansion vessel(s) shall be maintained to a minimum value.
- Flexible Connection must include a de-aeration sensor for signaling the controller to continue/stop the active de-aeration.
- Backflow Preventer c/w, water meter, ball valve and non-return valve, strainer/Particle filter/ and shut-off valve according to DIN 1988 and DIN EN 1717 in top up connection.
- The pressurization unit shall have two Flow regulating, solenoid valve in spill lines with duty/standby/assist function to avoid pressure peaks in the system and a safety relief valve for protection of vessel, two multistage pumps (orientation vertical/horizontal) with non-return valve, The use of electrically actuated ball valve in the spill line is not permitted since it takes time to react and increases pressure peaks which leads to malfunctioning of the system.
- The controller shall display the vessel contents, system pressure and status of the main operating components in real-time on the graphical display. This acts as confirmation that pump(s) or valves are operating and responding as required, while also verifying the system setup.
- The controller shall regulate the pump unit to provide duty/standby or parallel/backup operation and shall be selectable in dual pump units.
- Controller shall display fault code and generate the alarm in case of any fault situation.
- Pressurization unit shall be factory assembled. The product shall be installed according to the manufacturer's instructions using manufacturer's approved components.
- The unit shall be BMS compatible with RS 485 communication protocol.
- The controller shall be Microprocessor based touch screen with IP54 protection class.

INSTALLATION

i) The installation work shall be carried out in accordance with the detailed drawings prepared by the Air-conditioning Contractor and approved by the Engineer-in-charge.

ii) Air-conditioning contractor shall utilize the structural provisions for Air-conditioning services wherever provided by the Department in the building and make his own arrangements for additional changes.

iii) Expansion loops or joints shall be provided to take care of expansion or contraction of pipes due to temperature changes.

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

v) Wherever reducers are to be made in horizontal runs, eccentric reducers shall be used if the piping is to drain freely, in other locations, concentric reducers may be used.

vi) Open ends of piping shall be blocked as soon as the pipe is installed to avoid entrance of foreign matter.

vii) All pipes using screwed fittings shall be accurately cut to the required size and threaded in accordance with IS: 554 and burs removed before laying.

viii) Piping installation shall be supported on or suspended from structure adequately. The Air-conditioning contractor shall design all brackets, saddles, clamps, hangers etc. and shall be responsible for their structure integrity.

ix) Pipe supports, preferably floor mounted shall be of steel, adjustable for height and prime-coated with zinc chromate paint and finish-coated gray. Spacing of pipe supports shall not be more than that specified below:

Nominal Pipe size (mm)	Spacing (Meters)
12 and 15	1.25
20 and 25	2.00
32, 40, 50 and 65	2.50
80, 100 and 125	2.50
150 and above	3.00

Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stress on the pipes. Pipe hangers shall be fixed on walls and ceiling by means of metallic or rawl plugs or approved shear fasteners.

x) Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation.

xi) Anti vibration pads, springs or liners of resilient and non-deteriorating, material shall be provided at each support, so as to prevent transmission of vibration through the supports. xii)Pipe sleeves of diameter larger than the pipe by least 50 mm shall be provided wherever pipes pass through walls and the annular spaces shall be filled with felt and finished with retaining rings.

xiii) Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe with a 12 mm thick rubber pad or any other resilient material as approved by the Engineer-in-charge.

xiv) The space in the floor cut outs around the pipe work (after insulation work where applicable) shall be closed using cement concrete (1:2:4 mix) or steel sheet, from the fire safety considerations, taking care to see that a small annular space is left around the pipes to prevent transmission of vibration to the structure.

xv) Riser shall have suitable supports at the lowest point.

xvi) Where pipes are to be buried under ground, the top of the pipes shall be not less than 75 cms. From the ground level. Where this is not practicable, permission of the Engineer-in-charge shall be obtained for burying the pipes at lesser depth. The pipes shall be surrounded on all sides by sand cushion of not less than 15 cms. After the pipes have been laid and top sand cushion provided, the trench shall be refilled with the excavated soil and any extra soil shall be removed from the site of work by the Air conditioning contractors.

xvii) All pipes and their steel supports shall be thoroughly cleaned and given one primer coat of Zinc chromate before being installed.

xviii) After all the water piping has been installed; pressure tested in accordance with clause 10.10, all exposed piping in the plant room shall be given two finish coats of paint, approved by the Engineer-in

Charge. Similar painting work shall be done over insulated pipe work, valves etc. The direction of flow of fluid in the pipes shall be indicated with identifying arrows.

xix) 3 mm gasket shall be used for flanged joints.

xx) Cut-outs in floor slabs shall be sealed with cement concrete or steel plate after the plumbing work is done, from the fire safety point of view.

PRESSURE TESTING

(i) All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure, but not less than 10 kg./sq.cm. for a period not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer-in-Charge.

(ii) Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.

(iii) System may be tested in sections and such sections shall be securely capped.

(iv) It shall be made sure that proper noiseless circulation is achieved through all the coils and other heat exchange equipments in the system. If proper circulation is not achieved due to air-bound connections, the contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectification, including the tearing up and refinishing of floors, walls, etc. as required.

(vi) Pressure gauges may be capped off during pressure testing of the installation.

(vii) The contractor shall provide all materials, tools, equipments, instruments, services and labour required to perform the tests and to remove water resulting from cleaning after testing.

BALANCING

i) After completion of the installation, all water system shall be adjusted and balanced to first minimize throttling losses; then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Exceptions to above:

a) Where Variable frequency Drives are used as starter &capacity control. b) Impellers need not to be trimmed nor pump speed adjusted for pumps with pump motors of 7.5 kW (10 hp) or less,
c) Impellers need not to be trimmed when throttling results in no greater than 5% of the nameplate horsepower draw, or 2.2 kW (3hp), whichever is greater.

ii) Automatic control valves (Pressure Independent Balancing cum Control Valve) and three way diverting valves shall be set for full flow condition during balancing procedure. Water circuit shall be adjusted by balancing cocks provided for balancing. These shall be permanently marked after the balancing is completed so that they can be restored to their correct positions, if disturbed.

MEASUREMENT

Measurements of plumbing work shall be on following basis: -

a) Piping shall be measured along the centre line of installed pipes including all pipe fittings and accessories but excluding valves and other items for which quantities are specifically indicated in the schedule of work. No separate payment shall be made for fittings and accessories.

b) The rates for piping work shall include all wastage allowances, pipe supports, hangers, nuts and check nuts, vibration isolators, suspension where specified or required, and any other item required completing the piping installation. None of these items will be separately measured nor paid for.

c) Piping measurement shall be taken before application of the insulation in the case of insulated pipe work.

Section 5:- DIRT SEPARATOR

Dirt Separators - Furnish and install In-Line (400 mm) Microbubble type flanged steel Dirt Separator suitable for maximum pressure of 1600 Kpa (16bar) and 110 deg C operating temperature and sized for the full capacity / flow. The MS tank shall be heavy duty with external anti corrosion painting.

The entering velocities not to exceed 1.2 meters per second at specified flow rate. Units specifically designed for high velocity systems may have an entering velocity of up to 3.0 meters per second. The separator must confirm to design as per Pressure Equipment Directive PED (2014/68/EU) standards. The material standard shall be EN/ISO: S235JR

The core element is a tube mesh construction and the flow to be guided through an area with a greater cross-section than the connection dimensions in order to reduce the flow. The ensuing turbulence caused by the tube mesh causes heavy dirt particles to move to the bottom of the vessel from where they can be drained out and also be with magnetic separation facility. The Dirt separator shall be able to remove effectively dirt particles down to 4 microns. There shall be high capacity auto air vent.

The pressure drop across the dirt separator shall not exceed 0.5 bar.

Section-6: PIPING

PIPE MATERIALS

1. Pipes shall be of the following materials.

(i) Mild steel heavy class (ERWS Black steel) tube conforming to IS: 1239 for sizes up to 150 mm.

(ii) Welded black steel pipe, class 2, conforming to IS: 3589, for sizes greater than 150 mm. These pipes shall be factory rolled MS C class pipe. The thickness of MS pipe shall be minimum 8 mm for pipes of sizes 200 mm and above.

2. **PIPE JOINTS**

Seismic considerations shall be taken into account while planning joint details. Joints in black steel pipes shall be of any of the following types.

Screwed joints and union joints screwed to pipes, up to 25 mm size.

Butt welded joints for pipe sizes above 25mm. electric welding shall be used for sizes 100mm and above.

Flanges joints with flanges as per IS: 6392 for all sizes. Flanges may be steel welded neck type or slip on type welded to pipe, or alternatively screwed type. The item of flanges shall be measured and paid separately.

Flexible coupling V grooves joints.

Flexible connections shall be provided at the pumps, and other machine where requires as per following specifications-

a) The Flexible connections shall be flanged type expansion joint. Flanges shall be non-compressible and mechanically strong type and the Neoprene rubber shall be provided in between the flange ends.

b) The connections shall work for a temperature range of minus 10°C to 70°C. c) The length and working pressure of bellows shall be as follows:

Nominal Bore (mm)	Length (mm)	Pressure (Bar)
20-25	125	15
32-200	150	15
250-350	200	10

d) Connections shall be provided with control rods to control the excessive elongation or compression of piping systems.

e) These shall be capable to withstand torsional movement up to 3o without damage.

3. PRE INSULATED CHILLED WATER PIPES

All piping system for service reaching a maximum temperature of 254°F installed above ground with with HDPE jacketing.

i) The pipe shall be MS ERW as specified in the Piping Section.

ii) The pipe insulation shall be rigid polyurethane foam with excellent heat-insulating properties, good mechanical properties and good resistance against aging with minimum density of 48 kg/cu m, 90% minimum closed cell content, minimum compressive strength of 2.7kg/cm2, and initial thermal conductivity of 0.026W/mK and the insulation fulfills all technical requirements according to EN 253. The insulation shall completely fill the annular space between the service pipe and jacket and shall be bonded to both, the service pipe & jacket. Polyurethane foam made from Polyol and Isocyanate with 48 kg/ m3 density. Minimum thickness of insulation shall be 30mm.

Protective Jacket Material shall be as specified and shall be sufficiently sized to allow for desired insulation thickness for optimum performance of the system.

