



E-Tender
for
Supply, Installation, Testing and commissioning (SITC)
of
Central Air conditioning System
for Bank's Central Office Building, at
Fort , Mumbai
Part – I
(Techno commercial)

Name of Tenderer: _____

Address: _____

Due date and time for Submission of tender : Up to 14:00 Hrs on March 17, 2025

Reserve Bank of India
Premises Department, Central Office,
5th floor, Central Office Building, Shahid Bhagat Singh Marg,
Fort, Mumbai – 400001, Maharashtra, India

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Disclaimer

Premises Department, Central Office, Reserve Bank of India, 5th Floor, Central Office Building, Shahid Bhagat Singh Marg, Fort, Mumbai, has prepared this document to give background information on the project of Supply, Installation, Testing and Commissioning of Central Air Conditioning system For Bank`s Central office building at Fort, Mumbai to the tenderers. While Reserve Bank of India has taken due care in the preparation of information contained herein and believe it to be accurate, neither Reserve Bank of India nor any of its authorities or agencies nor any of their respective officers, employees, agents or advisors give any warranty or make any representations, express or implied as to the completeness or accuracy of the information contained in this document or any information which may be provided in association with it.

The information is not intended to be exhaustive. Interested tenderers are required to make their own inquiries and will also be required to confirm in writing that they have done so and they do not rely only on the information provided by Reserve Bank of India in submitting the tender document. The information is provided on the basis that it is non-binding on Reserve Bank of India or any of its authorities or agencies or any of their Officers, employees, agents, or advisors.

Reserve Bank of India reserves the right not to proceed with the project or to change the Configuration of the project, to alter the timetable / schedule reflected in this document or to change the process or procedure to be applied. It also reserves the right to decline to discuss the matter further with any tenderer submitting the tender. No reimbursement of cost of any type will be paid to person(s) or tenderer(s) submitting this tender.

The tender document should be signed and submitted by the person(s) duly authorized to bind the tenderer to the details submitted in the tender. The signatory should give a declaration and through authenticated documentary evidence establish that he/ she is empowered by the competent authority to sign the necessary documents and bind the tenderer into a legal contract. All pages of the tender documents are to be signed by the authorized signatory.

Notice Inviting e-Tender
(NIT)

Supply, Installation, Testing and commissioning of Central Air conditioning System for Bank's central Office Building at Fort , Mumbai

1. This is an open e-tender enquiry. However, only those tenderer /contractors who are qualified for the work as pre-qualification/Minimum eligibility criteria stipulated in the tender are eligible to participate in this tender. Tenderers are advised to upload the documents in support of their eligibility for the tender during the submission. The work is estimated to cost **₹475 Lakh** inclusive of all taxes and is to be completed within a period of **26 weeks**.

2. Eligibility Criteria:

The intending tenderer (**OEM of chillers/Authorised Dealers/ System Integrators**) must read the terms and conditions carefully. The intending tenderers should submit their bid only if they consider themselves eligible and are in possession of all the documents as required as under:

(i) The tenderer must be a single entity, registered as a Company under the Companies Act 2013 or Companies Act, 1956, or Partnership Firm registered under the Indian Partnership Act, 1932, or LLP registered under the Limited Liability Partnership Act, 2008 and should have been in existence in India.

Note: The tenderer shall submit a copy of Certificate of Registration/Incorporation under the respective Acts in India and the respective Memorandum of Association/ Partnership as documentary evidence.

(ii) The tenderer must have minimum 5 years of experience in the field of undertaking similar works* i.e. carrying out Central Air Conditioning System for large office buildings/commercial premises/ industrial houses. The similar work should have been completed on or before January 31, 2020.

(iii) The tenderer must have experience in executing the similar work(s) during the last five years as on after January 31, 2020, individually having Value of executed works* as under:

a) Three works each costing not less than the amount equal to 40% of the estimated cost

OR

b) Two works each costing not less than the amount equal to 50% of the estimated cost

OR

c) One work costing not less than the amount equal to 80% of the estimated cost,

Note:

Value of executed work*, shall be value of executed work exclusively towards the work of SITC of Central Air Conditioning system. Cost of any other works for SITC of Central AC system (such as ducting system, Air Handling Units, standalone AC units etc.) and cost of any civil works, interior works, electrical, electromechanical etc., if included in the work, shall not be considered in determining the value of work. For this purpose, the tenderer shall provide an undertaking on breakup of cost for above qualifying work(s), duly certified by their chartered accountant with Unique Document Identification Number (UDIN).

(iv) The tenderer shall have a minimum yearly turnover of 100% of the estimated cost during the last 3 financial years ending March 31, 2024.

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Note: The tenderer shall submit a certificate from chartered accountant with Unique Document Identification Number (UDIN) clearly showing the turnover of the tenderer in the above financial years.

(v) The tenderer should also furnish **Banker's certificate / Solvency Certificate amounting to ₹ 475 Lakh** (minimum) for indicating their financial capability to carry out the works for amounts as indicated as above. The tenderer must submit their **Bankers details**.

(vi) The tenderer shall submit the details of its **own Office(s) / full-fledged Service Set up/ Service Centre / Support Office** in Mumbai /sub urban area wherefrom required quality after sales services can be regularly provided

Note: The tenderer shall submit documentary evidence such as registration of their office / service centre under shop and establishment act, GST registration etc. issued by a government body in the name of tenderer and the copy of ownership document / rent agreement of their service centre in the name of the tenderer as the documentary proof of having their office.

(vii) The tenderer should be maintaining minimum two similar system for last two years as on or after January 31, 2023 in Mumbai and/or suburban area.

3. The tenderer should invariably furnish the below mentioned information in writing and upload copies of relevant documents along with Part I of the tender to satisfy the Bank about their eligibility for participating in the tendering process. Further, the contractor should submit the originals of the documents to the Bank when demanded to qualify for further tendering process.

a)	Composition of the firm	Full particulars (whether contractor is an individual or a partnership firm or a company etc.) of the composition of the firm of contractors in details should be submitted along with the name(s) of the partners/ Directors, copy of the Memorandum / Articles of association/power of Attorney/any other relevant document.
(b)	Work experience and completion of similar works of specified value during the specified period	Copies of the detailed work orders for the qualifying works indicating date of award, value of awarded work, time given for completing the work, etc. and the corresponding completion certificates indicating actual date of completion and actual value of executed similar works should be enclosed in proof of the work experience. The details along with documentary evidence of previous experience if any, of carrying out similar works for the Reserve Bank of India at any center, should also be given.
(c)	Turnover	Audited financial statements for the last three financial years i.e., 2021-22, 2022-23 and 2023-24 along with a certificate of Chartered Accountant indicating the turnover of these financial years.
(d)	Creditworthiness of the contractor and their turnover	The latest final accounts of the business of the contractor duly certified by a Chartered Accountant should be enclosed in proof of their creditworthiness and turnover for last three years.
(e)	Name(s) and Address (es) of the Bankers	Written information about the names and address of their bankers along with full details like names, postal addresses, e- mail IDs, telephone (land and mobile) nos. fax nos. etc. of the contact

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	and their present contract executives.	executives (i.e., the persons who can be contacted at the office of their bankers by the RBI, in case it is so needed) should be furnished.
(f)	Details of bank accounts	Full particulars of their bank accounts like account no., type, when opened, etc., should be given.
(g)	Name(s) and address(es) of the Clients and their present contract executives.	Written information about a few of their clients along with full details, like names, postal address, e- mail IDs, telephone (landline and mobile) nos. etc. of the contact executives (i.e., the persons who can be contacted at the office of their clients by the Bank in case it is so needed) should be furnished.
(h)	Details of completed works.	The client-wise names of work(s), year(s) of execution of work(s), awarded and actual costs (s) of executed work(s), completion time stipulated in the contracts(s) and actual time taken to complete the work(s), names and full contact-details of the officers/ authorities/ departments under whom the work(s) was/were executed should be furnished
(i)	Details about service set up at Mumbai	Proof of authorized, valid service set up, contact address , e-mail id , phone no etc

4. In the event of intending tenderers' failure to satisfy the Bank; the Bank reserves the right to reject the tender forms submitted by them.

5. Tender forms can be downloaded for viewing from the website www.mstcecommerce.com w.e.f., **February 12, 2025** from 13:00 Hrs. Tenders along with all the information/documents, mentioned in para 3 above, will have to be uploaded up to 14:00 Hrs on March 17, 2025 for Bank's examination.

6. A pre-bid meeting of the intending tenderers, will be held on March 06, 2025 at 11.30 Hrs in Premises Department, 5th Floor, Reserve Bank of India, central Office building fort Mumbai. All intending tenderers are advised to attend the Pre- Bid meeting. A site visit will also be arranged to acquaint them with the work. The minutes of pre-bid meeting will be uploaded on Bank's website and MSTC portal and it will be binding on all the tenderers for this work and no further clarifications will be entertained.

7. Part I of the tenders will be opened at 15:00 Hrs on March 17, **2025**. Part-II (Price bid) of only those tenderers who qualify in Part I, shall be opened on a subsequent date after scrutiny of the Technical bids received by the Bank, which will be intimated to the tenderers in advance.

8. The client's certificate for qualifying work as mentioned under S.No.3 (b) above shall be accepted only when the same is signed by an official of the rank of Executive Engineer or equivalent in respect of a Government/Semi Government organization or a PSU and only when they are supported by adequate proof of payment received by the contractor for the work done by them. The client's certificate issued by competent authority in the private organizations shall also accompany CA certified copy of Tax deducted at Source(TDS) certificate (Form 16A and 26A) shall be submitted along with the experience certificate and TDS amount shall tally with the actual amount of work done. Applications/tenders received without the above certificates may be rejected. The Bank shall have the right to independently verify these certificates. Format for clients' report is provided **at Annexure B** of this tender.

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9. The tenderer should also furnish **Banker's certificate / Solvency Certificate amounting not less than estimated cost** (minimum) **at annexure D** of this tender for indicating their financial capability to carry out the works for amounts as indicated as above.
10. Bank reserves the right to independently verify Banker's and Client certificate submitted by the tenderer and / or to obtain confidential report(s) from the Clients / Banker of the tenderer independently. If any of the report(s) is found to be unsatisfactory, the tenderer may not be considered for the work. The confidentiality of such reports shall be maintained, and details of such report(s) shall not be shared.
11. The certificates should be addressed to Smt. K Nikhila, Chief General Manager-in-charge, Reserve Bank of India, Premises Department, Central Office 5th Floor Central Office Building, Shahid Bhagat Singh Marg, Mumbai -400001 and shall be uploaded along with the tender.
12. Any amendments / corrigendum to the tender, if any, issued in future will only be notified on the RBI Website and MSTC Website as given above.
13. The Bank is not bound to accept the lowest tender and reserves the right to accept either in full or in part any tender. The Bank also reserves the right to reject all the tenders without assigning any reason therefore or incurring any liability to the tenderers.

**Chief General Manager-in-Charge
Premises Department
Reserve Bank of India
Central office, Mumbai**

SCHEDULE FOR SUBMISSION OF TENDERS

EVENT	DATE and TIME
1. E-tender No.	RBI/PD-Central Office Departments /Others/31/ 24-25/ ET/919
2. Name of the Work	Supply, Installation, Testing and commissioning of Central Air conditioning System for Bank's central Office Building, Fort , Mumbai
3. Estimated cost of the work	₹ 475 lakh
4. Time allowed for completion of the works from 14 th day from the date of written order to commence work	26 weeks
5. Mode of e-Tender	Online e-Procurement System (Part I - Techno-Commercial Bid and Part II - Price/ Financial Bid) through MSTC website (https://www.mstcecommerce.com/eprocn/)
6. Date of NIT (along with complete tender) available to download-on MSTC website	February 12, 2025, from 13:00 Hrs. onwards
7. Last date for submission of queries for clarification about the tender document by intending tenderer in writing via email (queries must be sent via email to hrahaman@rbi.org.in)	March 05 , 2025
8. Date and time for Pre-Bid Meeting with intending tenderer for providing clarifications on queries	March 06, 2025, at 11:30 hours
9. Date for issue of clarification, corrigendum, addendum, if any,	March 07, 2025
10. Tender Fees	Nil
11. Earnest Money Deposit (EMD)	₹ 9.5 lakhs
12. Date of Starting of e-Tender for submission of online Techno-Commercial Bid and price Bid at MSTC website (https://www.mstcecommerce.com/eprocn/)	March 07, 2025 from 14:00 Hrs. onwards

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EVENT	DATE and TIME
12. Last date and time for submission of proof of remittance for EMD/ original BG in lieu of NEFT.	Up to March 17 , 2025, from 14:00 Hrs.
13. Last date and time for submission of duly filled-in complete tenders on MSTC website	Up to March 17, 2025, from 14:00 Hrs.
14. Date and time for opening of Part- I of the tenders (i.e., Techno-Commercial Bid)	March17, 2025, at 15:00 Hrs.
15. Transaction Fee Please note that the vendors will have the access to online e-tender only after payment of transaction fees online.	Payment of transaction fee through MSTC payment gateway either by NEFT/RTGS through challan or by Online payment through Net banking/Debit card/Credit card in favour of MSTC LIMITED. Upon receipt of payment, system will automatically authorize the payment. Charges for participation in e-procurement will be made to M/s MSTC Ltd. through MSTC Gateway/NEFT/RTGS in favour of MSTC Limited or as advised by M/s MSTC Ltd.

Note:

- a) Maximum 2 participants (employees of the tenderer) from each tenderer can attend the pre-bid meeting on the scheduled date and time. The details of the participants must be sent by intending tenderer by email at hrahaman@rbi.org.in on or before **10:00 Hrs. on March 06, 2025**, for issuing the necessary entry pass.
- b) Address for conducting the Pre-Bid Meeting, submission of BG or proof of remittance of EMD and opening of e-tenders shall be Premises Department, Central Office, 5th Floor, Central Office Building, Shahid Bhagat Singh Marg, Fort, Mumbai-400001
- c) All clarifications, corrigendum, addendum, if any, shall be posted only in tender section of the Bank's website.
- d) The Application document containing details regarding the brief scope of work, minimum qualification, process & eligibility criteria, other terms, and conditions etc. can be downloaded from tender section of Bank's website.

Important instructions for E-procurement

Tenderers are requested to read the terms & conditions of this tender before submitting your online tender.

1	<p><u>Process of e-Tender :</u></p> <p>A) Registration: The process involves contractor's registration with MSTC E-procurement portal which is free of cost. Only after registration, the contractor(s) can submit his/their bids electronically. Electronic Bidding for submission of Technical Bid</p>
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as well as Commercial Bid will be done over the internet. The Contractor should possess Class III signing type digital certificate. Contractors are to make their own arrangement for bidding from a P.C. connected with Internet. MSTC is not responsible for making such arrangement. (Bids will not be recorded without Digital Signature).

SPECIAL NOTE: THE TECHNICAL BID AND THE COMMERCIAL BID

HAS TO BE SUBMITTED ON-LINE AT www.mstcecommerce.com/eprochome/rbi

1).Contractors are required to register themselves online with www.mstcecommerce.com→ e-Procurement → PSU/Govt depts → Select RBI Logo → Register as Contractor→ Filling up details and creating own user id and password → Submit.

2). Contractors will receive a system generated mail confirming their registration in their email which has been provided during filling the registration form. In case of any clarification, please contact RBI/MSTC, (before the scheduled time of the e-tender).
Contact person (RBI, Mumbai):

1. Shri Hasanur Rahaman, AGM(Tech) (Contact details: email - hrahaman@rbi.org.in phone – 8763528236
2. Shri Manish Madhukar Gaikwad, (Mgr) (Contact details: email - manishmgaikwad@rbi.org.in phone -9167645390

Contact person (MSTC Ltd):

HO Central Help Desk: (For contractors)

Phone Number :07969066600

Email ID: helpdeskho@mstcindia.in (Please mention "HO Helpdesk" as subject while sending emails)

WRO Helpdesk:7651915418/02269856817/02269856800

Contact Person: Mr. Tanmoy Sarkar, Deputy Manager: 8349894664 – wroopn11@mstcindia.in

Availability: 9:30 AM to 5:00 PM on all working days for all technical issues related to e-Tenders, System settings etc.

B) System Requirement:

i B) System Requirement:

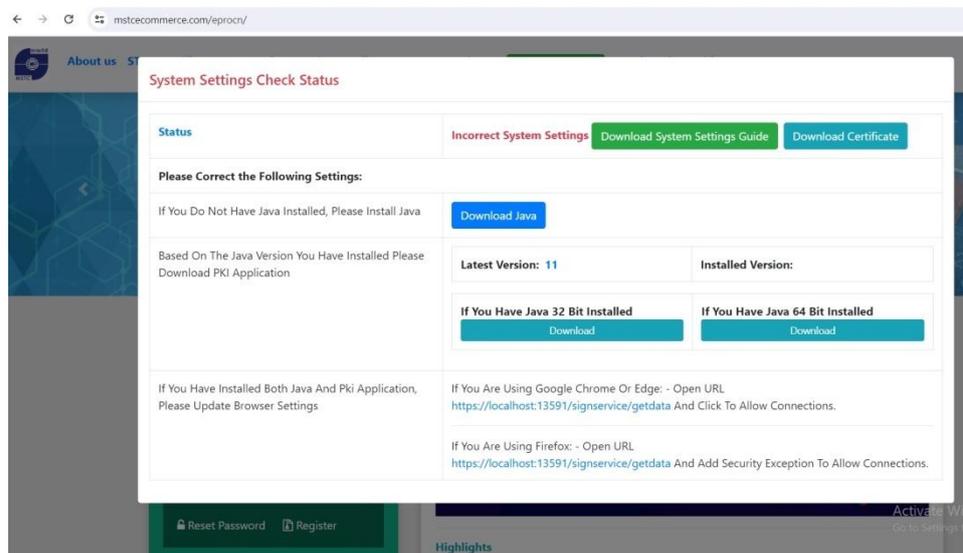
i) Windows 7 or above Operating System

ii) IE-9 and above Internet browser

iii) Signing type digital signature

iv) Latest updated Java Version (JRE- Windowsx86 Offline) software to be downloaded and installed in the system.

For details, Contractor may refer to the DOWNLOAD SYSTEM SETTING GUIDE available <https://www.mstcecommerce.com/eprocn/>



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A) Part I - Techno-Commercial bid will be opened electronically on specified date and time as given in the NIT.

(B) Part II - Price bid will be opened electronically of only those tenderer(s) whose Part I - Techno-Commercial Bid is found to be Technically and Commercially acceptable by RBI, Premises Department, Central Office/Estate Department ----- . Such tenderer(s) will be intimated about the date of opening of Part II - Price bid, through email.

Note:

The tenderers are advised to offer their best possible rates. There would generally be no negotiations hence please submit your most competitive prices while submitting the price bid. However, in case the lowest rate appears to be reasonable taking into account the prevailing market conditions, the order may be awarded to the lowest tenderer and if the rate is still considered high, action as per prevailing instruction/guideline shall be taken

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All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.

4	<p><u>Special Note towards Transaction fee:</u></p> <p>The tenderers shall pay the transaction fee using “Transaction Fee Payment” Link under “My Menu” in the Contractor login. The contractors have to select the particular tender from the event dropdown box. The Contractor shall have the facility of making the payment either through NEFT or Online Payment. On selecting NEFT, the Contractor shall generate a challan by filling up a form. The Contractor shall remit the transaction fee amount as per the details printed on the challan without making change in the same. On selecting Online Payment, the Contractor shall have the provision of making payment using its Credit/ Debit Card/ Net Banking. Once the payment gets credited to MSTC’s designated bank account, the transaction fee shall be auto authorized, and the Contractor shall be receiving a system generated mail.</p> <p>Tenderers may please note that the transaction fee should be deposited by debiting the account of the tenderer only; transaction fee deposited from or by debiting any other party’s account will not be accepted. Contractors are advised not to deposit cash in bank as it becomes difficult to ascertain the details of the remitter from such cash transactions.</p> <p><u>Transaction fee is non-refundable.</u></p> <p>A Contractor will not have the access to online e-tender without making the payment towards transaction fee. In case of failure to make payment towards Transaction fee for any reason, the contractor, in term, will not have the access to online e-tender.</p> <p>The tenderers should submit the transaction fee well in advance before the last date of submission of e-Tender as they will be activated for bid submission only after receipt of transaction fee by MSTC and they will have sufficient time to submit the bid.</p>
5	<p>Contractors are instructed to use Upload Documents link in My menu to upload documents in document library. Multiple documents can be uploaded. Maximum size of single document for upload is 5 MB.</p> <p>Once documents are uploaded in the library, contractors can attach documents through Attach Document link against the particular e-Tender. Please note that if the documents are not attached to any e-Tender, the same cannot be downloaded by RBI, Premises Department, and it will be deemed that the Contractor has not submitted the documents. For further assistance please follow instructions of Contractor guide.</p>
6	<p>Information about tenders /corrigendum, notices, correspondence, etc. to the tenderer(s) shall be sent by email only during the process till finalization of e-Tender by RBI, Premises Department as well as by MSTC (e-procurement service provider). Hence the tenderers are required to ensure that their email address provided is valid and updated at the stage of registration of Contractor with MSTC (i.e., Service Provider). Tenderers are also requested to ensure validity of their DSC (Digital Signature Certificate).</p>
7	<p>(i) Please note that there is no provision to take out the list of parties downloading the e-Tender document from the web site mentioned in NIT. As such, tenderers are requested to see the Bank’s/MSTC website/ (in case of empanelled tenderers, the email ID given to Bank at the time of application of empanelment) once again before the due date of e-Tender opening to ensure that they have not missed any corrigendum uploaded against</p>

	<p>the said e-Tender after downloading the e-Tender document. The responsibility of downloading the related corrigenda, if any, will be of the tenderers only.</p> <p>a) (ii) No separate intimation in respect of corrigendum to this NIT (if any) will be sent to tenderer (s) who have downloaded the documents from web site. Please see website https://www.mstcecommerce.com/eprocn/ of MSTC Ltd.</p>
8	E-tender cannot be accessed after the due date and time mentioned in NIT.
9	<p>Bidding in e-tender:</p> <p>a) Contractor(s) need to submit necessary EMD and Transaction fees separately for the e-tender to be eligible to bid. Transaction fees are non-refundable. No interest will be paid on EMD. EMD of the unsuccessful contractor(s) will be refunded by the tender inviting authority as per terms of the tender.</p> <p>b) The process involves Electronic Bidding for submission of Technical and Commercial Bid.</p> <p>c) The contractor(s) who have submitted transaction fee can only submit their Techno-Commercial Bid and Price Bid through internet in MSTC website https://www.mstcecommerce.com → e-procurement → Common Portal → Bid Floor Manager → live event → Selection of the live event → Transaction fee → Common terms → Attach Documents → Price Bid.</p> <p>Please Note: The Contractor after successful remittance of the transaction fees and EMD details, will get the attach documents and common terms tab enabled in their login. Post successful completion of this step, the contractors will be allowed to save the lot specific terms and submit their price bid against the lot through the portal or download and upload the excel file for submitting price bids, as the case may be. In case the attach documents and/or saving common terms step is unsuccessful, the tabs for saving lot specific terms and submitting price bid would be disabled. The status of whether the same is successful/pending would be displayed in the bid status button.</p> <p>d) The tenderer should allow to run an application namely java applet by accepting the risk and clicking on run. This exercise has to be done twice immediately after reaching the bid floor. If this application is not run, then the tenderer will not be able to save/submit his bid. (for details refer Contractor guide & FAQ).</p> <p>e) First the Contractor needs to fill up the Commercial specification if any and save it. Then the Contractors should fill up the Techno-commercial bid. After filling the Techno-Commercial Bid, tenderer should click 'save' for recording their Techno-Commercial bid. Once the same is done, the Price Bid link becomes active and the same has to filled up and then tenderer should click on "save" to record their price bid. Then once both the Techno-Commercial bid & price bid has been saved, the tenderer can click on the "Final Submission" button to register their bid.</p> <p>NOTE: After clicking the final submission "Delete bid" option would be shown. If the Contractor wants to delete the bid after final submission and re submit the bid, then he/she should click delete bid and resubmit the same and again click final submission.</p> <p>f) In all cases, Contractor should use their own ID and Password along with Digital Signature at the time of submission of their bid.</p>

	<p>g) During the entire e-tender process, the contractors will remain completely anonymous to one another and also to everybody else.</p> <p>h) The e-tender floor shall remain open from the pre-announced date & time and for as much duration as mentioned above.</p> <p>i) All electronic bids submitted during the e-tender process shall be legally binding on the contractor. Any bid will be considered as the valid bid offered by that Contractor and acceptance of the same by the Buyer will form a binding contract between Buyer and the Contractor for execution of supply/work. Such successful tenderer shall be called hereafter SUPPLIER/CONTRACTOR.</p> <p>j) It is mandatory that all the bids are submitted with digital signature certificate otherwise the same will not be accepted by the system.</p> <p>k) Buyer reserves the right to cancel or reject or accept or withdraw or extend the tender in full or part as the case may be without assigning any reason thereof.</p> <p>l) No deviation of the terms and conditions of the tender document is acceptable. Submission of bid in the e-tender floor by any Contractor confirms his acceptance of terms & conditions for the tender.</p> <p>m) Unit of Measure (UOM) is indicated in the e-tender Floor. Rate to be quoted should be in Indian Rupee as per UOM indicated in the e-tender floor/tender document.</p> <p>n) Any order resulting from this tender shall be governed by the terms and conditions mentioned therein.</p> <p>o) The online e-Tender should be submitted strictly as per the terms and conditions and procedures laid down in the website https://www.mstcecommerce.com/eprocn/. No deviation to the technical and commercial terms & conditions are allowed.</p> <p>p) The tender inviting authority has the right to cancel this e-tender or extend the due date of receipt of bid(s) without assigning any reason thereof. Contractors are requested to read the contractor guide and see the video in the page https://www.mstcecommerce.com/eprocn/ to familiarize them with the system before bidding.</p>
10	<p>All the above documents duly signed and sealed on all pages shall be uploaded on MSTC website and same will be downloaded at the time of opening Part I of tender for examination by the Bank. The documents uploaded by tenderer(s) will be scrutinized. The contractor should submit the original of the documents to the Bank when demanded for further tendering process, or afterwards. In case any of the information furnished by the tenderer is found to be false during scrutiny, EMD of defaulting tenderer(s) will be forfeited. Punitive action including suspension and banning of business can also be taken against defaulting tenderers.</p>
11	<p>The Bank will evaluate the said reports before evaluation of price bid of the tenders. If any tenderer is not found to possess the required eligibility for participating in the tendering process at any point of time, the Bank reserves the right to reject his offer even after opening of Part-I of the tender. The Bank is not bound to assign any reason for doing so.</p>

12	The Bank is not bound to accept the lowest tender and reserves the right to accept either in full or in part any tender. The Bank also reserves the right to reject all the tenders without assigning any reason there for.
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Important Note

In the price bid due to number of words limitation of 1000 characters, complete description could not be accommodated and description given thereof is brief. Before quoting rates, all the contractors must read the complete details of each item given in the un-priced bill of quantities (BOQ) given in Part-I of the tender. For execution and rate purpose, the details given in Unpriced Bill of Quantities in Part-I of the tender will be implemented.

**Chief General Manager-in-Charge
Premises Department
Reserve Bank of India
Central office, Mumbai**

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E-Tender for Supply, Installation, Testing and Commissioning (SITC) of central Air Conditioning system at Central Offices Building, of Reserve Bank of India, Fort, Mumbai-400001

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भाग I
निविदा फॉर्म

स्थान :
तारीख :

प्रति

श्रीमती के निखिला

प्रभारी मुख्य महाप्रबन्धक,
भारतीय रिज़र्व बैंक,
परिसर विभाग, केंद्रीय कार्यालय,
5^{वीं} मंजिल, केंद्रीय कार्यालय भवन
शहीद भगत सिंह मार्ग
फोर्ट, मुंबई

महोदया/ महोदय ,

हमने निर्दिष्ट ज्ञापन में उल्लिखित कार्यों से संबंधित विनिर्देशों, डिजाइन और मात्रा की अनुसूची की सावधानीपूर्वक जांच की है और उक्त ज्ञापन में निर्दिष्ट कार्यों की स्थापना साइट का दौरा करने तथा जांच करने और कोटेशन को प्रभावित करने वाली उससे संबंधित आवश्यक जानकारी प्राप्त करने के बाद, हम उक्त ज्ञापन में निर्दिष्ट कार्यों को उक्त ज्ञापन में निर्दिष्ट समय के भीतर, मात्राओं की संलग्न अनुसूची में उल्लिखित दरों पर और करार की शर्तों में लिखित रूप में दिए गए विनिर्देशों, डिजाइन और मात्रा की अनुसूची, निविदाकर्ता को सामान्य निर्देश और विशेष शर्तों, इसके पहले संदर्भित शर्तों, विनिर्देशों, डेटा शीट और मात्रा की अनुसूची, इसके लिये उपलब्ध करायी गयी सामग्री के साथ तथा अन्य सभी मामलों में ऐसी शर्तों के अनुसार जहां तक वे लागू हों, के अनुसार उक्त ज्ञापन में विनिर्दिष्ट कार्य को निष्पादित करने का प्रस्ताव रखते हैं।

ज्ञापन

(क)	कार्य का ब्योरा	फोर्ट, मुंबई में बैंक के केंद्रीय कार्यालय भवन के लिए केंद्रीय वातानुकूलन प्रणाली की आपूर्ति, स्थापना, परीक्षण और कमीशनिंग
(ख)	कार्य की अनुमानित लागत	₹475 लाख
(ग)	भुगतान का तरीका	निविदा के भाग-I के खंड III के अनुसार
(घ)	बयाना जमा राशि	₹9.5 लाख
(ङ)	प्रतिभूति जमा (i) बैंक गारंटी	निविदा की धारा-III, भाग-I के अनुसार बैंक गारंटी के रूप में पूंजीगत लागत का 5%
	(ii) प्रत्येक बिल से काटी जाने वाली राशि (प्रतिधारण धन)	धारा III में निर्दिष्ट के अनुसार प्रत्येक बिल से 5% : निविदाओं के लिए सामान्य निर्देश

भारतीय रिज़र्व बैंक, फोर्ट, मुंबई के केंद्रीय कार्यालय भवन में केंद्रीय वातानुकूलन प्रणाली की आपूर्ति, स्थापना, परीक्षण और कमीशनिंग (एसआईटीसी) के लिए ई-निविदा -400001

E-Tender for Supply, Installation, Testing and Commissioning (SITC) of central Air Conditioning system at Central Offices Building, of Reserve Bank of India, Fort, Mumbai-400001

(च)	कार्य पूरा करने के लिए समय की अनुमति	कार्य आदेश जारी होने की तारीख के बाद चौदहवें दिन से 26 सप्ताह
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2. हम इसके लिए भी सहमत हैं कि उक्त निविदा के भाग-1 के खोले जाने की तारीख से **90 दिनों तक निविदा बैंक द्वारा स्वीकार किए जाने के लिए वैध रहेगी** और यह वैधता अवधि बैंक और हमारे बीच लिखित रूप में पारस्परिक सहमति पर किसी भी अवधि तक बढ़ाई जा सकती है। हम निविदा की वैधता की पूरी अवधि और विस्तारित अवधि, यदि कोई हो, के दौरान **बयाना राशि के लिए बैंक गारंटी को संलग्न प्रोफार्मा के अनुसार** वैध रखने के लिए भी सहमत हैं **(अनुलग्नक च)**
3. निविदा स्वीकार होने पर हम यहाँ संलग्न ठेके को उक्त शर्तों के निबंधनों एवं प्रावधानों को, जहाँ तक वे लागू होते हैं, पूरा करने और उसका पालन करने के लिए या उसमें चूक करने पर निविदा में उल्लिखित शर्तों में निर्धारित राशि जब्त किये जाने और आप या आपके उत्तराधिकारी, या समनुदेशिती या नामांकित व्यक्ति को अदा करने के लिए सहमत हूँ/हैं।
4. निविदा स्वीकार होने पर हम यहाँ संलग्न निविदा को उक्त शर्तों के निबंधनों एवं प्रावधानों को, जहाँ तक वे लागू होते हैं, पूरा करने और उसका पालन करने के लिए या उसमें चूक करने पर ठेकेदार की लिखित स्वीकृति के साथ उक्त निविदा में उल्लिखित शर्तों में निर्धारित राशि जब्त किये जाने और आप या आपके उत्तराधिकारी, या समनुदेशिती या नामांकित व्यक्ति को अदा करने के लिए सहमत हूँ/हैं।
5. हम ऐसा समझते हैं कि आपके पास यह अधिकार सुरक्षित है कि आप बिना कारण बताए किसी भी निविदा या सभी निविदाओं को पूर्णतः या अंशतः स्वीकार या अस्वीकार कर सकते हैं। यदि हम निविदा को निष्पादित करने में विफल रहते हैं, तो हम इस बात से सहमत हैं कि यह राशि हमारे प्रति भारतीय रिज़र्व बैंक द्वारा जब्त कर ली जाएगी। ।
6. हम एतद्वारा घोषणा करते हैं कि हम निविदा दस्तावेजों और कार्य से जुड़े अन्य अभिलेखों को गुप्त/गोपनीय दस्तावेज़ मानेंगे और उस व्यक्ति जिसके साथ मैं/हम सूचना का उपयोग करने के लिए अधिकृत हैं, के अलावा किसी भी अन्य व्यक्ति से जानकारी/ उससे प्राप्त जानकारी/ व्युत्पन्न जानकारी का सम्प्रेषण नहीं करेंगे अथवा उपयोग नहीं करेंगे जो किसी भी तरह से भारतीय रिज़र्व बैंक की सुरक्षा के लिए हानिकारक हो। ।

दिनांक ----- वर्ष के कादिन

मेसर्स..... के लिए और उनकी ओर से

(प्राधिकृत हस्ताक्षरकर्ता के हस्ताक्षर और मुहर)

नाम:-

पदनाम:-

स्थान:-

तारीख:-

भारतीय रिज़र्व बैंक, फोर्ट, मुंबई के केंद्रीय कार्यालय भवन में केंद्रीय वातानुकूलन प्रणाली की आपूर्ति, स्थापना, परीक्षण और कमीशनिंग (एसआईटीसी) के लिए ई-निविदा -400001

E-Tender for Supply, Installation, Testing and Commissioning (SITC) of central Air Conditioning system at Central Offices Building, of Reserve Bank of India, Fort, Mumbai-400001

(बोर्ड संकल्प की प्रमाणित सत्य प्रति अथवा प्राधिकृत हस्ताक्षरकर्ता के रूप में उपर्युक्त हस्ताक्षरकर्ता का अधिदेश या मुख्तारनामा संलग्न किया जाना चाहिए)

अथवा

उस व्यक्ति का नाम जिसके पास संविदा पर हस्ताक्षर करने के लिए मुख्तारनामा है (लिमिटेड कंपनी के मामले में)

1-

(मुख्तारनामे की प्रमाणित प्रतिलिपि संलग्न की जानी चाहिए)

भवदीय,

(ठेकेदार के हस्ताक्षर)

साक्षी :

(1) नाम, पता तथा तारीख के साथ हस्ताक्षर

(2) नाम, पता तथा तारीख के साथ हस्ताक्षर

Section I
Form of Tender

Place:

Date:

Smt. K. Nikhila

Chief General Manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

5th Floor, Central Office Building

Shahid Bhagat Singh Marg

Fort, Mumbai – 400001

Madam,

Having examined the drawings, specifications, designs and schedule of quantities relating to the works specified in the Memorandum hereinafter set out and having visited and examined the site of the works specified in the said Memorandum and having acquired the requisite information relating thereto as affecting the tender, I/we hereby offer to execute the works specified in the said memorandum within the time specified in the said memorandum at the rates mentioned in the attached Schedule of Quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Conditions of Tender, Articles of Agreement, special instructions to the tenderers, general instructions to the tenderers and special conditions, conditions hereinbefore referred to, specifications, data sheet and Schedule of Quantities and with such materials as are provided for, by and in all other respects in accordance with such conditions so far as they may be applicable.