The pipe thickness, insulation thickness, HDPE jacketing thickness shall be as per BOQ

v) Underground systems shall be buried in a trench of not less than 600 mm deeper than the top of the pipe & not less than 450mm wider than the combined OD of all piping systems. A minimum thickness of 600mm of compacted backfill over the top of the pipe is desirable.

vi) Trench bottom shall have a minimum of 150mm of sand, pea gravel or specified backfill material, consolidated to suit operating weight & to act as a cushion for the piping.

vii) For pipes buried in ground outer protective insulation jacket shall be seamless, extruded, black, UV resistant, high-density polyethylene (HDPE). HDPE Jacket shall be of High-density polyethylene (HDPE) with > 944 kg/ m3 density Diameter from 90 to 1000mm with minimum 3 to 28mm wall thickness and compressive strength is 40 PSI as specified.

ix) All straight pipe lengths will have water tight end seal. All fittings will have square cut insulation cutback.

viii) Fitting can be fabricated at site over the carrier pipe and correct quantity of PUF shall be poured manually.

x) Field joints insulation shall consist of PUF poured manually in a site-fabricated GI cladding fixed around the joint

The pre insulated pipe shall be manufactured at factory. The insulation shall completely fill the annular space between the carrier pipe & jacket and shall be bonded to both, carrier & jacket. The preinsulated pipes must be manufactured using High pressure PUF injection machines. The outer jacket & the carrier pipe must be held concentric using special chucks. Vent holes must be drilled to ensure expiration of air. The necessary quantity of Polyol & ISO must be mixed at high speed & injected into the void. The quantity of PUF injected for each pipe must be kept as a verifiable record to ensure that the required Density & thickness of insulation is maintained.

Section 7 INSULATION WORK

1. SCOPE

This chapter covers the requirements of thermal insulation for chiller, 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.

2. Material for Chiller Insulation.

Supply and installation of **XLPE-** Chemically Cross Linked Closed Cell Polyethylene foam in **black color with extra flexibility and UV resistive** thermal insulation with nominal density of the material shall be **30 kg/m^3 ± 10%,** having thermal conductivity of **0.0329 W/m ^{o}k at 23 ^{o}C,** mean temperature, as per IS 3346:1980. Material shall be resistant to growth of Fungus as per **ASTM C 1338** and resistant to growth of Bacteria as per **ASTM E 2180 for applying on the chiller. The minimum thickness for chiller insulation shall be 50 mm in multi layers. The top layer shall be with UV painted factory manufactured glass cloth (Preferably grey or as approved by Engineer In Charge).**

Fire characteristics shall confirm to **BS 476 Part 7**, **Class 1**, for Surface Spread of Flame and meet requirement of Fire Propagation as per **BS 476 Part 6,** having an index **(I) of 5.06** with lamination and **5.17** for plain materials and sub-indices i_1(2.71); i_2(1.65); i_3(0.70). Visibility due to smoke shall confirm to Class A as per Standard UIC 564 – 2 Appendix 15.

Compliance to **BS EN 13501-1:2007 + A1:2009** (Reaction to fire performance) for 25 mm thickness sheet with Alupet + self - adhesive with classification BS1D0 in category of combustible thermal insulation with less fire propagation, low heat emission, zero smoke and zero fire droplets.

Compliance to **UL 94 HF -1** & **ASTM E84** with results FSI-15 and SDI-5.

2.1 MATERIAL-TYPES

The insulation material to be used for various applications shall be any of the following, as required:

- For insulation of water piping, pumps and tanks: -
  - Expanded polystyrene (T.F.Quality)
  - Resin bonded glass wool
  - Polyvinyl Nitrile (Closed cell rubber foam)
  - XLPE (Closed cell cross linked polyolefin foam)

Expanded polystyrene (T.F.Quality) shall be used for pipe insulation like inside the A.C. plant room, exposed to outside or burried in ground. In the case of expanded polystyrene (TF quality), Resin bonded glass wool the pipe insulation should be in rigid sections in two halves and preformed to fit snugly on to pipes (upto pipe sizes for which the preformed sections are manufactured by the manufacturer of insulation). For higher pipe sizes insulation slabs shall be used.

Resin bonded glass wool is to be used for piping inside the building due to its fire retardant properties, for considerations of fire safety.

Polyvinyl Nitrile (Closed cell rubber foam) available in tube shapes for sliding on to the small dia. pipes can be used if successfully tested for fire retardant properties.

However, all shall need to be covered with vapour barrier and cladding with aluminium sheet.

- For acoustic lining of duct work and AHU rooms: -
  (a) Resin bonded glass wool.
  (b) Resin bonded mineral wool.
- For suction line**, Chilled water pipe** : -
  (a) Expanded Polysterene (T.F.Quality)
  (b) Polyvinyl Nitrile (Closed cell rubber foam)

(v) For double skin AHUs:

(a) Polyurethane foam (PUF insulation)

2.2 MATERIAL SPECIFICATIONS

The insulation material shall satisfy the following requirements: -

- For thermal application on pipes.

Material	**Minimum Density (Kg/cu.m)**	**Maximum Thermal conductivity (K.cal/ hr. degree C/m at 10 Deg C mean temp.)**
Resin bonded glass wool	32	0.031
Expanded polystyrene (TF)	20	0.035
Polyvinyl Nitrile foam	55	0.034

- For thermal insulation of ducts:

Material	Minimum Density(Kg / cu.m)
Resin bonded glass wool	24
Polyvinyl Nitrile foam	40

Fibre Glass Insulation used for duct insulation shall be factory faced with aluminium foil on one side reinforced with kraft paper & fused to the insulation material.

Polyvinyl Nitrile foam Insulation used for duct insulation shall be factory faced with aluminium foil on one side.

- For acoustic lining:

Application Thickness		Material	Minimum Density (Kg./Cu.M)
Duct	25 mm	Resin bonded glass wool	32
AHU room	50 mm	Resin bonded glass wool/ Mineral wool	32/ 48

- The specification for resin bonded glass wool insulation & resin bonded mineral wool insulation shall conform to IS 8183 as amended upto date. The specification for expanded polysterene shall conform to IS-4671 as amended upto date.
- Expansion tank Insulation
  Expanded polystrene insulation of density not less than 20kg per cu.m. shall be used.

2.3 INSULATION THICKNESS

The thickness of insulation shall be as indicated below unless specified otherwise in the tender specifications.

- For pipe insulation (for chilled water as well as hot water application

	Pipe Size (mm)	Glass fibre /Exp. Polystyrene (mm)
	150 & below	50
	Above 150	75

ii) For Duct insulation Application	Fibre glass (mm)
Thermal for AC area	12.5
Thermal for Non AC area	25
Acoustic	25

iii) For room acoustic lining

Resin bonded glass wool	50 mm
Resin bonded mineral wool	50 mm

iv) For pumps :

Expanded polystyrene TF quality	50 mm

i) Chiller Insulation
Thickness of XLPE insulation used for chiller insulation shall not be less than 50 mm.

ii) Expansion tank

iii) Thickness of XLPE insulation used for chiller insulation shall not be less than 50 mm.

2.4 APPLICATION OF INSULATION ON PIPES (including suction line insulation)

(i) The surface to be insulated shall be first cleaned and a coat of zinc chromate primer shall be given. The insulation shall be fixed tightly to the surface with cold setting adhesive CPRX compound. All joints shall be staggered and sealed. The second layer of insulation wherever required shall be similarly applied over the first layer.

(ii) Pipes shall be preferably pre insulated at factory, meeting the requirement or the insulation shall be finished at site as under:

(a) For pipes laid inside the building, the insulation over the pipe work shall be finished with 0.63 mm thick aluminium sheet cladding over a vapour barrier of 120 gm/ sq.m. polythene sheet with 50 mm overlap and tied down with lacing wire and complete with type 3, grade-I roofing felt strip (as per IS 1322 as amended upto date) at the joints..

(b) For pipes outside the building laid above ground the finishing over the pipe insulation shall be finished with 0.63 mm G S sheet cladding over a vapour barrier of 120 gm/sq.m polythene sheet with 50mm overlap and tied down with lacing wire and complete with type 3 grade I roofing felt strip applied by means of cold setting CPRX compound..

(c) For pipes outside the building laid under ground the insulation shall be covered with 500 gauge polythene faced hessian, (the polythene facing outwards), with 50 mm overlap. All joints shall be sealed with bitumen. A layer of 0.50 mm x 20 mm G.I. wire mesh netting shall be provided over it butting all joints and it shall be laced down with GI wire, sand cement plaster (1:4) 20 mm. thick shall be provided in 2 layers of each 10mm and shall be water proofed by applying hot bitumen & fixing tar felt over the plaster. It shall be finally finished with a coat of hot bitumen.)

In case of factory pre insulated pipes, buried underground, a water leakage sensing wire shall also be provided, to detect the location of water leakage at later date.

(d) In case of factory pre insulated pipes, all joints shall be properly insulated at site as per recommendation of manufacturer

(iii) All valves, fittings, strainers etc. shall be insulated to the same thickness and in the same manner as for the respective piping, taking care to allow operation of valves without damaging the insulation.

2.5 APPLICATION OF INSULATION ON PUMPS

Expanded polystyrene (TF quality) 50mm thickness shall be sandwiched between two aluminium sheets of 0.5mm thickness and properly clamped to pump in two semicircular sections or XLPE insulation as per the requirement.

2.6 APPLICATION OF INSULATION ON EXPANSION TANK

Insulation of expansion tank shall be XLPE/ expanded polysterene (T.F.Quality) of thickness not less than 50mm. It shall be applied as under

- Surface shall be thoroughly cleaned with wire brush and rendered free from all dust & grease.
- The two layers of hot bitumen shall be applied.
- The insulation slabs will then be fixed in one layer and joints shall be sealed with hot bitumen.
- The insulation slab then shall be covered with 0.63 mm x 19mm G.I. wire

mesh netting which shall be fixed to insulation with brass / G.I. nails.

- The insulation shall then finally be finished with aluminium cladding of thickness not less than 0.5mm.

2.7 APPLICATION OF INSULATION (THERMAL) ON DUCT

- The surface of duct on which the external thermal insulation is to be provided shall be thoroughly cleaned with wire brush and rendered free from all dust and grease.

- Two coats of cold compound adhesive (CPRX compound) shall be applied over the duct. (Any other adhesive recommended by the manufacturers may also be used with the approval of the Engineer-in-charge).

2.8 APPLICATION OF DUCT LINING (ACOUSTIC INSULATION)

Where specified in the tender specifications, ducts shall be lined internally with acoustic insulation as detailed below:

- The Inside surface of duct on which the acoustic lining is to be provided shall be thoroughly cleaned with wire brush and rendered free from all dust and grease.

- Then 25 x 25 sq.mm section of minimum 1.25 mm thick G.I. sheet shall be fixed on both ends of the duct piece.

- The insulation slabs shall then be fixed between these section of ducts using CPRX adhesive compound and stickpins.

- The insulation shall then be covered with Reinforced plastic/ fibre glass tissue **with proper overlap**, sealing all joints so that no fibre is visible.

- The insulation shall finally be covered with minimum 0.5 mm thick perforated aluminium sheet having perforations between 20-40%.

2.9 APPLICATION OF ACOUSTIC LINING IN AHU ROOMS

- The wall/ roof surface should be thoroughly cleaned with wire brush.

- A 610x610 mm frame work of 25mm x50mm x50mm x50mm x25mm shape channel made of 0.6mm thick G.S.S. shall be fixed to walls leaving 610mm from floor by means of raw plugs in walls and dash fasteners in ceiling. Similar frame work shall also be fixed on ceiling by means of dash fasteners.

- Resin bonded glass wool/ mineral wool as specified cut to size will be friction fitted in the frame work and covered with tissue paper.

- Aluminium perforated sheet having perforation between 20-40%of thickness not less than 0.8mm shall be fixed over the entire surface neatly without causing sag/ depression in between and held with screws. Sheet joints should overlap minimum 10mm.

- Aluminum beading of 25mm wide and thickness not less than 1.00 mm shall be fixed on all horizontal/ vertical joints by means of screws.

2.10 MEASUREMENT OF INSULATION

a) 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 centre line of the pipes, and no special rate shall be applicable for insulation of any accessories, fixtures or fittings whatsoever.

b) Duct insulation and acoustic lining shall be measured on the basis of 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 centre of thickness of insulation, multiplied by the centre-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.

SECTION- 8 Valves, Y-Strainer and associated controls

1. VALVES

i) The material of butter fly valves shall be as under: Body- Castiron
Disc- Cast Bronze or Stainless Steel Seat- Either integral or Nitrile rubber O-ring- Nitrile/ Silicon

ii) Balancing valve shall be of cast iron flanged construction with EPDM/ SG iron with epoxy coated disc with built in pressure drop measuring facility (pressure test cocks) to compute flow rate across the valve. The test cocks shall be long enough to protrude out of pipe insulation.

iii) Non return valves shall be of gun metal construction upto 65 mm, the metal conforming to class 2 of IS: 778. For 75 mm and above, the valve shall be of bronze or gun metal, body being of cast iron. While screwed or flanged ends may be provided upto 65 mm, flanged ends shall be provided for larger sizes.

iv) Air valves shall be of gunmetal body.

2. STRAINERS

1. Strainers shall be of 'Y" type or pot type as specified.
2. 'Y' strainers shall be provided on the inlet side of each air-handling unit and pump in chilled water and condenser water circuit.
3. Pot strainers, where specified, shall be provided in return water headers, for chilled water and condenser water if enough floor area is available in the refrigeration plant room, as an alternate to individual Y type strainers with pumps.
4. The strainers shall be designed to the test pressure specified for the gate valves.
5. Filtration area of Y-strainer shall be minimum four times the connecting pipe size.
6. Strainers shall have a removable bronze/ stainless steel minimum 1mm thick screen with 3 mm perforations and permanent magnet.
7. Strainers shall be provided with flanges or threaded sockets as required. They shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of screen without disconnection of the main pipe.
8. Strainers shall be provided with equal size isolating gate valves on either side so that the strainers may be cleaned without draining the system.
9. Pot strainer shall be fabricated out of MS sheet and the sizes shall be as under:

Pipe sizes (mm)	Pot dia (mm)	Pot Height (mm)	Basket dia (mm)	Basket Height (mm)
50	300	400	200	240
80	350	450	250	250
100	450	500	300	280
125	500	600	330	340
150	540	700	360	390
200	610	815	400	470
250	800	955	550	510
300	1000	1105	750	580
350	1190	1300	895	678
400	1350	1500	1020	785
450	1518	1700	1060	890
500	1690	1800	1100	900

3. INSTRUMENTS

i) *Pressure gauge of appropriate range and 150 mm. dial size shall be provided at the following locations.*

a) *Supply and return of all heat exchange equipments.*

b) *Suction and discharge of all pump sets.*

The pressure gauge shall be duly calibrated before installation and shall be complete with shut off cocks.

ii) *Direct reading industrial type thermometer of appropriate range shall be provided at the inlet and outlet of all heat exchange equipments. The thermometers shall be installed in separate wells.*

iii) *Appropriate number of additional sockets shall be provided for the installation of pressure & temperature transducers for BMS.*

SECTION 9:- ELECTRICAL WORK SCOPE

This chapter covers the requirements for the electrical works associated with heating, air conditioning, ventilation and cold room applications, namely, switch boards, power cabling, control wiring, earthing, p.f. capacitors and remote control-cum-indicating panels. Electric motors are not covered here, as these are covered as part of the respective equipment specifications.

1. GENERAL

i) Unless otherwise specified in the tender specifications, all equipments and materials for electrical works shall be suitable for continuous operations on 415 V / 240 V + 10%(3 phase/single phase), 50 Hz. AC system. Where the use of high voltage equipments is specified in particular works, all the respective equipment's shall be suitable for continuous operation on such specified high voltage.

ii) All electrical works shall be carried out complying with the Indian Electricity Rules, 1956 as amended to date.

iii) All parts of electrical works shall be carried out as per appropriate CPWD General specifications for Electrical works, namely, Part I (Internal) 2013, Part II (External) 1994 work, and Part IV (Sub-station), 2013 all as amended to date.

iv) All materials and components used shall conform to the relevant IS specifications amended to date.

2. SWITCH BOARDS

i) The main switch board in the A.C. plant room shall be floor mounted, free standing cubical type and shall be factory built fabricated by one of the reputed switch board manufacturer. It shall be suitable for termination of the incoming cable(s)/ bus trunking from top/ bottom. The switchboards in air handling unit (AHU) rooms shall be wall mounted, or floor mounted as feasible at site and as approved by the Engineer- incharge, but they shall be cubical design, unless otherwise specified and open able from front.

ii) The capacity of switch gear, starters etc. shall be suitable for the requirements of loads fed/controlled. Starting currents shall be duly considered in case of motor loads.

iii) Switch fuse units shall be used upto and including 63 A and fuse switch units shall be used for 100 A and above. ACB shall be used for 630 A and above ratings.

iv) All switch fuses/fuse switches dis-connector switches shall be of AC 23 duty as per IS: 4064-1978 as amended upto date. They shall be complete with suitable HRC cartridge type fuses.

v) Switch boards controlling motors shall house starters for motors, unless otherwise specified. Independent single phasing preventors for each such starter shall be provided. The starter and SPP shall be located adjacent to the controlling switch gear.

vi) One volt meter with selector switch, a set of indicating lamps and fuses for voltmeter and lamps shall be provided at each switchboard. One ammeter with CTS, and selector switch shall be provided with each motor starter. Instruments shall be flush mounted with the panel and have a glass index not higher than 1.5. The instruments and accessories shall be provided whether or not specifically indicated in the tender specifications.

vii) The fabrication of switchboard shall be taken up only after the drawings for the fabrication of the same are approved by the Engineer-in-charge.

viii) Switchboards shall be fabricated as per specifications indicated in subpara above.

ix) The layout of bus bars and cable alleys shall be designed for convenient connections and inter- connections with the various switchgear. Connections from individual compartments to cable alleys shall be such as not to shut down healthy circuits in the event of maintenance work becoming necessary on a defective circuit.

x) Care shall be taken to provide adequate clearances between phase bus bars as well as between phase bus bars, neutral and earth.

xi) Where terminations are done on the bus bars by drilling holes therein, extra cross section shall be provided for the bus bars. Alternatively, terminations may be made by clamping.

xii) Provision shall be made for proper termination of cables at the switchboards such that there is no strain either on the cables, or on the terminators. Cables connected to the upper tiers shall be duly clamped within the switchboard.

xiii) Identification labels shall be provided against each switchgear and starter compartment, using plastic engraved labels.

xiv) Metallic danger board conforming to relevant IS shall be fixed on each electrical switchboard.

xv) Switchboard housing only isolators near cooling towers shall be housed in weather proof enclosure. The mounting arrangement shall be as approved by the Engineer-in-Charge to suit the site conditions.

3. POWER CABLING

i) Unless otherwise specified, the power cables shall be XLPE insulated, PVC outer sheathed aluminium conductor, armoured cables rated for 1100 V grade. The power cables shall be of 2 core for single phase, 4 core for sizes upto and including 25 sq.mm, 3-1/2 core for sizes higher than 25 sq.mm for 3 phase. Where high voltage equipments are to be fed, the cables shall be rated for continuous operation at the voltages to suit the same.

ii) Power cables shall be of sizes as indicated in the tender specifications. In all other cases, the sizes shall be as approved by the Engineer-inCharge, after taking into consideration the load, the length of cabling and the type of load.

iii) Cables shall be laid in suitable metallic trays suspended from ceiling, or mounted on walls, or laid directly in ground or clamped on structures, as may be required. Cable ducts shall not be provided in plant rooms. Cable trays shall be fabricated from slotted angle/solid angles to make ladder type cable tray, designed with adequate dimensions for proper heat dissipation and also access to the cables. Alternatively, cable trays may be of steel sheet with adequate structural strength and rigidity, with necessary ventilation holes therein. In both the cases, necessary supports and suspenders shall be provided by the Air conditioning Contractor as required.

iv) Cable laying work shall be carried out in accordance with 13.4 (iii) above. The scope of work for the Air-conditioning Contractor shall include making trenches in ground and refilling as required, but excludes any masonry trenches for the cable work.

4. CONTROL WIRING

i) Control wiring in the plant rooms and AHU rooms shall be done using ISI marked PVC insulated and PVC sheathed, 1.5 sq.mm copper conductor, 250 V grade, cables drawn in ISI marked steel or PVC conduits. Alternatively, armoured multi-core copper conductor cables may also be used for the purpose. The control

cables interconnecting the plant room and the AHU rooms shall be of multi-core armoured type only, and suitable for laying direct in ground.

ii) The number and size of the control cables shall be such as to suit the control system design adopted by the Air-conditioning Contractor.

iii) ISI marked steel conduit pipes, wherever used, shall be of gauge not less than 1.6 mm thick for conduits upto 32 mm dia and not less than 2.0 mm thick for higher sizes. All conduit accessories shall be threaded type with substantial wall thickness.

iv) Control cables shall be of adequate cross section to restrict the voltage drop.

v) In the case of control wires drawn through steel conduits, the wire drawing capacity of conduits as specified under the CPWD General Specifications for Electrical Works (Part I) 1994 shall not be exceeded.

vi) Runs of control wires within the switchboard shall be neatly bunched and suitably supported/clamped. Means shall be provided for easy identification of the control wires.

vii) Control wiring shall correspond to the circuitry/sequence of operations and interlocks approved by Engineer-in-Charge.

viii) In cold storage involving temperatures below zero deg. C, polythene cables shall be used instead of PVC cables.