MEMORANDUM

(a)	Description of works	Supply, Installation, Testing and commissioning of Central Air conditioning System for Bank's central Office Building at Fort , Mumbai
(b)	Estimated cost	₹475 Lakh
(c)	Mode of payment	As per Section III, Part-I of tender
(d)	Earnest Money Deposit	₹ 9.5 Lakh
(e)	Security Deposit	5% of Capital Cost in the form of Bank Guarantee as per Section III, Part-I of tender
	(i) BG	
	(ii) Amount to be deducted from each bill (Retention money)	5% from each bill as specified in Section III: General Instructions to Tenders

भारतीय रिज़र्व बैंक, फोर्ट, मुंबई के केंद्रीय कार्यालय भवन में केंद्रीय वातानुकूलन प्रणाली की आपूर्ति, स्थापना, परीक्षण और कमीशनिंग (एसआईटीसी) के लिए ई-निविदा -400001

E-Tender for Supply, Installation, Testing and Commissioning (SITC) of central Air Conditioning system at Central Offices Building, of Reserve Bank of India, Fort, Mumbai-400001

(f)	Time allowed for completion of work for all the offices.	26 Weeks from fourteenth day of the date of award of work
-----	----------------------------------------------------------	------------------------------------------------------------------

2. We also agree that our tender will remain **valid for acceptance by the Bank for 90 days** from the date of opening of Part I of the tender and this period of validity can be extended for such period as may be mutually agreed between the Bank and us in writing. We also agree to keep the **Bank Guarantee towards earnest money** valid during the entire period of validity of tender and the extended period, if any, as per enclosed pro forma (**Annexure F**).
3. Should this tender be accepted, we hereby agree to abide by and fulfil all the terms and conditions of the contract and in default thereof, to forfeit Earnest Money Deposit and pay to you or your successors, or assignees or nominees such sums of money as are stipulated in the said conditions.
4. Should this Tender be accepted, we hereby agree to abide by and fulfil all the Terms and Conditions of the Tender and in default thereof, to forfeit and pay to you or your successors, or assignees or nominees such sums of money as are stipulated in the conditions contained in the tender together with the written acceptance of the Contract.
5. We understand that you reserve the right to accept or reject any or all the tenders either in full or in part without assigning any reason therefor. If we fail to execute the Contract when called upon to do so, we do hereby agree that EMD deposited shall be forfeited by us to the Reserve Bank of India.
6. We hereby declare that We shall treat the tender documents and other records connected with the work as secret/confidential documents and shall not communicate information/derived therefrom to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the Reserve Bank of India

Dated thisday of 2025.

For and on behalf of M/s

(Signature of authorized signatory with seal)
The Name of Partners/Directors of our firm are-

Name _____
Designation _____
Place _____
Date _____

(Certified true copy of Board Resolution or mandate or Power of Attorney of the above signatory as authorized signatory should be enclosed).

OR

Name of person having power of attorney to sign the contract (in case of limited company)

भारतीय रिज़र्व बैंक, फोर्ट, मुंबई के केंद्रीय कार्यालय भवन में केंद्रीय वातानुकूलन प्रणाली की आपूर्ति, स्थापना, परीक्षण और कमीशनिंग (एसआईटीसी) के लिए ई-निविदा -400001
E-Tender for Supply, Installation, Testing and Commissioning (SITC) of central Air Conditioning system at Central Offices Building, of Reserve Bank of India, Fort, Mumbai-400001

1-

(Certified true copy of the power of Attorney should be attached)

Your Faithfully,

(signature of Contractor)

Witnesses

(1) Signature with name, address and date _____

Witness

(2) Signature with name, address and date _____

Section II
Article of agreement

(On Non- judicial Stamp Paper of appropriate value)

ARTICLES OF AGREEMENT made the _____ day of _____ between the **Reserve Bank of India**, Premises Department, Central Office Building at Fort, Mumbai-400001 (hereinafter called "The Bank") on the one part and _____(hereinafter called "the Contractor") on the other part.

WHEREAS the Employer is desirous of "**Supply, Installation, Testing and commissioning of Central Air conditioning System for Bank's Central Office Building at Fort , Mumbai**" and has caused specifications and Schedule of Quantities describing the works to be done which have been signed by or on behalf of the parties hereto

AND WHEREAS the said specifications, the Schedule of Quantities and drawings have been signed by or on behalf of the parties hereto.

AND WHEREAS

a) the Contractor has agreed to execute upon the subject to the conditions set forth herein and to the conditions set forth in the Special Conditions and in the Schedule of Quantities and Conditions of Contract (all of which are collectively hereinafter referred to as "the said Conditions") the works shown upon the said drawings and/or described in the said specification and included in the Schedule of Quantities at the respective rates therein set forth amounting to the sum as therein arrived at or such other sum as shall become payable thereunder(hereinafter referred to as 'the said Contract Amount').

b) The Contractor has agreed to maintain the Central air Conditioning system installed by them including the retained equipments (hardware and software) during the **one-year Defect Liability Period (DLP) and fourteen years of Comprehensive Annual Maintenance Contract (CAMC)** thereafter at the amounts for respective years as quoted by them in tender part II.

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. In consideration of said Contract Amount to be paid at the times and in the manner set forth in the said conditions, the Contractor shall upon and subject to the said Conditions execute and complete the work shown upon the said Drawings and described in the said Drawings and described in the said Specifications and the Schedule of Quantities.

2. The Bank shall pay the Contractor the said Contract Amount, or such other sum as shall become payable, at the times and in the manner specified in the said conditions.

3. The Employer shall administer and directly arrange for supervision of works, certification of bills, making payments and implementation of various terms, conditions and stipulations of the contract.

4. The said Conditions and Appendix thereto shall be read and construed as forming part of this agreement and the parties hereto shall respectively abide by, submit themselves to the said Conditions and perform the agreements on their part respectively in the said Conditions contained.

5. The plans, agreement and documents mentioned herein shall form the basis of this Contract.

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6. This Contract is neither a fixed Lump sum Contract nor a Piece Work Contract but is a Contract to carry out the work of conducting **“Supply, Installation, Testing and Commissioning of Central Air conditioning System for Reserve Bank of India Central Office Building at Fort, Mumbai”** for ₹ _____/- (Rupees _____ only) and **Comprehensive Annual Maintenance Contract Rate ₹-----/- (Rupees----- only) for the first year after DLP and operational charges of ₹ ----- after handing over the system** to be paid for according to actual measured quantities at the rates contained in the Schedule of Rates and Probable Quantities or as provided in the said conditions.
7. The Contractor shall afford every reasonable facility for carrying out of all works relating to the said work in the manner laid down in the said Conditions and shall make good any damages done to walls, floors etc. after the completion of such works.
8. The Employer reserves to itself the right of altering the nature of the work by adding to or omitting any items of work or having portions of the same carried out without prejudice to this contract.
9. Time shall be considered as the essence of this Contract and the Contractor hereby agrees to commence the work from fourteen day of date of issue of formal work order as provided for in the said Conditions and to complete the **entire work within 26 weeks subject** nevertheless to the provisions for extension of time, failing which the employer shall be entitled to recover liquidated damages as per the said conditions.
10. All payments by the Employer under this Contract will be made only at Mumbai
11. The parties to this Agreement agree to settle their disputes arising under this Agreement, by mutual consultations at the first instance with the aid of an escalation matrix, failing which the parties agree to settle their disputes by way of arbitration by a sole arbitrator to be appointed by mutual consent. However, the person to be appointed as the sole arbitrator shall be one who is adequately qualified and experienced to resolve the dispute sought to be raised before the said arbitrator. The place of arbitration shall be Mumbai
12. All disputes arising out of or in any way connected with this Agreement shall be deemed to have arisen at Mumbai and Courts in Mumbai shall have jurisdiction to determine the same.
13. That the several parts of this Contract have been read and fully understood by the Contractor.
14. The Contractor shall not disclose directly or indirectly any information, materials and details of the Bank's infrastructure/ systems/ equipment etc., which may come to the possession or knowledge of the Contractor during the course of discharging its contractual obligations in connection with this agreement, to any third party and shall at all times hold the same in strictest confidence. The Contractor shall treat the details of the contract as private and confidential, except to the extent necessary to carry out the obligations under it or to comply with applicable laws. The Contractor shall not publish, permit to be published, or disclose any particulars of the works in any trade or technical paper or elsewhere without the previous written consent of the Employer. The Contractor shall indemnify the Employer for any loss suffered by the Employer as a result of disclosure of any confidential information. Failure to observe the above shall be treated as breach of contract on the part of the Contractor and the Employer shall be entitled to claim damages and pursue legal remedies. The Contractor shall take all appropriate actions with respect to its

employees to ensure that the obligations of non-disclosure of confidential information under this agreement are fully satisfied. The Contractor's obligations with respect to non-disclosure and confidentiality will survive the expiry or termination of this agreement for whatever reason.

15. Where the business or undertaking of the contractor, is taken over by any other person / entity in any legally recognized mode of take-over, then unless the contractor is entitled to continue to provide to the Bank the services contemplated under this Agreement, it shall be duty of the contractor to ensure that such other person / entity is obligated to provide the services contemplated under this Agreement under the same terms and conditions. In case the contractor does not so ensure and consequently maintenance services are not provided, or the successor of the contractor fails to honour the terms of this Agreement, then –

- a) Any sums due to the contractor towards CAMC shall be liable to be forfeited and successors of the contractor shall not be entitled to claim any money due to the contractor; and
- b) The Bank shall arrange to get the CAMC services through their successor or any other contractor mutually agreed with the Bank, at the risk and cost of the Contractor/ successor, as the case may be.

16. The Bank shall have right to forfeit the earnest money deposit, security deposit, retention money, performance Bank Guarantee submitted by the Contractor in case of failure by the Contractor to provided satisfactory services.

17. Scope of work

A) During contract period, defect liability Period (DLP) and comprehensive Annual Maintenance contract (CAMC):

Tenderer shall

- a) Design the system as per requirement, supply the entire material to Bank's Office including packing, handling, insurance policies, transporting, clearing, loading/unloading etc.
- b) Install, test commission all the components/ equipment/ accessories etc. as per technical specifications & site requirement and hand it over to the Bank and provide necessary site training to the users.
- c) Ensure that they deploys trained, qualified and competent person who are physically fit and are not suffering from any chronic or contagious diseases for carrying out the works. Be responsible and liable for payment of salaries, statutory minimum wages and other legal dues time to time to the person who are employed by him for the purpose of rendering the DLP/ CAMC services required by the Bank/ employer under the agreement.
- d) Ensure that qualified staff deployed by them, for the purpose for rendering the services required by the Bank under this agreement, is insured with Government of India recognized insurance companies, for which no extra payment will be made by the Bank.
- e) Ensure that no employees of the tenderer will enter or remain on the Bank's premises beyond the specified time limits unless and necessary for fulfilling tenderer's obligations.
- f) Be liable for any damage caused to the Bank or its premises or any part thereof or to any equipment thereof or any property of the Bank and therein by any act, omission, default or negligence of the tenderer or his employees or agents.

B) Scope of work for AC operators deputed at site for operation of central AC system

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E-Tender for Supply, Installation, Testing and Commissioning (SITC) of central Air Conditioning system at Central Offices Building, of Reserve Bank of India, Fort, Mumbai-400001

- a) The contractor shall depute minimum 5 (five) trained manpower qualified and experienced AC plant operator (technician) for six days a week in normal duty or shift duty as per the Bank's requirement.
- b) The brief scope of work of the manpower deployed by the contractor shall be as under:
- i) The operators shall report to the Bank Engineers/ Control Room in charge of the Bank, provide all operational assistance and ensure that the system maintenance is being done in proper manner. The operators shall also do necessary modification in configuration of system with the approval and direction of Bank's authorities if required. The operators shall comply with the instructions issued by the Bank from time to time with regard to operation and maintenance of the Central AC system.
 - ii) During absence of the regular AC operators, the contractor shall arrange to provide other AC operators on a temporary basis with equal qualification/ experience etc. The contractor should not change their AC operators on frequent basis. The contractor should inform the Bank in writing in advance about the change of AC operators under unavoidable circumstance.
- c) Working hours: All AC plant operators shall report to the duty as per duty roster as per the instructions of Bank's Engineer. The deployed manpower shall sign the attendance register available in COB, the working hours shall be 8 hours (excluding 30 minutes lunch break), 6 working days in a week in shift manner. The detailed timing of duty shall be communicated in the duty roster. During emergency works the workers will have to continue to work till the emergency is over. The weekly holiday should be given to the workers alternatively in consultation with the Bank.
- d) The tenderer will provide insurance cover to its Workmen/ AC operators working in the Bank. The AC operators or their legal heirs shall not claim any insurance benefit from the Bank in case AC operators suffer any loss or damage to their life or person or property while working in the Bank premises.
- e) In addition, the AC operators must comply with the following:
- i) At all times abide by general rules of conduct and discipline as required by the Bank and changes made to it from time to time.
 - ii) At all times strictly follow the confidentiality conditions laid out by the Bank and changes made to it from time to time.
 - iii) Will be provided with individual security passes to enable access into the office and facilities on the understanding that these will be returned on termination of contract.
 - iv) Displaying identity card with photo from the company. The AC operators shall possess good quality of uniform, safety shoes, tool kit, testing equipment etc. at all times.
 - v) Should have police verification issued by competent authority.
 - vi) Should submit weekly pending calls report
 - vii) Monthly downtime report
 - viii) Monthly report of standby's / spares deployed; hardware repaired.
 - ix) In case, Bank is not satisfied with the performance of AC operators deputed by the Bidder, for the contractor shall change the engineer if advised by the Bank.

18. Obligations of the Contractor during Defect Liability Period and Comprehensive Annual Maintenance Contract Period

- a) The Contractor shall provide all-inclusive Comprehensive Annual Maintenance for the Central Air conditioning System which includes periodic routine/ preventive and breakdown maintenance (at least once per month) and also any number of breakdown calls along with supply

of all spares and labour involved for the supplied/ installed equipment and its accessories in order to ensure proper functioning of the system. The CAMC period will commence from expiry of one year defects liability period and accordingly shall be further valid for a period of **fourteen** years.

b) Security Deposit (furnished by the contractor and Retention Money (5% of the certified amount deducted from each bill) shall be kept by the Bank as Security for due fulfilment of terms and obligation of **defects liability period of one year** from the date of commissioning and handing over of the works.

c) The contractor shall furnish a **Performance Bank Guarantee** (Bank Guarantee of 5 % of the contract value) as Security for due fulfilment of terms and obligation of defects liability period from the date of commissioning and handing over of the works and Comprehensive Annual Maintenance Period as specified in the tender to the Bank.

d) The contractor shall ensure that the required spares etc. for proper maintenance are readily available with them and for the satisfactory completion of DLP and CAMC period. The contractor shall also ensure to keep spare equipment at site to ensure prompt rectification of the defect during DLP and CAMC period.

e) The Complaint/ Message may be sent by the Bank to the address/ Telephone Number/ email of the Contractor.

f) The Contractor has to replace any defective parts with the Manufacturer's genuine parts under intimation to the Bank's authorized personnel.

g) The Contractor shall keep the Bank indemnified in case any action is taken against them by any Authority on account of contravention by the Contractor or its employees, of any of the provision of any act or rules made there under pertaining to maintenance of the equipment(s). If the Bank is made liable to pay or reimburse any amount due to non-observance, if any, on the part of Contractor, of any provision stipulated in the notification by law/act/rules/regulations etc., then Bank, shall have the right to deduct any money due to the Contractor under this Agreement.

h) The Contractor shall only employ its own employees / OEM's employees for rendering the services contemplated under this Agreement. The Contractor shall ensure that all the personnel deployed by it, act with proper demeanour and in case the Bank notifies the Contractor that any of its personnel need to be replaced for any reason, the Contractor shall promptly act upon such notice by the Bank and replace the concerned personnel.

i) The Contractor shall familiarize itself and fully comply with the provisions of all the Acts/ Rules/ Regulations and orders of the State/ Central Government applicable to the work, including the Payment of the Wages Acts, Workman's Compensation Acts, Contract Labour (R&A) Act etc. and shall be fully responsible and liable for due observance of the same.

j) The CAMC payment shall be made on quarterly basis on rendering satisfactory services. The annual maintenance service contract rate shall also consider all the cost, including labour, travel cost from the nearest service station, all spares parts, oil, and upgradation of technologies and relocating the system as and when required, consumable items etc. required for smooth functioning of the system.

k) The amount of service contract shall be renewed for an additional period of at least **thirteen years** after two years from date of handing over the Entire System (one-year defect liability period

and one-year CAMC on quoted rates). While renewing the contract amount will be arrived at based on following formula.

$$AC = AP [(15+ 60 \times (EPIC/EPIP) + 25 \times (CPIC/CPIP))] / 100$$

AC	The contract amount for the current year (excluding taxes)
AP	The contract amount for the previous year (excluding taxes)
CPIC	Consumer Price Index for Industrial Workers (All India Average) 6 months prior to the commencement date of contract for the current year
CPIP	Consumer Price Index for Industrial Workers (All India Average) 6 months prior to the commencement date of contract for the previous year
EPIC	Wholesale Price Index for Electrical/ Electronics/ Electro-mechanical (related to similar work) Products 6 months prior to the commencement date of contract for the current year.
EPIP	Wholesale Price Index for Electrical/ Electronics/ Electro-mechanical (related to similar work) Products 6 months prior to the commencement date of contract for the previous year.

Note: Every year in month of March new amount of AMC will be communicated through letter. If contractor fails to complete the 5 years of service contract from the date of handing over the system. The Bank has right to blacklist the firm for further participating in any other tender invited by the RBI and security deposit amount will also be forfeited.

l) Renewal of operating cost of the Central AC system

The AMC contract for operation & maintenance period is initially for one year. The contract shall be considered for further renewal for maximum 14 occasions on same terms and conditions at discretion of the Bank provided the Bank finds the services of the contractor satisfactory.

The contract amount shall be renewed based on latest minimum wages declared from time to time by the Maharashtra State Government (MSG) / Central Government (CG), whichever is higher.

Variation in AMC contract amount

$$VC= V*(SS - SS0)/SS0$$

Where

VC = Variation in Contract cost i.e., increase or decrease in the amount in ₹ to be paid or recovered from previous amount.(including GST)

V= previous AMC contract amount in ₹ (including GST)

S. No.	Description	Category	Latest Minimum Wages (higher of CG /MSG)	Revised Wages	Previous Minimum wages
1	AC Plant operator	Semi-Skilled	SS		SS0

Note: The Bank shall compensate the Contractor for any increase in Minimum wages as prescribed by the Chief Labour Commissioner (Central), Ministry of Labour & Employment from time to time and the associated applicable liabilities like Bonus, PF and other statutory components shall also be compensated accordingly. However, the other component of these items viz. Contractor's profit/Overhead will remain same.

19. Penalty for Delay in services

a) During DLP and CAMC Period

During the currency of the Contract, if the downtime of any chiller package exceeds one day in case of minor repairs and five days in case of major repairs, at any one instance, except for the annual shutdown period as may be allowed for major maintenance and descaling etc., a penalty equivalent to two times of the daily rate of service contract amount (arrived at by dividing the annual contracted amount by 360 and rounding it off to next higher rupee) multiplied by the number of penalty days, will be recovered from the payment due to the firm. In case the contractor is not able to render call back service due to "force majeure" conditions prevailing at their works/office, the Bank may recover from the contractor, the pro-rata cost for that period. The vendor under such circumstances will be required to inform the Bank the date of commencement/termination of such "force majeure conditions in their works/office.

For the purpose of penalty, following items will be considered as major repairs.

- a) Rewinding/ replacement of motor/ Pumps
- b) Replacement of compressor
- c) Replacement of bearings, gears etc.
- d) Opening of compressor for changing shaft, blades etc.
- e) Replacement of chiller and condenser tubes etc.

They shall also ensure that the required spares etc. for proper maintenance is readily available with them.

If the downtime exceeds the allowed rectification time, penal recovery shall be made from any payment due to contractor at above rates subject to maximum of 60% of the prevailing CAMC cost.

b) Penalty for absence of AC operators: The days of absence of the AC operators shall attract a penal recovery at double the rate of the charges payable towards AC operators for such duration.

Note: Notwithstanding the above provisions, Bank reserves the right to:

1. Impose penalty as deemed fit, for the defects / abnormalities (including data loss) observed in the system not enumerated above and not rectified within time frame conveyed by Bank.
2. Get the rectification of defects carried out through the OEM or their authorised service partners or through any other resource and recover the cost incurred on such rectification / upgrades.
3. Encash the BG submitted for the due fulfilment of the terms and obligations the DLP and CAMC contract.
4. To terminate the contract after serving a notice of 30 days.

20. The contractor shall comply to the provisions of Prevention of Sexual Harassment at workplaces Act:

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- a) The firm shall be solely responsible in case of any complaint of sexual harassment against its employee within the premises of the Bank. The complaint will be filed before the Regional Committee constituted by the Reserve Bank of India and Bank shall ensure appropriate action under the said Act in respect of the complaint.
- b) Any complaint of sexual harassment from any aggrieved employee of the firm against any employee of the Bank shall be taken cognizance of by the Regional Complaint Committee constituted by the Bank.
- c) The firm shall be responsible for any monetary compensation that may need to be paid in case the incident involves the employees of the firm, for instance any monetary relief to Bank's employees, if sexual violence by the employee of the firm is proved.
- d) The firm shall be responsible for educating its employees about prevention of sexual harassment at workplace and related issues.
- e) The firm shall provide a complete and updated list of its employees who are deployed within the Bank's premises.

21. The Contractor shall in respect of labour employed by him or his sub-contractor comply with or cause to be complied with the Tenderer Labour Regulation in regard to all matters provided therein. The contractor shall comply with the provisions of the payment of Wages Act, 1936, Minimum Wages Act, 1948, Employers Liability Act, 1938. Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit Act, 1970, Sexual Harassment of Women at workplace (Prevention, Prohibition and Redressal) Act, 2013, or any modification thereof or any other law relating thereto and rules made there under from time to time. The Contractor shall indemnify and keep indemnified the RESERVE BANK OF INDIA against

- a) Any claim arising out of third party loss / damage to life or property caused by / during execution of the work.
- b) Any claim arising out of loss / damage to the workmen engaged by the contractor during execution of the work.
- c) Any claim due to non-compliance of applicable PF / Labour laws, ESI Regulations etc.
- d) The contractor shall take Workmen Compensation Policy with Reserve Bank of India as the first name, at their cost, before commencement of the work at site.
- e) The Contractor shall comply with the provisions of Contract Labour (Regulation & Abolition) Act, 1970. Before release of final bill, the contractor shall submit a certificate to the effect that he has actually paid the entire dues to the labourers of all descriptions engaged by him, for completion of this work at the rate, which is not less than the one prescribed under the Minimum Wages Act, 1949 and has complied with the provisions of CLRA Act with regard to providing the essential amenities to the Contract Labour.

22. Termination of Agreement:

Without prejudice to what is contained hereinabove, the Bank shall at its sole and absolute discretion, be entitled to terminate this agreement forthwith by one month's written notice without assigning any reason and without payment of any compensation, if

- a) In the opinion of the Bank (which shall not be called in question by the tenderer and shall be binding on the tenderer), the tenderer fails or refuses to implement this agreement to the Bank's satisfaction and/ or
- b) The tenderer commits a breach of any terms and conditions of this agreement and/ or
- c) For any reason whatsoever, the tenderer becomes disentitled in law to perform his obligations under this agreement and/ or

d) There is any variation in the ownership/ partnership or management of the tenderer or his business without the prior approval in writing of the Bank to such variation.

IN WITNESS THEREOF the Employer has set its hand to these presents through its duly authorised official and the Contractor has caused its common seal to be affixed hereunto and the said two duplicates / has caused these presents and the said two duplicates hereof to be executed on its behalf, the day and year first hereinabove written.

SIGNED AND DELIVERED by the
Reserve Bank of India by the hand of
Shri _____
(Name and designation)

in the presence of
(1) _____
Address _____

(2) _____
Address _____

(Witnesses)

The COMMON SEAL OF _____
Was hereunto affixed pursuant to the resolutions
passed by its Board of Directors at the meeting
held on _____

In the presence of
Witness-
(1) _____
(2) _____

Directors, who have signed these presents in
token thereof in the presence of
(1) _____
(2) _____

If the Contractor signs under common seal, the signature clause should tally with the sealing clause in the Articles of Association.

SIGNED AND DELIVERED BY the Contractor by
the hand of Shri _____
and duly constituted attorney.

If the Contractor is signing by the hand of power of attorney, whether a company or an individual.

Note: The Bank reserves the right to amend this agreement before the actual execution of agreement.

Section –III
GENERAL INSTRUCTIONS TO TENDERERS

Online e-tenders in two parts (Part-I and Part-II) are invited for Supply, Installation, Testing and commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai.

3.1 Eligibility Criteria:

The intending tenderer (**OEM of chillers /Authorised Dealers/System Integrators**) must read the terms and conditions carefully. The intending tenderers should submit their bid only if they consider themselves eligible and are in possession of all the documents as required as under:

(i) The tenderer must be a single entity, registered as a Company under the Companies Act 2013 or Companies Act, 1956, or Partnership Firm registered under the Indian Partnership Act, 1932, or LLP registered under the Limited Liability Partnership Act, 2008 and should have been in existence in India.

Note: The tenderer shall submit a copy of Certificate of Registration/Incorporation under the respective Acts in India and the respective Memorandum of Association/ Partnership as documentary evidence.

(ii) The tenderer must have minimum 5 years of experience in the field of undertaking similar works* i.e. carrying out Central Air Conditioning System for large office buildings/commercial premises/ industrial houses. The similar work should have been completed on or before January 31, 2020

(iii) The tenderer must have experience in executing the similar work(s) during the last five years as on or after January 31, 2020, individually having Value of executed works* as under:

- a) Three works each costing not less than the amount equal to 40% of the estimated cost
OR
- b) Two works each costing not less than the amount equal to 50% of the estimated cost
OR
- c) One work costing not less than the amount equal to 80% of the estimated cost,

Note:

Value of executed work*, shall be value of executed work exclusively towards the work of SITC of Central Air Conditioning system. Cost of any other works for SITC of Central AC system (such as ducting system, Air Handling Units, standalone AC units etc.) and cost of any civil works, interior works, electrical, electromechanical etc., if included in the work, shall not be considered in determining the value of work. For this purpose, the tenderer shall provide an undertaking on breakup of cost for above qualifying work(s), duly certified by their chartered accountant with Unique Document Identification Number (UDIN).

(iv) The tenderer shall have a minimum yearly turnover of 100% of the estimated cost during the last 3 financial years ending March 31, 2024.

Note: The tenderer shall submit a certificate from chartered accountant with Unique Document Identification Number (UDIN) clearly showing the turnover of the tenderer in the above financial years.

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(v) The tenderer should also furnish **Banker's certificate / Solvency Certificate amounting to ₹ 475 Lakh** (minimum) for indicating their financial capability to carry out the works for amounts as indicated as above. The tenderer must submit their **Bankers details**.

(vi) The tenderer shall submit the details of its **own Office(s) / full-fledged Service Set up/ Service Centre / Support Office** in Mumbai /sub urban area wherefrom required quality after sales services can be regularly provided

Note: The tenderer shall submit documentary evidence such as registration of their office / service centre under shop and establishment act, GST registration etc. issued by a government body in the name of tenderer and the copy of ownership document / rent agreement of their service centre in the name of the tenderer as the documentary proof of having their office.

(vii) The tenderer should be maintaining minimum two similar system for last two years as on or after January 31, 2023 in Mumbai and/or suburban area.

Note: Only those tenderers who qualify as per the above, will be eligible to tender for the work. The bid submitted shall become invalid and e-bidding processing fee shall not be refunded if:

(a) The tenderer is found ineligible.

(b) The tenderer does not upload EMD declaration form within the period of bid submission.

(c) The tenderer does not upload the documents as stipulated in the bid document within the period of bid submission.

(d) If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the tenderer in the office of bid opening authority.

(e) Scanned copies of documents are illegible.

3.2 General

If the intending tenderer feels that any of the terms and conditions of the tender documents are not acceptable to them or they feel that additional terms and conditions are required to be incorporated, they may indicate these conditions or additional or amended conditions uploaded in a separate sheet. All other terms and conditions on which there are no observations by the intending tenderers shall be constructed as acceptable to the tenderer.

(a) **Validity:** Tenders shall remain open to acceptance by the Bank for a period of 90 days from the date of opening Part-I of the Tender which period may be extended by mutual agreement and the Tenderer shall not cancel or withdraw the Tender during this period.

(b) **Language:** The Tender form must be filled in English. If any of the documents is missing or unsigned, the tender may be considered invalid by the Bank in its discretion.

(c) **Lowest tender not necessarily to be accepted / Right to accept part tender:** The Bank is not bound to accept the lowest/any tender Reserve Bank of India does not bind itself to accept the lowest or any tender and reserve to itself to accept or reject any or all the tenders either in whole or in part, without assigning any reasons for doing so.

(d) As regards make of equipment acceptable to the Bank the tenderers are advised to refer to "**Section VI and VII – Technical Specification**" and to the List of Approved make of materials/equipment. The tenderer are advised to quote for the make out of the approved list, conforming to the specification and which is most economical. The tenderers are advised not to quote with alternative equipment. The tender shall be accompanied by leaflets/literatures giving

complete technical & constructional details along with list of make of components of the equipment offered.

(e) The rates quoted in the tender shall include all charges for scaffoldings, watching and lighting by night as well as day including Sundays and holidays, protection of all other erections, matters or things and the Contractor shall take down and remove any or all such shuttering, scaffolding etc. as occasion shall require or when ordered so as to do, and fully reinstate and make good all matters and things disturbed during the execution of work and to the satisfaction of the Bank.

3.3 Part- I – Techno-Commercial Bid

Part I of the tender uploaded by the tenderer on MSTC website shall contain the following documents:

- a) **Power of Attorney/** authorisation with the seal of the tenderer in the name of the person signing the tender documents (**Annexure ‘A’**)
- b) Duly filled in (sealed and signed) **Tender Part-I** issued by the Bank, along with compliance sheet for technical specifications of the offered equipment and technical literature thereof.
- c) The particulars/Catalogues/technical literature and the names of manufacturers of specified item in support of technical details of proposed system as per **Section VII**
- d) Signed and stamped Un-priced Bill of Quantities **without writing any rates** therein
- e) Any other technical information relevant to the proposed work
- f) **Time schedule for Work Execution (Bar Chart)**: Location-wise schedule indicating timelines for delivery of various equipment, installation, testing, commissioning and handing over system to Bank within the stipulated time period of 26 Weeks. The schedule should be prepared keeping in view installation of the new system without any shutdown.
- g) Copies of detailed work order indicating scope and value of works for indicating the experience.
- h) Client certificate obtained from the clients in prescribed format as **per Annexure ‘B’** for qualifying works
- i) Financial Status of the firm certified by a certified Chartered Accountant as in the format of **Annexure ‘C’**
- j) Audited financial statement for turnover for last 3 years (File name eg: FS1, FS2 etc.)
- k) Banker’s solvency Certificate as per **Annexure ‘D’**.
- l) Details of Bankers as per **Annexure ‘E’**
- m) Details of service setup- In the format of **Annexure ‘H’**.
- n) Schedule of technical and commercial deviations – As per **Annexure ‘J’ & ‘K’**.
- o) Letter of Authorisation from the **Original Equipment Manufacturers (OEMs)** to participate in the bid as per **Annexure ‘L’**.
- p) **Undertaking for maintenance confirmation** by the tenderer for after sales service as per **Annexure ‘M’**.
- q) Undertaking / Declaration / Certificate by the Tenderer regarding country sharing land border with India in Banks pro forma **Annexure ‘N’**
- r) Undertaking Regarding Declaration of Debarment By Public Institution(S) **Annexure-‘O’**
- s) Undertaking indemnifying the employer against non-compliance with labor laws/ minimum wages and other statutory requirements **Annexure ‘P’**

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- t) Undertaking indemnifying the employer with respect to patent rights **Annexure 'Q'**
- u) The e-waste under buyback and during the maintenance period shall be disposed responsibly through registered producers, re-furbisher or recycler following the latest guidelines issued by Government of India in the matter. An undertaking as per **Annexure-'R'** shall be submitted with the tender. After disposal of e-waste, a certificate from the authorised e-waste disposal agency shall be submitted to the Bank.
- v) Escalation Matrix with designation of the officials and contact details (phone/ mobile/ email ID etc.) to whom the issues can be addressed by the Bank's officers during the execution/ Maintenance period.
- w) Drawing indicating the schematic plan/ layout plan/ route plan/ roadmap/ SOP etc. for entire equipment for the entire execution/ maintenance period.
- x) Any other technical information the tenderer wishes to furnish

3.4 The e-tender shall be submitted in two-part viz. "Part I – Techno-Commercial" and "Part II – Price Bid" on MSTC website. Part I containing technical specifications of Central Air conditioning System its parts and equipment, and terms and conditions (Rates and amounts of items shall not appear anywhere in this part) and Part II containing only rates and amounts of items quoted / submitted / uploaded on MSTC website. All the information called for shall be complete in all respects and to be uploaded in MSTC website with supporting documents. Information furnished on sheets other than those supplied may not be considered. However, the firms can upload only the relevant catalogues/ leaflets/ brochures of the manufacturers of the equipment offered. Incomplete tenders or tenders not complying with the requirement are liable for rejection. No enclosure/ attachment is permitted in Part II of the tender. Insertions, postscripts, additions and alterations shall not be valid unless confirmed by the tenderer's signature. All copies of the tenders should be complete in all respects with all attachments/ enclosures/ annexures.

3.5 Telegraphic, Fax and E-mail tenders will not be accepted. Tenders submitted physically/ send through courier will not be considered.

3.6 Tenderers are advised to use only the forms (tender form) issued by the Bank. However, if they desire to submit additional information, they may do so on their own letter head. Each page of the tender shall be signed and uploaded on e-tendering portal.

3.7 Conditional tenders are liable for rejection at the discretion of the Bank.

3.8 Pre-Bid Meeting

(a) A pre-tender briefing meeting of the eligible tenderers will be held **as per SOT** in premises, 5th Floor, Central Office building Reserve Bank of India at Fort, Mumbai to clarify any point / doubt raised by them in respect of the tender. No separate communication will be sent for this meeting.

(b) All communications regarding points requiring clarifications shall be given through email to hrahaman@rbi.org.in by the eligible tenderers **one day before** said meeting.

(c) **All firms must attend the pre-bid meeting in order** to get clarification on any issue related to the tender from the Bank. No request for change in date of pre-bid meeting will be entertained thereafter. If a firm don't attend pre bid meeting, no clarification in future will be entertained and Minutes of Pre Bid meeting will be binding on them,

(d) Inclusion/submission of any deviations in the tender conditions in Part-I of the tender after

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pre-bid meeting is liable for rejection.

(e) The minutes of pre-bid meeting and corrigendum/modification/addendums issued regarding bidding process if any, will be hosted in the Bank and MSTC website only and shall not be published elsewhere.

3.9 Earnest Money Deposit (EMD): Tenderers shall submit to the Bank Earnest Money Deposit (EMD) of an amount as specified in the Memorandum in the form of NEFT (Name of the Beneficiary: **Reserve Bank of India, IFSC code: RBIS0COD001; A/c No.: 41861403873**) or **Demand Draft** favouring **Reserve Bank of India, Mumbai** payable at Mumbai or Irrevocable Bank Guarantee (of equivalent amount) issued by any scheduled Bank in India as per Proforma at **Annexure F** initially valid up to **September 16, 2025 (6 months)**. Such Bank Guarantee (BG) submitted by the tenderer toward EMD shall be suitably extended by the tenderer, if necessary.

3.10 The tenderers should send the proof of NEFT remittance with transaction number (transaction slip) to manishmgaikwad@rbi.org.in or should submit the EMD in the form of Demand Draft or Bank Guarantee to the Bank in a sealed envelope. The envelop should be titled as **EMD of E-Tender for Supply, Installation, Testing and Commissioning (SITC) of Centralized Air Conditioning System for Bank's Central Office Building, Reserve Bank of India at Fort, Mumbai** and addressed to Smt. K. Nikhila, Chief General Manager-in-Charge, Reserve Bank of India, Premises Department, Central Office, 5th Floor, Central Office Building, Shahid Bhagat Singh Marg, Fort, Mumbai.

3.11 Such EMD (in case of DD / BG) or proof of EMD (in case of NEFT) must reach to the Bank on or before **date specified in the Schedule of Tender**, failing which e-tender submitted by such tenderer will not be considered. A tender without EMD or with inadequate EMD shall not be opened and will be rejected. Under no circumstances, Earnest Money Deposit will be accepted in any other form. EMD of unsuccessful tenderers shall be returned after award of the captioned work.

3.12 EMD shall be forfeited if the Tenderer:

(a) makes misleading or false representations in the forms, statements and attachments submitted, has suppressed any material information, details of any legal proceedings pending in the court which might otherwise have created any impact on the eligibility criteria; or

(b) Withdraws his Bid during the period of Bid validity; or does not sign the contract after award of Contract.

(c) Has been blacklisted by any Government agency and the blacklisting is in force as on date of notice inviting the tender.

(d) Withdraws bid after opening of the price bid.

(e) Fails to commence the work awarded within the prescribed time limit.

3.13 Security Deposit Money (SDM):

a) BG as security deposit for completion period and Defect Liability period (DLP):

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i) In addition to the Retention Money as specified, on award of the work, the successful tenderer shall furnish an amount equal to 5% (Five percent) of the contract value in the form of a Bank Guarantee (BG) from any scheduled Bank in the form prescribed by the Bank as per **Annexure G** towards entire period of currency of Contract (work completion +DLP) for due fulfilment of the Contractual obligations by the contractor. This Performance Bank Guarantee (EMD) shall be initially valid for a period of project completion period plus 60 days and shall be suitably extended till DLP of the work plus 60 days in case of extension of contract period. Such Performance Bank Guarantee (PBG) should be submitted to the Bank within 14 days of the issue of work order.

ii) Submission of Performance Bank Guarantee shall be ensured as stipulated in the tender. In case of delay in unavoidable circumstances, charge for delay in submission of Performance Bank Guarantee shall be recovered from the bills of the contractor at Bank rate.

iii) The Bank Guarantee towards EMD shall be suitably extended, if necessary, by the successful tenderer till furnishing the Bank Guarantee towards Security Deposit. The EMD of successful tenderer shall be released after the submission of the security deposit.

iv) The Bank reserves the right to enforce the Bank Guarantee in case of unsatisfactory performance of the terms, conditions of DLP set out in the tender at any time during the DLP i.e. one year from handing over the work.

b) Retention Money Deposit (RMD)

i) In addition to security deposit, Retention Money @ 5% of certified amount will be deducted from each bill. RMD shall be kept by the Bank as Security for due fulfilment of terms and obligation of **defects liability period of one year** from the date of commissioning and handing over of the works.

c) PBG towards committed CAMC period:

One month before Completion of DLP, a separate Bank Guarantee shall be submitted for an amount equal to 5 % of the contract value for due fulfilment of the contract conditions of CAMC for a further period of 14 years thereafter. Earlier 5% BG will be discharged on (a) after successful completion of defect liability period; and (b) on submission of a fresh **Bank Guarantee amounting to 5% of the contract value for fulfilment of terms and obligation of CAMC period.**

d) All compensation or other sums of money payable by the Contractor to the Bank under the terms of this Contract for completion period, defect liability and CAMC period may be deducted from the security deposit/ retention money/ performance bank guarantee, if the amount so permits unless the contractor deposits such amounts within fifteen days of issue of demand notice by the Bank.

3.14 Taxes:

a) The prices quoted shall include all taxes, custom duty, excise duty, octroi, local levies, Cess or any other taxes/duties imposed by /State Government/ Local Bodies, charges for insurance etc

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except Goods and Service Tax (GST). The GST shall be calculated in the bid at the applicable rate on the quoted cost.

b) If the Bank is required to discharge the liability of any taxes on the transaction like TDS(IT), GST under reverse mechanism or any other similar taxes, which is or becomes payable by RBI, the same shall be deducted from the bills of the contractor. If the tenderer fails to include such taxes and duties in the tender, no claim thereof will be entertained by the Bank afterwards.

c) No claim in respect of changes in any taxes/ duties except GST shall be entertained by the Bank.

3.15 Evaluation of tenders:

The financial bids of the tenders will be evaluated based on Total Cost of Ownership (TCO) by using Net Present Value (NPV) method. Calculation of total cost of ownership shall include the following:

a) The capital cost (A) quoted for the equipment/ System and

b) Less buy back amount (B) quoted for removal and taking away of existing Central AC systems and allied equipment.

c) Rates quoted for Comprehensive all-inclusive Annual Maintenance Contract (CAMC) (C), subject to minimum CAMC rates as indicated in the following para, for a period of 14 years after expiry of Defect Liability Period of one year and

d) The amount for Comprehensive all-inclusive Maintenance service Contract (E) per chiller unit quoted for maintenance of existing chiller units from the date of handing over of the existing Chiller units.

e) The amount for day to day operation of AC plant for deputing AC plant operator at Bank's site subject to minimum wages(as per CLC, GOI) rate (D) as indicated in the following para during the following period:

i) The period of replacement of old Central AC system from the date of handing over of maintenance of the old Central AC system to the tenderer to the virtual completion of the new Central AC system.

ii) The entire expected life of the system (15 years) from the date of handing over the new system to the Bank.

For arriving at the NPV of CAMC amounts, multiplication factors for each year will be computed as per the following parameters:

(a)	Discount factor	8% per annum
(b)	Annual Escalation in the quoted rate per annum for CAMC after completion of first year CAMC	5% per annum
(c)	Period of CAMC	14 years after completion of one year DLP

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(d)	Payment terms of CAMC	Quarterly payment after satisfactory completion of the service
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1.1 For arriving at the NPV of the annual charges for deputing AC plant operators, a multiplication factor will be computed as per the following parameters:

(a)	Discount factor	8% per annum
(b)	Annual Escalation in the quoted rate per annum for day to day operation contact after completion of the proposed work.	5% per annum
(c)	Period of day to day operation Contract	15 years after handing over of the system
(d)	Payment terms of day to day operation contract	Monthly payment after satisfactory rendering of the services

NPV Multiplying Factors for		
Year	CAMC	AC operator
1	NPV for rates quoted for Comprehensive all-inclusive CAMC (15 years), the multiplying factor F1= 10.35589	NPV for rates quoted for deploying AC operator (15 years), the multiplying factor F2= 12.2298074

Total Cost of Ownership, TCO = A - B + F1*C + F2*D + E

A = Capital cost of the equipment/ System

B = Buyback amount quoted for removing and taking away the old equipment

C = Amount quoted for Comprehensive Annual Maintenance Contract (CAMC) charges for New system

D = Amount quoted for deputing AC operator charges for operation of new system

E = Amount quoted for Comprehensive Annual Maintenance Contract (CAMC) charges for three existing chiller Units per annual.

The total cost of ownership (TCO) shall be worked out as above. The tenderer who quotes the lowest total cost of ownership, shall be considered the lowest tenderer.

f) Minimum Base Rate for Comprehensive AMC: In case, the tenderer quotes the rates for comprehensive AMC for the proposed system lower than the following rate, then the following rate of AMC will be considered for calculation of Total Cost of Ownership.

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For Comprehensive AMC – 5% (Five percent) of the quoted capital cost (Excluding Buyback)

For deputing AC operator – Prevailing minimum wages rates for 5 AC operators (semi-skilled) of ₹18.50 Lakh (incl. GST)

Note: Notwithstanding the above, the Bank shall pay only the quoted rate of the CAMC and operation of AC plant during the currency of the committed contract period, subject only to escalation formulae indicated in the tender.

3.16 Signing of contract agreement:

On receipt of intimation from the Bank of the acceptance of their tender, the successful tenderer shall be bound to implement the Contract and within fourteen days thereof, the successful tenderer shall sign an **agreement with the Bank where the work is to be executed in accordance with the draft agreement given in the tender document**. The agreement should be on a non-judicial stamp paper of required value as per applicable stamp act and the cost for the same shall be completely borne by the tenderer. Notwithstanding the signing of the agreement, the written acceptance by the Reserve Bank of India of a tender in itself will constitute a binding contract between the Reserve Bank of India and the person so tendering, whether such agreement is or is not subsequently executed.

The contractor shall not assign the contract. He shall not sublet any portion of the contract except with the written consent of the Bank. In case of breach of these conditions, the Bank may serve a notice in writing on the Contractor rescinding the contract whereupon the security deposit shall stand forfeited to the Bank, without prejudice to his other remedies against the Contractor.

3.17 Program chart/ Progress report:

The contractor shall submit a suitable work program preferably in form of Bar Chart/ PERT Chart/ Gantt's chart/MS Project/ Primavera shall be drawn up for completion of different stages of work, so as to ensure completion of work within allotted period of time. Such program should be submitted within 14 days of the award of work

3.18 Capacity and power consumption criteria

Tenderers should submit, along with Part I of the tender, ARI certification for the equipment quoted through computer selection both at operating conditions specified in the tender and at ARI relief in order to establish the tonnage, IKW & other design parameters of the selected Chiller Package, conforming to the tender specifications.

The Tenderer shall guarantee that the work shall conform to the detailed specifications. The tenderer may please note that the chiller package selected by him must meet the capacity and power consumption in terms of IKW/TR mentioned by the Bank in the Equipment schedule/ part I of the tender.

3.19 Insurance

3.19.1 The contractor shall take the following insurance policies for the work in the joint names of the Bank and the contractor (Bank's name being first) for the full contract value. The policies shall remain valid **from delivery of materials at site till virtual completion of work:**

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- a) Contractor All Risk Policy of contract value including Storage, installation, testing and commissioning.
- b) Workmen compensation policy for the employees of the contractor at site.
- c) Third party liability policy for a total of ₹40 lakhs and with a limit of ₹ 5 lakh per accident.
- d) Fire Insurance, Flood insurance, earthquake, if not covered in policy at (a) above.

3.19.2 In case of any delays in the completion of the work for any reason whatsoever, the contractor shall arrange to renew these policies without any additional cost to Bank

3.19.3 If the above policies are not submitted / renewed by the contractor in time, the Bank reserves the right to take the above insurance policies and recover the cost of insurance along with the administrative charges from the contractor's bill.

3.20 Drawing and documents:

(a) Along with Tender : The tenderer should prepare detailed working drawings with schematic equipment plan after examining the site along with detailed calculation sheet for each equipment with selection chart . The same shall be submitted with tender. The following shop drawings shall be prepared by the AC contractor –

1. Chiller Plant Layout plan and Sections.
2. System Schematic (Including Chillers, Pumps, Cooling Towers, piping etc.)
3. Foundation details for all the equipment.
4. CPM & BMS System Architectures as per approved I/O Summary.
5. Performance curves (capacity Vs total head, efficiency, NPSH and KW requirement) ranging from zero to maximum capacity.
6. Technical Data sheet for various equipment sufficient details to indicate the type, size, arrangement, weight, external, connection, fixing arrangement, dimensions and clearances and space required between various portion of equipment for operation and ease of maintenance.
7. Any other shop drawings, if required.

(b) before Commencement : All required drawings for equipment lay out inside the plant room and common piping header layout should be prepared by the tenderer and submitted to the Bank for examination before commencement of work. The approval of such drawings by the Bank's Engineer shall be from the point of view of assisting the contractor in coordination of services with other agencies and shall not absolve the contractor from his absolute and indivisible responsibility on performance of his installations. The contractor shall carry out all the work strictly in accordance with drawings, details specifications and instructions of the Bank's Engineer.

(c) After completion, the contractor shall submit as executed layout drawing and final test reports of the entire system in a flash disk drive (Pen drive) after incorporating all the changes and modifications done at site for records. The Contractor should note that unless otherwise stated the tender is strictly on item rate basis and his attention is drawn to the fact that rates for each and every item should be correct, workable and self-supporting. The quantities in the Schedule of Quantities approximately indicate the total extent of work but may vary to any extent and may even be omitted depending upon the site conditions and requirements solely at the discretion of the Bank thus altering the aggregate value of the Contract. No claim shall be entertained on this account. Upon commissioning and final handover of the installation, the contractor shall submit (within 4 weeks) to the Bank 3 (three) portfolios of the following indexed and bound together in hard cover ring binder (300 x 450 mm) in addition to the completion drawings:

- (i) Comprehensive operation and maintenance manual

- (ii) Test certificates, consolidated control diagram and technical literature on all controls.
- (iii) Equipment warranties from manufacturers.
- (iv) Commissioning and testing reports (3 copies each) (in soft and hard copies)
- (v) Rating charts for all equipment
- (vi) Log books as per equipment manufacturers standard format

3.21 Inspection of material/ Work at site: - The contractor shall provide, without any extra charge, all materials, tools, labour and assistance of every kind which the Bank's Engineer may demand of him for any test/inspection and examination which he shall require to be so made on the contractor's premises and shall bear and pay all costs attendant thereon. However, cost of traveling, boarding and lodging of Bank's Engineer (s) to the site of inspection shall be borne by the Bank.

3.22 Method of Testing:-

- (a) The system shall be tested in the manufacturer's factory/Contractor's works to ascertain the compliance of offered specifications.
- (b) Before offering the system to the Bank for testing, the firm shall carryout the various tests mentioned in the tender in their factory and forward the copy of those test reports to the Bank along with invitation for Bank's testing. All the testing facilities should be available at the time of testing of equipment by the Bank's engineers. Satisfactory performance at this stage meeting the prescribed limits will only be construed as acceptance of the system. System which falls short of the prescribed specifications is liable to be rejected.
- (c) Further, the system shall be tested at the site for proper functioning and performance.
- (d) The above will, however, not in any way absolve the contractor of his responsibility about proper performance of the system / components after installation and commissioning at the designated place.

3.23 Inspector Authority to certify performance: - The Bank's Engineer shall have the power:

- a) To certify that the system or any portion thereof are not in accordance with the contract owing to adoption of any unsatisfactory method of manufacture.
- b) To reject any equipment or parts submitted as not being in accordance with the specification;
- c) To reject the whole of the equipment tendered for inspection, if after inspection of such portion thereof as he may in his discretion think fit, he is satisfied that the same is unsatisfactory; and
- d) To mark the rejected equipment or parts with a rejection mark so that it may easily be identified if re-submitted.

3.24 Rejection/ Penalties for deviations in performance:

3.24.1 Consequence of rejection: If the equipment or its part thereof, being rejected by the Bank's Engineer the contractor fails to make satisfactory supplies or rectify the faulty work thus executed within the stipulated period of delivery/completion period, the Bank shall be at liberty to:

- a) Allow the contractor to re-submit the equipment or parts in replacement of those rejected, within a time to be specified, the contractor bearing the cost of freight if any, on such replacement without being entitled to any extra payments on that account; or
- b) Purchase/execute or authorize the purchase/execution of quantity/work of the equipment or parts rejected or others of a similar description (when equipment or parts exactly complying with specifications are not in the opinion of the Bank which shall be final, readily available) to the contractor at his risk and cost and without affecting the contractor's liability as regards supply under the contract; or
- c) Cancel the contract and purchase/execute or authorize the purchase/execution of the equipment or others of a similar description (when equipment or parts exactly complying with specifications are not in the opinion of the Bank, which shall be final, readily available) at the risk and cost of the contractor. In the event of action being taken under such clause (b) above or this clause the provision of delivery clause apply as far as applicable.

Bank's Engineer decision as to rejection final: - The Bank's Engineer's decision as regards the rejection shall be final and binding on the contractor subject to contractor's appeal.

3.24.2 Compensation for shortfall in Contract Rating/capacities of the plant:

- a. The rating/capacities of the plant offered at the time of tender are subject to realization during the performance tests. In case, the capacity/rating of the chiller packages established during the performance tests fall below 3% of the contract capacity/rating, the employer reserves the right to insist on replacement of the machines, while conducting the capacity test of the chiller package at the manufacturers test bench.
- b. No weightage will however be given for any excess capacity.

3.25 Packing and dispatch:

The equipment shall be properly and securely packed in boxes suitable for multiple handling and transportation under Indian conditions. All equipment/ components shall be delivered on Duty Delivery Paid (DDP) basis in the Bank's Office Building.

3.26 Coordination and monitoring:

It is the prime responsibility of the site staff to ensure that execution of the works proceeds smoothly in proper co-ordination among different agencies and in accordance with the programme for completion and maintaining of proper records and following registers at site of work on day-to-day basis with proper authentication by Contactor's authorized representative and Bank's site Engineers:

- (a) Site progress (Site order) register
- (b) Material register
- (c) Register of drawing and working details
- (d) Log book of defect
- (e) Site Hindrance register
- (f) Various Test reports of Equipment, material and other subsidiary trades
- (g) Daily labour/staff register

- (h) Variation order/ extra item register (obtaining prior approvals for execution of items for which quantity exceeds 25% of tender quantities)
- (i) Any other related to works

3.27 Measurements Book

- (a) Bank's Engineer shall, except as otherwise provided, ascertain and determine by measurement, the value in accordance with the contract of work done. The Contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for measurements and recording levels.
- (b) Measurement of all items having financial value shall be entered in Computerized Measurement Book (CMB) so that a complete record is obtained of all works performed under the contract after joint measurement of Bank and authorized representative of the contractor. All bills (Running Account (RA) & Final bill) should be in bound volume of Computerised Measurements (A4 size) to be furnished by the contractor, duly machine numbered for pages, and with MB number to be given by the Bank. – Format of Measurement and Abstract Book as provided by the Bank.
- (c) The Bank Engineer shall incorporate necessary corrections in the sheets of MB. After incorporating the corrections, the Contractor shall submit revised copies. All pages of the finalized, computerized MB sheets, after due check / test check measurements shall have full signature with date of the authorized official of the Contractor.

3.28 Variation/ Deviation/ Extra items

The rates for the items of works which are completely new or the quantity of any of the tender items increases 25% beyond the Bill of Quantities shall be prepared on the basis of market rate analysis of materials and labour. Further, an element of profit and overhead, etc., @ 15 % may be allowed. The same shall be executed by contractor with prior approval and intimation by the Bank.

3.29 Time for Completion:

Time allowed for carrying out the work as mentioned in the Memorandum shall be strictly observed by the Contractor. The work shall throughout the stipulated period of the Contract be proceeded with all due diligence and if the Contractor fails to complete the work within the specified period he shall be liable to pay compensation as per Contract.

3.30 The Contractor shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or executing of the work, whatever the cause of delays may be, including delays arising out of modifications to the work entrusted to him or in any sub-contract connected therewith or delays in awarding contracts for other trades of the project or in commencement or completion of such works or in procuring Government controlled or other building materials or in obtaining water and power connections for construction purposes or for any other reason whatsoever and the Employer shall not be liable for any claim in respect thereof. The Employer does not accept liability for any sum besides the tender amount, subject to such variations as are provided for herein.

3.31 Liquidated Damages:

(a) Time is one of the important factor of the contract. The entire work shall be completed within scheduled completion period as specified in the Memorandum. The work shall, throughout the stipulated period of the contract, be proceeded with all due diligence. If the contractor fails to complete the work within this specified period, he shall be liable for liquidated damages @ **0.25% of the contract value** per week of delay subject to a maximum of 10% of the contract value (contract value means the total value of capital cost of work, excluding buyback value etc., at which the work is awarded) as defined in “Appendix herein before referred to” of the contract. The liquidated damages will be levied in following manner:

(b) If the Contractor fails to maintain the required progress of the works by the completion time stipulated in the Contract or within any extended time under time extension Clause and the employer certifies in writing that in her/ his opinion the same ought reasonably to have been completed, the Contractor shall pay the Employer the sum named as “Liquidated Damages” for the period during which the said works shall so remain incomplete and the Employer may deduct such damages from any moneys due to the Contractor.

(c) The projects falling under this category shall be broken down in at least three suitable milestones clearly indicating time and amount for achieving each milestone. In case, the contractor does not achieve a particular milestone(s), if any, mentioned in the Contract or rescheduled milestone(s) in terms of time extension clause, the amount to be calculated based on the targeted financial progress for the milestone and the delay up to the Running Account bill under processing shall be withheld (as per the method given below) to be adjusted against the liquidated damages levied at the time of completion of contract. Withholding of payments on failure to achieve a milestone shall be automatic and without any notice to the Contractor. However, if the Contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make-up for the delay before the subsequent milestone(s), the amount mentioned against each missed milestone shall also be withheld. No interest whatsoever shall be paid by the Bank on such withheld amount/s.

(d) The delay period shall be calculated from the stipulated date of occurrence of a milestone until the date when the milestone is actually achieved, however, the amount to be withhold from a R.A. bill before reaching to a particular milestone(s) shall be calculated for the delay until the date of R.A. bill. The application of liquidated damages shall not effect a change in the milestone or release the Contractor of her/ his obligation to improve the progress of work.

(e) The contractor hereby specifically agrees and authorizes the Employer to deduct such liquidated damages, if any, from any instalment of payment becoming due and payable to the contractor in terms of this contract or from the retention money.

Specimen Milestone Chart:

Milestone	Due date	Milestone Target amount
Project Start	D0	0
1st	D1	T1
(N-X) th	D(N-X)	T(N-X)
(N-X+1) th	D(N-X+1)	T(N-X+1)
(N-X+2) th	D(N-X+2)	T(N-X+2)

(N-1) th	D(N-1)	T(N-1)
N th	D(N)	T(N)

Say a RA bill received on D_(R) is certified for gross amount of R where:

- i) $T_{(N-X)} \leq R < T_{(N-X+1)}$ i.e., Progress reached up to (N-X)th milestone
- ii) RA Bill date D_(R) is after D_(N) i.e. Nth milestone has become due as on RA bill date
- iii) Withhold amount for not achieving Nth milestone

$A_{(N)} = (0.0025/7) * (D_R - D_N) * (T_N - T_{(N-1)})$ where T_(N-1) will be zero if Nth milestone is the first in the series of delayed milestones.

(f) Gross Withhold amount for current RA bill: The withhold amount shall be calculated as follows:

- i) Withhold amount for milestones achieved with delay till previous RA Bill = P
- ii) withhold amount for milestones achieved with delay during current RA bill = Q
- iii) withhold amount for milestone due but not achieved till current RA bill. = R

$$P = A_{(1)} + A_{(2)} + \dots + A_{(N-X-1)}$$

$$Q = A_{(N-X)}$$

$$R = (0.0025/7) * ((D_R - D_{(N-X+1)}) * (T_{(N-X+1)} - T_{(N-X)}) + (D_R - D_{(N-X+2)}) * (T_{(N-X+2)} - T_{(N-X+1)}) + \dots + (D_R - D_N) * (T_{(N)} - T_{(N-1)}))$$

For the Project N=3 i.e., three milestones as follows:

Milestone	Due date	Milestone Target amount
Project Start	D ₀	0
1 st	D ₁ = 12 weeks from scheduled commencement of work	T ₁ = 30% of contract value
2 nd	D ₂ = 20 weeks from scheduled commencement of work	T ₂ = 70% of contract value
3 rd	D ₃ = 26 weeks from scheduled commencement of work	T ₃ = 100% of contract value

3.32 Project Management:

(a) During the execution, the tenderer shall assign an experienced engineer at site, suitably empowered to take independent decisions, who will act as the **project manager** where the work is executed. The project manager shall be provided with required complement of engineers/ technicians including those from OEMs who will ensure completion of the work within the scheduled completion period. The Bank's engineer will interact directly with the project manager for issues regarding the work. The tenderer shall also submit the details of the escalation matrix with designation of the officials and contact details (phone/ mobile/ Email Id etc.) to whom the issues can be addressed by the Bank's engineer.

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- (b) The Project Manager should have experience in setting up Central Air conditioning System, similar to the project.
- (c) The Project Manager will track as per already submitted program and control the project delivery; daily/ weekly reports are to be submitted to the Bank's engineer.
- (d) The contractor shall submit the baseline of program in MS Project software (provided by Bank) within 14 days of the award of work for completion of the work within the contractual completion period from the 14th day of letter of award of work.
- (e) Bank will provide storage space within the compound of the building. However, the responsibility for the safety of the materials stored will be with the contractor. No accommodation will be provided for any worker by the Bank

3.33 Removal of improper works:

The Employer shall, during the progress of the works, have power to order in writing from time to time the removal from the works within such reasonable time or times, as may be specified in the order, of any materials which in the opinion of the Employer are not in accordance with the Specifications or the instructions of the Employer, the substitution of proper materials, and the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the Drawings and Specifications or instruction, and the Contractor shall forthwith carry out such order at his own cost. In case of default on the part of the Contractor to carry out such order, the Employer shall have the power to employ and pay the other persons to carry out the same, and all expenses consequent thereon, or incidental thereto shall be borne by the Contractor, or may be deducted by the Employer from any amount due, or that may become due, to the Contractor.

3.34 Scope of work during defect liability Period (DLP) and Comprehensive Annual Maintenance contract (CAMC):

3.34.1 Contractor shall:

- i. Ensure that they deploy trained, qualified and competent person who are physically fit and are not suffering from any chronic or contagious diseases for carrying out the works. Be responsible and liable for payment of salaries, statutory minimum wages and other legal dues from time to time to the personnel who are employed by him for the purpose of rendering the DLP/ CAMC services required by the Bank/ employer under the agreement.
- ii. Ensure that his employees, while in the Bank premises or while carrying out their obligations under agreement, observe the standards of cleanliness, decorum, safety, good behaviour and general discipline laid down by the Bank and the Bank/ employer shall be the sole judge as to whether or not the Contractor and/ or his employees have observed the same.
- iii. Personally, and exclusively supervise the work of his employees so as to ensure that the services rendered under agreement are carried out to the satisfaction of the Bank.
- iv. Ensure that no employees of the contractor will enter or remain on the Bank's premises beyond the specified time limits unless and necessary for fulfilling contractor's obligations.
- v. Be liable for any damage caused to the Bank or its premises or any part thereof or to any equipment thereof or any property of the Bank and therein by any act, omission, default or negligence of the contractor or his employees or agents.