5. EARTHING

i) Provision of earth electrodes and the type of earthing shall be as specified in the tender specifications.

ii) The earth work shall be carried out in conformity with CPWD Specifications for Electrical works (Part-I), Internal 1994.

iii) Metallic body of all medium voltage equipments and switch boards shall be connected by separate and distinct earth conductors to the earth stations of the installations; looping of such body earth conductors is acceptable from one equipment, or switch board to another.

iv) G.I. plate earthing shall be provided for PTAC plants and reciprocating central AC plants upto 100 TR capacity. Above 100 TR reciprocating units and centrifugal/ screw chilling units copper plate earthing shall be provided.

v) The size of earth conductors for body earthing of equipments shall be as under:

Motors upto and including 10 HP rating	2 Nos. 3 mm dia copper wire/ 2 nos. 4mm dia GI wire
12.5 HP to 40 HP	2 Nos. 4 mm diacopper wire/ 2 nos. 6mm dia GI wire
50 HP to 75 HP	2Nos. 6 mm dia copper wire/ 2 nos. 25x3mm GI strip
Above 75 HP	2Nos. 25mm x 3mm copper strip/ 2 nos. 25x6mm GI strip
Switch boards with incoming rating	
Upto 100 A	2 Nos. 3 mm dia copper wire/ 2 nos. 4mm dia GI wire

125 A to 200 A rating	2 Nos. 6mm diacopper wire/ 2 nos. 25x3mm GI strip
Above 200 A rating	2Nos. 25mm x 3mm copper strip/ 2 nos. 25x6 mm GI strip

vi) Armouring of cables shall be connected to the body of the equipments/switch board at both the ends. Compression type glands shall be used for all such terminations in the case of PVC cables.

Section 10 INSPECTION, TESTING AND COMMISSIONING GUIDELINES

1.1 SCOPE

This chapter covers initial inspection and testing of Chillers, Pumps, Expansion Tanks, Dirt Separator, Cooling Tower, BMS System and pre insulated pipe, valves at manufacturer‘s works, initial inspection of other equipments/ materials on receipt at site, final inspection testing & commissioning of all equipment at site & description of testing requirements & procedure.

1.2 INITIAL INSPECTION AT MANUFACTURER’S WORKS

i) Manufacturer‘s internal test certificate shall be furnished and same shall be checked as per contract requirements

ii) Pneumatic pressure test at twice the normal pressure for the pre insulated chilled water pipe shall be carried out.

iii) Hydraulic test at 10 Kgf/sq.cm. for the Pre insulated chilled water pipe shall be carried out as per the Indian Standard.

U value of the pre insulated pipe have to be verified at the manufacturing works as per the Factory Testing:

All instruments and personnel for tests shall be provided by the contractor. Contractor shall inform the client about the pre insulated pipe factory testing schedule min. 10 to 15 days before the pipes are ready for factory testing.

- Pipes and Valves

i) It should be checked that the same is as per makes specified in contract.

ii) Dimensions including weight shall be checked for pipes against the requirements of contract.

iii) Manufacturer’s test certificates for valves for testing of pressure withstand .

- Insulation and acoustic lining

i) Physical verification for thickness and make should be made as per contract before application of insulation.

ii) Manufacturer‘s test certificate for density , thermal conductivity , sound absorption and class of fire retardation wherever applicable should be furnished.

Note: Accuracy of testing instruments shall be as mentioned in the final inspection procedure.

1.3 FINAL INSPECTION

i) After completion of the entire installation as per specification in all respects, the AC contractor shall demonstrate trouble free running of the AC equipments and installation for a period of minimum 120 hours of running..

ii) After the trial run, the AC contractor shall offer the plant for the seasonal test, namely test for summer or monsoon season whichever occurs earlier. The test results as per Appendix G shall be furnished.

iii) The equipment capacity computations shall be carried out.

iv) The Input KW of the unit / TR at full load shall also be checked against contract requirements, if any.

v) Pressure drops across chiller and condenser at specified flow rates shall be checked against the contract requirements.

vi) All instruments for testing shall be provided by the AC contractor . The accuracy of the instruments shall be as follows:

a. Temperature: Liquid in glass thermometer having accuracy + 1 deg. C as per IS: 4825.

b. Wet bulb Temperature : Sling psychrometer conforming to IS:6017.

Scale Error:

For less than 0 deg. C : 0.3 deg C + 0.2 deg. C.

For over 0 deg. C : 0.2 deg. C + 0.1 deg. C.

c. Pressure Gauge: With the accuracy of + 1% for maximum scale value from 10 to 90%, and + 1.9% for maximum scale value for rest of the scale conforming to IS: 3695.

d. Water flow meter : Water flow shall be measured using the arrangement installed as per schedule of work. In case the tendering firms do not have testing instruments of the accuracy mentioned above, they should specify the accuracy of the instrument available with them for testing at the tender stage.

1.4 Miscellaneous

The contractor shall supply the skilled staff and all necessary instruments and carry out any test of any kind on a piece of equipment, apparatus, part of system or on a complete system, if the architect requests such a test for determining specified or guaranteed data, as given in the specification or on the drawings.

1.4.1 Any damage resulting from the tests shall be repaired and/or damaged material replaced, to the satisfaction of the Engineer In Charge without any extra cost.

1.4.2 In the event of any repair or any adjustment having to be made, other than normal running adjustment, the tests shall be void and shall be recommenced after the adjustment or repairs have been completed.

1.4.3 The contractor must inform the Engineer In Charge when such tests are to be made, giving sufficient notice, in order that the architect or his nominated representative may be present.

1.4.4 The contractor may be required to repeat the test as required, should the Ambient conditions at the time, do not give, in the opinion of the Engineer In Charge, sufficient and suitable indication of the effect and performance of the installation as a whole or of any part, as required.

7.4 IDENTIFICATION OF SERVICES

1.1 SCOPE

The scope of this section comprises of identification of services for each piece of equipment

1.2 VALVE LABELS AND CHARTS

Each valve shall be provided with a label indicating the service being controlled, together with a reference number corresponding with that shown on the Valve Charts and " as fitted" drawings. The labels shall be made from 3 ply (black / white/ black) Trifoliate material showing white letters and figures on a black background. Labels to be tied to each valve with chromium plated linked chain.

A wall mounted, glass covered plan to the approval of the Architect / Engineer shall be provided and displayed in each plant room showing the plant layout with pipe work, valve diagram and valve schedule indicating size, service, duty, etc.

1.3 IDENTIFICATION OF SERVICES

Pipe work and duct work shall be identified by colour bands 150 mm. wide or colour triangles of at least 150 mm. / side. The bands of triangles shall be applied at termination points, junctions, entries and exits of plant rooms, walls and ducts, and control points to readily identify the service, but spacing shall not exceed 4.0 metres.

1.3.1. **Pipe work Services :-**

For pipe work services and its insulation the colours of the bands shall comply with BS. 1710: 1971.

Basic colours for pipe line identification :

Pipe Line Contents	**BS. 4800 Colour Reference**	**Colour.**
Water	12 D 45	Green
Steam	10 A 03	Grey
Oils	06 C 39	Brown
Gas	08 C 35	Yellow / Brown
Air	20 E 51	Blue
Drainage	00 E 53	Black
Electrical	06 E 51	Orange

Colour code indicator bands shall be applied as colour bands over the basic identification colour in the various combinations as listed below :-

Pipe Line Contents	Colour Bands to BS. 4800
Water Services :	
Cooling	00 E 55

Fresh / drinking	18 E 53
Boiler feed	04 D 45/00 E 55 / 04 D 45
Condensate	04 D 45/14 E 53 / 04 D 45
Chilled	00 D 55/14 E 53 / 00 D 45
Central Heating Services :	
Below 100° C	18 E 55/04 D 45/18 E 53
Above 100° C	04 D 45/18 E 53 /04 D 45
Cold Water Storage Tanks:	00 E 55/18 E 53/00 E 55
Hot Water Supply	00 E 55/04 D 45/00 E 55
Hydraulic Power	04 C 33
Sea / River Untreated	Basic Colour only
Fire Extinguishing	04 E 53
Steam Services:	Basic Colour only
Air : Compressed	Basic Colour only
Vacuum	White.
Town Gas : Manufactured	14 E 53
Natural	10 E 53
Oils:	
Diesel	00 E 55
Lubricating	14 E 53
Hydraulic Power	04 C 53
Transformer	04 D 45
Drainage and other fluids :	Basic Colour only
Electrical Services :	Basic Colour only

In addition to the colour bands specified above all pipe work shall be legibly marked with black or white letters to indicate the type of service and the direction of flow, identified as follows :-

High Temperature Hot Water	HTHW
Medium Temperature Hot Water	MTHW
Low Temperature Hot Water	LTHW
Chilled Water	CHW
Condenser Water	CONDW
Steam	ST
Condensate	CN

Pipe shall have the letters F and R added to indicate flow and return respectively as well as directional arrows.

7.5 Technical Submittals

The successful tenderer after award of work shall furnish technical submittals for various items incorporating complete technical details prior to procurement of equipment/materials, for the approval of the Engineer-in-charge. The submittals for items mentioned in the tender document but not restricted to the following:

a.	CHILLER WITH CHILLER PLANT MANAGER
b.	CHILLED WATER PRIMARY PUMPS
c.	CHILLED WATER SECONDARY PUMPS
d.	CONDENSER WATER PUMP
e.	EXPANSION TANK CUM DEGASSER
f.	COOLING TOWER
g.	DIRT SEPARATOR
h.	ELECTRICAL PANELS & COMPONENTS.
i.	VALVES, PIPES AND ASSOCIATED CONTROL
j.	CHILLER INSULATION MATERIAL

Test certificates for various items shall also be submitted by the contractor.

7.6. **APPENDIX I**

Undertaking from major equipment OEM's (Original Equipment Manufacturer)

The lowest tenderer shall submit along with the performance guarantee after the acceptance of tender, an undertaking from OEM's as at Annexure-1 to 6 regarding major equipment's as mentioned below:

- The Authorization Certificate from Chiller Manufacturer.
- In Annexure 1 for the 2 years defect liability period in favor of IIT Kanpur. The OEM shall un conditionally support the lowest tenderer technically throughout the execution of the contract as well during DLP , comprehensive warranty & non comprehensive maintenance contract period for the useful life of the equipment.
- The OEM shall provide list of all the necessary spares required for healthy functioning of the chiller till the useful life of the equipment.

ANNEXURE – 1

Original Equipment Manufacturers (OEM) undertaking for providing 2 years of Defect Liability Period of the chiller with CPM to the lowest tenderer for 500 TR Screw Chiller including its integrated VFD proposed to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We....., OEM for 500 TR screw Chiller including its integrated VFD do hereby give undertaking to IIT Kanpur for the 2 years of Defect liability period through M/s……., lowest tenderer for the work, "***Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.".***

1. We also give undertaking to provide maintenance support and all the spares to IIT Kanpur throughout the useful life of the equipment for the hardware, software, integrated VFD and any other accessories for running the equipment.

M/s…….

Authorized signatory with stamp.

ANNEXURE – 2

Original Equipment Manufacturer (OEM) undertaking for ensuring availability of the refrigerant throughout the useful life of 500 TR screw Chiller proposed to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We..... , OEM for 500 TR screw Chiller do hereby give undertaking to IIT Kanpur for the providing refrigerant throughout the life of the chiller through M/s ....., lowest tenderer for the work, "Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.".

2. We also give undertaking to provide un conditional support to the lowest tenderer technically throughout the execution of the contract as well during DLP, comprehensive warranty & non comprehensive maintenance contract period for the useful life of the equipment.

M/s…….

Authorized signatory with stamp.

ANNEXURE – 3

Original Equipment Manufacturers (OEM) undertaking for providing 2 years of Defect Liability Period after DLP of the Pumping system including pump logic controllers to the lowest tenderer for primary, secondary, condenser pumping proposed to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We ……, OEM for pumps do hereby give undertaking to IIT Kanpur for the 2 years of Defect liability period through M/s……., lowest tenderer for the work, "***Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.".***

3. We also give undertaking to provide maintenance support and all the spares to IIT Kanpur throughout the useful life of the equipment for the hardware, software and any other accessories for running the equipment.

M/s…….

Authorized signatory with stamp.

ANNEXURE – 4

Original Equipment Manufacturers (OEM) undertaking for providing 2 years of Defect Liability Period to the lowest tenderer for Automatic Pressurization system with twin pump expansion tank / Dirt Separator system proposed to be supplied to IIT Kanpur under the above tender No…… by M/s…….

1. We ……., OEM for Expansion Tank & Dirt Separator do hereby give undertaking to IIT Kanpur for the 2 years of Defect liability period through M/s , lowest tenderer for the work, "***Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.***".

1. We also give undertaking to provide maintenance support and all the spares to IIT Kanpur throughout the useful life of the equipment for the hardware, software and any other accessories for running the equipment.

M/s…….

Authorized signatory with stamp.

ANNEXURE – 5

Original Equipment Manufacturers (OEM) undertaking for providing 2 years of Defect Liability Period to the lowest tenderer for Cooling Tower system proposed to be supplied to IIT Kanpur under the above tender No… ..... by M/s…….

1. We..... , OEM for Cooling Tower do hereby give undertaking to IIT Kanpur for the 2 years of Defect liability period through M/s , lowest tenderer for the work, "***Construction of 1000 TR Water Cooled Central AC plant for Data Centre under NSM-II (2 nos. Screw Chillers each of capacity 500 TR) near IWD AC plant, IIT Kanpur.***".

1. We also give undertaking to provide maintenance support and all the spares to IIT Kanpur throughout the useful life of the equipment for the hardware, software and any other accessories for running the equipment.

M/s…….

Authorized signatory with stamp.

7.7 List of approved Makes for HVAC Installation Works (as applicable).

S. No.	Items	Makes
1	Air handling unit/ Treated Fresh Air Unit	System Air/Flaktwood/ Zeco/Edgetech
2	Exhaust Air Unit	System Air/Flaktwood/ Zeco/Edgetech/Zair
3	Pipe (MS & GI)	Tata/Jindal(Hissar)/QST/Jindal(Star)
4	Blower	Nicotra/Comferi/ Kruger
5	Cooling coil	Zeco/Edgetech/ AHRI Certified
6	Hepa Filter	Thermadyne /Anfilco/ Dyna Air Filtration
7	Fan Coil Units	Cruise/Zeco/Edgetech/Kubic Midea/Trane
8	Duct (factory fabricated)	Rola Star / Techno Fabri-duct/Zeco/Ductofab
9	Water strainers (Y- strainer/pot strainer)	Emerald/Sant/D.S. Engineering / Maharaja Casting/Advance
10	Proportional thermostat	Siemens /Honeywell/Johnson
11	3 Way Motorized/ Mixing / Diverting valves	Siemens /Honey-well/Johnson/ Danfoss/Advance
12	Pressure gauges for water line/Refrigerant	Emerald / Fiebeg/ H. Guru
13	Thermometers	Emerald/ Japsin
14	V-Belts	Fenner India/ Dunlop
15	Fibre glass wool	UP Twiga /Ownes Corning
16	Nitrile Rubber insulation (Open/close cell) with specific-ation as per BOQ.	Armacell/ K-flex/ A-flex/ Supreme/Aerolam
17	Fire retardant flexible duct connection	Air flow / Twiga/ATCO/GP spira/caryaire
18	Gasket for ducts	Prima Kool / Nuprine
19	Anchor Fasteners	Hilti / Fischer
20	Extruded Aluminum grilles & diffusers Fresh air louvers/Dampers	Caryaire/ Ravi Star/ Air Flow/Air master/Titus/System air
21	Fire damper	Ravi Star/Air Flow/ Mapro/System air/Ruskin Titus/Greenheck
22	Duct attenuator	AirFlow/Ravi Star/ Contin-ental/Mahajan
23	Vibration isolators	Resistolex /Gerb / Base/ Dunlop
24	Motors	Siemens/Crompton/ABB/Bharat Bijlee
25	Fuse switch unit/switch fuse unit/HRC fuse	Larsen Toubro / Siemens / Schneider (MG)/Havells
26	Humidistat	Honeywell/Danfoss/Penn
27	Condenser/ Chiller	Trane/Carrier/York/Daikin
28	Polyurethane Foam (PUF)	Malanpur/ Lloyd /Best Opuf
29	Thermocole	Pioneer/Styrin

30	Chemical Reagent	Antiscalant/ Descalant / Antifungal Hibird / amacid/ Maic
31	VFD with sensors	ABB/DANFOSS/ Siemens
32	Cooling Tower	Paharpur/Flow air-tech Pvt.Ltd/Bell/Advance
33	Cooling Tower PVC Fills	Paharpur/Bell/Advance/Flow air tech
34	Window/Split Air conditioner/ Hi-wall split AC	Voltas/Hitachi / Carrier/Panasonic/Blue star/ Toshiba/Daikin
35	Dosing pump	M/s Ion Exchange (I) Ltd/ Milton Royal
36	Tower AC units	Voltas/Hitachi / Carrier/Panasonic/Blue star/ Toshiba/Daikin
37	Inverter VRF system	Voltas/Hitachi/ Carrier/Panasonic/Blue star/ Toshiba/Daikin/ Mitsubishi Electric
38	Hi wall type chilled water FCU	Cruise/Zeco/Edgetech/Kubic Midea/Trane
39	Wet scrubber	Zeco/Edgetech/ZAIR
40	Air washer (Evaporative cooling unit)	Carryaire/Zeco/Zair/Edgetech/Airflow
41	Pre-Insulated Pipe	Permapipe/Urecon/Sevenstar/Eurotube
42	VAV Boxes	Ruskin Titus/Honeywell/Trox/Trane/Johnson Controls/Tristar
43	Self-Cooled PAC server Rack	Schneider/Emersion/ Flakt
44	Victaulic coupling	Sevcon/Victaulic/Smith Copper
45	Dehumidifier	Bry-Air/Munters/Bri
46	PICV valve	Advance/Siemens/Denfoss/Honeywell
47	Axial Fans	Krugar/Nicotra/Comefri/Green Deck/Airflow
48	Spiral Flat Oval Duct (with GSS sheets of preferred make)	Dustech/GP spira/Spiral Tubes/Western air ducts/ Ductofab/Seven star
49	Silicone flexible duct connector	Easyflex/Airflow//Resistoflex/Dustech
50	Motorized butterfly valve/ Modulating Valve/Solenoid valve	Advance/Danfoss/Belimo/Johnson Control/Zoloto/Tyco/Victaulic/Honeywell
51	Expansion Bellow	Easyflex/Resistoflex/Cori
52	Fire rated vane Axial/Fire rated tube Axial/Vane Axial/Tube Axial Fan	Nicotra/Comferi/Kruger/Greenheck/Airflow/system air/Zair
53	Inline Fan	Nicotra/ Kruger/Greenheck/Airflow/system air
54	Propeller fan	Nicotra/ Kruger/Caryaire/Crompton/GE
55	Butterfly valve	Audco / Advance / C&R/Honeywell/ Kirloskar
56	Check Valve (Non return valve)	Audco/SKS/Advance/ Zoloto/ Honeywell
57	Balancing valve	Advance /Audco/ Honey- well/Danfoss
58	Centrifugal pump / Monobloc Pump	Grundfoss/Armstrong/Willo/Xylem
59	Water Softening Plant	Ion Exchange Ltd. / Milton Royal
60	Pressure switch	Indfoss / Honewell Indfoss / Honey- well
61	Bronze ball valve	Emerald/ Zolto / Leader/ Sant
62	Bronze ball valve with Y strainer	Emerald / Rapid control/ BAP
63	Suction guide	Anergy instrument Pvt.Ltd./Johnson/Pump OEM make
64	Water cooled screw chilling unit	Trane/Carrier/York/Daikin
65	Chemical reagent	Eco friendly bio clean pond clarifier/Volga

66	Sand filter	M/s Ion Exchange (I) Ltd / Pentair
67	Compressor	Emerson/Tecumsheh/Bohn/Danfoss
68	Cold room/Deep freezer	Danfoss/Blue Star/Bohn
69	Air-cooled ductable split/ceiling mounted Cassette type air-conditioning unit	Voltas/Hitachi / Carrier/Panasonic/Blue star/ Toshiba/Daikin
70	PVC water tank	Syntex/ Polycon
71	Water Cooler	Blue Star/Usha/Sidwal/Voltas
72	Control cables	CCI/ Fort Gloster/ Universal/ Incab/ Havells/KEI
73	Modular type Variable Refrigerant Flow/ Variable Refrigerant Volume air cooled Out- door units with specification as per BOQ	Voltas/Hitachi/carrier/Panasonic/Blue star/Daikin/Mitsubishi Electric
74	High static pressure VRF/VRV ceiling mounted ductable type Indoor Unit with specification as per BOQ.	Voltas/Hitachi/carrier/Panasonic/Blue star/Daikin/Mitsubishi Electric
75	Copper refrigerant piping with specification as per BOQ	Mandev/Rajco/ Maxflow
76	uPVC plumbing drain pipe with specification as per BOQ.	Supreme /Finolex
77	Fabricated GSS/GI Sheet with specification as per BOQ.	Jindal/Tata/SAI/Bhushan
78	80Amp, 4P, 300 Ma Weather proof RCB with specification as per BOQ.	L&T, Schneider, ABB
79	XLPE Class-O tubular insulation with specification as per BOQ.	Supreme / K-Flex/ A-Flex/Aerolam
80	PAC Unit with specification as per BOQ	Schneider (Uniflair)/StulzChspl (In- dia) Pvt.Ltd /Emerson Climate Technologies/ Bluebox
81	Electrical Panel with specification as per BOQ.	Siemens /L&T/Schneider / Le grand/Tecnic / ABB/ C&S/Neptune Milestone switchgear/Tricolite/ Essaar/Morden switch gear/Adlec
82	Portable type dehumidifier with Specification as per BOQ.	White Westinghouse/Power Pye Electronics/Bryair/Munter
83	GI volume control duct damper with specification as per BOQ.	Airmaste Equipment Emirates/Omega/Airflow
84	Soft duct (Fabric Duct)	Duct Sox/Prihoda
85	Smoke cum fire damper (Bare Damper)	Dynacraft/Mapro/Servex/Ruskin
86	Smoke cum fire damper (Actuator)	Belimo/Joventa/Honeywell/Siemens
87	Automatic Pressurization cum expansion tank	Flamco/Reflex/ IMI Hydronics/Ballandgosset
88	Dirt separator	Flamco/Reflex/ IMI Hydronics/Spirotech

Any other item not covered in the above list shall be ISI marked and as approved by Engineer In Charge.