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- vi. During this period (DLP & CAMC) servicing at not less than **12** servicing in a year (cleaning of rails, lubrication of moving parts, checking of electro mechanical components, safety, interlocking checking or any other checking as recommended by OEM) and attending to ANY NUMBER of breakdown calls shall be carried out free-of-cost.
- vii. The annual maintenance service contract rate shall also consider all the cost, including labour, travel cost from the nearest service station, all spares parts, oil, cables, and upgradation of technologies and relocation of system as and when required, consumable items etc. required for smooth functioning of the Air conditioning system.
- viii. Comprehensive maintenance of the entire Central Air conditioning System shall be provided under the scope of works including all Chiller units including its microprocessor and electric panel, chilled and condenser water pumps, all types of valves at chilled and condenser water lines, cooling towers and it's allied equipment's, BMS & SCADA, all hardware and software etc.
- ix. In case of any defect in any equipment within the system, the same shall be repaired within specified period including replacement of spares/ components/ sub-system/ cards/ consumables and any other component, part or whole, which may need replacement/ repairs. In case the repair is not possible due to any reason whatsoever, then the defective item/ equipment shall be replaced with the new equipment (having same or better specifications and from the approved make list or as approved by the Bank) without any additional cost to the Bank. During such period of repairs or replacement, the contractor shall provide similar standby / spare equipment temporarily (not more than one month) for keeping the system in proper working condition. Beyond which the contractor has to replenish with the new equipment as described above.
- x. The contractor shall keep the sufficient stock of the spares at site for easy and fast repair/ replacement of defective equipment. Non-availability of spares/ standby units/ components will not be accepted as a reason for waiving of penalty towards delay in rendering prompt service. For ensuring prompt service, at least some important spares and standby units shall be retained in the custody of the operator/ technician which will be verified by Bank from time to time. After use of any such spare unit/ cards etc., the same shall be replenished with new equipment (having same or better specifications and from the approved make list or as approved by the Bank).
- xi. The contractor shall arrange the visits of technical representative of the OEMs of Chiller Units and BMS installed at site to inspect working of the entire system/ respective equipment **at least once a year** to ensure proper functioning of the system and OEM shall issue necessary certificate of system healthiness.
- xii. **Software upgrades and Renewal of Licences to be provided:** The contractor shall have to provide and implement all software updates, releases, version upgrades, new versions etc. of BMS software included in the product including renewal of all licences as and when required/ latest version released By OEM without extra cost to the Bank ..

3.34.2 Operation of Central AC system:

- a. The contractor shall depute minimum 5 (five) trained semiskilled manpower qualified and experienced AC plant operator (technician) for six days a week in normal duty or shift duty as per the Bank's requirement.

i) Qualification: Minimum ITI qualification or equivalent

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ii) Training/ certification: Valid certification from recognized institutions in the field of SCADA, CPM system.

iii. Experience: Minimum 3 years in the field of installation/ operation/ maintenance of the Central AC system.

iv. Out of the above five AC plant operator , one suitable Technician shall be identified by the contractor as Nodal / lead AC plant Operator for the purpose of taking instructions from the Bank's Engineer, deploying and coordination among rest of the operator, reporting to Bank's Engineer etc.

b. **Scope of Work**: The brief scope of work of the manpower deployed by the contractor shall be as under:

i. The operators shall report to the Bank Engineers/ Control Room in charge of the Bank, provide all operational assistance and ensure that the system maintenance is being done in proper manner. The operators shall also do necessary modification in configuration of system with the approval and direction of Bank's authorities if required. The operators shall comply with the instructions issued by the Bank from time to time with regard to operation and maintenance of the Central AC system.

ii. During absence of the regular AC operators, the contractor shall arrange to provide other AC operators on a temporary basis with equal qualification/ experience etc. The contractor should not change their AC operators on frequent basis. The contractor should inform the Bank in writing in advance about the change of AC operators under unavoidable circumstance.

c. **Working hours**: All AC plant operators shall report to the duty as per duty roster as per the instructions of Bank's Engineer. The deployed manpower shall sign the attendance register available in COB, the working hours shall be 8 hours (excluding 30 minutes lunch break), 6 working days in a week in shift manner.. During emergency works the workers will have to continue to work till the emergency is over. The weekly holiday should be given to the workers alternatively in consultation with the Bank`s Engineers.

d. The tenderer will provide insurance cover to its Workmen/ AC operators working in the Bank. The AC operators or their legal heirs shall not claim any insurance benefit from the Bank in case AC operators suffer any loss or damage to their life or person or property while working in the Bank premises.

In addition, the AC operators must comply with the following:

- i) At all times abide by general rules of conduct and discipline as required by the Bank and changes made to it from time to time.
- ii) At all times strictly follow the confidentiality conditions laid out by the Bank and changes made to it from time to time.
- iii) Will be provided with individual security passes to enable access into the office and facilities on the understanding that these will be returned on termination of contract.
- iv) Displaying identity card with photo from the company. The AC operators shall possess good quality of uniform, safety shoes, tool kit, testing equipment etc. at all times.
- v) Should have police verification issued by local competent authority.
- vi) Should submit weekly pending calls report
- vii) Monthly downtime report
- viii) Monthly report of standby's / spares deployed; hardware repaired.
- ix) In case, Bank is not satisfied with the performance of AC operators deputed by the Bidder, for the contractor shall change the operator if advised by the Bank.

f. e. Terms of Payment of AC operators: The payment towards charges for the AC operators shall be made **every month after statutory deductions and** after satisfactory rendering of the service against submission of the bill. The tenderer shall quote his rates in rupees per annum for deputing AC operators. These rates shall remain firm for the first year after handing over the Central AC system by the contractor and these rates shall be renewed thereafter as specified in the tender. **Works to be done on monthly basis:**

- i) To check the belt tension of AHU's installed on various floor and take corrective steps if required.
- ii) To check the gland/seal, coupling of pumps and cooling towers.
- iii) To check the solenoid valves, safety control and the interlocking of the various equipment.
- iv) To clean all the strainers and the filters of the cooling tower.
- v) AHU Filters to be cleaned weekly basis or as and when required.
- vi) Periodically clean water strains in evaporator and condenser water lines
- vii) Cooling tower collects lot of dust and dirt clean the cooling sump regularly.

g. Break Down Maintenance

During breakdowns, the Technical staff should immediately rectify the problem or contact the respective equipment maintenance contractor, if any, for attending the breakdowns in Chiller plant, AHUs, Fresh air fans, cooling towers, Panels, ACs etc. and get the servicing / repairing done by them.

h. **Tool to be kept at Bank's site by Contractor:** After the handing over of the Central AC system, adequate number of the following tools of Taparia / Jhalani / Jainson / othe reputed make shall be provided by the contractor and shall be maintained / replaced whenever required during the currency of the contract:

- i) Plier (for each staff)
- ii) Nose Plier (for each staff)
- iii) Set of screw Driver (for each staff)
- iv) Allen key set (for each staff)
- v) Test pen (for each staff)
- vi) Box spanner set
- vii) Ratchet set
- viii) Test lamp (for each staff)
- ix) Safety Gloves & Safety Shoes (for each staff)
- x) Chargeable LED Emergency Torch
- xi) Tong Tester / Tong tester for testing bus-bar and cable current
- xii) Multi meter
- xiii) Screw driver set
- xiv) Blower
- xv) Digital Handheld Anemometer
- xvi) Emergency Medical kit with medicines and burn treatment ointment. The same shall be replenishment immediately after use / expiry
- xvii) any other equipment as instructed by the Bank's engineer required for the operation and maintenance of electrical infrastructure / equipment in the Bank

i. **Scope of work for Nodal / Lead AC Plant Operator:-** The Nodal / Lead operator shall be sole responsible for coordination among all the manpower deployed and shall monitor the operations & maintenance of entire AC plants of Bank's Central Office Building carefully. In any observations/fault's findings, they have to logging complaints to all CAMC venders, keeping all records by maintaining registers /log books/call sheets etc. in consultation with bank's engineers. The Nodal / Lead operator shall report to Bank's Engineer on daily basis and inform the Bank's Engineer about all the developments at the earliest.

j. General Instructions:

- i) The Contractor shall be responsible for any mischief / damages that may take place in

the working office premises on account of workmen's negligence.

- ii) The Contractor shall provide a mobile handset with SIM card for AC Plant Room for communication with the staff of substation duty. No extra charges shall be paid by the Bank for recharge of SIM card or for mobile handset.
- iii) All the removed materials for routine maintenance works should be brought to the office for accountability and a separate register needs to be maintained showing all received/used material consumables supplied by the Bank. No materials should be left anywhere in the campus.
- iv) The list of scope of work is only indicative. Any maintenance work not specifically mentioned above but required for the healthy operation of the system concerned and for the satisfaction of the user dept./as directed by Bank's Engineer will be considered as part of scope of work.
- v) The contractor is required to maintain following registers during the job of AMC
 - a. Register for Day to day operation & routine maintenance activity to be got verified by Bank's Engineer.
 - b. Stock register for materials supplied by Bank.
 - c. Preventive maintenance register.
 - d. test measurement record

3.34.2 Maintenance of exiting (old) Central Air conditioning System: Taking handover of the existing 3x300 TR centrifugal chiller unit (Make: Kirloskar McQuay) from the date of commencement as mentioned in memorandum and providing all-inclusive comprehensive maintenance service to keep the Central Air conditioning System functional individual chiller units are replaced by new one. For this purpose, the contractor will depute their team at least one week before the due date of takeover and understand the system thoroughly. Further, payment for this line item shall be made quarterly on pro-rata basis till the commencement of dismantling work for respective chiller unit, subject to rendering satisfactory services.

3.35 Renewal of Contract Rates

a. Comprehensive AMC for proposed System:

The amount of service contract shall be renewed for an additional period of at least 13 years after two years (one-year defect liability period and one-year AMC on quoted rates). While renewing the contract amount will be arrived at based on following formula.

$$AC = AP [(15+60 \times (EPIC/EPIP) + 25 \times (CPIC/CPIP))] / 100$$

AC	The contract amount for the current year (excluding taxes)
AP	The contract amount for the previous year (excluding taxes)

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CPIC	Consumer Price Index for Industrial Workers (All India Average) 6 months prior to the commencement date of contract for the current year
CPIP	Consumer Price Index for Industrial Workers (All India Average) 6 months prior to the commencement date of contract for the previous year
EPIC	Wholesale Price Index for Electrical/Electronic/Electro mechanical Products 6 months prior to the commencement date of contract for the current year.
EPIP	Wholesale Price Index for Electrical/Electronic /Electro mechanical Products 6 months prior to the commencement date of contract for the previous year.

Every year in month of March new amount of CAMC will be communicated through letter. If contractor fails to complete the 5 years of service contract from the date of handing over the system. The Bank has right to blacklist the firm for further participating in any other tender invited by the RBI and security deposit amount will also be forfeited.

b. Renewal of operating cost of the Central AC system

The contract for operation & maintenance of new system period is initially for one year from date of hand over of the system. The contract shall be considered for further renewal for maximum 14 occasions on same terms and conditions at discretion of the Bank provided the Bank finds the services of the contractor satisfactory.

The contract amount shall be renewed based on latest minimum wages declared from time to time by the Maharashtra State Government (MSG) / Central Government (CG), whichever is higher.

Variation in AMC contract amount

$$VC = 0.85 V * (SS - SS0) / SS0$$

Where

VC = Variation in Contract cost i.e., increase or decrease in the amount in ₹ to be paid or recovered from previous amount.(including GST)

V= previous AMC contract amount in ₹ (including GST)

S. No.	Description	Category	Latest Minimum Wages (higher of CG /MSG)	Revised Wages	Previous Minimum wages
1	AC Plant operator	Semi-Skilled	SS		SS0

Note: The Bank shall compensate the Contractor for any increase in Minimum wages as prescribed by the Chief Labour Commissioner (Central), Ministry of Labour & Employment from time to time and the associated applicable liabilities like Bonus, PF and other statutory components shall also be compensated accordingly. However, the other component of these items viz. Contractor's profit/Overhead will remain same.

3.36 Penalty clause

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i) Penalty During the currency of the contract, if the downtime of any chiller package exceeds one day in case of minor repairs and five days in case of major repairs, at any one instance, except for the annual shutdown period as may be allowed for major maintenance and descaling etc., a penalty equivalent to two times of the daily rate of service contract amount (arrived at by dividing the annual contracted amount by 360 and rounding it off to next higher rupee) multiplied by the number of penalty days, will be recovered from the payment due to the firm. In case the contractor is not able to render call back service due to "force majeure" conditions prevailing at their works/office, the Bank may recover from the contractor, the pro-rata cost for that period. The vendor under such circumstances will be required to inform the Bank the date of commencement/termination of such "force majeure conditions in their works/office.

For the purpose of penalty, following items will be considered as major repairs.

- a. Rewinding of motors/ Pumps
- b. Replacement of compressor
- c. Replacement of bearings, gears etc.
- d. Opening of compressor for changing shaft, blades etc.
- e. Replacement/repairing of evaporator and condenser tubes

If the downtime exceeds the allowed rectification time, penal recovery shall be made from any payment due to contractor at above rates subject to maximum of 60% of the prevailing CAMC cost.

Note: Notwithstanding the above provisions, Bank reserves the right to:

- f. Impose penalty as deemed fit, for the defects / abnormalities (including data loss) observed in the system not enumerated above and not rectified within time frame conveyed by Bank.
- g. Get the rectification of defects carried out through the OEM or their authorised service partners or through any other resource and recover the cost incurred on such rectification / upgrades.
- h. Encash the BG submitted for the due fulfilment of the terms and obligations the DLP and CAMC contract.

ii_) Penalty for absence of AC operators: The days of absence of the AC operators shall attract a penal recovery at double the rate of the charges payable towards AC operators for such duration.

3.37 Payment Terms: The following terms of payment, subject to statutory deductions, shall be applicable to this contract:

The following terms of payment, subject to statutory deductions, shall be applicable to this contract:

(a) 60% value of the quoted rate shall be released on pro rata basis, after equipment's is/are tested in the factory and on delivery at site of the same together with all the ancillary items and are accepted at site by the Employers authorized representatives along with submission of following documents.

- i) Bank Guarantee towards Security Deposit.
- ii) Manufacturer's inspection and test certificate
- iii) Certificate that all the components, parts, subsystems, consumables etc., for successful installation, commissioning and testing of the systems including maintenance have been received

at site in good condition and if any shortfall is noticed during installation, commissioning and testing they will be supplied free to the Bank.

iv) Policies of insurance/ PBG as per tender conditions.

(b) Balance **30%** of the quoted rate on satisfactory completion of erection, testing, commissioning and handing over the system to the Bank and an undertaking confirming that all the dues towards material and labour related to this work has been paid to the concerned vendors / labour as per prevailing acts.

(c) **10%** of the quoted rates after receiving confirmation from the OEMs about the installation, testing and commissioning and system configuration have been executed as per OEM standard practice/ Guidelines.

3.38 Schedule/ Bill of Quantities in respect of each work: The Schedule of Quantities is liable to alteration by omissions, deductions or additions at the discretion of the Bank. The payment shall be made based on measurement of finished items of work only. Any extra material left after completion of work shall not be paid.

3.39 The work has to be carried out in an occupied office Building which may restrict the availability of work fronts during working hours. The tenderers are therefore advised to plan for execution of work beyond Bank's normal working hours and full day working on hours during the Saturdays/Sundays/Bank's holidays subject to availability of site. The above aspect may be kept in mind while submitting the tenders.

3.40 Minimum wages to the workman: The contractor shall ensure that minimum wages as per statutory requirement i.e., as per Central Labour Commissioner's Rates (C.L.C. rates) to be paid to all the workmen. A certificate to that effect, on every month, to be submitted to the Bank during period of execution of work and subsequent warranty and AMC period.

3.41 Labour License: The contractor shall adhere to various provisions of the Contract Labour (Regulation & Abolition) Act 1970 and fulfil all the statutory requirements. All necessary licenses/ registrations such as labour license, EPFO, ESI, welfare registration etc., as applicable shall be taken by contractor within the time limit.

3.42 Force Majeure conditions (applicable during work execution period and subsequent committed DLP and CAMC period).

Neither Party shall be responsible for any failure to perform due to unforeseen circumstances or due to causes beyond the defaulting Party's control even after exertion of best efforts to prevent such failure, which failure may include, but not be limited to, acts of God, war, riots, embargoes, strikes, lockouts, acts of any Government authority, delays in obtaining licenses or rejection of applications under the Statutes, fire or floods.

3.43 Provision of Rule 144(Xi) of the GFR 2017:

Compliance with the Rule 144(xi) of GFR 2017 inserted vide Office Memorandum (OM) F. No. 7/10/2021-PPD dated February 23, 2023 issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, Government of India, the Public Procurement Orders issued in furtherance thereto, and their subsequent revisions shall be mandatory. In this regard, Tenderer

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shall submit a copy of Undertaking / Declaration / Certificate on their letter head duly sealed and signed by the authorized signatory in the format given at **Annexure O**. If the Undertaking / Declaration / Certificate submitted by the tenderer is found to be false, his/her/its tender / work order will be immediately terminated, and legal action in accordance with law including forfeiting of Earnest Money Deposit / Performance Bank Guarantee / Security Deposit may be initiated and the Bank may also debar the tenderer from participating in the tenders invited by the Bank in future.

- a) Any tenderer from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the tenderer is registered with the Competent Authority. *Further, any tenderer (including tenderer from India) having specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India, shall also require to be registered with the same competent authority.*
- b) The successful tenderer shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.
- c) The registration shall be valid at the time of submission of bid and at the time of acceptance of bid.
- d) If the tenderer was validly registered at the time of acceptance/ placement of order, registration shall not be a relevant consideration during contract execution

3.44 STATUTORY APPROVALS:

The work shall be executed by the Contractor as per pre-NOC & local body approval received from respective statutory authorities such as **Pollution Control Board(PCB) / Chief Electrical Inspector (CEI) / Local fire Authority / Local Municipal Authority etc/ Local statutory Authority, if applicable.** The contractor shall be responsible to understand all the provisions made in all such approvals accorded. In case of any requirements of any additional work/ modification thereof, the same shall be brought to the notice of Engineer in charge well in advance. The work has to be executed adhering to the norms of local body authorities. The contractor shall assist in preparation of documents, reports etc. as required during & after completion of work for obtaining further approvals & final completion & occupancy certificate from the respective authorities. He shall also extend all support to the consultant already appointed by the E-in-C. The contractor shall also be responsible to attend meetings & do all liaisoning works with respective authorities & the consultant for the AC system. No extra payment will be made on this account. However, the fee paid to the local bodies / authorities, if any, shall be borne by the Bank .

3.45 Waste Management

- (a) The tender shall ensure that the different types of waste generated (wet, dry, hazardous, debris, garden, e-waste) at site shall be properly collected & disposed. They shall encourage reuse, recycle, reduce and refuse principle. The e-waste under buyback and during the maintenance period shall be disposed responsibly through registered producers, re-furbisher or recycler following the latest guidelines issued by Government of India in the matter. After disposal of e-waste, a certificate from the authorised e-waste disposal agency shall be submitted to the Bank.
- (b) **Disposal of unserviceable e-waste material:**

The successful tenderers shall submit an undertaking/certificate that e-waste items out of old/obsolete/unserviceable e waste material will be stored/process/disposed off as per Rule (s) of

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E-waste (Management and Handling) rules, 2016 as applicable) notified by the Ministry of environment and Forests vide notification dated 23 March 2016 or any other notification subsequent to it.

3.46 Use of Green building material

To comply with Green Building requirement, wherever called for, the contractor shall provide necessary documents and shall generally cover test certificates, , thermal values, and relevant data, MSDS, write-ups / detailed description of the particular material / equipment, as per applicability, as stipulated by the Bank’s Engineer prior to ordering the materials and after the supply of materials or at appropriate stages.

I/We declare that I/We have read and understood all the above-mentioned instructions for the guidance of the tenderers.

3.47 Police Verification: The contractor shall also arrange and provide Police Verification of the workmen deputed by them under the contract, in case of regular deputation at site.

3.48 The tenderer must obtain for himself on his own responsibility and at his own expense, all the information which may be necessary for the purpose of making a tender and for entering into a contract and must examine the drawings, inspect the site of the work, and acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto. The Bank’s decision in such cases shall be final and shall not be open to arbitration.

3.49 The successful tenderer must co-operate with other contractors appointed by the Bank so that the work shall proceed smoothly with the least possible delay. He should make his own arrangement for storage and protection of all materials supplied by him.

I/We hereby declare that I/we have read and understood the above instructions for the guidance of the tenderers

Witness

Signature of tenderer

Address

Address

Date

Date

SAFETY CODE

General Safety

1. First-aid appliances, including adequate supply of sterilized dressings and cotton wool, shall be maintained in a readily accessible place.
2. The injured person shall be taken to a public hospital without loss of time, in cases where the injury necessitates hospitalisation.
3. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from ground.
4. No portable single ladder shall be over 8 meters in length, the width between the side rails not less than 30 cm (clear) and the distance between two adjacent rungs shall not be more than 30 cm. When a ladder is used, an extra labour shall be engaged for holding the ladder.
5. The excavated material shall not be placed within 1.5 meters of the edge of the trench or half of the depth of the trench, whichever is more. All trenches and excavations shall be provided with necessary protection of minimum height of one meter.
6. Every opening in the floor of a Building or a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be one metre.
7. No floor, roof or other part of the structure shall be so over-loaded with debris or materials as to render it unsafe.
8. Workers employed on mixing and handling material such as asphalt, cement, mortar or concrete and lime mortar shall be provided with protective footwear and rubber hand-gloves.
9. Those engaged in welding works shall be provided with welder's protective eye-shields and gloves.
10. No paint containing lead or lead products shall be used except in the form of paste or readymade paint.
11. Suitable face masks should be supplied for use by the workers when the paint is applied in the form of spray or surface having lead paint dry rubbed and scrapped.
12. Hoisting machines and tackles used in the work, including their attachments, anchorage and supports shall be in perfect condition.
13. The ropes used in hoisting or lowering material or as a means of suspension shall be of durable quality and adequate strength and free from defects.
14. Any debris generated from the work shall be collected on daily basis, removed from site and stored at the designated place in proper manner.
15. None of the passages near lift lobby and staircases shall be used for stacking / dumping any kind of materials/waste.

Fire Safety

- i. All the temporary electrical power for carrying out various services at site such as cutting / drilling machine shall be provided through properly rated earth leakage protection devices (ELCB).
- ii. Only ISI marked 3 pin plug and other appliances and equipment's shall be used.
- iii. Electrical power cables/wires used shall be properly rated and joints should be avoided. If there, the joint should be proper and insulated.
- iv. All electrical appliances i.e., welding, drilling, cutting machine, etc. shall be safely and securely earthed to prevent leakage current while in operation.
- v. Before commencing the welding work for the first time on any day, fire section shall be informed and only after the site inspection by the Fire officers/Personnel, work shall be started.
- vi. Fire buckets filled with clean dry sand and ready for immediate use for extinguishing fires, in addition to fire extinguishers suitable for dealing with fires, shall be conspicuously marked and kept at site at convenient location
- vii. Personal protective equipment such as safety shoes, hand gloves, welder's mask, ear plugs, etc. as applicable depending upon the requirement of the work, shall be used by the workmen to prevent occupational health hazards.
- viii. The safety belt shall be used by the workmen while working from height for more than 10 feet from ground level.
- ix. Power supply shall be switched off from the Mains when equipment is not in use.
- x. Wood-shavings, saw-dust or any debris generated from the work shall be collected on daily basis, removed from site and stored at the designated place in proper manner.
- xi. The work site shall be properly illuminated during the work.
- xii. All the electrical works should be carried out by licensed/ authorized electricians/ wiremen.
- xiii. Portable battery-operated lights may be used at work site to avoid laying of temporary wire for lights.
- xiv. Necessary barricading and signage boards of good quality shall be fixed at conspicuous locations at the work site.
- xv. Aluminium / steel ladders should have proper rubber insulation at the base and wherever required, these ladders shall be kept on electrical insulating safe rubber mats.
- xvi. None of the fire extinguishers shall be removed/shifted from its designated location.

PLACE:

SIGNATURE AND SEAL OF THE CONTRACTOR

DATE :

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Section IV

The Conditions Hereinafter Referred to

Interpretation Clause

1. In construing these Conditions, the Specifications, Schedule of Quantities and Contract Agreement, the following words shall have the meanings herein assigned to them except where the subject or context otherwise required.
- (a) “Employer” Shall mean The Reserve Bank of India and shall include its assigns and successors.
- (b) “Contractor” “Contractor” or “Tenderer” or “Tenderer” shall mean
(in the case of Company) _____ a company incorporated under _____ and having its registered office at _____ and shall include its successors and assigns.
- (c) “Site” Shall mean the site of the contract works including any Building and erections thereon and any other land (inclusively) as aforesaid allotted by the Employer for the Contractor’s use.
- (d) “This Contract” Shall mean the Articles of Agreement, the Special Conditions, the Conditions, the Appendix, the Schedule of Quantities and Specifications etc. attached hereto and duly signed.
- (e) “Notice in writing” in Or written notice shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been received) by registered post to the last known private or business address to have been received when in the ordinary course of post it would have been delivered.
- (f) “Act of Insolvency” of Shall mean any Act of Insolvency as defined by the Presidency Towns Insolvency Act or the Provincial Insolvency Act or any Act amending such original.
- (g) “Net Prices” If in arriving at the contract amount, the Contractor shall have added to or deducted from the total of the items in the Tender any sum, either as a percentage or otherwise, then the net price of any item in the tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the Tender as the price of that item a similar percentage or proportion of the sum so added or deducted by

the Contractor the total amount of any Prime Cost items and provisional sums of money shall be deducted from the total amount of the tender. The expression “net rates” or “net prices” when used with reference to the contract or accounts shall be held to mean rates or prices so arrived at.

- (h) “The works” Shall mean the Supply, Installation, Testing and Commissioning (SITC) of Central Air conditioning System for Central Office Building of Reserve Bank of India at Fort, Mumbai as provided herein.

Scope of Contract

2. The work includes the supply, installation, testing and commissioning of Central Air conditioning System as specified. The Contractor shall carry out and complete the said work in every respect in accordance with this Contract and with the directions of and to the satisfaction of the Employer. The Employer may in his absolute discretion and from time-to-time issue further drawings and/or written instructions, details, directions and explanations, which are hereafter collectively referred to as “Employer’s Instructions” in regard to:

- (a) The variation or modification of the design, quality or quantity of works or the addition or omission or substitution of any work.
- (b) Any discrepancy in the Drawings or between the Schedule of Quantities and/or Drawings and/or Specifications.
- (c) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material therefor.
- (d) The removal and/or re-execution of any works executed by the Contractor.
- (e) The dismissal from the works of any persons employed thereupon.
- (f) The opening up for inspection of any work covered up.
- (g) The amending and making good of any defects under Clause 28 & 29 hereof.

The Contractor shall forthwith comply with and duly execute any work comprised in such Employer’s instructions provided always that verbal instructions, directions and explanations given to the Contractor or his representatives upon the works by the Employer shall, if involving a variation, be confirmed in writing by the Contractor within seven days, and if not dissented from in writing within a further seven days by the Employer, such shall be deemed to be Employer’s instructions within the scope of the Contract.

For the purpose of entering day to day instructions by the employer, the, a “**Site instruction Book**” shall be maintained in which the instructions shall be entered by the employer. Instructions to the contractor shall be issued through Bank’s engineer/ engineer-in-charge.

3. Scope of contract includes, but is not limited to, the following:

- a) The coordination, scheduling, and management of work of component suppliers and subcontractors.
- b) Provide equipment as specified in the technical specifications.

Contractor’s Duties

4. Contractor’s duties include the following:

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- a) Provide and pay for labour, materials and equipment, tools and other facilities and services necessary for the proper execution and completion of the specified works.
- b) Secure and pay for required permits, statutory workman's compensation insurance, fees and licenses necessary for proper execution and completion of required work.
- c) Give required notices.
- d) Promptly submit written notice to the Employer of observed variance of this Specification from legal requirements.
- e) Enforce strict discipline and good order among employees. Do not employ persons unskilled in assigned task.

Variations to be approved by Employer

5. The Contractor shall submit a statement of variations giving a quantity and rates duly supported by analysis of rates, vouchers etc. The rates on scrutiny and final acceptance by the Employer shall form a supplementary tender. Employer shall not be liable for payment of such variations until these statements are sanctioned by it.

Drawings, Schedule Of Quantities & Agreement

6. The Contract shall be executed in duplicate, and the Contractor shall be entitled to one executed copy for his use. The contractor shall pay the applicable stamp duty on the agreement. Before the issue of the final certificate to the Contractor, he shall forthwith return to the Employer all Drawings and Specifications.

Work sequence

7. The successful Contractor shall include all costs in the tender to complete the works in the time schedule as given by him in the work schedule table. By submitting a tender, the Contractor agrees that they have reviewed the project specifications and drawings, toured the jobsite, and will complete all work in accordance with the overall **time frame of 26 weeks** as per the approved schedule. The schedule time frame starts after a notice to proceed, or contract is received from the Employer. The Contractor shall provide a detailed project schedule, in accordance with the time frame approved as per the work task schedule, prior to award of the project.

Contractor's use of premises

8. The site of the work is an occupied office Building. Contractor's use of site shall be subject to following:

- Confine operations at the site to areas permitted by law, ordinances, permits, Specification, and Employer's specific instructions.
- Do not unreasonably encumber the site with materials or equipment.
- Assume full responsibility for protection and safekeeping of tools and products stored on or off site.
- Move stored products which interfere with operations of Building or the operations of other trades.
- Obtain and pay for use of additional storage or work areas needed for operations.

Contractor to provide everything necessary at his cost

9. The Contractor shall provide at his cost, everything necessary for the proper execution of the works according to the intent and meaning of the Drawings, Schedule of Quantities and Specifications taken together whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred therefrom, and if the Contractor finds any discrepancy in the Drawings or between the Drawings, Schedule of Quantities and Specifications, he shall immediately and in writing refer same to the Employer who shall decide which is to be followed. The Contractor shall provide all works under this specification in full accordance with Health and Safety Regulations.

No disruption to normal office functions

10. This project is to be executed in an occupied office Building. It is essential that the Contractor gives special attention and priority to all matters concerning safety, protection from dust and loose materials, reduction of noise levels, protection from water and air infiltration into Building, and maintenance of neat and orderly conditions in and around work areas inside and outside of Building. Packaging, scrap materials and demolition debris shall be promptly removed from the building and site on a daily basis.

11. If the contract includes works, which will be disruptive during normal business operations, or would be dangerous to Building occupants, said works shall be performed during hours as the Employer dictates. The Contractor shall perform such work during Employer dictated hours and shall include all costs in its tender.

12. The Contractor shall keep noise levels below 75 dB during normal Building hours. When it is necessary to produce noise above this level, the Contractor shall advise the Employer of such needs and times will be scheduled as directed. The Contractor shall anticipate any excessive noise generating procedures and include an allowance for it in the tender.

Protection of Work and Property

13. The Contractor shall take due care for protection of the work and Employer's property.

Authorities, Notices and Patents

14. The Contractor shall conform to the provisions of any Act of the Legislature relating to the works, and to the regulations and bye-laws of any authority, and of electric supply and other companies and/or authorities with whose systems, the installation is proposed to be connected and shall, before making any variations from the Drawings or Specifications that may be necessitated by so conforming, give to the Employer, written notice, specifying the variation proposed to be made and the reason for making it and apply for instructions thereon. In case the Contractor shall not receive such instructions **within ten days**, he shall proceed with the work conforming to the provisions, regulations or byelaws, in question, and any variation so necessitated shall be dealt with under Clause No. 26 thereof.

The Contractor shall bring to the attention of the Employer, all notices required by the said Acts, regulations or byelaws to be given to any authority and pay to such authority, or to any public office, all fees that may be properly chargeable in respect of the works, and lodge the receipts with the Employer.

The Contractor shall indemnify the Employer against all claims in respect of rights, and shall defend all actions arising from claims, and shall himself pay all royalties, license fees, damages, cost and charges of all and every sort that may be legally incurred in respect thereof.

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Setting out of work

15. The Contractor shall set out the works and shall be reasonable for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof. If at any time any error in this respect shall appear during the progress of the works within a period of two year from the completion of the works, the Contractor shall, if so required, at his own expense, rectify such error to the satisfaction of the Employer.