8.Special Conditions of Contract

8.1 Timely Completion

1. The work included in this tender is of urgent nature.
2. The work of all components must be started simultaneously and has to be delivered togetheror early within the given time schedule.
3. The contractor has to deploy the labor and supervisory staff in shifts to meet the targetedcompletion date. The work may be executed in extended shifts or two shifts.
4. Number of days from the date of issue of letter of acceptance for reckoning date of startshall be as per Schedule. *If the Contractor commits default in commencing the executionof the work as aforesaid, the performance guarantee shall be forfeited.*
5. The detailed program chart approved by the engineer-in-charge shall indicate how the resources will be deployed by the contractor to maintain desired progress and for the completion of the work within the specified period. If the submitted program is approved, the milestone shall be redefined accordingly by the Superintending Engineer,IITK. The amount to be withheld in such a case, for non-achievement of milestone(s), shall remain unaltered. Any delay in achieving the milestone must be compensated within the limitations of time imposed in the Contract document
6. The contractor shall procure the required materials in advance so that there is sufficienttime for testing of the materials and approval of the same before use in the work, as required.

8.2 Rates

8.2.1 Unless otherwise provided in the schedule of quantities of the work the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building (Exclusive of GST) and nothing extra shall be payable to him on this account.

8.2.2 The rates for all items of work shall, unless clearly specified otherwise, include cost of all labours, materials and other inputs involved in the execution of the item irrespective of whether they have been specifically mentioned in the tender document or not.

8.2.3 In case the same item (s) appear more than once in the schedule of work / BOQ under the same sub head or among the different subhead of works, the lowest rate quoted for that item (s) shall be considered for the particular item(s) wherever appeared in any partof BOQ / Schedule of works for the purpose of tender evaluation although web generatede-price bid may incorporate different quoted rate for same item(s) as per the quoting pattern of the tenderer. The tendered amount thus worked out shall be final &shall be binding on the contractor.

8.2.4 The rates quoted by the contractor will be deemed to be inclusive of any extra expenditure of this reason. The contractor has to increase the manpower or other tools etc. to do the work as per requirement of the work at his own expenses. Nothing shall be paid on this account.

8.2.5 The contractor shall provide at his own cost suitable weighing, surveying and leveling and measuring arrangements as may be necessary at site for checking. All such equipment shall be got calibrated in advance from laboratory, approved by the Engineer-in-Charge.Nothing extra shall be payable on this account.

8.2.6 Other agencies may also simultaneously execute and install the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, openings, trenches etc. as may be required for such related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be available as specified elsewhere in the contract) and the contractor shall fix the same at the time of casting of concrete, stone work and brick work, if required, and nothing extra shall be payable on this account.

8.2.7 All material shall only be brought at site as per program finalized with the Engineer-in- Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

8.2.8 Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to approved manufacturers specifications where CPWD Specifications are not applicable. The contractor should get the materials (fixtures/fittings) tested from approved labs wherever required at his own cost.

8.2.9 The contractor shall be responsible for the watch and ward / guard of the buildings, safetyof all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the client department. No extra payment shall be made on this account.

8.2.10 The rates quoted by the Contractor are deemed to be inclusive of site clearance, setting out work, profile, establishment of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, preparatory works, working during monsoon, working at all depths, height, lead, lift and location etc until / unless specified otherwise and any other incidental works required to complete this work. Nothing extra shall be payable on this account.

8.3 Quality and Workmanship

8.3.1 The contractor shall be entirely responsible and answerable for all the works done by him regarding quality, adherence to the laid down specifications, terms and conditions, defect liability period

8.3.2 /guarantee etc. and he shall be liable to bear any compensation that may be levied by the department under any of the clauses of the agreement.

8.3.3 The materials having ISI mark shall have precedence over the one conforming to IS Specifications.

8.3.4 The proposed is for Institute premises and quality of work is paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T & Pand other equipment to execute the work.

8.3.5 Samples of all materials and fittings to be used in the work in respect of brand manufacturerand quality shall be approved from the Engineer-in-Charge, well in advance of actual execution and shall be preserved till the completion of the work.

8.3.6 All materials used in the work shall be new and of good quality, conforming to the relevant specifications as per good engineering practice. All the materials proposed to be used inthe work should be approved from Engineer in Charge before use in work.

8.3.7 Articles bearing BIS certifications mark shall only be used unless no manufacturer has got BIS/ISI mark for the particular material. Any material/fitting whose sample has not been approved in advance and any other unapproved material brought by the contractor shallbe immediately removed as soon as directed. Where the make of any particular materialis not specified in the Contract document, the material shall be supplied as per makes desired by the engineer-in-charge.

8.3.8 It will be the responsibility of the contractor / bidder to ensure use of genuine materials in the work. The department reserves the right to get (any / all materials / components) inspected by the manufacturer or their authorized representatives at any stage of the execution of work. If any of the materials, supplied and used in work is found spurious atany stage, then the department reserves the right to ask the contractor to replace it by genuine one and make suitable recovery till it is done, even if any payment against that material is already made.

8.3.9 The contactor should get the make/TDS documents approved before procuring any materialat site. The TDS/Make once approved shall not be changed without any valid recorded reasons. No material to be brought and used at site without the prior knowledge & approval of Engineer-in-Charge.

8.3.10 The department may ask for any valid document like manufacturer's test certificate, document for purchase of the material, document for import/shipment of imported materials etc. as deemed fit by the engineer-in- charge to ascertain genuinely of material supplied by/used in the work by the contractor. The contractor shall remain bound to submit all such documents to the department failing which payment may not be made or if alreadypaid may be recovered/ withheld from subsequent running account payment.

8.3.11 All equipment and their components, and all the materials to be used in the work shall be suitable for the environmental conditions at the location of the work.

8.3.12 The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance programme within two weeks of the award of work. The quality assurance programme should include method statement for various items of work to be executed along with check lists to enforce quality control.

8.3.13 The contractor shall get the source of all other materials, not specified elsewhere in the document, approved from the Engineer-in-Charge. The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of the Engineer-in-Charge for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Engineer-in-Charge along with samples and once approved, he shall stick to it.

8.3.14 Other Laboratories: The contractor shall arrange carrying out of all tests required underthe agreement through the laboratory as approved by the Engineer-in-Charge and shallbear all charges in connection therewith including fee for testing. The said cost of tests shall be borne by the contractor/department in the manner indicated below.

8.3.15 By the contractor, if the results show that the test does not conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.

8.3.16 By the department, if the results conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.

If the tests, which were to be conducted in the site laboratory, are conducted in other Laboratories for whatever the reasons, the cost of such tests shall be borne by the contractor.

8.3.17 Sample of building materials fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge. Articles manufactured by companies of repute and approved by the Engineer-in-Charge shall only be used. Articles bearing BIS certification mark shall be used in case the above are not available, the quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work.

8.3.18 The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge.

8.3.19 BIS marked materials except otherwise specified shall be subjected to quality test atthe discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/materials. Wherever BIS marked materials are brought to the site of work, the contractor shall if required, by the Engineer-in-Charge furnish manufacturers test certificate or test certificate from approved testing laboratoryto establish that the material produced by the contractor for incorporation in the work satisfies the provisions of BIS codes relevant to the material and/or the work done.

8.3.20 The contractor shall procure all the materials at least in advance so that there is sufficient time to testing and approving of the materials and clearance of the same before use in work.

8.3.21 All materials brought by the contractor for use in the work shall be got checked from the

Engineer-in-Charge or his authorized representative of the work on receipt of the same at site before use.

8.3.22 The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system.

8.4 Natural calamity:

No payment will be made to the contractor for any damage caused by rain, snow fall, floods, dampness, fire, sun or any other natural cause whatsoever during the execution of work. The damage to the work due to above reason, if any, shall have to be made good by the contractor at his own cost and no claim on this account shall be entertained.

8.5 Stocking and Disposal of Materials & Debris

8.5.1 The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, compound wall, services etc. are to be constructed.

8.5.2 After completion of work the agency shall remove materials and debris etc. from site as per the direction of Engineer-in-Charge, at no extra cost.

8.5.3 Contractor's job will also include removing of all malba and debris arising in the process of painting including washing of floor to remove stains of paint, at no extra cost.

8.5.4 The contractor shall conduct work so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Chargeand shall as far as possible arrange his work and shall place and dispose of the materialsbeing used or removed so as not to interfere with the operations of other contractor or heshall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of others.

8.5.5 For construction/renovation works which are likely to generate malba/rubbish to the tuneof more than a tempo/truck load, contractor shall dispose of malba, rubbish & other unserviceable materials and wastes at their own cost to the notified/specified dumping ground and under no circumstances these shall be stacked/dumped, even temporarily outside the construction premises.

8.5.6 Dismantled but useful materials/components/equipment, if any, should be returned to the Institute as per the direction of Engineer-in-Charge.

8.6 Safety and Security

8.6.1 The contractor has to follow all safety norms as laid down in National Building Code of India. All the workers shall be equipped with the required safety gadgets while working at site such as ISI marked helmets, Shoes and safety belts, gumboots, gloves etc.

8.6.2 The contractor, the authorized representative(s), workmen etc., shall strictly observe orders pertaining to fire precautions prevailing in the area.

8.6.3 The contractor shall be fully responsible for the safe custody of materials brought by him/ issued to him even though the materials may be under double lock key system.

8.6.4 Contractor will arrange proper metal ladders, M.S. double scaffolding (for working, painting,etc. at higher levels) at his own cost and will take all safety measures like double harnesssafety belt, mechanized electrically operated platform etc. If it is observed that work is proceeding without adequate safety precautions, work may be stopped by Engineer-in- charge and in such cases, contractor will be solely responsible for delay and its consequencesthereof.

8.6.5 The contractor shall be responsible for the watch and ward/guard of the buildings, safetyof all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the department. No extra payment shall be made on this account.

8.6.6 The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night speed limit boards red flags, red lights and providing barriers. He shall be responsible for all dangers and incidents caused to existing / new work due to negligence on his part. No hindrances shall be caused to traffic during the execution of the work.

8.6.7 It shall be ensured by the contractor that no electric live wire is left exposed or unattended to avoid any accidents in this regard.

8.6.8 The Institute shall not have any responsibility or liability in case of any accident injury to the personnel to the contractor at work site or to the general public at the work site due to mishandling equipment by the personnel of the contractor or any other similar reason. The responsibilities and liabilities for such accidents and incidents shall be borne by the contractor.

8.7 Approach to Site

8.7.1 The tenderer shall see the approaches to the site. In case any approach from main road is required at site or existing approach is to be improved and maintained for cartage of materials by the contractor, the same shall be provided, improved and maintained by thecontractor at his own cost.

8.7.2 Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost.

8.8 Water and Flooding

8.8.1 The contractor shall have to arrange water of desirable quality for the construction purpose for which he may have to install water purifier at site or might have to bring/ purchase water from outside as per decision of Engineer-in-charge. Nothing extra shall be paid on this account.

8.8.2 For works below ground level the contractor shall keep that area free from water. If dewatering or bailing out of water is required the contractor shall do it and nothing extrashall be paid except otherwise provided in the items of schedule of quantities.

8.8.3 In case of flooding of site on account of rain or any other cause and any consequent damage, whatsoever, no claim financially or otherwise shall be entertained not withstanding any other provisions elsewhere in the contract agreement. Also, the Contractor shall make good, at his own cost, the damages caused, if any.

8.8.4 The water charges (for water connection as well as tanker water) shall be borne by the contractor. Also, if the contractor obtains water connection for the drinking purposes from the Institute or any other statutory body, the consequent sewerage charges shall be borneby the contractor.

8.9 Acts and Laws

8.9.1 The Contractor shall keep himself fully informed of all acts and laws of the Central & State Governments, all orders, decrees of statutory bodies, tribunals having any jurisdiction or authority, which in any manner may affect those engaged or employed and anything related to carrying out the work. All the rules & regulations and bye-laws laid down by Collector / MC etc. and any other statutory bodies shall be adhered to, by the contractor,during the execution of work.

8.9.2 The Contractor shall also adhere to all traffic restrictions notified by the local authorities.

8.9.3 All statutory taxes, levies, charges (including water and sewerage charges, charges for temporary service connections and / or any other charges, as applicable) payable to suchauthorities for carrying out the work, shall be borne by the Contractor.

8.9.4 The Contractor shall arrange to give all notices as required by any statutory / regulatoryauthority and shall pay to such authority all the fees that is required to be paid for the execution of work. He shall protect and indemnify the Institute and its officials & employees against any claim and /or liability arising out of violations of any such laws, ordinances, orders, decrees, by himself/herself or by his/her employees or his/her authorized representatives. Nothing extra shall be payable on these accounts.

8.9.5 The fee payable to statutory authorities for obtaining the various permanent service shallbe borne by the Institute.

8.10 Labour and Laws

8.10.1 The Contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc. under various labour laws and other regulations applicable to the works, at his site office.

8.10.2 Huts for labour are not permitted within the premises of the Institute. No extra cost shallbe payable even if the contractor provides such accommodation at a place as is acceptableto the local body.

8.11 Nondisclosure Agreement

8.11.1 The Agency shall take all precautions not to disclose, divulge and/or disseminate to any third party any confidential information, proprietary information on the Institute business or security arrangements (including but not limited to the Assignment instructions, Schedules and other subsequent Arrangements) and/or business of the Institute. The obligation is not limited to any Scope and the Agency shall be held responsible in case ofbeach of the confidentiality of Institute's information.

8.11.2 If the Agency receives enquiries from Press/Media/Radio/Television or other bod-ies/persons, the same shall be referred by the Agency to Institute immediately on receiptof such queries.

8.12 Indemnification:

8.12.1 The agency shall be directly responsible to indemnify the Institute against all charges, dues, claims, etc. arising out of the disputes relating to the dues and employment of the personnel deployed and further for any claim/compensation against all damages andaccidents caused due to negligence on the part of the agents, employees and other personnelof the agency.

8.12.2 That the contractor shall keep the IITK indemnified against all claims whatsoever in respect of the employees deployed by the contractor. In case any employee of the contractor so deployed enters in dispute of any nature whatsoever, it will be the primarily responsibilityof the contractor to contest the same. In case IITK is made party and is supposed to contest the case, IITK will be reimbursed for the actual expenses incurred towards Counsel Fee and other expenses which shall be paid in advance by the Contractor to IITK on demand. Further, the contractor shall ensure that no financial or Any other liability comes on IITK in this respect of any nature whatsoever and shall keep IITK indemnified in thisrespect.

8.13 Force Majeure:

If at any time, during the continuance of this contract, the performance in whole or in part by either party of any obligation under this contract is prevented or delayed by reasons of anywar, hostility, acts of public enemy, civil commotion, sabotage, fires, floods, explosion, epidemics quarantine restriction, strikes, lockouts or acts of god (hereinafter referred to as events) provided notice of happenings of any such event, is served by party seeking concession to the other as soon as practicable, but within 21 days from the date of occurrence and termination thereof. Provided the Party satisfies Institute adequately of the measures taken by it. Neither party shall, by reason of such event, be entitled to terminate this contract, nor shall either party have any claim for damages against the' other in respect of such non-performance or delay in performance. Further, the services under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist and the decision of Institute as to whether the services have to resume or not shall be final and conclusive, provided further, that if the performance in whole or in part of any obligation under this contract is prevented or delayed by reason of anysuch event for a period exceeding 60 days, Institute may at his option, terminate the contract.

8.14 Dispute resolution

8.14.1 The institute reserves the right to amend rules whenever and wherever considered necessary and appropriate. The same shall be intimated to the agency in due course.

8.14.2 Any dispute arising out of and in relation to this agreement shall be referred to the arbitration by sole arbitrator to be appointed by Director of the Institute. The arbitration would be conducted and governed by and under the provisions of Arbitration Act, 1996 and its amendments. Any legal dispute will be subject to jurisdiction of Kanpur Courts only and no other court shall have the jurisdiction.

8.14.3 Any dispute arising out of and in relation to this agreement shall be referred to the arbitration by sole arbitrator to be appointed by Director of the Institute. The arbitration would be conducted and governed by and under the provisions of Arbitration Act, 1996. Any legal dispute will be subject to jurisdiction of Kanpur Courts only and no other court shall have the jurisdiction.

8.15 Arbitration

8.15.1 Except as otherwise provided anywhere in this Agreement, if any dispute, difference, thequestion of disagreement or matter, whatsoever, arises between the parties, as to the meaning, operation or effect of the Agreement or out of or relating to the Agreement or breach thereof, the same shall be referred to a Sole Arbitrator, to be appointment by theDirector of the Institute at the time of the dispute.

8.15.2 If the Arbitrator, to whom the matter is originally referred, dies or refuses to act or resigns for any reasons from the position of arbitration, it shall be lawful for the Director of the Institute to appoint another person to act as Arbitrator in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was leftby its predecessor, provided both the parties consent to this effect, failing which, the arbitrator shall be entitled to proceed on the matter de- novo.

8.15.3 It is a term of the Agreement that the party invoking the arbitration shall specify all disputes to be referred to arbitration at the time of invocation of arbitration under the clause.

8.15.4 It is a term of the contract that the cost of arbitration shall be borne by the parties themselves.

8.15.5 The place of the arbitration shall be Kanpur Nagar, Uttar Pradesh, India.

8.15.6 Subject as aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 and anystatutory modifications, amendments or re-enactment thereof and rules made thereunder and for the time being in force, shall apply to the arbitration proceeding under this clause.

8.15.7 Except as otherwise provided anywhere in this Agreement, the Arbitration proceedings shall be conducted in English and the Agreement shall be constructed, interpreted and governed by the law of India, for the time being in force.

8.16 Jurisdiction of Courts

The court(s) at Kanpur Nagar, Uttar Pradesh, shall have the exclusive jurisdiction to try any asall the disputes(s) between the parties arising out this Agreement.

8.17 Other Terms & conditions

8.17.1 In interpreting the specifications, the following order of decreasing importance shall befollowed in case of contradictions:

8.17.1.1 Schedule of quantities

8.17.1.2 Technical specifications of the NIT

8.17.1.3 Approved Drawing (If any)

8.17.1.4 CPWD General specifications Part-I (Internal) 2014, BIS Codes amended up to date, practices.

8.17.1.5 CPWD General Specifications for Electrical Works Part-II (External), 2014 amended up to date.

8.17.1.6 Relevant IS or other international code in case IS code is not available.

8.17.1.7 Indian Electricity Act 2003 and Indian Electricity Rules 1956 amended up to date.

8.17.1.8 Local Fire Regulations applicable at the place of installation. Relevant and applicable foreign standards and specifications amended up to date.

8.17.1.9 Any other relevant act or rules and local by-laws.

8.17.2 contractor will identify one of the supervisors for taking care of implementation of Safetysystems.

8.17.3 Smoking is strictly prohibited at workplace.

8.17.4 Nobody is allowed to work without wearing safety helmet. Chinstrap of safety helmet shall be always on. Drivers, helpers and operators are no exception.

8.17.5 No one is allowed to work at or more than three meters height without wearing safety belt and anchoring the lanyard of safety belt to firm support preferably at shoulder level.

8.17.6 No one is allowed to work without adequate foot protection.

8.17.7 Usage of eye protection equipment shall be ensured when workmen are engaged for grinding,chipping, welding and gas-cutting. For other jobs as and when site safety co-coordinator insists eye protection has to be provided.

8.17.8 All safety appliances like Safety shoes, Safety gloves, Safety helmet, Safety belt, Safety goggles etc. shall be arranged before starting the job. .

8.17.9 All excavated pits shall be barricaded & barricading to be maintained till the backfilling isdone. Safe approach to be ensured into every excavation.

8.17.10 Adequate illumination at workplace shall be ensured before starting the job at night.

8.17.11 All the dangerous moving parts of the portable / fixed machinery being used shall be adequately guarded.

8.17.12 Ladders being used at site shall be adequately secured at bottom and top. Ladders shall not be used as work platforms.

8.17.13 Material shall not be thrown from the height. If required, the area shall be barricaded and one person shall be posted outside the barricading for preventing the trespassers from entering the

area.