Materials and workmanship to conform the descriptions

16. All materials and workmanship shall so far as procurable be of the respective kinds described in the Schedule of Quantities and/or Specifications and in accordance with the Employer's instructions, and the Contractor shall upon the request of the Employer furnish him with all invoices, accounts receipts and other vouchers to prove that the materials comply therewith. The Contractor shall at his own cost arrange for and/or carry out any test of any materials which the Employer may require.

Contractor's superintendence and representative on the works

17. The Contractor shall give all necessary personal superintendence during the execution of the works, and as long thereafter as the Employer may consider necessary until the expiration of the "Defects Liability Period" stated in the Appendix hereto. The Contractor shall also during the whole time the works are in progress, employ a competent representative who shall be constantly in attendance at the works while the men are at work. Any directions, explanations, instructions, or notices given by the Employer to such representative shall be held to be given to the Contractor.

Dismissal of Workmen

18. The Contractor shall on the request of the Employer, immediately dismiss from the works, any person employed thereon by him who may, in the opinion of the Employer, be incompetent or misconduct himself and such persons shall not be again employed on the works, without the permission of the Employer.

Access to Works

19. The Employer and their respective representatives shall at all reasonable times have free access to the works and/or the workshops, factories, or other places where materials are lying or from which they are being obtained and the Contractor shall give every facility to the Employer and their representatives necessary for inspection and examination and test of the materials and workmanship. No person not authorised by the Employer except the representatives of public authorities shall be allowed on the works at any time.

Assistant Manager (Tech)/Manager (Tech)

20. The term "Assistant Manager (Tech)/Manager (Tech)" shall mean the person appointed and paid by the Employer to inspect the works, the Contractor shall afford the Assistant Manager (Tech)/ Manager (Tech), every facility and assistance for inspecting the works and materials and for checking and measuring time and materials. The Assistant Manager (Tech)/Manager (Tech) shall have power to set out works or to revoke, alter, enlarge, or relax any requirements of the

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Contract or to sanction any work, additions, alterations, deviations or omissions or any extra work whatever, except in so far as such authority may be specially conferred by a written order with the prior concurrence in writing of the Employer.

The Assistant Manager (Tech)/Manager (Tech) or any representative of the Employer shall have power to give notice to the Contractor or to his representative of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued by the Assistant Manager(Tech)/Manager (Tech) but such examination shall not in any way exonerate the Contractor from the obligation to remedy any defects which may be found to exist at any stage of the works or after the same is completed.

Assignments and Sub-letting

21. The whole of the works included in the Contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign or under-let the Contract or any part share thereof or any interest therein without the prior written consent of the Employer, and no undertaking shall relieve the Contractor from the full and entire responsibility of the Contract or from active superintendence of the works during their progress.

22. No alteration, omission or variation shall vitiate this Contract but in case the Employer thinks proper at any time during the progress of the works to make any alterations in or additions to or omissions from the works or any alteration in the kind or quality of the materials to be used therein and shall give notice thereof in writing under his hand to the Contractor, the Contractor shall alter, add to or omit from, as the case may be, in accordance with such notice but the Contractor shall not do any work extra to or make any alterations or additions to or omissions from the works or any deviation from any of the provisions of the Contract, Stipulation, Specifications or Contract Drawings without the previous consent in writing of the Employer and the value of such extras, alterations, additions or omissions shall in all cases be determined with the prior approval in writing of the Employer in accordance with the provisions of Clause 26 hereof, and the same shall be added to or deducted from the Contract Amount, as the case may be, accordingly.

Schedule of Quantities

23. The Schedule of Quantities, unless otherwise stated, shall be deemed to have been prepared in accordance with the Standard Method of Measurement.

Any error in description or in quantity or in omission of items from the Schedule of Quantities shall not vitiate this contract but shall be rectified and the value thereof as ascertained under Clause 26 hereof, shall be added to, or deducted from the Contract Amount (as the case may be) provided that no rectification of errors, if any, shall be allowed in the Contractor's Schedule of Rates.

Sufficiency of Schedule of Quantities

24. The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the prices stated in the Schedule of Quantities and/or the Schedule of Rates and Prices which rates and prices shall cover all his obligations under the Contract, and all matters and things necessary for the proper completion of the works.

Measurement of Works

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25. The Assistant Manager (Tech)/Manager (Tech) may from time to time intimate to the Contractor and the Employer that he requires the works to be measured, and the Contractor shall forthwith attend or send a qualified Agent to assist the Assistant Manager (Tech)/Manager (Tech) in taking such measurements and calculations and to furnish all particulars or to give all assistance required by any of them.

Should the Contractor not attend or neglect or omit to send such Agent, then the measurement taken by the Assistant Manager (Tech)/ Manager (Tech) shall be taken to be correct measurements of the works. Such measurements shall be taken in accordance with the Mode of Measurement detailed in the Specifications.

The Contractor or his Agent may at the time of measurement take such notes and measurements as he may require.

All authorised extra works, omissions and all variations made with the prior approval in writing of the Employer shall be included in such measurements.

Prices for extra etc. ascertainment of

26. The Contractor may, when authorised by Employer, add to, omit from, or vary the works shown upon the drawings, or described in the Specification, or included in the Schedule of Quantities, but the Contractor shall make no addition, omission or variation without such authorisation or direction. A verbal authority or direction by the Employer shall, if confirmed by him in writing within seven days, be deemed to have been given in writing

No claim for any extra shall be allowed unless it shall have been executed under provisions of Clause 14 & 23 hereof with the concurrence of the Employer as herein mentioned. Any such extra is herein referred to as authorised extra and shall be made in accordance with the following provisions.

- (a) (i) The net rates or prices in the original tender shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced therein.
- (ii) Rates for all items, wherever possible, should be derived out of the rates given in the Priced Schedule of Quantities.
- (b) The net prices of the original tender shall determine the value of the items omitted, provided if omissions vary the conditions under which any remaining items of works are carried out, the prices for the same shall be valued under sub-clause (c) hereof.

- (c) Where the extra works are not of similar character and/or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items of works are carried out or if the amount of any omission or additions relative to the amount of the whole of the Contract works or to any part thereof shall be such that in the opinion of the Employer the net rate or price contained in the Priced Schedule of Quantities or tender or for any item of the works involves loss or expense beyond that reasonably contemplated by the Contractor or is by reason of such omission or addition rendered unreasonable or inapplicable, the Employer shall fix such other rate or price as in the circumstances he shall think reasonable and proper.
- (d) Where extra work cannot be properly measured or valued, the Contractor shall be allowed day work prices at the net rates in accordance with the local day work rates and wages for the district, provided that in either case vouchers specifying the daily time and materials employed, be delivered for verification to the Employer at or before the end of the week following that in which the work has been executed plus 15% towards establishment charges, contractor's overhead and profits.

The measurement and valuation in respect of the Contract shall be completed within the "period of final measurement" stated in the Appendix, or if not stated, then defined in Clause 30 hereof.

Unfixed materials when taken into account to be the property of the Employer

27. Where in any Certificate (of which the Contractor has received full payment) the Employer has included the value of any unfixed materials intended for and/or placed on or adjacent to the works, such materials shall become the property of the Employer and they shall not be removed except for use upon the works, without the written authority of the Employer. The Contractor shall be liable for any loss of or damage to such materials. However, if it is observed that the material brought at site and paid for the same is not going to be used at site or is in excess and the contractor shall take the same back on the advice of the Bank and cost already paid for the same shall be adjusted in the payments due to the contractor.

Removal of improper work

28. The Employer shall, during the progress of the works, have power to order in writing from time to time the removal from the works within such reasonable time or times, as may be specified in the order, of any materials which in the opinion of the Employer are not in accordance with the Specifications or the instructions of the Employer, the substitution of proper materials, and the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the Drawings and Specifications or instruction, and the Contractor shall forthwith carry out such order at his own cost. In case of default on the part of the Contractor to carry out such order, the Employer shall have the power to employ and pay the other persons to carry out the same, and all expenses consequent thereon, or incidental thereto shall be borne by the Contractor, or may be deducted by the Employer from any moneys due, or that may become due, to the Contractor.

Defects after virtual completion

29. Any defect, shrinkage, settlement or other faults which may appear within the "Defects Liability Period" stated in the Appendix hereto, if none stated, **then within 12 months after** the virtual completion of the works, arising in the opinion of the Employer from materials or workmanship not in accordance with the contract, shall upon the directions in writing of the Employer, and within such reasonable time as shall be specified therein, be amended and made good by the Contractor, at his own cost and in case of default, the Employer may employ and pay other persons to amend and make good such defects, other faults, and all damages, loss and expenses consequent thereon or incidental thereto shall be made good and borne by the Contractor and such damage, loss and expenses shall be recoverable from him by the Employer or may be deducted by the Employer from any moneys due or that may become due to the Contractor, or the Employer may in lieu of such amending and making good by the Contractor deduct from any money due to the Contractor a sum to be determined by the Employer equivalent to the cost of amending such work and in the event of the amount retained as Security Deposit being insufficient, recover the balance from the Contractor, together with any expenses the Employer may have incurred in connection therewith. Should any defective work have been done or material supplied by any Sub-Contractor employed on the works who has been nominated or approved by the Employer as provided in various clauses hereof, the Contractor shall be liable to make good in the same manner as if such work or material had been done or supplied by the Contractor and been subject to the provisions of this Clause and Clause 2 hereof. The Contractor shall remain liable under the provision of this Clause, notwithstanding the signing of any certificate or the passing of any accounts, by the Employer.

Certificate of virtual completion and Defects Liability Period

30. The works shall not be considered as completed until the Employer has certified in writing that they have been virtually completed. The Defects Liability Period shall commence from the date of such Certificate.

Nominated Sub-Contractor

31. All Specialists, Merchants, Tradesman, and others executing any work of supplying and fixing any goods, for which prime cost prices or provisional sums are included in the Schedule of Quantities and/or Specifications, who may be nominated or selected by the Employer are hereby declared to be Sub-Contractors employed by the Contractor and are herein referred to as nominated Sub-Contractors.

No nominated Sub-Contractors shall be employed on or in connection with the works against whom the Contractor shall make reasonable objection or (save where the Employer and Contractor shall otherwise agree) who will not enter into Contract provided

(a) That the nominated Sub-Contractors shall indemnify the Contractor against the obligation in respect of the Sub-Contractor as the Contractor is under in respect of this Contract.

(b) That the nominated Sub-Contractor shall indemnify the Contractor against claims in respect of any negligence by the Sub-Contractor, his servants or agents or any misuse by him or them of any scaffolding or other plant, the property of the Contractor or under any Workmen's Compensation Act in force.

(c) Payment shall be made to the nominated Sub-Contractor within fourteen days provided that all nominated Sub-Contractor's accounts included in previous Certificates have been duly discharged, in default whereof, the Employer may pay the same and deduct the amount thereof from any sums due to the Contractor. The exercise of this power shall not create contract as between Employer and Sub-Contractor.

Other persons employed by Employer

32. The Employer reserves the right to use the Estate and any portions of the site for the execution of any work not included in this Contract, which it may desire to have carried out by other persons, and the Contractor shall allow all reasonable facilities for the execution of such work but shall not be required to provide any plant or materials for the execution of such work. Such work shall be carried out in such manner as not to impede the progress of the works included in the Contract and the Contractor shall not be responsible for any damage or delay which may happen to or occasioned by such work.

Insurance in respect of damage to person and property

33. The Contractor shall be reasonable for all injury to persons, animals or things, and for all structural and decorative damage to property which may arise from the operation or neglect of himself or of any nominated Sub-Contractor or any employee or either, whether such injury or damage arises from carelessness, accident or any other cause whatever, in any way connected with the carrying out of this Contract. The liability under this clause shall be held to include inter alia any damage to Building, whether immediately adjacent or otherwise, and any damage to roads, streets, footpaths, bridges or ways as well as all damage caused to the building and other structures and works forming the subject matter of this Contract. The contractor shall also be responsible for any damage caused to the building and other structures and works forming the subject matter of this Contract by frost, rain, wind or other inclemency of weather. The Contractor shall indemnify and keep indemnified the Employer and hold him harmless in respect of all and any loss and expenses arising from any such injury or damage to persons or property as aforesaid and also against any claim made in respect of injury or damage, whether under any Statute or otherwise and also in respect of any award of compensation or damages consequent upon such claim. **The contractor shall, at his own expense, effect and maintain with effect from the date of commencement till issue of the completion certificate under this contract, with an approved insurance company, an All Risks Policy for insurance for an amount equal to the amount of the contract including earthquake risk in the joint names of the Employer and the contractor (the name of the former being placed first in the policy) against all risks as per the standard all risk policy for contractors and deposit such policy or policies with the employer before commencing the works.** The Contractor shall reinstate all damage of every sort mentioned in this Clause, so as to do delivery of the whole of the Contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties. The Contractor shall also indemnify and keep indemnified the Employer against all claims which may be made against the Employer by any person/ member of the public or other **third party** in respect of anything which may arise in respect of the works or in consequence thereof and **shall at his own expense arrange to effect and maintain, with effect from the date of commencement until the completion of the Contract, with an approved Insurance company a policy of Insurance in the joint names of the Employer and the Contractor(the name of the former being placed first in the policy) against such risks and deposit such Policy or**

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Policies with the Employer before commencement of the work. The minimum limit of coverage under the policy shall be as defined elsewhere under General instructions to the tenderer. The Contractor shall also similarly indemnify the Employer against all claims which may be made upon the Employer whether under the **Workmen Compensation Act** or any other statute in force during the currency of this contract or at Common Law in respect of any employee of the Contractor or any Sub-Contractor and **shall at his own expenses effect and maintain, with effect from the date of commencement until the completion of the Contract, with an approved Insurance company a policy of Insurance in the joint names of the Employer and the Contractor(the name of the former being placed first in the policy) against such risks and deposit such Policy or Policies with the Employer from time to time during the currency of the Contract.** In default of the contractor ensuring as provided above, the employer may so ensure and may deduct the premiums paid from any money due or which may become due to the contractor.

The Contractor shall be responsible for any liability which may be excluded from the Insurance Policies above referred to and also for all other damages to any person, animal or property arising out of and incidental to the negligent or defective carrying out of this Contract, whatever may be the reasons due to which the damage shall have been caused. He shall also indemnify and keep indemnified the Employer in respect of all and any costs, charges or expenses arising out of any claim or proceedings relating to the works and also in respect of any award of compensation or damages, arising therefrom. Without prejudice to the other rights of the employer against contractor in respect of such default, the Employer shall be entitled to deduct from any sums payable to the Contractor the amount of any damage, compensation, costs, charges, and other expenses paid by the employer and which are payable by the contractor under this clause. The contractor shall upon settlement by the insurer of any claim made against the insurer pursuant to a policy taken under this clause proceed with due diligence to rebuild or repair the works destroyed or damaged. In this event all the money received from the insurer in respect of such damage shall be paid to the contractor and the contractor shall not be entitled to any further payments in respect of the expenditure incurred for Building or repairing of the materials or goods destroyed or damaged.

The contractor, in case of re-Building or reinstatement after damage shall be entitled to such extension of time for completion as the Employer may deem fit, but shall, however, not be entitled to reimbursement by the employer of any shortfall or deficiency in the amount finally paid by the insurer in settlement of any claim arising as set out herein.

34 Without prejudice to his liability under this clause, the contractor shall also cause all nominated sub-contractors to effect, for their respective portions of works similar policies of insurance in accordance with the provisions of this clause and shall produce or cause to produce to the employer such policies. The contractor shall not permit a nominated sub-contractor to commence work at site unless said insurance policies are submitted. In the event of failure of the sub-contractor to take out such policy or policies of insurance before commencing the works at site, the contractor shall be responsible for any claim or damage attributable to the said sub-contractor.

Date of Commencement And Completion

35. The Contractor shall be allowed admittance to the site on the "Date of Commencement" stated in the Appendix hereto or such later date as may be specified by the Employer and he shall

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thereupon and forthwith begin the works and shall regularly proceed with and complete the same (except such painting or other decorative work as the Employer may desire to delay) on or before the "Date of Completion" stated in the Appendix subject nevertheless to the provisions for extension of time hereinafter contained.

Damages for Non-completion

36. If the Contractor fails to maintain the required progress of the works and fails to complete the works by the completion time stipulated in the Contract or within any extended time under time extension Clause 37 hereof and the employer certifies in writing that in his opinion the same ought reasonably to have been completed, the Contractor shall pay the Employer the sum named as "**Liquidated Damages**" for the period during which the said works shall so remain incomplete and the Employer may deduct such damages from any moneys due to the Contractor. The contractor hereby specifically agrees and authorizes the Employer to deduct such liquidated damages, if any, from any instalment of payment becoming due and payable to the contractor in terms of this contract or from the retention money."

Delay And Extension of Time

37. If in the opinion of the Employer, the works be delayed (a) by force majeure or (b) by reason of any exceptionally inclement weather or (c) by reason of proceedings taken or threatened by or dispute with adjoining or neighbouring owners or public authorities arising otherwise than through the Contractor's own default or (d) by the works or delays of other Contractors or Tradesmen engaged or nominated by the Employer and not referred to in the Schedule of Quantities, and/or Specification or (e) by reason of Employer's instructions as per Clause 2 hereof or (f) by reason of civil commotion, legal combination of workmen or strike or lock-out affecting any of the Building trades or (g) in consequence of the Contractor not having received in due time, necessary instructions from the Employer for which he shall have specifically applied in writing or (h) from other causes which the Employer may certify as beyond the control of Contractor or (i) in the event the value of the work exceeds the value of the Priced Schedule of Quantities owing to variation, the Employer may make a fair and reasonable extension of time for completion of the Contract works. In case of such strike or lock-out the Contractor shall nevertheless constantly use his endeavours to prevent delay and shall do all that may reasonably be required to the satisfaction of the Employer to proceed with work.

If the contractor needs an extension of time for completion of the work or if the completion of work gets delayed for any reason beyond the due date of completion stipulated in the contract, the contractor shall apply to the employer for extension of time in writing at least 7 days before the expiry of the scheduled time and while applying for extension of time, contractor shall furnish the reasons in detail and his justification along with documentary evidence (copy of relevant pages of hindrance register), if any, for delays. Only that period of extension of time as granted by the employer (on receipt of the application from the contractor or even in absence of any such application certification as to the reasonableness of the grounds for delay) will qualify for exemption of imposition of liquidated damages. For the balance period in excess of original stipulated period and an authorised extension of time granted by the employer, the provision of liquidated damages as stated under clause 36 will become applicable.

Further, the contract shall remain in force even for the period beyond the due date of completion irrespective of whether the contractor has applied or not, for the grant of extension of time for completion unless the employer decides to terminate the contract. The delay for completion of work for any reason will not entail any right to the contractor to claim any revision of rates or any extra compensation for any reason.

Failure by Contractor to comply with Employer's instructions

38. If the Contractor after receipt of written notice from the Employer requiring compliance within ten days fails to comply with such further drawings and the Employer may employ and pay other persons to execute any such work whatsoever that may be necessary to give effect thereto, and all costs incurred in connection therewith shall be recoverable from the Contractor by the Employer as a debt or may be deducted by him from any moneys due to the Contractor.

Termination of Contract by the Employer

39. If the Contractor being an individual or a firm commits any "act of insolvency", or shall be adjudged an insolvent or being an Incorporated Company shall have an order for compulsory winding up made against it or pass an effective resolution for winding up voluntarily or subject to the supervision of the Court and the Official Assignee or the Liquidator, in such acts of insolvency or winding up, as the case may be, shall be unable, within seven days after notice to him requiring him to do so, to show the reasonable satisfaction of the Employer that he is able to carry out and fulfil the Contract and to give security therefor, if so required by the Employer.

Or if the Contractor (whether an individual, firm or Incorporated Company) shall suffer execution or other process of Court attaching property to be issued against the Contractor,

Or shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractor,

Or shall assign or sublet this Contract without the consent in writing of the Employer first had and obtained,

Or shall charge or encumber this Contract or any payments due or which may become due to the Contractor hereunder,

Or if the Employer determine that the Contractor

(i) has abandoned the Contract, or

(ii) has failed to commence the works, or has without any lawful excuse under those Conditions suspended the progress of the works for 14 days after receiving from the Employer notice to proceed, or

(iii) has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or

(iv) has failed to remove materials from the site or to pull down, and replace work for seven days after receiving written notice that the said materials or work were condemned and rejected by the Employer under these Conditions or

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(v) has neglected or failed persistently to observe and perform all or any of the acts, matters or things by the Contract to be observed and performed by the Contractor for seven days after written notice shall have been given to the Contractor requiring the Contractor to observe or perform the same.

Then and in any of the said cases, the Employer may, notwithstanding any previous waiver, after giving seven days' notice in writing to the Contractor, determine the Contract and liabilities of the Contractor, the whole of which shall continue in force fully as if the Contract had not been so determined, and as if the works subsequently executed had been executed by or on behalf of the Contractor and further, the Employer by his agents or servants may enter upon and take possession of the works and all plant, tools, scaffoldings, machinery and materials lying upon the Estate or the adjoining lands or roads, and use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by employing any other Contractor or other person or persons to complete the works, and the Contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other contractor or other person or persons employed for completing and finishing or using the materials and plant for the works. When the works shall be completed or as soon thereafter as convenient, the Employer shall give a notice in writing to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within a period of fourteen days after receipt thereof by him, the Employer may sell the same by public auction, and give credit to the Contractor for the net amount realised. The Employer shall thereafter ascertain and certify in writing under his hand what (if anything) shall be due or payable to, or by the Employer, for the value of the said plant and materials so taken possession of by the Employer and the expense or loss which the Employer shall have been put to in procuring the works to be completed, and the amount, if any, owing to the Contractor and the amount which shall be so certified shall thereupon be paid by the Employer to the Contractor or by the Contractor to the Employer, as the case may be, and the decision of the Employer shall be final and conclusive between the parties.

Termination of Contract by Contractor

40. If payment of the amount payable by the Employer under certificate of the Bank's engineer shall be in arrears and unpaid for thirty days after notice in writing requiring payment of the amount as aforesaid shall have been given by the Contractor to the Employer or if the Employer shall repudiate the Contract, or if the works be stopped for three months under the order of the Employer or by any injunction or other order of any Court of Law, then and in any of the said cases, the Contractor shall be at liberty to determine the Contract by notice in writing to the Employer and he shall be entitled to recover from the Employer, payment for all works executed and for any loss he may sustain upon any plant or materials supplied or purchased or prepared for the purpose of the Contract.

In arriving at the amount of such payment, the net rates contained in the Contractor's original Tender shall be followed, or where the same may not apply, valuation shall be made in accordance with Clause 26 hereof.

Certificates and Payments

41. The Contractor shall be paid by the Employer from time to time by instalments under Interim Certificate to be issued by the Employer's engineer on account of the works executed, work to the

approximate value named in the Appendix as “**Value of work for Interim Certificates**” (or less at the reasonable discretion of the Employer) has been executed in accordance with this Contract. The Employer may, at his discretion, include in the Interim Certificate such amount as he may consider proper on account of materials delivered upon the site by the Contractor for use in the works. And when the works have been virtually completed and the Employer shall have certified in writing that they have been completed, the contractor shall be paid the balance amount by the employer in accordance with the certificate to be issued by the Employer’s engineer. **The Contractor shall be entitled to the release of the Bank guarantee towards Security Deposit in accordance with the Final certificate to be issued in writing by the Employer at the expiration of the period referred to as “the Defects Liability Period”** in the Appendix hereto from the date of Virtual Completion or as soon after the expiration of such period as the works shall have been finally completed and defects made good according to the true intent and meaning hereof, whichever shall last happen, provided always that the issue by the Employer of any certificate during the progress of the works at or after their completion shall not relieve the Contractor from his liability under Clause 2 and 29 nor relieve the Contractor of his inability in cases of fraud, dishonesty or fraudulent concealment relating to the works or materials or to any matter dealt within the Certificate, and in case of all defects and insufficiencies in the works or materials, which a reasonable examination would not have disclosed. No Certificate shall of itself be conclusive evidence that any works or materials, to which it relates, are in accordance with the Contract neither will the Contractor have a claim for any amounts which the Employer might have certified in any interim bill and paid by the Employer, and which might subsequently be discovered as not payable and in this respect the Employer’s decision shall be final and binding.

The Employer shall have power to withhold any Certificate if the works or any parts thereof are not being carried out to his satisfaction.

The Employer may by any Certificate make any correction in any previous certificate which shall have been issued by him.

Payments shall be made within the period named in the Appendix as “Period for honouring Certificates” after such Certificates have been delivered to the Employer.

Delayed Payment

42. Any amounts payable by the Employer to the Contractor if not paid within the “Period for honouring Certificates” named in the Appendix, carry interest at the rate named in the Appendix as the “Rate of interest for delayed payment” from the date upon which such sum ought to have been paid by the Employer until the payment.

Matters to be finally determined by Employer

43. The decision, opinion, direction, Certificate (except for payment), with respect to all or any of the matter under Clauses 2, 9,16,21,28,39, 41 hereof (which matters are herein referred to as the excepted matters) shall be final and conclusive and binding on the parties hereto and shall be without appeal. Any other decision, opinion, direction, Certificate or valuation of the Employer or any refusal of the Employer to give any of the same shall be subject to the right of arbitration and review under Clause 44 hereof in the same way in all respects (including the provision as to opening the reference) as if it were a decision of the Employer.

Settlement of dispute by Arbitration

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44. All disputes and differences of any kind whatever arising out of or in connection with the contract or the carrying out of the works (whether during the progress of the works or after the completion and whether before or after the determination, abandonment or breach of the contract) shall be referred to and settled by the Employer who shall state its decision in writing. Such decision may be in the form of a final certificate or otherwise. The decision of the Employer with respect to any of the excepted matters shall be final and without appeal as stated in Clause 43 hereof. But if either party be dissatisfied on any matter, except the excepted matter as above, the party may within 28 days after receiving notice of such decision give a written notice to the other party requiring that the matters in dispute be arbitrated upon. Such written notice shall specify the matters, which are in dispute or difference of which such written notice has been given. If both the parties agree a single arbitrator would be appointed for the purpose. In case no agreement could be reached on the appointment of single arbitrator, both the parties will nominate one person each as an arbitrator on their behalf. The two arbitrators nominated by the parties shall nominate one more person to act as third arbitrator.

The arbitrator or arbitrators, as the case may be, shall have power to open up, review and revise any certificate, opinion, decision, requisition or notice, save in regard to the excepted matters, referred to in the preceding clause, and to determine all matters to dispute which shall be submitted to arbitration and of which notice shall have been given as aforesaid.

The arbitrator or arbitrators, as the case may be, shall make his or their award within one year (or such further extended time as may be decided by him or them as the case may be with the consent of the parties) from the date of entering on the reference. In case during the arbitration proceedings, the parties mutually settle or compromise their dispute or difference, on the parties filing their joint memorandum of the settlement or compromise, the arbitrator or the arbitrators, as the case may be, shall make an award in terms of such settlement or compromise.

Upon any such reference, the decision on the cost incidental to the reference and award respectively shall be in the discretion of the arbitrator or arbitrators, as the case may be, who may determine the amount thereof or direct the same to be taxed as between the party and party and shall direct by whom and to whom and in what manner the same shall be borne and paid.

This submission shall be deemed to be a submission to arbitration within the meaning of the Indian Arbitration and Conciliation Act, 1996 or any statutory modification thereof.

The award of the arbitrator or arbitrators, as the case may be, shall be final and binding on the parties. It is agreed that the Contractor shall not delay the carrying out of the works by reason of any such matter, question or dispute being referred to arbitration, but shall proceed with the works with all due diligence and shall until the decision of the arbitrator or arbitrators is given, abide by the decision of the Bank. No award of the arbitrator or arbitrators, as the case may be, shall relieve the Contractor of his obligations to adhere strictly to the Bank's instructions with regard to the actual carrying out of the works. The Employer and the Contractor hereby also agree that arbitration under this clause shall be a condition precedent to any right of action under the contract.

The venue of arbitration shall be the centre/city in which the work is being executed.

Right of technical scrutiny of final bill

45. The Employer shall have a right to cause a technical examination of the works and the final bill of the Contractor including all supporting vouchers, abstracts etc. to be made at the time of

payment of the final bill. If as a result of this examination or otherwise, any sum is found to have been overpaid or over-certified, it shall be lawful for the Employer to recover the sum.

Employer entitled to recover compensation paid to workmen

46. If, for any reason, the Employer is obliged, by virtue of the provision of the Workmen's Compensation Act, 1923, or any statutory modifications or re-enactment thereof to pay compensation to a workman employed by the Contractor in execution of the works, the Employer shall be entitled to recover from the Contractor the amount of compensation so paid, and without prejudice to rights of the Employer under the said Act. The Employer shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by the Employer to the Contractor under this Contract or otherwise. The Employer shall not be bound to contest any claim made against it under the said Act, except on the written request of the Contractor and upon his giving to the Employer full security to the satisfaction of the Employer for all costs for which the Employer might become liable in consequence of contesting such claim.

Abandonment of Works

47. If at any time after acceptance of the tender, the Employer shall, for any reasons whatsoever, not require the whole or any part of the works to be carried out, the Employer shall give notice in writing to the Contractor who shall have no claim to any payment of compensation or otherwise whatsoever on account of any profit or advantage which he might have derived from the execution of the whole works.

Return of surplus materials

48. Notwithstanding anything contained to the contrary in any or all the Clauses of this Contract, where any material for the execution of the Contract is procured with the assistance of the Employer by purchases made under orders or permits or licenses issued by Government, the Contractor shall hold the said materials economically and solely for the purpose of the Contract and not dispose of them without the prior written permission of the Employer and return it to the Employer, if required by the Employer, at the price to be determined by the Employer having due regard to the condition of the materials, the price to be determined not to exceed the purchase price thereof inclusive of sales tax, octroi and other such levies paid by the Contractor in respect thereof. In the event of breach of the aforesaid condition, the Contractor shall, in addition to being liable to action for contravention of the terms of licenses or permits and/or criminal breach of trust, be liable to the Employer for all moneys, advantages or profits resulting, or which in the usual courses would have resulted to him, by reason of such breach.

Right of Employer to terminate Contract in the event of death of Contractor, if individual

49. Without prejudice to any of the rights or remedies under this Contract, if the Contractor, being an individual, dies, the Employer shall have the option of terminating the Contract without incurring any liability for such termination.

Accident Reports

50. In the event of accidents of any kind, the Contractor shall furnish the Client with copies of all accident reports. The reports shall be sent without delay and at the same time that they are forwarded to any other parties.

Marginal Notes

51. The notes in the box and in the catch lines hereto and in the annexures hereto are meant only for convenience of reference and shall not in any way be taken into account in the interpretation of these presents and the annexures hereto.

SPECIAL CONDITIONS

Progress Of Work

52. Upon award, the Contractor shall **submit** completion schedule including equipment delivery **and** details of all the important activities involved. The contractor shall also inform the Bank in writing the details of the project team and the project manager (names, personal details, qualifications etc.) who will be responsible for planning/ execution of the work, besides the name and other details of the resident engineer.

53. The Contractor shall submit, in writing, monthly reports showing current equipment delivery dates and anticipated completion dates for individual activity along with reasons, if any for deviations from the approved/ accepted schedule.

54. The contractor shall also submit the various drawing as mentioned in the tender.

The Sexual Harassment of women at workplace

55. The Contractor / Agency shall be solely responsible for full compliance with the provision of "the Sexual Harassment of women at workplace (Prevention, Prohibition and Redressal) Act, 2013.

a) In case of any complaint of sexual harassment against its employee within the premises of the Bank, the complaint will be filed before the Internal Complaints Committee constituted by the Contractor / Agency and the Contractor / Agency shall ensure appropriate action under the-said Act in respect to the complaint.

b) Any complaint of sexual harassment from any aggrieved employee of the contractor against any employee of the Bank shall be taken cognizance of by the Regional Complaints Committee constituted by the Bank.

c) The contractor shall be responsible for any monetary Compensation that may need to be paid in case the incident involves the employees of the contractor, for instance any monetary relief to Bank's employee, if sexual violence by the employee of the contractor is proved.

d) The contractor shall be responsible for educating its employees about prevention of sexual harassment at workplace and related issues.

NON-DISCLOSURE and Indemnity CLAUSE during the execution of work, DLP and CAMC period

56. The contractor shall not disclose directly or indirectly any information, materials and of the Bank's infrastructure/ system/equipments etc. which may come to the profession or knowledge of the contractor during the course of discharging its contractual obligations in connection with the agreement, to any third party and shall at all times hold the same in strictest confidence. The contractor shall treat the details of the contract as private and confidential, except to the extent necessary to carry out the obligations under it or to comply with applicable laws. The contractor shall not publish, permit to be publish, or disclose ant particulars of the works in any trade or technical paper or elsewhere without the previous written consent of the Employer.

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The contractor shall indemnify the Employer for any loss suffered by the Employer as a result of disclosure of any confidential information. Failure to observe the above shall be treated as breach of contract on the part of the contractor and the Employer shall be entitled to claim damages and pursue legal remedies.

The contractor shall take all appropriate actions with respect to its employees to ensure that the obligations of non-disclosure of confidential information under this agreement are fully satisfied. The contractor's obligations with respect to non-disclosure and confidentiality will survive the expiry or termination of this agreement for whatever reason.

Place:

Date :

Seal and Signature of Tenderer

Section (V)

Appendix Hereinbefore Referred to

1.	Defects Liability Period	Twelve months from the date of Virtual Completion Certificate as per tender conditions.
2.	Period of Final Measurement	3 months
3.	Date of Commencement	14 th day from the date of letter of award of work.
4.	Date of Completion	Date of virtual completion certificate.
5.	Liquidated damages at the rate of	0.25% of the contract value per week of delay subject to a maximum of 10% of the contract value as per tender conditions.
6.	Value of works for interim certificates	Minimum 20% of the contract value for each RA bill
7.	Period for honouring certificates	One month for interim bills and 3 months for final bill.
8.	Interest for delayed payment	3% per annum

Signature of the contractor with date and stamp

Section (VI)
Overview of the Central Air Conditioning System

6 Introduction:

The Bank's Central Office Building (COB) at Fort, Mumbai comprises basement and 25 upper floors which are centrally air-conditioned from Upper Basement, Ground to 25 floor. The work covers supply, installation, testing and commissioning of all the equipments except existing AHUs, chiller & condenser pipes as detailed in the technical specifications to achieve proper air conditioning of the COB.

The equipment and systems proposed to be supplied shall be latest technical specifications, energy efficiency eco-friendly air conditioning system focussed on sustainability, scalability and minimizing environmental impact using eco-friendly refrigerant. Any part not mentioned in this document but essential for operation of the system as a whole shall be included in the scope of work and offered as a part of the complete package. The tenderer shall clearly indicate during **Pre-bid meeting** such additional equipment/components if any with all technical details.

The total responsibility for the maintenance of individual equipment and the system as a whole rests with the contractor as regards the ratings, performance, reliable and trouble free working. The tenderer shall visit the premises and ascertain site conditions, existing structures and other obstructions if any. The work has to be carried out in COB without causing inconvenience to the normal working of the Bank. The tenderer will consider suitably for these exigencies in his offer and no extra claims will be entertained later on these grounds.

The make of individual equipment covered under this specifications shall only be from among those indicated in the **approved lists or equivalent makes and models** in the tender. The tenderer shall clearly indicate the make of various equipments or components offered by him. In case of non-availability of the brand indicated by the contractor, he shall be allowed to use one of the alternative brands indicated in the tender subject to submission of documentary evidence of non-availability of such equipments.

6.1 All equipment and materials used shall be standard components from the current range of products that are regularly manufactured and used in the system. The scope of this consists of but is not necessarily limited to the following:

- a)** Supply of BMS compatible chillers with associated motors and Pumps, soft starter, cooling tower, existing AHUs and accessories etc.
- b)** All associated items herein to be supplied, delivered and installed as per submitted and approved shop drawings.
- c)** Assembly of chiller components including connection of chillers, condensers, motors, pumps, compressors with common header and cooling Tower etc. into complete Central Air conditioning System.
- d)** Provide manufacturer's factory representative's services, including coordination, and start-up and testing supervision.
- e)** Testing (factory and field), start-up supervision, training and providing necessary documentation and tools for operation.

- f) Carry out performance test run at site.

6.2 The Air conditioning System and the workstation (PC) shall be provided with required operating system, SCADA software, hardware and latest anti-virus software of reputed brand (to be decided with the approval of the Bank) and any other required software. All the original licenced copies of the software(s) shall be kept in the custody of the Bank.

6.3 Unless otherwise mentioned in the tender documents, the following works shall be done by the contractor and therefore, their cost shall be deemed to be included in the tendered cost- whether specifically indicated in the Schedule of quantities or not:

- a) Foundations for equipment including foundation bolts and vibration isolation spring/pads, Suspenders, brackets and floor/wall supports for suspending/supporting pipes.
- b) Suspenders and/or cable trays for laying all the cables,
- c) Excavation and refilling of trenches in soil wherever the pipes are to be laid directly in ground, including necessary base treatment and supports.
- d) Sealing of all floor slab/wall openings made by the contractor for pipes and cables, from fire safety point of view, after laying of the same
- e) Space for accommodating all the equipment and components involved in the work.
- f) Making openings in the walls/floors/slabs or modification in the existing openings wherever provided for carrying pipe line, cables etc.
- g) All electrical works including cable/wires, earthing etc. except power and water supply (made available by the Bank).
- h) Making good all damages caused to the structure during installation and restoring the same to their original finish.

6.4 Scheme for air conditioning

It is proposed to install 3 nos. new 350TR water cooled multi screw chiller with microprocessor based control panel to cater to the above refrigeration load. The chilling machines shall work in conjunction with 3 Nos. condenser water pump sets 3 Nos. chilled water pump set 3 Nos. induced draft cooling towers, MS C class condenser water and chilled water piping duly insulated and aluminium clad with fittings and valves, nitrile rubber insulation etc. The electrical work shall comprise of unit mounted LT Panel, power, communication and control cabling with earthing system etc. The chilled water piping from the Central Air conditioning System room located in upper basement floor shall run vertically in each AHU room and tapping from the vertical riser has been taken for the individual existing AHU on each floor. Further, single main incomer will be provided and unit mounted LT panel including starter arrangement for receiving power to compressor motor for each chiller unit will be made accordingly. Power shall be supplied to the chiller at 415 volts — 3 phase - 50 Hertz.

The existing AHUs are located at different locations and each AHU feeds individual area zone wise. The conditioned air is fed with GSS ducting and diffused through aluminium extruded grills/diffusers. The return air is taken back through void between roof and false ceiling.

6.5 Refrigeration load

Based on the parameters given below, the total refrigeration load for the areas served by central air conditioning plant works out to 728 TR approximately.

6.6 Design Parameters

Given below are some parameters which have been followed in designing the 350 TR Chiller Package Unit and selection of equipments. The tenderers shall ensure that the equipment selected by them conform to and comply with these operating parameters.

a) Chiller Package

(a)	Temperature of chilled water entering the chiller (°C)	12
(b)	Temperature of chilled water leaving the chiller (°C)	7
(c)	Fouling factor of chiller (MKS)	0.0001
(d)	Fouling factor of condenser (MKS)	0.0002
(e)	Chiller water flow (LPM)	3540
(f)	Condenser Water flow (LPM)	5111
(g)	Temperature of water to inlet of condenser (°C)	32.2
(h)	Temperature of water leaving the condenser (°C)	36.4
(i)	Max. power consumption at 100% load at AHRI Condition	0.6030 IKW/TR
(j)	IPLV (Max)	0.43 IKW/TR
(k)	NPLV (Max)	0.42 IKW/TR
(l)	Water side pressure. Drop in chiller & condenser	should not be more than 10 Meter.

b) Condenser Water Pump Sets

(a)	Quantity	3 Nos.
(b)	Capacity of each (LPM)	5111
(c)	Total operating head (M)	25
(d)	RPM	1500
(e)	Type of motor	TEFC squirrel cage
(f)	Type of starter	Star Delta
(g)	Type of impeller	Bronze
(h)	Type of pump	End suction /Horizontal split casing
(i)	Factory fitted mechanical seal	Yes
(j)	Efficiency	>75%

c) Chilled Water Pump Sets

(a)	Quantity	3 Nos.
(b)	Capacity of each (LPM)	3540

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(c)	Total operating head (M)	50
(d)	RPM	1500
(e)	Type of motor	TEFC squirrel cage
(f)	Type of starter	Star Delta
(g)	Type of impeller	Bronze
(h)	Type of pump	End suction/Horizontal split casing
(i)	Factory fitted mechanical seal	Yes
(j)	Efficiency	>75%

d) Cooling Tower

(a)	Number of Cooling Towers	3 Nos.
(b)	Capacity of cooling tower at operating WB temperature	Suitable for 350 TR capacity chiller package, as detailed above.
(c)	Type of cooling tower	GI / Moulded FRP Induced Draft Counter flow, CTI certified.
(d)	Approach temperature °C	3.9
(e)	Atmospheric temperature WB	28.3 deg.C (Monsoon)
(f)	Cooling across tower	4.3 deg.C
(g)	Water flow rate in each cooling tower LPM	5111
(g)	Water in temperature	36.4 deg.C
(h)	Water out temperature	32.2 deg.C
(i)	Material of fan	FRP
(j)	Type of motor	Squirrel cage TEFC IE03 or better with efficiency >90%
(k)	Type of starter	Star Delta
(l)	Colour of cooling tower	Ice Blue or as approved by the Bank
(m)	Thickness of FRP Basin	
	(i) Bottom	5 mm
	(ii) Top	3 mm
	(iii) Panel	3 mm
(n)	Thickness of Louvers	0.2 mm

e) Outdoor Conditions

Outside design conditions	DBT (° c)	WBT (°c)
Summer	40	27.9
Monsoon	31.8	28.3
Winter	22	18

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f) Indoor Conditions

Inside design conditions	DBT (°C)	RH
Summer/Monsoon	22 ± 2 °C	Not to exceed 60%

g) Power Supply

Three phase four wire AC supply at 415 Volts \pm 10%, 50 Hz \pm 6% shall be made available in the plant room by the Bank. All other electrical works as specified and provided for in the bill of quantities (BOQ)/ schedule of quantities (SOQ) form part of the Contract.

6.7 FIRST FILL OF CONSUMABLE, OIL AND LUBRICANTS:

a) All the first fill of consumables such as oil, lubricant, refrigerant etc. required for trial run, testing and commissioning the plant shall be furnished by the contractor. The contractor shall make good any loss of refrigerant, oil, consumable supplied by him as first charge during the defect liability period, if the loss is on account of faulty workmanship or defective material.

b) Notwithstanding approval of the tests or equipment by the Bank, the contractor shall be required to perform site tests and prove the correctness of ratings and performance of equipment/ machinery and materials supplied and installed by him as per the contract specification and conditions. The employer shall reserve the right to reject any equipment/ material/ machinery should it on tests after erection, be found not to comply with the contract specifications.

Seal and signature of the Contractor

Section-VII

Technical Specifications

7.1 General

The followings terms have been used in the tender specifications, drawings etc.

ARI	Air Conditioning & Refrigeration Institute
ASA	American Standard Association
ASHRAE	American Society of Heating Refrigeration & Air-conditioning Engineers, USA
ASME	American Society of Mechanical Engineers
BS	British Standards
CMH	Cubic Meter Per Hour
DB	Dry Bulb Temperature
DP	Drain Point
FAD	Fresh Air Damper
FD	Fire Damper
Hz	Hertz (Cycles per second)
IS	Bureau of Indian Standards
K Cal/Hr.	Kilo Calories Per Hour
Kg/CM ²	Kilograms Per Square Centimetre
MV	Mechanical Ventilation
RAD	Return Air Damper
RH	Relative Humidity
RPM	Revolutions Per Minute
SAD	Supply Air Diffuser
SAF	Supply Air Filters
SAG	Supply Air Grills
VCD	Volume Control Damper
WB	Wet Bulb Temperature

7.2 CONFORMITY WITH STATUTORY ACTS, RULES, ORDERS, STANDARDS AND CODES

a) The design, manufacture and performance of equipment should comply with all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The system and all the equipment should also conform to the requirement of the latest editions of applicable IS/ B.S Standards and other clearances as required. The contractor should refer the relevant sections of this specification for equipment standards and codes. Nothing in this specification should be construed to relieve the contractor of his responsibility.

b) All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 2003 and Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2010, NEC 2011 amended to date.

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c) List of Codes and Standards

The codes, regulation as detailed below shall be followed in this contract wherever applicable.

In case of discrepancy between the provision in the codes regulation and the Bank's specifications, the stringent of the two will be applicable for this contract.

S. Nos.	IS Code	Year	Reaffirmed Year	Description
1.	I.S. 3615	2020	-	Glossary of Terms Used in Refrigeration & Air Conditioning.
2.	I.S. 3624	1987	2018	Bourden Tube Pressure and Vacuum Gauges
3.	I.S. 7403	1974	2018	Code of practice for selection of standard worm and helical gear boxes
4.	I.S. 996	2009	2019	Single phase small A.C. and Universal motors
5.	I.S. 1239	2004	2014, 2019, 2021	Mild steel tubes, tubular and other wrought steel fittings
6.	I.S. 3589	2001	2022	Electrically welded steel pipes for water, gas and sewage
7.	I.S. 6392	2020	-	Steel pipe flanges
8.	I.S. 778	1984	2020	Copper Alloy gate, globe and check valves for general purpose
9.	I.S. 277	2018	2022	Galvanized steel sheets
10.	I.S. 737	2008	2018	Wrought aluminum and aluminum alloy sheet and strip for general engineering purposes.
11.	I.S. 655	2006	2022	Specification of Air ducts
12.	I.S. 732	2019	-	Code of Practice for Electrical Wiring Installations
13.	I.S. 900	2019	-	Code of Practice for Storage, Installation and Maintenance of Induction Motors
14.	I.S. 1248	2021	-	Direct acting indicating analogue electrical measuring instruments and their accessories.
15.	I.S. 1554 (Part-I)	1988	2020	PVC insulated (heavy duty) electric cables: Part 1 for working voltage up to and including 1100 volts
16.	I.S. 1554 (Part-II)	1988	2020	PVC Insulated (Heavy Duty) Electric Cables - Part 2 : for Working Voltages from 3"3 kV up to and Including 11 kV
17.	I.S. 8183	2024	-	Bonded Mineral Wool - Specification
18.	I.S. 4671	2018	-	Specification for expanded polystyrene for thermal insulation purposes.

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19.	I.S. 11561	2018	2022	Code of practice for testing of Water cooling towers.
20.	I.S. 7896	2023	-	Air Conditioning Outdoor Design Conditions Data For Indian Cities.
21.	I.S. 8148	2018	2022	Ducted and Packages air conditioners
22.	I.S. 2370	2014	-	Walk-in Cold Rooms - Specification
23.	I.S. 5111 (ISO 917 : 1989)	1993	2022	Testing of refrigerant compressors
24.	I.S. 10594	2021	-	Thermostatic Expansion Valve
25.	IS 12615	2018	-	Line Operated Three Phase A.C. Motors (IE CODE) "Efficiency Classes and Performance Specification
26.	IS/ISO 817	1966	2019	Code of practice for training and testing of metal arc welders
27.	IS 8188	1999	2020	Reviewed in 2020) Code of practice for treatment of water for cooling towers
28.	IS 1391(Part 1)	2023	-	Specification for Room Air conditioners : Unitary air conditioners
29.	IS 1391 (part 2)	2023	-	Specification for Room Air conditioners: Split air conditioners
30.	IS 12976	2023	-	Code of practice for solar water heating systems.
31.	IS 3103	1975	2018	Code of practice for industrial ventilation.
32.	IS 4831	2019	-	Recommendation on units and symbols for refrigeration
33.	Is 2312	1967	2020	Specs for Propeller type AC ventilating fans
34.	IS 4736	1986	2021	Hot Dip Zinc coatings on Mild steel tubes
35.	IS 3588	1987	2014	Spec for electrical Axial flow fans
36.	IS 4894	1987	2019	Specification for centrifugal pumps
37.	IS: 5111/ ISO : 1999	1993	2022	Testing of refrigerant compressors
38.	IS 732	2019	-	Code of practice for electrical wiring installations
39.	IS 3043	2018	-	Code of practice for earthing
40.	IS 1255	1983	2016	Code of practice for installation and maintenance of power cables up to and including 33 kV rating
41.	IS 10773	1995	2021	Wrought copper tubes for refrigeration and air - Conditioning purposes - Specification
42.	IS 4759	1996	2021	Hot - Dip zinc coatings on structural steel and other allied products - Specification
43.	IS 2629	1985	2021	Recommended practice for hot-dip galvanizing of iron and steel

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44.	SP 7	2016		National Building code of India – 2016
45.	ECBC 2017	2017		Energy Conservation Building Code of India
46.	SP 30	2023		National Electrical Code of India (NEC)
47.	CEA	2023		Central Electricity Authority (Measures relating to Safety and Electric Supply Regulations, 2022)
48.	IS 3069	2020	-	Glossary of Terms, Symbols and units relating to thermal insulation Materials
49.	IS 661	2019	-	Thermal Insulation of Cold Storage — Code of Practice
50.	IS 14164	2008	2019	Industrial application and finishing's of thermal insulation materials at temperatures above -80°C and up to 750°C - code of practice
51.	IS 13095	2020	-	Butterfly valves for general purposes.
52.	IS : 5312	2004	2019	Swing Check Type Reflux (Non-Return] Valves for Water Works Purposes
53.	IS 3950	1979	2022	Specification for surface boxes for sluice valves.
54.	IS: 12992 (part - 1)	1993	2018	Safety relief valves, spring loaded design.
55.	IS : 3483	1965	2020	Code of practice for noise reduction in industrial buildings.
56.	IS: 8418	1999	2019	Specification for horizontal centrifugal selfpriming pumps.
57.	IS 12615	2018	-	Line Operated Three Phase a.c. Motors (IE CODE) "Efficiency Classes and Performance Specification
58.	IS 966	2023	-	Desiccated Coconut – Specification
59.	IS 17570 (Part 1 to 4)	2021	-	Air Filter for general Ventilation
60.	ISO: 16000 (Part 1 to 34)	2021	-	Indoor Air Quality
61.	ISO 13964	1998	1998	Air quality — Determination of ozone in ambient air — Ultraviolet photometric method
62.	IS : 9842	2024	-	Preformed Fibrous Pipe Insulation - Specification
63.	IS/IEC 61439 (Part 1-7)	2020	-	Low voltage switchgear and control gear assemblies
64.	IS : 3961		2021	Recommended current rating of cables

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65.	IS : 1079	2017	2022	Hot rolled carbon steel sheets
66.	IS : 513	2016	2021	Cold reduced low carbon sheet
67.	IS : 5504	1997	2018	Spirally welded pipes
68.	IS : 13114	1991	2022	Forged brass gate, globe and check valves
69.	IS : 10221	2008	2021	Code of practice for coating & wrapping of underground mild steel pipes
70.	IS : 10617	2018	2022	Hermetic compressors
71.	IS : 11329	2018	2022	Finned type heat exchangers for room ac
72.	IS : 16656 (ISO 817 : 2014)	2017	2001	Refrigerants - defenitions & safety classifications
73.	IS 16678 (Part 1 to 4) (ISO 5149 (part 1 to4) : 2014)	2018	2022	Refrigeration systems and heat pumps -safety and environmental requirements
74.	IS : 3315	2019	-	Specification for evaporative Air coolers (desert coolers)
75.	IS: 12976	2023	-	Code of practice for solar Water heating systems
76.	IS 16590	2023	-	Liquid chilling package units-specification
77.	IS 16590	2017	2022	Water cooled chilling packages using the vapour compression cycle — specification
78.	ASTM C 578			Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
79.	ASTM D 1248			Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable1
80.	NFPA 13			Standard for the installation of sprinkler systems
81.	NFPA 72			National fire alarm signaling code
82.	NFPA 90 A			Standard for the installation of air conditioning and ventilation systems
83.	NFPA 92			Standard for smoke control systems
84.	NFPA 92A			Standard for smoke control using barriers and pressure differences
85.	NFPA 96			Standard for ventilation control and fire protection of commercial cooking operations
86.	ASHRAE 52			Filter testing standard 52
87.	ASHRAE			Standards and handbooks

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88.	ASHRAE 52.2			Method of cleaning general ventilation air cleaning devices for removal efficiency by particle size
89.	ASHRAE 62.1			Ventilation for acceptable indoor air quality
90.	ASHRAE 90.1			Energy standard for buildings
91.	ASHRAE 189.1			Standard for design of high performance buildings
92.	ASHRAE 170			Ventilation of health care facilities
93.	ASHRAE 55.1			Thermal environment conditions for human occupancy
94.	ISHRAE	2017		HVAC Data book
95.	IS: 13621	1998	2021	Sound power rating of air - Conditioning and air - Source heat pump equipment
96.	IS: 1475	2001	2022	Self - Contained drinking water coolers – Specification
97.	IS : 16753	2022	-	High Efficiency Filters and Filter Media for removing Particles from Air
98.	IS : 17584	2022	-	Refrigerant properties
99.	IS: 7872	2020	-	Deep Freezers- Specification

d) I.S. SAFETY CODES

I.S. 660 Safety Code for Mechanical Refrigeration

I.S. 659 Safety Code for air conditioning

I.S. 3016 Code of Practice for Fire precautions in welding and cutting operations

I.S. 818 Code of practice for safety and health requirements in electrical and gas and cutting operations.

IS. 5216 Code for safety procedure and practice in electrical works

I.S. 3696 Safety code for scaffolds and ladders

e) GRIHA Applicability of Design:

- i) Water efficiency in air-conditioning system.
- ii) Minimum efficiency requirements in air-conditioning system.
- iii) CFC/HCFC free refrigerant.
- iv) Zero ozone depletion refrigerants.
- v) Non-smoke building.

7.3 Scope of work

- a) SITC of all equipment that includes,
 - i) Chillers
 - ii) Cooling Towers

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- iii) Pumps –Chillers and Condensers
 - iv) Expansion Tanks
 - v) Connecting chilled and condenser pipes, valves and insulation
 - vi) BMS compatible electrical LT panel for each chiller unit.
 - vii) BMS and SCADA system for entire AC system
 - viii) Cabling and earthing system
 - ix) Any other equipment in central Air Conditioning System
- b) Foundations for equipment including foundation bolts and vibration isolation spring/pads,
 - c) Suspenders, brackets and floor/wall supports for suspending/supporting ducts and pipes.
 - d) Suspenders and/or cable trays for laying the cables.
 - e) Sealing of all floor slab/ wall openings provided by the lead contractor or contractor for pipes and cables, from fire safety point of view, after laying of the same.
 - f) Calibration of various sensors shall be carried out every year.
 - g) Painting of all exposed metal surfaces of equipment and components with appropriate colour.
 - h) Making openings in the Walls/Floors/Slabs or modification in the existing openings wherever provided for carrying pipe line, ducts, cables etc.
 - i) Making good all damages caused to the structure during installation and restoring the same to their original finish.
 - j) All electrical associated works as per BOQ and drawings, specifications.
 - k) Colour scheme for the equipment and components
 - (i) Colour scheme for equipment like chilling unit, pumps, cooling tower, piping, vent etc. shall be as per manufacturer's standard colour scheme.
 - (ii) The scheme of colour code painting of pipe work services for air conditioning installation shall be as per National building code and is indicated below:-

Description	Ground Colour	Lettering Colour	First Colour band
Condenser water piping	Sea Green	Black	French Blue
Chilled water piping	Sea Green	Black	Black
Drain Pipe	Black	White	
Vent	White	Black	
Valves and pipe line fittings	White with Black Handles	Black	
Belt guard	Black & Yellow diagonal strips		
Machine bases, Inertia Base Plinth	Charcoal grey		

(iii) Colour bands shall be 150mm wide, superimposed on ground colour to distinguish type and condition of fluids. The spacing of band shall not exceed 4.0m.

(iv) 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:

- Chilled water : CHW
- Condenser water : CDW
- Condensate : C

7.4 Water Cooled Screw chiller Package

a) General

1. Chillers shall be certified in accordance with the AHRI water cooled water chilling packages certification program.

2. The chiller shall be designed/manufactured and tested in accordance with the applicable portions of the latest revisions of the following Standards and Codes, which is based on AHRI standard 550/590 (I-P) and AHRI standard 551/591 (SI).

- a) AHRI 550 - Performance rating of water chilling packages;
- b) AHRI 590 – 2003 using the vapour compression cycle.
- c) AHRI 575 - Air Conditioning and Refrigeration Institute. Standard Method of Measuring Machinery Sound within Equipment Rooms (Base of all data presented or field testing of equipment with relation to sound requirements).

b) Compressor (Multi Screw Design)

Factory assembled, liquid chiller shall consist of multiple rotary screw(twin / mono) compressor with drive motor, initial oil and refrigerant operating charge, water cooled chiller with all accessories, and water cooled shell and tube type condenser, auto capacity control and safety systems, motors, lubrication system, oil cooler, cooling and anti-freeze thermostats, unit mounted starter with auxiliary contacts, interconnecting copper wiring, power wiring from starter to motor of required size, Victaulic coupling, insulation for chiller and suction line, and micro-processor based mounted control system. From Existing power distribution LT panel, two run of 240 sq. mm power cable will be connected at unit mounted LT panel for power supply to each chiller unit.

Compressor motor starter and local disconnect services units shall be mounted on the same frame with bolts and anti-vibration pads, wired and tested by the chiller manufacturer. Chiller shall be charged with R134A/HCFC or better eco-friendly refrigerant only. Compressor casing shall be constructed from a high strength iron casting, having reinforced double wall construction to provide a rigid structure and minimize the transmission of noise. Oil separator shall be provided at discharge side of compressor. Step-less capacity control to exactly match system load shall be provided. A microprocessor based controller shall modulate slide valve in response to chilled water outlet temp. Controller shall be programmed for necessary logic. Compressor shall be able to unload up to 25% of load with stable running. Single main incomer will be provided and unit mounted LT panel including starter arrangement for receiving power to compressor motor for each chiller unit will be made accordingly. Power shall be supplied to the chiller at 415 volts — 3 phase - 50 Hertz.

i) Capacity control shall be via a hydraulically activated slide or other proven and established method.

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- ii) The compressor shall be horizontal in design. The compressor shall be of the same make as that of the chiller
- iii) Each Chiller unit have min 2 nos of compressors, Unit mounted Star Delta starter with auxiliary contacts, suitable for Single main incomer.
- iv) It shall be complete with suction and discharge shut-off valves, refrigerant drier with isolating valves, electronic expansion valve, safety relief valves, safety control and switches, oil filter, suction filter, muffler, dual manual reset type pressure state, oil safety switch, refrigerant suction and discharge pressure gauges, crank case heaters and relays, direct coupled motor, oil separator, oil cooler.
- v) Compressor safeties shall include high compressor discharge temperature, high motor winding temperature, low oil pressure, reverse rotation, and high discharge pressure and/or any other safety as is prescribed by the manufacturer and is found necessary for safe/trouble free operation of the system.
- vi) There shall be built in oil reservoir to ensure full supply of lubricants to all bearings and a check valve to prevent backspin during shut down.
- vii) Compressor shall be equipped with internal pressure relief to protect against over pressure. For compressors not equipped with internal pressure relief, the high side shall be protected with an external relief valve capable of passing the full load flow produced by the compressor.
- viii) There shall be oil pump or other means of differential pressure inside the compressor for forced lubrication of all parts during start-up, running and during shut down. An oil sump heater shall be provided in the casing.
- ix) Sound level should not exceed 85 dB at a distance of two meter.
- x) Vibration level not to exceed 4 mm/s

c) Motors and starters

Motor shall be Hermetic / semi hermetic motors as required or as recommended by Manufacturer shall be suction gas cooled, two pole, squirrel cage induction types. Motor shall be designed and guaranteed for continuous operation. Temperature rise of motor under rated service conditions shall not exceed 80 Deg C (by resistance method of measurement) over an ambient of 40 Deg C. the motor shall be provided with a combination of ball and roller bearing or as per OEM design. All terminal boxes shall be located at the same side of the motor and have terminal and cable glands suitable for the specified cables. **The starting current is more than 2 times of full load current soft starter shall be provided.** For hermetic motors, load limit mechanism & solid state sensors shall be provided for positive thermal and current over load protection. The control provision should be made so as to ensure that more than 5 attempts per hour are not permitted.

- i) Compressor motor shall be of single speed, non-reversing suitable for the voltage shown on the equipment schedule.
- ii) In case of hermetic compressors, motors shall be suitable for operation in a refrigerant atmosphere and shall be cooled by atomized refrigerant in contact with the motor windings. In semi-hermetic system, the motor shall be of SPDP.
- iii) Motor/stator shall be arranged for service/removal with only minor compressor disassembly and without breaking of main refrigerant piping connections.
- iv) The motor shall be liberally sized and the rating shall be such that the motor is loaded not more than 90% when the compressor is fully loaded.
- v) Motors shall be protected against winding over temperature by means of suitable sensors.
- vi) **The following features shall be provided:**

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- (a) Door interlocked circuit breaker capable of being padlocked.
- (b) Ground fault protection.
- (c) Over voltage and under voltage protection.
- (d) 3-phase sensing motor over current protection.
- (e) Single phase protection.
- (f) Insensitive to phase rotation.
- (g) Over temperature protection.

Inbuilt Digital readout at the chiller unit control panel of output frequency, output voltage, three phase output current, input Kilowatts and Kilowatt-hours, self- diagnostic service parameters.

d) Evaporators/ Chillers

i) These heat exchangers shall be horizontal shell and tube type designed for efficient heat transfer with special refrigerant distributor. Chillers shall be flooded and designed for duty specified in the schedule of equipment. The same shall be labelled as per BEE norms. Shell shall be of steel and Tubes shall be of copper and not less than 16mm. dia. Tubes shall be removable without affecting the strength and durability of support OR causing any leakages in the adjacent tubes. Tubes shall be adequately supported to prevent vibration.

ii) The chiller shall be made of rolled carbon steel plate with fusion welded seams. Removable compact water boxes of cast iron or welded steel with stub-out water connections shall be provided to permit access for tube cleaning and replacement.

iii) Water boxes shall be designed for 300 psig working pressure and hydraulically tested at 450 psig. The tubes shall be finned from outside having spiral ridges from inside, roller expanded into the tube sheets providing a leak-proof seal. The tubes shall be of seamless, hard drawn copper with a minimum tube wall thickness as per applicable standard code of practice (minimum of 0.71 mm for plain tubes & minimum 0.63mm at the root of fins). Intermediate steel tube supports should be provided at intervals not exceeding 1200 mm.

iv) Chillers shall be suitable for use with electronic expansion valves as refrigerant feeding device. Provision shall be made on the chiller for fixing manually reset-type antifreeze thermostat. Chiller shall be provided with eliminator to prevent liquid carry over to the compressor.

v) The chiller shall be provided with liquid level sight glass and a relief device (of the bursting type) to prevent excess pressure in the heat exchanger.

vi) The chiller shall be provided with the following connections and accessories

- (a) Refrigerant inlet and outlet pressure gauges.
- (b) Grooved coupling at Water inlet and outlet connections.
- (c) Drain and vent connections with stop valves.
- (d) Pressure gauges on water inlet and outlet connections.

e) Chillers shall be designed for test pressure of 10 kg/CM² on refrigerant side and 20 kg/CM² on water side.

Liquid level indicator/Electronic expansion valves.

- (i) Refrigerant shut - off valve.
- (ii) Necessary drain valve, air vent, charging connection with valves.
- (iii) Eliminator, distributor and rupture disk.
- (iv) Chillers shall be insulated as specified under the item of insulation.
- (v) Water inlet and outlet connections with temperature sensors, differential pressure type flow sensor, drain valve, air vent valve, etc.as detailed under Micro-processor based control system
- (vi) Factory fitted DP Switch to be provided.
- (vii) The Evaporator shall be designed and tested in accordance with ASME code and U stamping. Chiller Manufacturing to be done in ASME certified Factory & Factory Should have ASME Certification for at least 5 Years. Manufacturer to be provide factory ASME certificate. Also U stamp certificate should be provided under the scope of “ Manufacturer pressure vessel of above location only “

f) Condensers

- a) The condenser shall be of shell & tube construction and shells will be of rolled carbon steel plate with fusion welded seams. Removable compact water boxes of cast iron or welded steel with stub-out water connections shall be provided to permit access for tube cleaning and replacement. Water boxes shall be designed for 300 psig working pressure and hydraulically tested at 450 psig. The tubes shall be finned from outside having spiral ridges from inside, roller expanded into the tube sheets providing a leak-proof seal. The tube material shall be copper, intermediate steel tube supports should be provided at intervals not exceeding 1200 mm. Grooved coupling at Water inlet and outlet connections. The condenser shall be designed and tested in accordance with ASME code and U stamping. Chiller Manufacturing to be done in ASME certified Factory & Factory Should have ASME Certification for at least 5 Years. Manufacturer to be provide factory ASME certificate. Also U stamp certificate should be provided under the scope of “ Manufacturer pressure vessel of above location only “
- b) The Condenser shall be complete with the following accessories:
 - i) Hot gas inlet and liquid out let connection, relief valve, purge valve and refrigerant shut-off valve.
 - ii) Water inlet and outlet connections with temperature sensors, differential pressure type flow sensor, drain valve, air vent valve, etc. as detailed under Micro-processor based control system
 - iii) Factory fitted DP Switch to be provided.

g) Frame

The Chiller shall be included with anti-corrosive adequate structural base frame in order to ensure resistance to external environmental corrosion, the structure and panels of the casing shall be produced entirely in galvanized steel. The paint shall conform to OEM Standard regarding resistance to saline humidity; therefore, the units can be installed in any atmospheric conditions. All external fastenings shall be in stainless steel.

h) Isolation mounting:

The chiller unit shall have vibration isolation mounts between floor and structural supports for field mounting. The chilling machine shall be installed over a platform and shall be adequately isolated as per manufacturers' recommendations against transmission of vibrations to the building structure.

i) Lubrication System

The lubrication system shall ensure that the oil is distributed throughout the compressor. Oil separator and return system shall be designed to ensure that oil is adequately returned to the compressor and does not collect in the heat exchangers.

j) Expansion valve

The refrigerant circuit will be equipped with all necessary components in order to ensure proper operation of the unit such as filter driver, liquid right glass shut off valves etc. The unit shall be equipped with expansion valve that allows precise refrigerant flow to the evaporator.