8.17.14 Other than electricians no one is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.

8.17.15 All electrical connections shall be made using 3 or 5 core cables, having a earth wire.

8.17.16 Inserting of bare wires for tapping the power from electrical sockets is completely prohibited.

8.17.17 A tools and tackles inspection register must be maintained and updated regularly.

8.17.18 Debris, scrap and other materials to be cleared from time to time from the workplace andat the time of closing of work every day.

8.17.19 All the unsafe conditions, unsafe acts identified by contractors, reported by site supervisors and / or safety personnel to be corrected on priority basis.

8.17.20 No children shall be allowed to enter the workplace.

8.17.21 All the lifting tools and tackles shall be stored properly when not in use.

8.17.22 Clamps shall be used on Return cables to ensure proper earthling for welding works.

8.17.23 Return cables shall be used for earthling.

8.17.24 All the pressure gauges used in gas cutting apparatus shall be in good working condition.

8.17.25 Proper eye washing facilities shall be made in areas where chemicals are handled.

8.17.26 Connectors and hose clamps are used for making welding hose connections.

8.17.27 All underground cables for supplying construction power shall be routed using conduit pipes.

8.17.28 Spill trays shall be used to contain the oil spills while transferring / storing them.

8.17.29 Tapping of power by cutting electric cables in between must be avoided. Proper junction boxes must be used.

8.17.30 All the E & M works shall be carried out as per direction and to the satisfaction of the Engineer-in-charge.

8.17.31 If the specifications for any item or its component are not available in the CPWD specifications cited above, relevant BIS specification as amended up to date shall be followed, whether or not the specific reference of a particular BIS specification has been made in this specification/ tender document.

8.17.32 Wherever any reference to any Indian Standard specification occurs in the document relating to this contract the same shall be inclusive of all amendments issued there to or revisions thereof, if any, upto the date of opening of tenders.

8.17.33 All materials should conform to relevant BIS specifications wherever the same exists in absence of stipulation in this tender document.

8.17.34 Where manufacturers furnish specific instructions / recommendations relating to the ma- terials used in this job and/or their installation, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases and shall be deemed to be included in the schedule of work whether they have been specifically mentioned or not.

8.17.35 All chase cuttings in the wall, for recessed conduits & boxes and drilling the holes shall be done

with power operated machines only. No chase shall be allowed to be cut manually with the use of hammer & chisel.

8.17.36 All cuttings in cement plaster and brick shall be made good by using cement mortar 1:3 (1 part cement, 3-part coarse sand) The cut surfaces shall be repaired by an experiencedmason only so as to match the repaired plaster with the original. All such repaired surfaces shall be cured for 3 to 4 days to keep the surfaces wet, using water spray machine (hand/motor operated) and avoid unnecessary flooding of the area.

8.17.37 The structural and architectural drawings shall at all times be properly co-related before executing any work.

8.17.38 For the purpose of recording measurements and preparing running account bills, the abbreviated nomenclature indicated in the publications Abbreviated Nomenclature of Items of DSR 2022 shall be accepted. The abbreviated nomenclature shall be taken to cover all the materials and operations as per the complete nomenclature of the relevant items in the agreement and relevant specifications. In case of items for which abbreviated nomenclature is not available in the aforesaid publication and also in case of extra and substituted items for which abbreviated nomenclature are not provided for in the agreement, full nomenclature of item shall be reproduced in the measurement books and bill forms for running account bills. For the final bill, however, full nomenclature of all the items shall be adopted in preparing abstract in the electronic measurement books and in the bill forms.

8.17.39 The following drawings must be submitted to Office of Executive Engineer within seven days of award of work.

8.17.39.1 G.A and schematic drawings of chilled water headers with pumps, pumps drawings with associated valves etc. showing material and size of sheet steel, technical data sheet, test certificate and make and ratings etc.

8.17.39.2 Pump selection and design datasheet along with the performance curves, Pipe materials, control valve technical data sheet to be submitted.

8.17.39.3 Along with the submission of TDS of pumps for approval, the agency shall submit warranty undertaking from the OEM of the pump.

8.17.40 On completion of works and before issuance of completion certificate, the contractor submit completion drawings in the form of three complete set of originals (reproducible).

8.17.40.1 G.A and schematic drawings of chilled water headers with pumps, pumps drawings with associated valves etc. showing material and size of sheet steel, technical data sheet, test certificate and make and ratings etc.

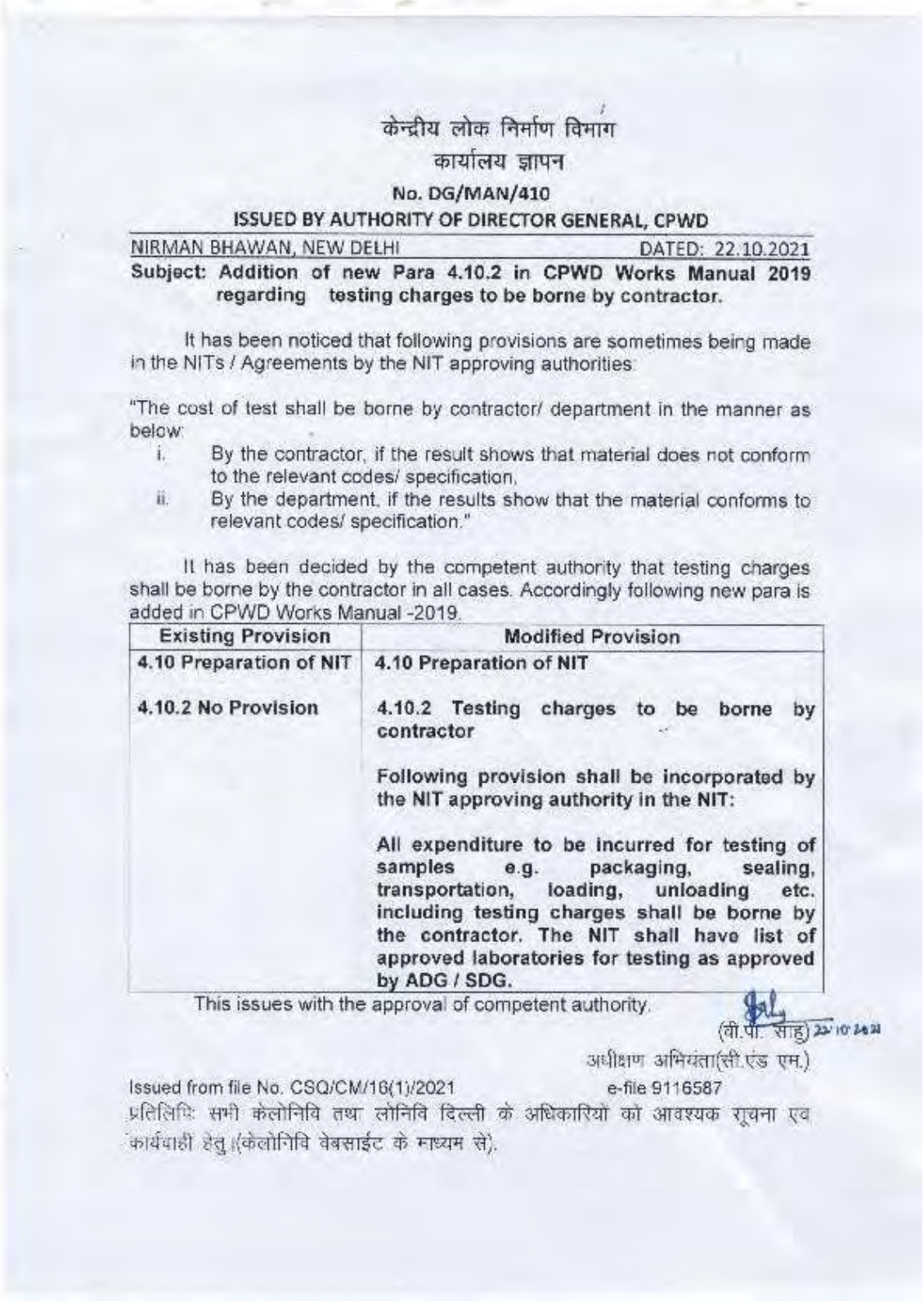
8.17.40.2 Pump selection and design datasheet along with the performance curves, Pipe materials, control valve testing and commissioning reports.

8.17.40.3 Technical literature, test certificates and operation and maintenance manuals required

8.17.41 Works Inspection and Testing of Equipment (If applicable): Prior to dispatch of equipment the Institute reserves the right to inspect for testing of the pumps as per relevant applicable standards or other items, the same at the manufacturer's works and the contractor shall provide and secure every reasonable access and facility at the manufacturers works for inspection, for witness of all acceptance and routine tests as per relevant Indian Standards. Contractor shall give a reasonable notice of about 15 days for the purpose of test, and witness of all major equipment.

8.17.42 Pre-commissioning test: All routine tests shall be carried out on the electrical equipment. Protective & measuring devices should be checked for calibration of MCCB's/MCB's, network

rack panel & cable meggaring, earthing measurements etc.



केन्द्रीय लोक निर्माण विभाग

कार्यालय ज्ञापन

No. DG/MAN/410

ISSUED BY AUTHORITY OF DIRECTOR GENERAL, CPWD

NIRMAN BHAWAN, NEW DELHI DATED: 22.10.2021

Subject: Addition of new Para 4.10.2 in CPWD Works Manual 2019 regarding testing charges to be borne by contractor.

It has been noticed that following provisions are sometimes being made in the NITs / Agreements by the NIT approving authorities:

"The cost of test shall be borne by contractor/ department in the manner as below:

i. By the contractor, if the result shows that material does not conform to the relevant codes/ specification.

ii. By the department, if the results show that the material conforms to relevant codes/ specification."

It has been decided by the competent authority that testing charges shall be borne by the contractor in all cases. Accordingly following new para is added in CPWD Works Manual -2019.

Existing Provision	Modified Provision
4.10 Preparation of NIT	**4.10 Preparation of NIT**
4.10.2 No Provision	**4.10.2 Testing charges to be borne by contractor** **Following provision shall be incorporated by the NIT approving authority in the NIT:** **All expenditure to be incurred for testing of samples e.g. packaging, sealing, transportation, loading, unloading etc. including testing charges shall be borne by the contractor. The NIT shall have list of approved laboratories for testing as approved by ADG / SDG.**

This issues with the approval of competent authority.

(वी.पी. साहू) 22/10/2021

अधीक्षण अभियंता(सी.एंड एम.)

Issued from file No. CSQ/CM/16(1)/2021 e-file 9116587

प्रतिलिपि: सभी केलोनिवि तथा लोनिवि दिल्ली के अधिकारियों को आवश्यक सूचना एवं कार्यवाही हेतु।(केलोनिवि वेबसाईट के माध्यम से).

Figure 1: Modified provisions in CPWD works manual 2019 regarding testing charges to be borne by contractor.