7.5 Automatic tube cleaner and Vacuum Degasser

a) Automatic tube cleaning system with common injection cum collection pump or separate pumps for injection and collection shall be microprocessor controlled injection system which pushes an external cleaning agent such as soft balls or stars through the condenser tubes of the water cooled chiller. Frequency of injection shall be adjustable from micro-processor based control panel.

b) It shall be delivered fully pre-programmed, with settings that can, where necessary, be simply and quickly changed to cater for varying water qualities. The automatic tube cleaning system shall use no chemicals. Control valves for reversing directions of cleaning agents shall be provided and shall be operated from chiller control panel. Frequency of injection shall be settable from the microprocessor control panel.

c) Pumps shall have Y strainer on suction side and NRV on discharge side. It is advisable for providing common ATCS system for all component requirements.

d) Vacuum degasser chilled water system shall remove dissolved gases from chilled water using a vacuum. Allows quick venting of air at start-up .

7.6 Microcomputer control centre (MCC)

7.6.1 Each unit such as chiller, condenser, pumps, cooling towers etc. shall be furnished with MCC in factory mounted, wired and tested. It shall include a touch screen, coloured display and graphical display showing all system parameters in English language with numeric data in English (FPS) units.

7.6.2 The chiller shall be controlled by a standalone microprocessor based control panel. Microprocessor shall be capable of supporting remote management. Each Unit shall be suitable to connect to the central controller. The chiller control panel shall control chiller operation and shall monitor chiller sensors, actuators, relays and switches.

7.6.3 The chiller control panel shall be equipped with: -

a) System operating information including:

(i) Chilled and Condenser water inlet and outlet temperature

(ii) Evaporator and condenser refrigerant temperature and pressure

(iii) Oil pressures

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- (iv)** Percentage of power consumption & motor current
 - (v)** Compressor discharge temperature & pressure
 - (vi)** Oil reservoir temperature
 - (vii)** Flow switch status
 - (viii)** Approach temperatures
- b) Chiller package status like start-up sequence status & shut down and operation status:-
- (i)** Operating hours (Total hours)
 - (ii)** Number of starts of compressor & Compressor ON & OFF status
 - (iii)** Compressor unloading status
 - (iv)** Time of last start and time of last stop
 - (v)** Fault history
- c) Digital programming of set points through the touchpad including a.
- (i)** Leaving chilled water temperature
 - (ii)** Percent current limit
 - (iii)** Pull-down demand limiting
 - (iv)** Minimum six-weeks schedule (complete with local holiday schedule) for starting and stopping the chiller & chilled water pump
 - (v)** Remote reset temperature range
- d) Status messages indicating:
- (i)** system ready to start
 - (ii)** system running
 - (iii)** system close down
 - (iv)** system safety shutdown-manual restart
 - (v)** system cycling shutdown-auto restart
- e) Safety shutdowns enunciated through the display and the status bar and consist of system status, system details, day, time, cause of shutdown and type of restart required. Safety shutdowns shall include:
- (i)** evaporator – low pressure
 - (ii)** evaporator – low temperature
 - (iii)** Anti-freeze protection cut-out
 - (iv)** condenser – high pressure
 - (v)** discharge – high temperature
 - (vi)** oil – high / low temperature
 - (vii)** oil – high / low pressure
 - (viii)** control panel – power failure indicator
 - (ix)** motor or starter – current imbalance / controller fault
 - (x)** Electrical over load (current)
 - (xi)** Sensor malfunction

- f) Security access to prevent unauthorized change of set points, to allow local or remote control of the chiller. System shall be accessed through ID and password recognition, which is defined by three different levels of user competence: view, operator and service.
- g) The operating program stored in non-volatile memory (EPROM) to eliminate reprogramming the chiller due to AC power failure or battery discharge. Programmed set points shall be retained in lithium battery-backed RTC memory for a minimum of 5 years with power removed from the system.
- h) A fused connection through a transformer in the compressor motor starter to provide individual over current protected power for all controls.
- i) An RS-232 / 485 Modbus / Bacnet port to output all system operating data, shutdown / cycling message and a record of cycling or safety shutdowns as mentioned in technical specifications for SCADA to a field- supplied printer. Data logs to a printer at a set programmable interval. This data may be pre-programmed to print.
- j) The capability to interface with any third party building automation system to provide:
 - (i) remote chiller start and stop
 - (ii) remote chiller leaving temperature adjust
 - (iii) remote current limit set point adjust
 - (iv) safety shutdown
 - (v) cycling shutdown :Cycling shutdowns shall include: low water temperature; low oil temperature: chiller/condenser water flow interruption; power fault; internal time clock; and entire cycle.
 - (vi) run & shut down status

Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Contractor shall provide field control wiring necessary to interface sensors to the chiller control system

Note: Also necessary hardware cards and software shall be provided for integration of the chiller micro panel with the PLC based building automation system to ensure two way communications and the system should be achievable through remote BMS system

7.6.4 Power Control & distribution panel with automatic electronic Control System

- a) Unit mounted power control & distribution panel

The panel shall be unit mounted. The microprocessor based automatic controller as per specification shall also be housed in a separate enclosure forming a part of the unit mounted power control & distribution panel. The panel shall be complete with incoming MCCB with microprocessor based over current, short circuit and earth fault protection, individual MCCBs of suitable rating for individual compressor motor with inbuilt over current , earth fault and short circuit protection, required individual starters, all internal wiring, control/interlock terminals, control fuses, contactors, operating & safety controls as per manufacturer's standards.

- b) Automatic Microprocessor Based Electronic Control System

In order to continuously monitor the operating parameters and also for fault annunciation and system protection, the microprocessor based electronic control system shall be provided. The

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system shall be having the following data display features, system protection/ trips with an audio alarm

c) Data available on Display

- ❖ Suction pressure
- ❖ Discharge pressure
- ❖ Differential Oil pressure between compressor & oil filter
- ❖ High & low pressure cut out switch
- ❖ Compressor lead-leg switch.
- ❖ Chilled Water Inlet Temperature
- ❖ Chilled Water Outlet Temperature
- ❖ Condenser water Inlet Temperature
- ❖ Condenser water outlet Temperature
- ❖ Discharge Temperature
- ❖ Discharge Super Heat
- ❖ Evaporating Temperature
- ❖ Condensing Temperature
- ❖ Percent Motor Rated load amps (RLA)
- ❖ Oil Pressure
- ❖ Chiller operating hours (With start/stop time & number of starts.)
- ❖ Supply voltage
- ❖ Supply frequency
- ❖ Compressor motor current
- ❖ Percentage slide valve position

(If the electrical parameters can not be displayed on Micro controller, the same shall be displayed through a multi function meter, installed on the unit)

d) *System Protections/Trips*

- ❖ High Condenser Pressure
- ❖ Low Evaporator Pressure
- ❖ Low Differential oil pressure
- ❖ Anti freeze trip
- ❖ Compressor motor overload on current
- ❖ Differential pressure across condenser
- ❖ Differential pressure across chiller
- ❖ Over voltage and under voltage
- ❖ Motor winding overheat
- ❖ Low condenser water flow
- ❖ Low chilled water flow
- ❖ Single phasing & Phase reversal
- ❖ Low oil level
- ❖ Discharge high temperature

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- ❖ Discharge low temperature
- ❖ High Oil temperature
- ❖ Low Oil temperature
- ❖ Watchdog - Software reboot

e) *Other features*

- ❖ Alarm History of logging
 - ❖ Anti recycling of compressor should be automatic
 - ❖ Tier password Protection
 - ❖ PC connectivity
 - ❖ Loading/unloading/starting/stopping on chilled water outlet automatically
- ❖ All trips/system protection should be accompanied by **an audio alarm** with appropriate display.

The test displayed within the system status and system detail field shall be displayed as a colour coded message to indicate severity e.g., red for safety fault, orange for cycling faults, yellow for warning and green for normal operation.

The data display, system protection/ trips and other features may vary depending upon standard practices of different manufacturers. Minor variations in the above shall be acceptable based on the written declaration of the manufacturer to that effect.

f) Control

(i) The chiller shall be provided with a factory installed and wired microprocessor control system with individually replaceable modular component construction. The system shall include a control centre, temperature (thermostat) and pressure (transducer) sensors, and all necessary auxiliary devices required for proper operation. **Controls shall be provided with adequate battery backup to prevent the loss of configuration information in case of power failure.**

(ii) The chiller control system shall have the ability to interface and communicate directly to the building control system without the use of additional field installed hardware or software.

(iii) The microprocessor control centre shall include a suitable touch screen, coloured display and graphical display showing all system parameters in English language with numeric data in English (FPS) units and stop button and an alarm light.

(iv) The default standard display screen shall simultaneously indicate preferably the following information:

- ❖ Date and time of day
- ❖ 24 character primary system status message
- ❖ 24 character error message
- ❖ chiller operating hours

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- ❖ Chilled water temperature at inlet
- ❖ Chilled water temperature at outlet
- ❖ Condenser water temperature at inlet
- ❖ Condenser water temperature at outlet
- ❖ Oil sump temperature
- ❖ Percent motor Rated Load Amps (RLA)
- ❖ Supply voltage
- ❖ Frequency
- ❖ Compressor motor current

(v) The function keys shall be software driven within the status, Schedule, Set point and Service menu structures.

(vi) Upon request to start the compressor, the control system shall first verify that condenser and chiller water flows have been established. The controller shall then compare the entering/leaving chilled water temperature with the chilled water set point & give the signal to compressor.

(vii) A user-configurable ramp loading rate, effective during the chilled water temperature pull down period, shall control the rate of slide valve opening to prevent a rapid increase in compressor power consumption. The controls shall allow configuration of the ramp loading rate in either degree/minute of chilled water temperature pull down or percent motor amps/minute. During the ramp loading period, a message shall be displayed informing the operator that the chiller is operating in ramp loading mode.

(viii) The control system shall include compressor runtime timers to protect the motor from rapid cycling (a 15 minute minimum start to start timer and a 1 minute minimum stop to start timer). In addition, the compressor will be inhibited from restarting if more than 8 starts within a 12 hour period have occurred. However, these timers shall be able to bypass in case of testing/ maintenance.

(ix) The control system shall automatically and optimally cycle the compressor to minimise energy usage whenever the leaving chiller water temperature is below the desired chiller water set point. When the leaving chilled water temperature rises above the set point by a user configured amount, the compressor shall automatically restart. During the shutdown period, a message shall be displayed informing the operator a recycle restart is pending.

(x) The control centre shall monitor line voltage and if loss of voltage, higher or low line voltage, or single cycle dropout is sensed the chiller shall shut down.

(xi) The control system shall allow configuration or reset of the chilled water temperature set point based on either water temperature rise across the evaporator **or** an external 4-20 mA signal , or a remote temperature sensor(such as outdoor air).

(xii) The control centre shall limit amp draw of the compressor to the rated load amps (RLA) or to a lower value (ranging from 40% to 100%) of compressor RLA. The control centre shall allow configuration of demand limit based on either a user input or an external 4-20 mA signal.

(xiii) When demand limit is active, a message shall be displayed indicating the course of the demand signal.

g) Schedule Function

The chiller controls shall be configurable for manual or automatic start up and shut down. In automatic operation mode, the controls shall be capable of automatically starting and stopping the chiller according to a stored user programmable occupancy schedule. The controls shall also provide for chiller start up and shutdown through a remote contact closure from a customer supplied device or from a building management system software command.

h) Set Point Function

The controls shall provide the capability to view and change and should be password protected for the leaving chilled water set point, entering chilled water set point and demand limit set point at any time during chiller operation or shut down periods. The controls shall allow for the specification of capability control through either leaving chiller water or entering chilled water.

i) Service Function

The controls shall provide a password protected service functions which allow authorised individuals to:

- ❖ View the alarm history file which contains the specified number of alarm/alert messages with time and date stamp. These messages shall be displayed in text form, not in codes.
- ❖ Execute the chiller control test function for quick identification of malfunctioning components
- ❖ View/modify chiller configuration
- ❖ View/modify system time and date

j) Diagnostics and Service

(i) The control system shall execute a series of pre start checks whenever a start command is received to determine if pressure temperatures and timers are within pre start limits thereby allowing start up to proceed. If any of the limits are exceeded a text alert message will be displayed informing the operator of the cause of the pre start alert.

(ii) In addition to the automated control test, the controls shall provide a manual test that permits selection and testing of individual control components and inputs. A thermistor test and transducer test shall display the actual reading of each thermistor and each transducer installed on the chiller on the display screen in real time

(iii) All sensors shall have quick disconnects to allow replacement of the sensor without replacement of the entire sensor wire. Pressure transducers shall be capable of field calibration to ensure accurate reading and to avoid unnecessary transducer replacement. Transducers shall be serviceable without the need for refrigerant charge removal or isolation.

(iv) The microprocessor shall have a suitable input/ output port for connection to a PC/ SCADA system for recording/ monitoring/ controlling of parameters on a pre-determined periodicity. The status of all controls and safety devices shall also be automatically logged whenever the plant trips on any fault along with the values of all parameters at the moment of or just prior to occurrence of fault and shall be having provision to take out a hard copy of the log extract on demand/daily basis.

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7.6.5 Regulation of cooling capacity

The unit should have automatic capacity control through regulation of slide valve in the compressor thus ensuring proper control on leaving chilled water temperature.

7.6.6 Thermo-wells & Sight Glasses

In addition to the thermos-wells provided for the standard unit safety use, additional wells shall be provided for measurement of refrigerant condensing and evaporating temperatures. Sight glasses shall be provided to monitor oil charge level, oil flow, compressor rotation.

7.7 Chilled and condenser water Pumps

7.7.1 The motor shall be totally enclosed fan cooled type. The motor shall have efficiency class IE-3 / EFF-1 or better efficiency. Pumps shall be of **End Suction/Horizontal split casing** type and suitable for the given duty points and parallel operation :

(i)	Type	End Suction /Horizontal split casing
(ii)	Capacity and head	As per design data sheet
(iii)	Casing	Cast iron, common base with anti-vibration base
(iv)	Impeller	Bronze
(vi)	Shaft	High tensile/ strength stainless steel with minimum shaft deflection.
(vii)	Bearings ring	Ball/Roller to minimise pressure leakage and prevent rotation
(viii)	Coupling	Rigid spacer type coupling for vertical pump-sets / Flexible coupling for horizontal pump-sets with coupling Guard
(ix)	Seal	Mechanical type(Silicon carbide) lower seal chamber throttle bushing
(x)	Motor	Squirrel Cage TEFC with Class-F electrical insulation, high efficiency,
(xi)	Starter	Star Delta
(xii)	Shaft sleeve	Bronze
(xiii)	Efficiency	>75%

7.7.2 Pumps shall be selected for the rated conditions indicated. Peak efficiency shall be obtained at or near rated conditions. Impellers shall be statically and dynamically balanced. Contractor shall select their drives at least 10% in excess of the maximum BHP of the pumps.

7.7.3 The following accessories shall be provided where required with each pump besides other standard accessories:

- a) Lubrication fitting and seal packing
- b) Test and air vent cock

- c) Drain cock
- d) Adequately sized of sealed Terminal box for termination of 2 runs , 3 core copper conductor armoured cable.
- e) Coupling Guard for pumps.
- f) Pressure gauges at suction and discharge sides,
- g) Butterfly valves on suction and discharge, and
- h) Reducers, as may be required to match the sizes of the connected pipe work.
- i) Non-return valve at the discharge.
- j) Strainer at suction side

7.7.4 This shall be shrouded type with machined collars. Wear rings, where fitted to the impeller, shall be of the same material as the impeller. The impeller surface shall be smooth finished for minimum frictional loss. Rile impeller shall be secured to the shaft by a key.

7.7.5 The thrust balancing can be of balancing holes or back vanes. The direction of rotation of the impeller is clockwise when viewed from the motor and having sufficient strength to withstand the forces due to water flow at all working conditions.

7.7.6 The shaft seal shall be stuffing box type unless otherwise specified, so as to allow minimum leakage compatible with the operation of the seal. The stuffing box shall be of adequate length and shall be packed with graphite asbestos or any other suitable material for the operating temperature.

a) Drip well shall be provided beneath the seal. Shaft shall be high strength stainless steel. Pumps shall be fitted with outside balanced mechanical seals (factory fitted). The shaft shall be of with optimum diameter to provide maximum strength with minimum shaft deflection.

b) In the case of HSC (Horizontal Split Case) pumps, the same shall be directly coupled to the motor shaft through a flexible coupling protected by a coupling guard.

c) In case of mono block pumps with solid casing, the motor and pumps shall be on a common shaft.

d) The pump and motor shall be mounted on a common base plate either of cast iron or fabricated from rolled steel section, with vibration isolation pads. The base plate shall have rigid, flat and true surfaces to receive the pump and motor mounting feet.

7.7.7 After complete installation, original paint of the pump shall be retouched and accessories, fittings and floating foundations frame shall be given two coats of synthetic enamel paints of colour specified in specification for painting works.

7.7.8 All external and exposed Cast iron parts shall 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 shaft shall not be painted.

7.7.9 Foundation

The pump shall be installed on RCC Foundation of dimensions as recommended by the pump manufacturer. The grade of concrete and design as well as quantity of rebar used in making the pump foundation, shall be as approved by the Bank. SS J-Bolts along with 2 SS nuts per bolt shall be used for anchoring the pump-set to its foundation. Installation shall be done as per the Manufacturer's foundation / GA drawing. Pump RCC foundation shall be with M.S Angle frame along the edges of the foundation, made of 50x50x5 mm M.S Angles. The pump shall be capable

of getting installed with pipe support and without flexible connectors on the suction and delivery side.

7.7.10 SEQUENCE OF OPERATION FOR PUMPS (WHEREVER AUTOMATION IS USED)

- a) The system shall consist of pump logic controller with manual and automatic alternation and pump staging.
- b) The pumping system shall start upon the closure of customer's contact when pump logic controller mode of operation selector switch is in the REMOTE position.
- c) When the pump logic controller selector switch is in the LOCAL position and start command on controller is given via operator interface, the pumping system shall operate automatically.
- d) Sensor / transmitter shall send a 4-20 mA signal to the pump logic controller, indicative of process variable condition.
- e) The pump logic controller shall compare each signal to the independent engineer / user determined set points.
- f) When all set points are satisfied by the process variable, the pump speed shall remain constant at the optimum energy consumption level.
- g) The pump logic controller shall continuously scan and compare each process variable to its individual set point and control to the latest satisfied zone.
- h) As the worst-case zone deviates from set point, the pump logic controller shall send the appropriate analogue signal to the BMS to speed up or slow down the pump/motor.
- i) In case of faults, the pump controller shall display an alarm condition through a plain English message.
- j) Fault indication shall be continuously displayed on the operator interface of the pump until the fault has been corrected and the controller has been manually reset.
- k) In the event of the failure of a sensor/transmitter, its process variable signal shall be removed from the scan/compare program. Alternative sensor/transmitters, if available, shall remain in the scan/compare program for control.
- l) Upon sensor / transmitter failure a plain English warning message shall be displayed on the operator interface of the pump logic controller.
- m) In the event of failure to receive process variable signals, the BMS shall maintain a user adjustable speed; reset shall be automatic upon correction of the failure.

7.8 COOLING TOWERS

The cooling tower shall be selected as per **CTI certification standards** as per design parameters. The structural support and foundation shall be designed and constructed based upon certified loads and dimensions provided by accredited manufacturer. The contractor shall ensure no water leakage from the cooling tower, basin and sump.

a) Type

Cooling towers shall be vertical, induced draft counter flow type in accordance with requirement of drawings suitably for site conditions. Provision for suitable control panel for cooling tower fan motor is within the scope of work.

- i. Cooling Towers shall be suitable for outdoor use. Tower shall be made from G-235 (Zinc-coated steel construction/moulded FRP), in rectangular / square / octagonal profile, complete with fan, motor, diffusion deck spray section, eliminator, steel supports, and sound attenuation Equipment.
- ii. G-235 Components fabricated of zinc-coated steel shall be not lighter than 16 gauge steel, protected against corrosion by a zinc coating. The zinc coating shall conform to ASTM A153 and ASTM A123, as applicable and have an extra heavy coating of not less than 2-1/2 ounces per square foot (762 g per square meter) of surface galvanized surface damaged due to welding shall be coated with zinc rich coating conforming to ASTM D520, Type 1. Bolts shall be cadmium-plated, zinc coated steel, or type 304 stainless steel. Each bolt shall be provided with neoprene and cadmium-plated steel washer under the heads. Nails shall be silicon bronze, commercial bronze, or stainless steel. Hardware shall meet the salt spray fog test as defined by ASTM B117.
- iii. Side casing : This shall be made out of G-235 Galvanized Steel casing panel shall totally encase the fill media to protect the fill from damage due to direct atmospheric contact.
- iv. Cold water basin shall be a G-235 Galvanized steel. Removable stainless steel strainer with openings smaller than nozzle orifices. Joint shall be Bolted and sealed water tight or welded.
- v. Basin shall be fabricated and installed to ensure that air shall not enter outlets when operating and no water will overflow and shutdown, each individual sump shall be provided with an individual outlet. Each outlet shall be provided with a 1/2 inch (13MM) mesh, zinc coated steel wire securely mounted to prevent trash from entering the outlet, each basin shall be provided with overflow and valve brain connection, each basin shall be provided with a float controlled, makeup water valve as indicated, the makeup water shall discharge not less than 2 inches (51MM) or two pipe diameters, whichever is greater, above the top of the basin.
- vi. Basin fitting shall include the following:-
 - i) Side Outlet
 - ii) Screened Suctioned Assembly
 - iii) Drain connected to side/under side of basin.
 - iv) Overflow connected to the side of basin.
 - v) Built-in bleed off attached to inlet header discharging through polyethylene tube into overflow pipe.
 - vi) Ball type automatic makeup water valve.
 - vii) Quick fill connected to the side of basin.
 - viii) Equalizing connection and balancing wall for multiple CTs.

Note:- Two single cell cooling tower out of three cooling towers may be merged by eliminating middle partition wall for site constraints but separate basin and have separate operation facility, may be accepted)

b) Distribution System

Non-corrosive materials. Pipe shall be Schedule 40PVC, non-corrosive material, Nozzles are non-clogging, ABS plastic, threaded into branch piping.

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c) Fillings

Fillings shall be made of corrosion proof and rigid PVC fill. PVC fill resistant to rot, decay and biological attack, formed, cross fluted bonded together for strength and durability in block format for easy removal and replacement, suitable for use as a working surface, self-extinguishing with flame spread rating of 54 per ASTM E84-81a, able to with stand continuous operating temperature of 55 degree C, and fabricated, formed and installed by the manufacture to ensure water breaks up into droplets. PVC Drift Eliminator shall be installed. They shall be arranged in such a manner to ensure negligible resistance to air flow and to eliminate back water spots and prevent fouling trough scales that may form. In order to reduce carry-over losses through entertainment of moisture drops in air stream, PVC drift eliminators shall be installed. The fill should include both louvers and drift eliminators & the louvers should prevent water from escaping the fill sheets to assure proper & efficient heat transfer throughout wide variations in the airflow. The HDG steel structural tubes shall suspend, support & stabilize the fill in position & should also hold the fill sheets above the cold water basin floor to simplify the cleaning of the basin. Suitable screens between the side of the cold water basin & the base of the fill should be provided to prevent foreign materials in the circulating water flow & should be easily removable.

d) Mechanical Equipment

(i) The fan shall be axial-flow type, belt driven, multi aero foil blades with variable pitch. The fan blades shall be made of aluminium alloy and housed within a fan cylinder, design for smooth unobstructed air entry. The fan shall be factory balanced both statically and dynamically. A fan having non-automatic adjustable pitch blades permits the same fan to be used over a wide range of kW with the fan adjusted to deliver the desired air flow at the lowest power consumption. Automatic variable pitch blades can vary air flow in response to changing load conditions.

(ii) The fan motor shall be totally enclosed fan-cooled, weather proof type. It shall be connected through a set of easily adjustable and low maintenance.

(iii) Fan shall be driven by $415 \pm 10\%$ volts, 3 phase, 50 Hz, AC supply, energy efficient motor, totally enclosed air over (TEAO), fan-cooled, weather-proof construction (IP65), Class F, designed and selected to operate in humid air stream. Fan shall be protected by a fan guard and bird screen of galvanized steel construction to prevent birds from nesting during idling period & shall be easily accessible for inspection and maintenance. G.S.S canopy shall be provided over the fan motor for protection against rain water. Motor terminal box shall be made water tight. The motor and cooling tower shall be designed suitable for operating at 115% of design capacity. The cooling tower fan motor shall be suitable for operating with Variable Frequency Drive as specified in the BOQ.

e) Installation

(i) Cooling towers shall be assembled, rigged and installed in accordance with the manufacturer's recommendations to the satisfaction of the Bank's engineer. The associated auxiliary structural support shall be supplied.

(ii) The cooling tower shall be installed on 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 brickwork.

(iii) These may be located at a well-ventilated place at ground level and contiguous to the plant room in consultation with the Bank official. 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 contractor. The cooling towers shall be rested on Mild Steel-I sections & not on slab directly. Sufficient free space shall be left all around for efficient operation of the cooling tower.

(iv) 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.

(v) Precautions shall be exercised throughout the assembly of cooling towers to minimize objectionable air-borne noise. Vibrations of the cooling towers must be effectively isolated from the structure of the building.

f) Handrail & ladder

Hot Dipped Galvanized made Ladder & Handrail should to access to the top of the cooling tower should also be part of scope, whether or not it forms a part of the Schedule of quantities.

g) Safety and access

(i) The tower shall be designed and equipped to provide comfortable, safe access to all components requiring routine inspection and maintenance.

(ii) An inspection door (internal walkway) shall be provided to gain entry into the tower to facilitate inspection and easy maintenance. Access ladder shall be installed on the tower permanently.

(iii) The cooling tower shall be on the low operating noise type. Noise level shall not exceed the sound level as per standard.

(iv) Supply and install all ancillary including make-up water supply pipe from the makeup tank, quick fill and bleed-offs facilities

(v) The cooling towers shall be supplied with the manufacturers standard finish painting as per directed by the bank`s engineer-in - Charge.

7.9 Water Piping

7.9.1 This section deals with supply and laying of heavy class pipes with bevelled ends. All pipe accessories such as bends, elbows, flanges, G.I nuts, G.I bolts, thermo-wells for temperature gauges, descaling tee, G.I. channel angle rod supporting work and PCC supports with full round high density PUF supports, vibration isolators and valves, testing and balancing of the piping system, required for the complete installation in accordance with the site requirement. All piping inclusive of fittings and valves shall follow the Indian Standards (IS). The scope includes breaking and making good walls/surfaces/ramps/pathways/roads etc. as required.

- a) Water pipes shall be bevelled ended, ERW Mild Steel (MS) Class `C` (Heavy Class) conforming to relevant BIS-1239 Code and all the fittings also shall be of Mild Steel. Factory rolled pipes above 150 NB shall have maximum wall thicknesses as per IS 3589. All jointing in the pipe system shall generally be by welding, unless otherwise mentioned, or directed at

site. All welding shall be done by qualified welders and shall strictly conform to BIS Code of practice for manual metal arc welding of Mild Steel.

b) All welded joints (except pipe welded end-to-end) shall be made by use of forged one-piece welding flanges, caps, nozzles, elbows, branch outlets and tees of approved make. For pipes up to 200mm diameter, readymade pipe fittings shall be used. Fabricated fitting shall not be used for pipes up to 200mm. Cut samples shall be submitted for approval, if directed. All such fittings etc. shall be of a type which maintain full wall-thickness at all points, simple radius and fillets, and proper bevels or shoulders at ends. All job welding shall be done by the electric arc welding process.

c) The wall thickness of "C" Class M.S.E.R.W. Black pipes shall be as follows:-

	Nominal pipe dia. in mm	Wall thickness of pipe in mm
(a)	25	4.00
(b)	32	4.00
(c)	40	4.00
(d)	50	4.50
(e)	65	4.50
(f)	80	4.80
(g)	100	5.40
(h)	125	5.40
(i)	150	5.40
(j)	200	6.35
(k)	250	6.35
(l)	300	6.35
(m)	350	6.35
(n)	400	7.13
(o)	450	7.13

d) All pipes and their steel supports shall be thoroughly cleaned and given two coats of primer and epoxy paint before installation. For vibration isolators pre moulded polyurethane pipe sections of 160 Kg/m³ density with adhesive shall be fixed between pipe and MS support. 10 mm thick MS 'U' clamp shall be fixed on the pipe so that the pipe is kept in position. All welded piping shall be subject to the approval at site.

7.9.2 Pipe Fittings

(a) The pipe fittings for screwed piping shall be malleable iron and for piping with welded joints shall be of weld-able quality. Also the fittings shall be suitable for same pressure ratings as for the piping system. All bends up to sizes 150 mm dia. shall be of heavy duty readymade.

(b) All bends in sizes 200 mm and above shall be fabricated from the same dia. and thickness of pipe in at least four sections and having a centre in radius of at least 1.5 times diameter of pipes. Fittings such as tees, reducers etc. shall be from the same pipe and at least of length twice the diameter of the pipe.

(c) The dead ends are to be formed with flanged joints and 6 mm thick blank between flange pair for 150 mm and over in case future extension is to be made. Otherwise blank end disc 6 mm thicknesses are to be welded with additional stiffness from 50mm x 50 mm M.S. heavy angles. For sizes above 350 mm all ends larger than 400 mm dia. shall have dished ends and tested. Above ground pipes shall be given 2 coats of primer and epoxy paint

(d) Flanges

All flanges shall be of mild steel as per relevant IS code (with latest amendments) & shall be slip on type welded to the pipes. Flanged thickness shall be to suit Class II pressure. 3 mm thick gasket shall be used in between the flanges. Flanged pair shall be used on all such equipment which are required to be isolated or removed for service for example condenser/chilled water pumps, chilling machine, cooling tower etc.

Mild steel ANSI 125 flanges shall be used for pipes of 65mm dia. and above. The supply of flanges shall form part of piping shall also include supply of bolts, washers, nuts and suitable asbestos fibre / rubber insertion gaskets (min 3 mm thick).

(e) Butterfly Valves

Butterfly valves shall be ISI marked and of PN 16 / PN 20 rating as per IS 13095 preferably with fixed linear design to suit duty and flanges as per IS 6392 Table "E" Valves of sizes 32 mm and above diameter shall be made of cast iron close end body, cast iron epoxy coated disc. Nitrile Seat and SS 410 Stem with Teflon bush. **All valves shall be supplied with factory test reports.**

(f) Valve housing

Housing shall be ductile iron, ASTM A536-65T, class 60-45-18 rated 4000 kPa static pressure/forged brass ASTM B584 rated 2500kPa static pressure and 120°C.

(g) Balancing/Controller Valves

The valve shall be of Gun Metal Casting up to 40mm with screwed ends. 50mm and above angular flanged type body. The valve should have pressure drop measuring facility on the flanges. The valves up to 125mm shall have digital hand wheel with least count of 0.1 turns and for sizes 150mm and above shall have least count of 0.5 turns. The valves shall have suitable locking facility at desired setting. The valves shall be suitable for working pressure of 20 kg/cm².

Double regulating globe valve type manual balancing valves shall be provided at various lines as indicated in schedule of quantities. These valves shall have built-in pressure-drop measuring facility to compute flow rate across the valve. The test cocks shall be long enough to protrude out of pipe insulation. To enable accurate and practical operation, measurement of flow and differential pressure shall be made with a computerised balancing instrument which shall enable the operator to read the flow directly without the use of diagrams or tables. In addition to measuring flow rate, differential pressure and temperature, computerised balancing instrument shall be compatible with the provided BMS/ SCADA system to provide the following functions:

- ❖ To balance the AC installation and calculate the necessary valve settings, based on system measurements.
- ❖ To store the results of balancing.

- ❖ To log measured values from a valve (differential pressure, flow rate or temperature).
- ❖ To print out saved data in computerized measurement protocol (CMP) consisting of:
 - Name and size of Balancing Valve (BV)
 - Pre-setting position of BV
 - P at BV
 - Flow at BV
 - Design Flow

The valves shall be insulated with the same insulation as the adjoining pipes and with the same thickness.

(h) Non Return valve

The non-return valve shall be wafer type, dual plate with Cast Iron body and flap shall be of SG Iron as per relevant IS code, seat shall be integrally moulded of nitrile / EPDM, suitable for work pressure of 20 Kg/cm². To be suitable for vertical pipeline / horizontal pipeline as per site requirement and in line with relevant IS, it shall be suitable for PN 20/16 bar service as specified and shall have safe operating range between 5 Deg. Centigrade and 55 Deg. Centigrade. The valve shall have flanges. If a disc or plate type valve is used then its disc shall be of stainless steel grade SS 304 and it shall have a spring of Stainless Steel and the Seal shall be of EPDM elastomer. The valves shall be insulated with the same insulation as the adjoining pipes and with the same thickness.

Non return (check) valves shall be provided as shown on the Drawings, conforming to relevant BIS Codes and in accordance with the following specification:

	Size	Construction	Ends
a.	15 to 25 mm	Gun Metal	Screwed
b.	30 to 40 mm	Gun Metal	Flanged
c.	50 mm and over	Cast Iron body with Nitrile sheet.	Wafer Type

Air release and clean out plugs shall be provided and valves shall be suitable for not less than 20 kg per sq.cm gage working pressure.

(i) Y-Strainer / suction guide pump

Strainers shall be of cast iron body. Strainers shall incorporate a removable SS-316 or better 20 gauge screen with 3mm perforations and a permanent magnet to arrest MS particles. Strainers shall be provided with matching flanges at both ends for connecting with the chilled water pipes & condense water pipes. They shall be designed to enable blowing out the accumulated dirt and facilitate removal / replacement of screen without disconnecting the main pipe. The strainers shall be insulated with the same insulation as the adjoining pipes and with the same thickness. The Y-strainer shall be fabricated out of MS 'C' class pipe two size higher than that of pipe size. **The body shall be pressure tested at 20 Kg/Sq.cm.** and shall be hot dip galvanized.

j) Air-Vents Valve

Air vents for purging of air trapped in piping system shall be provided at the highest point. Globe valves of the size as indicated below shall be provided.

Pipe Size	Valve Size
Upto 100mm	25 mm dia
100 mm to 350mm	40 mm dia

The float shall be of synthetic material and shall keep the venting valve closed under normal condition. When air is collected inside the float chamber, the water level inside the auto air vent shall decrease and the venting valve shall be opened. The collected air then shall escape through the venting valve and the water level inside the float chamber shall increase again, closing the venting valve. This process shall continue as long as air is collected in the float chamber. There shall be a check valve at the bottom to seal the system when the auto air vent is removed for servicing.

k) Pressure Gauges / Thermometers

All arrangements for connecting pressure gauges at the points specified below shall form part of piping work and the cost thereof shall be included in the rate/amount quoted for the piping. All pressure gauges shall be complete with globe valves conforming to relevant IS code. Similarly for measuring the temperature of water in pipe at the points specified below thermos-wells shall also be provided and the cost thereof shall be included in the rate/amount quoted for piping.

- ❖ Both pressure gauge and Temperature gauges shall be made of stainless steel body and stem. The gauges shall be weather proof and water proof. The valve shall have the accuracy of +/- 1% of the reading
- ❖ Pressure gauges' dial shall be not less than 150 mm dia. They shall be selected for appropriate range and shall be complete with siphon and cock, etc. Pressure gauges as specified shall be provided at chilled water and hot water supply and return at each air handling units. Care shall be taken to protect pressure gages during testing. Pressure gage sockets on insulated pipes and accessories shall be extended up to insulation to avoid damage of insulation for replacement of gages.
- ❖ Temperature gauges' dial shall not be less than 150 mm dia. These shall be of thermo-well type and as specified shall be provided at chilled water inlet and outlet. Temperature gauges shall be with long stem. Their socket shall be extended up to insulation thickness so that they can be removed without damaging the insulation.

I) MAGNETIC TYPE FLOWMETERS

Magnetic type flow meters for measuring the flow in chilled water pipes and hot water pipes. The capacities of the Magnetic type flow meters shall be as indicated in the Schedule of Quantities and their selection shall be as per relevant Indian Standards.

7.9.3 Set up of Piping

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- a) All pipes to be used for makeup water, drain, and condensate drain and fittings shall be galvanized steel class `C`/ `B` class conforming to relevant BIS Codes.
- b) All jointing in the pipe system shall be by screwed joints and/or by screwed flanges using 3 mm 3 ply rubber insertion gaskets. Pipe threads and flanges shall be as per relevant BIS Codes.
- c) Fittings shall be galvanized steel `medium class` malleable casting of pressure rating suitable for the piping system. Flanges shall be of approved make. Supply of flanges shall include bolts, nuts, and gaskets as required. Sufficient number of flanges and unions shall be provided for future cleaning and servicing of piping. Tee-off connection shall be through equal or reducing tees. All equipment and valve connections or connections to any other mating pipes shall be through flanges required for the making connections. Fittings & flanges shall form part of piping and are not separately identified in Schedule of Quantities.
- d) Valves, strainers shall be similar to those specified for chilled water piping.
- e) All pipe supports shall be of steel, coated with two coats of anti-corrosive paint and finally finished with paint.
- f) The pipe spacing shall be as follows:

Dia. of Pipe	Spacing between supports
Upto 25mm	1.25 mtr.
30mm to 50mm	2.0 mtr.
65mm to 75mm	2.5 mtr.
100mm to 125mm	2.5 mtr.
150mm	3.0 mtr.
200mm and above	3.0 mtr.
Vertical supports	3.0 mtr.

7.11 Insulations

7.11.1 PIPING INSULATION

a) **All chilled water pipes and condensate drain pipes** shall be insulated with closed cell nitrile rubber insulation (thicknesses are specified in the SOQ) in the manner specified herein. Closed cell elastomeric nitrile rubber of minimum 45 Kg / cu m density, thermal conductivity 0.037 W/MK or better at 20 deg. mean temperature class 'O' insulation. The material shall be thermally stable (at least up to 100°C). It shall be fire retardant type with Class O fire rating self-extinguishing, CFC free, non-dripping type.

The Thickness of Insulating material of closed cell elastomeric nitrile rubber Fire retardant grade to be used for various sizes of pipes is as under.

Pipe Dia. (mm)	thickness (mm)
10-25	19

30-65	25
80 to 150	32
200 to 350	38

b) PIPE SUPPORT

Insulated pipe support, single piece with self-adhesive closure, PUR/PIR load bearing Insert (Density 140 -180 kg/m³) embedded in elastomeric nitrile rubber insulation with two outer metal shells made of aluminium sheet, which also acts as a vapour barrier for the PUR/PIR inserts.

c) RECOMMENDED ADHESIVE

In all cases, the manufacturer's recommended Adhesive should be used for the specified purpose. Wherever, the pipes/ducts have exposed installation, an adhesive "Mastic" shall be applied on the overlapping of glass cloth.

7.11.2 PUMP INSULATION

Pumps shall be insulated with the same material and to the same thickness or more as the pipe to which they are connected to give proper shape of the pump. Care shall be taken to apply insulation in a manner as to allow the dismantling of pumps without damaging the insulation.

7.11.4 PROTECTIVE COATING OVER INSULATION

To provide mechanical strength and protection from damage & UV rays all exposed duct insulation shall be covered with woven glass fabric cloth. The glass fabric shall be applied with one coat of fire proof epoxy or acrylic compound. The coat shall be allowed to cure to non-stick state. Subsequently second coat of compound shall be applied to give a tough and smooth finish to the insulated surface.

7.11.5 CHILLER INSULATION

The insulation shall be provided with necessary clamps, supports, hanger, vibration isolators and fittings such as bends, elbows, tees etc. but excluding valves, strainers, gauges etc. duly insulated with closed cell elastomeric nitrile rubber of minimum 45 Kg / cu m density, thermal conductivity 0.037 W/MK or better at 20 deg. mean temperature class 'O' insulation applied by suitable adhesive, Nitrile Rubber Compatible Sealant and Aluminium/PVC Tape, complete finally applying 0.63 mm aluminium sheet cladding complete with type 3, grade 1 roofing felt strip (As per relevant IS code as amended up to date) at joint repairing of damage to building etc. The insulation shall comply with ASTM C1136 (Type IV, Class 2),

BS 4841-100 (1991) and Ozone Depletion Regulations

Note:- The Pipes of sizes 150mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 8 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 8mm thick MS sheet for pipes of 400 mm dia and above. All ends of straight pipes and fittings shall be sealed with polyolefin end seal, applied to the exposed ends of the insulation for protection against moisture ingress.

7.11.6 CONDENSER PIPELINE COATING

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a) The condenser pipeline shall be protected with a high-performance coating system, comprising a high build Fiberglass Reinforced Plastics (FRP) layer and a high build anti-corrosive chlorinated rubber coating, achieving a total thickness of 3 mm. The pipeline surface shall undergo thorough preparation, including sandblasting to SA 2.5 standards or equivalent, to ensure a clean and angular surface profile of 20-30 microns roughness, enhancing coating adhesion. A high build FRP layer, consisting of glass fibres embedded in a suitable epoxy or polyester resin matrix, shall be applied in two stages.

b) Initially, a resin layer shall be followed by a chopped strand mat (CSM), allowed to cure, and then ground to a smooth surface. A second CSM layer, topped with a final resin layer, shall complete this 2 mm thick (adjustable) component. Curing shall occur under controlled conditions, as per the manufacturer's instructions, typically within 24 hours at 20°C. The FRP layer shall be over coated with a high build, fast-drying chlorinated rubber coating, preceded by a high corrosive resistant, suitably plasticized primer.

c) The primer and topcoat layers shall collectively contribute to the remaining 1 mm of the total 3 mm thickness. Curing shall take place in a well-ventilated area, protected from direct sunlight, within 2-4 hours at 20°C, as per the manufacturer's guidelines. Optionally, a wax-mixed resin coating may be applied to achieve the desired thickness or provide additional protection, while maintaining the overall 3 mm thickness.

7.12 Electrical Motors & Starters

Electrical works associated with installations namely motors, switch boards, power cabling, communication cable and control wiring, earthing and remote control-cum-indicating panels.

(i) Unless otherwise specified in the tender specifications, all equipment and materials for electrical works shall be suitable for operations on 415 V / 240 V \pm 10% (3 phase/single phase), 50 Hz AC system.

(ii) All electrical works shall be carried out complying Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2010 and NEC 2011, as amended up to date.

7.12.1 Motors

The motors shall be squirrel cage AC induction type. The motors shall be suitable for continuous duty and rating necessary to drive the pump at 150 percent of its rated discharge with at least 65 percent rated head. The motor shall be totally enclosed fan cooled type conforming to protection clause IP 21 complying latest relevant IS code. The class of insulation shall be 'F'. The synchronous speed shall be 1500/3000 rpm as per requirement of the pump. The motor shall conform to IS: 325 (amended up to date).

7.12.2 Starters

The type of starter to be used shall be as follows unless otherwise specified.

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Type of motor	Starting current	Starting method
Squirrel cage motor up to 7.5 HP	600 % of full load current	Direct On Line
Above 7.5 HP	200% of full load current	Star/Delta

a) The motor starter shall conform to IS: 1822 “Motor starters of voltage not exceeding 1000 volts” (latest version) and shall be air insulated and suitable for 415 V, $\pm 10\%$, 50 Hz, 3 phase AC supply and shall be integrated in the panel.

b) Each starter shall be provided with the following protections: -

(i) Thermal overload on all the three phases with adjustable settings,

(ii) Independent single phase preventer. (Current sensing type).

(iii) Adequate number of extra CT, Selector, Switch NO/NC contacts etc. for interlocks, indicating lamps, remote operation etc. shall be provided on the starter/ contactor.

7.13 Cables

7.13.1 Power Cables

a) Unless otherwise specified, the power cables shall be XLPE insulated, PVC outer sheathed aluminium/copper conductors, armoured cables 1100 V grade. The power cables shall be of 2 core along with suitable size earth wire for single phase, 4 core for sizes up to and including 25 sq.mm for 3 phase and 3-1/2 core for sizes higher than 25 sq.mm for 3 phase. Alternatively, XLPE/PVC insulated copper cable (single core/multicore armoured/un-armoured) of grade 1100 V shall be used. **For main power cable(s)** from AC LT panel to equipment, if the cable(s) is taken in cable trench duly filled with sand & with proper distancing from other cables within the cable trench, or in fire rated shaft, then the cable(s) of above type be used. However, if the cable(s) is likely to be exposed to fire, then fire survival cable(s) shall be used.

b) Power cables shall be of sizes to meet the starting and running current of motors fed and shall be as approved by the Bank, after taking into consideration the load, the length of cabling.

c) Cables shall be laid in suitable metallic trays suspended from ceiling, or mounted on walls. Cable ducts shall not be provided in AC control rooms Cable trays shall be of perforated steel sheet with adequate structural strength and rigidity. Necessary supports and suspenders for cable trays shall be provided by the contractor as required.

7.13.2 Control/ Signal wiring

a) Control/ Signal wiring shall be done using ISI marked PVC insulated and PVC sheathed, FRLS 2.5 sq.mm, 650 V grade, armoured multi-core copper conductor cable. The control cable shall also be laid in the same manner as power cable.

b) The number and size of the control cables shall be such as to suit the control system design adopted by the contractor.

c) 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.

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

7.13.3 Communication cable

UTP CAT 6 Cable (unarmoured) shall be run along with suitable size FRLS rigid PVC conduit pipe including all accessories such as bends, elbows, Tees, reducers, Junction boxes, saddles & spacers etc. suitably mounted on wall/ceiling. Suitable numbers of CAT 6 cables shall be laid in the FRLS rigid PVC conduit pipe and termination of cables on each end shall be done with required connectors complete in all respect etc. The contractor shall make required holes in brick/RCC walls, RCC ceiling/false ceiling etc. and making good the same as and where required. The cables shall be properly dressed in a neat manner. **The cable shall have marking of length at every meter.**

7.14 Cable Trays

- a) Cable trays, tray support systems, fittings and accessories shall be fabricated out of mild steel free from flaws. The trays shall be fabricated from slotted steel sheets.
- b) Cable trays, tray support systems, fittings, accessories and hardware shall be hot dip galvanised as per relevant clauses of this specification after cutting, drilling welding and other operations.
- c) Special fittings / accessories such as horizontal/vertical bends, tee's, cross reducer etc. shall be fabricated and galvanised. All hardware like bolts, nuts, washers, etc. are also to be galvanised as required to complete the system in all respects.
- d) Cable trays shall have standard width of 100 mm, 150 mm, 300 mm, 450 mm and 600 mm. Each straight section shall be supplied in standard length of 2.5 or 3 metres.
- e) The cable trays, accessories shall be as per the following table.

Sr. No.	Tray Width	Side Flange Height	Perforated MS sheet thickness (min)
	(mm)	(mm)	(mm)
1.	100	25	2
2.	150	25	2
3.	300	50	2
4.	450	50	3
5.	600	50	3
6.	750	50	3

- f) Each unit length of cable trays offered shall include all necessary side coupler plates, hardware etc. The cable tray support system shall be designed such that it allows easy assembly at site of pre-fabricated factory galvanised components using mainly the bolting or clamping arrangement including anchor fasteners.
- g) Cable trays with support systems such as M.S. angle / channel / flats/ rods etc. shall be provided and fixed by the contractor.
- h) Cable shall be fixed in cable trays in single tier formation and cable shall be clamped with G.I. clamps and galvanized bolts / nuts.
- i) Earthing flat/ wire can also be laid in cable tray along with cables.

7.15 Earthing

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A reliable earthing system is crucial for the safe operation of Central Air Conditioning system, protecting both the equipment and personnel from electrical shocks.

a) Design Considerations:

1. Soil Resistivity: Measure soil resistivity at the installation site to determine the most suitable earthing system. Use a soil resistivity tester to obtain readings at various depths and locations.
2. Earthing System Type selection:

- i) Plate Earthing: Suitable for low-resistivity soils ($< 10 \Omega\text{m}$).
- ii) Pipe Earthing: Recommended for medium-resistivity soils (10-100 Ωm).
- iii) Deep Earthing (Rod Earthing): Ideal for high-resistivity soils ($> 100 \Omega\text{m}$) or rocky terrain.

3. Material Selection: Earthing Electrodes: Use copper or copper-alloy plates/pipes/rods for optimal conductivity. Earthing Conductor: Select a copper cable with a minimum cross-sectional area of 50 mm².

4. Installation of Plate Earthing:

(a) Plate Size and Depth:

- i) Plate size: 600 mm x 600 mm x 3.5 mm (or as calculated based on soil resistivity).
- ii) Bury the plate at a depth of 3-4 meters, depending on soil conditions.

(b) Backfilling:

- i) Use a mixture of soil, sand, and charcoal to enhance conductivity.
- ii) Compact the backfill material in layers to prevent air pockets.

(c) The earth work shall be carried out in conformity with relevant IS codes for Electrical works.

(d) Metallic body of all motors, medium voltage equipment and switch boards shall be connected by two 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.

(e) The size of earth conductors for body earthing of equipment shall be 2 Nos. 6 mm dia copper wire/2 Nos. 25 x 3 / 2nos. 50X6 mm copper strip as per site requirement.

(f) Armour of cables shall be connected to the body of the equipment/switch board at both the ends. Compression type glands shall be used for all such terminations in the case of PVC/XLPE cables.

7.16 Modes of Measurement

The following mode of measurement shall apply for the Contract.

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7.16.1 Piping work

- a) The length of piping shall be measured along its centre line from flange to flange including bends, elbows, tees etc. All such fittings/accessories shall be treated as part of piping work. While taking the measurements special fittings such as any type of valve, non-return valve and strainers will be excluded.
- b) Flanges shall not be measured, as they form part of piping work.
- c) For thermo wells and pressure gauge sockets no measurement shall be done separately.
- d) All kinds of supports, hangers etc. shall be part of piping work and no extra measurement shall be done.

7.16.2 Insulation

(A)	Insulation of water pipe	
	(i)	Insulation of pipes shall be measured in terms of linear length of pipe for each size. No separate measurement will be made for fittings valves and accessories.
(B)	Insulation of chiller/expansion tank/suction line	
		The insulation of the above equipment shall be deemed to form part of equipment and no separate measurements for insulation of such items will be accounted for.
(C)	Electrical cabling work	
	(a)	All power cables/control cables shall be measured on linear basis in meters.
	(b)	Cable termination: one set means termination with lugs and glands at both the ends of the cable
	(b)	Control cable shall be measured on linear basis in meters which includes end termination.

7.16.3 Steel Support

No extra price shall be paid on account of supports required for piping, ducting and cable trays.

7.17 Building automation and control system requirements

7.17.0 Overview

The software shall be open system architecture type, which facilitates interoperability with other system. Complete functions as described in specs shall be included. The system should comply with 21 CFR part II.

The following software packages shall have below minimum features and compliances. Software shall have minimum 2000 BACNET Data Points with 600 validated points and shall have future expansion capability. Additional 1 Client required.

- a) 3D & HD vector dynamic graphics with AutoCAD import of plan with Zoom in & Zoom Out facility.
- b) Native 64 Bit System, BTL, UL, EN Certified System, BACNET Profile B-AWS (Advanced workstation) as per the BTL Listing.
- c) Multi-Monitor Support-(Min 4 Nos), Multi-language support
- d) Certified OPC DA Server by OPC Foundation.
- e) HTML5 based Web-Server software shall permit use of Standard Web-Browsers such as Microsoft Edge, Google Chrome, Mozilla Firefox, etc.

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- f) The Software shall comply with international standards and strive to deliver products that meet security standards such as ISA/IEC 62443, UL2900, ISO/IEC 27001, ISO/IEC62443 and OWASP.
- g) Cybersecurity SL2, Seamless integration of Security certificates within customer IT infrastructure, Microsoft's active directory-based authentication, LDAP integration, Use of network infrastructure that supports physical network or VLAN segmentation, End-to-end encryption from client to server, End-to-end encryption between servers, Certificate-based data exchange, Encrypted backups.
- h) Audit Trail, 4-Eye Principle, Data Point Validation, Verified-tempering evidence for report transmission.
- i) The software shall integrate with BIM data seamlessly
- j) Ability to provide data to other systems through OPC DA Server and / Or Rest web services interface
- k) Reports - Customized reports for Trends and alarm with Graphic screen shots. Report facility should be inbuilt in software.
- l) Seamless integration of Fire alarm system should be there.
- m) Alarm Escalation: Assisted treatment of alarms which helps in Predefined & fast intervention steps for faster response

Energy dashboards having cockpit view of total energy utilized. Energy and Power reports shall be generated at-a-click.

7.17.1 System requirements

- (a) General requirement including energy monitoring.

Include a digital (DDC) building technology control system to operate technical equipment in buildings. The system must be able to carry out comprehensive measuring, control, optimization, and monitoring functions. The possibility for free programming of individual system components should be available to individually modify customer-specific requests.

All systems deployed supply information on operating states and energy use to render current energy efficiency transparent or to display weaknesses. Measures can be made pursuant to this information that contributes to increased energy efficiency.

- (b) User designation

The entire system (management, automation level including room automation) must be designed to define a clear, user designation UD encompassing 255 characters. The UD must be fully usable in the user programs on the management level. The UD structure must allow to use separators (e.g. -*/| etc.) to be better readable for the operator. On the automation level as well, the UD must at a minimum be able to query details via local operating units.

- (c) Requirement for a project as per BACnet

Communications through the entire building automation and control system must be based on the BACnet standard in a recent BACnet revision version (that qualifies as a "minimum protocol revision" according to the official BTL test policies at the time of the bidding). It must be possible to change/assign the BACnet Object in according to the user preferences during the engineering process.

7.17.2 System up-to-datedness

(a) Product lifecycle

The system provider must offer a transparent product lifecycle to ensure the required consistency. All equipment offered for this project must be contained in the current product portfolio. The existing system environment must allow for easy and smooth integration of devices and extensions. The system provider must offer Software- and Firmware-Patches during the lifecycle.

(b) System continuity

Products used must have a label for a global standard that ensures interaction with products from various manufacturers.

7.17.3 Architecture

(a) Three system levels

A building automation and control system featuring system architecture as per ISO EN 16484-3 is required. The three system levels must be interconnected via communications.

- Management level
- Automation level (building automation stations and individual room automation stations)
- Field level (field device)

(b) Building automation stations

The system offered must provide largely decentralized intelligence to achieve high operational and plant availability. The devices are autonomous components that can independently execute assigned building automation and control.

(c) Implement third-party systems.

Third-party systems must be able to be integrated on both management and automation levels to ensure full system consistency. Default interfaces must be provided. Third-party protocol implementation must be possible and require little effort. To do this, all hardware and software required for integration, all required services, clarifications with other technical and mechanical building installations, interface testing, data transmission testing, data point generation/integration as well as plant picture creation, backup, test protocol generation and specific documentation must be included in total costs.

7.17.4 Consistency

(a) Uniform system

The supplier must prove that the required functions originate from a single manufacturer and using one automation and control system, where the hardware and software are developed in a manner that allow for simple modification while operational for subsequent function extensions or changes.

(b) Implement new data points.

Building automation and control must be coherent to ensure possibility of future extensions and changes. This means that data points must be acquired once only, and then be provided automatically as needed to operator units and management level.

7.17.5 Integration of open standards

(a) Implement via BACnet

Default protocols and suitable physical communications media must guarantee interoperability (ISO standard). Use only listed protocols and communications media. Third-party systems are integrated via BACnet. Provide only data required to operate building services plants efficiently and economically. BACnet communication, in compliance with the BACnet standard including B-BC profile.

(b) Decentralized integration of communicating devices/equipment

A decentralized interface module must allow for connecting communicating pumps to a BACnet-capable building automation station. The building automation station provides the following functions:

- ❖ Event-oriented communications
- ❖ Peer-to-peer (cross communication)
- ❖ Alarm and message processing, distribution to local operator units and building automation and control system.
- ❖ Scheduler with days of the week
- ❖ Calendar function
- ❖ local trend recording in device buffer (long-term trend)

(c) Communication & protocols

KNX PL-Link bus connection for sensors, actuators, and control units (including power supply of the devices) with "Plug and Play" connection to field devices with KNX PL-Link as well as integration of standard devices with KNX S-Mode (ETS Engineering)

7.17.6 Integrate Modbus devices.

(a) Integrate third-party devices via Modbus.

Modbus-capable devices must be able to be connected to a BACnet-capable automation station for bidirectional data exchange. This connection must be direct via RS232 or RS485 interface and without conversion. The data points of the third-party system are mapped to input/output functions in BACnet and are then available as fully communicating data points for further processing and connection, e.g. for:

- ❖ Alarm handling and prioritization
- ❖ Override control, priority control and commands for central operation.
- ❖ Grouping
- ❖ Scheduler

- ❖ Trend recording
- (b)** System must support the following Modbus properties:
 - ❖ natively support Integration of Modbus devices via RTU and / or TCP
 - ❖ Baud rate options of 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
 - ❖ integration of multiple Modbus RTU devices on the same trunk, even if the devices have different characteristics (e.g. baud rate, parity, stop bits)
 - ❖ on-board bus termination, switchable with DIP switch
 - ❖ on-board pull-up/pull-down resistances, switchable with DIP switch
 - ❖ signed, unsigned, floats and double register data types.
 - ❖ support up to 64 bit big- and little-endian registers.

7.17.7 Power failure

- a. Individual building automation stations must have onboard power back-up provided via a super capacitor.
- b. The data must be saved for extended periods of time in case of power failure or extensions or removal of building automation stations. The applications and all vital operating parameters (including setpoints, scheduler values, etc.) must not be lost due to a power outage. Other operating values such as alarms, etc. must be capable of being saved locally on the building automation station. Important and vital plant data including controls (building automation station) must continue to run during power failure (switch-off via power switch or control fuse, etc.).
- c. All plants and their aggregates and components as well as all building automation stations fail during a power failure (switch-off via power switch or control fuse, etc.).
- d. After power returns, all building automation stations and plants including their aggregates and components must start automatically. The various plants must be switched on and released at intervals to prevent switch-on of peak loads. The current status for all switching and positioning commands, set points, manual interventions, etc. remains saved in the building automation station and/or is re-enabled following power restoration and used for the current operating mode.

7.17.8 System time

- (a)** System must support the maintenance of a real time clock up to 7 days.
- (b)** Time synchronization in BACnet: Local time and UTC time (coordinated universal time)

The building automation and control system must have a uniform system time. To this end, a time master supporting BACnet BIBB DM-TS-A as per the PICS document must be defined. The time master must receive the DCF77, GPS or Internet NTP signal and provide it synchronized to all remaining system devices.

- (c)** Subsystem autonomy

The building automation stations must autonomously run their own time if the time master fails. The building automation and control time must be resynchronized automatically after the time master becomes available again.

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7.17.9 Self-monitoring and self-diagnosis

(a) Watchdog

The building automation and control system must monitor itself to always know its latest and current status. A watchdog function helps detect and signal failed system devices and restarts them in a defined mode.

(b) Self-diagnosis

Self-diagnosis must be available to quickly detect errors. It must provide information on system function and load. e.g. CPU and memory load must be displayed.

7.17.10 General plant operating states

(a) There shall be five interchangeable operating modes for all equipment:

- ❖ Local emergency operation without building automation station functionality (direct via I/O module or directly on the control cabinet as agreed to with owner).
- ❖ Local manual operation with building automation station functionality (control panel in the control cabinet).
- ❖ Local - manual operation via visualization on the management level (all functions on the local building automation station are set to Auto).
- ❖ Scheduler program under the condition that all plants are enabled for automatic operation.
- ❖ Automatic detection.

All safety and interlocking functions must take highest priority for operation independent of operating mode.

(b) Automatic detection

The plants of the building automation and control system are switched on and off either automatic, or dependent on time or event. The following functions apply to the actual plant descriptions.

(c) Controlled via scheduler program.

The Chiller plants must be set to automatic for this operating mode. The plants of the building automation and control system must be switched on and off by individual use via a day, week, month, or annual scheduler program.

(d) Manual operation

- ❖ Different options are required for manual operation.
- ❖ Manual operation via management level (remote operation)
- ❖ Manual operation via local operator unit or laptop directly at the control cabinet.
- ❖ Manual operation via operator unit or directly at the control cabinet.

Manual operation generally is possible only if the corresponding building automation station is running. Manual operation allows for manually overriding scheduled plant switching. Plants

switched off by schedule can be switched on via plant switching command. Manual control of the plant switching command is equal to automatic control, i.e. the scheduled control is retained for as long as the scheduler remains active.

(e) Emergency operation

❖ Local priority override takes place directly via the I/O modules. To this end, the I/O modules must have an integrated local override priority as per ISO 16484-2. All aggregates on the module must be able to be switched via this operation. To this end, the I/O modules must feature preselection switches Automatic - Manual as well as LED status displays or LCDs.

❖ Valves, dampers, etc. must allow for continuous manual adaption. All interventions are signaled to the management station via building automation station and are then logged and visualized accordingly.

❖ A manual operating level at the control cabinet must be included in the unit price if no integrated local priority override can be offered due to the system type.

7.17.11 Monitoring and evaluation

1. Automation level

(a) Key performance indicators on the automation level

Monitoring and evaluation of measured values for primary plants (components and plant parts, software/program/system functions, set points, et.) must occur directly on the automation level. Monitoring and evaluation is intended to recognize unfavorable operations of plants/components early on and thus lower or optimize energy consumption and wear and tear.

(b) Monitoring and evaluating analog measured values.

The following monitoring and evaluation must be able to be implemented for analog measured values (sensors, set point, modulating control of valves, dampers, variable speed drives if required, etc.):

❖ Determine the minimum, maximum and average values (lowest and highest values) and deviation that the measured value deviated from the upper and lower set point within a defined timeframe.

❖ Determine the linger period (in hours) during which the measured value moves between freely definable limit values.

(c) Monitoring and evaluation of digital and multi-stage measured values.

Digital measured values (messages, switching commands, operating modes, etc.) must be definable as key performance indicators and make possible the following evaluation and monitoring:

❖ Determine the runtime (operating hours) for each stage as well as entire system within a defined timeframe.

❖ Determine the switch-on frequency for each stage as well as entire system within a defined timeframe.

(d) Monitoring and evaluating metered values.

Metered values (consumption meters, pulse meters, etc) must be definable as key performance indicators and make possible the evaluation and monitoring of the difference value of power consumption within a defined timeframe.

❖ All the above determined values shall be monitored to a minimum and maximum and displayed as quality state for breach and/or exceeding thereof.

❖ The values from the current and previous timeframe shall be displayed and made available to the trend data. The evaluation shall cease for a fault to the measured value (sensor interrupt, module fault, etc.), until the measured value once again assumes a reliable state. This fact must also be recognizable in the trend data.

2. Evaluation over different timeframes

Monitoring and evaluation must be able to occur over definable timeframes (annually, monthly, weekly, daily, hourly, 15-minutes).

3. Weighting of monitoring and evaluation criteria

Since an aggregate or component may include multiple evaluations, it is required to be able to weigh them so that they are included differently in the calculation of the resulting quality state.

4. System and tool platform

(a) Creating solutions must be as efficient as possible, i.e. programming on construction sites; use of pre-defined application blocks, fast exchange of standard functions, etc. The goal is to achieve the maximum required level of flexibility at as little expense as possible.

(b) A version of the engineering tool must be freely distributed and license free base software. It must be possible to keep the tool up to date via unattended user interactions (e.g. patch distribution over cloud)

7.17.12 Management Level Requirement

(a) The management level shall be the graphical, interactive interface for the operator to the automation station and the integrated plants and plant parts. System operation must be based on a simplified approach. The operator should be able to display, query, process, save, or print any plant information via the peripheral units at the management level.

(b) The plants should be displayed in synoptic images and the values and states shall be presented and displayed dynamically. Special programs are used for higher control, optimization functions, maintenance, and energy management.

(c) Scada Platform

The building management system must be based on a SCADA platform that is compatible with the BACnet revision 1.18 and the B-AWS (Advanced Workstation) profile, B-ALSWS (BACnet Advanced Life Safety

Workstation), B-AACWS (BACnet Advanced Access Control Workstation), B-RTR (BACnet Router), B-BBMD (BACnet Broadcast Management Device). It must permit integration of any building installation including AC and lighting.

(d) The building management system must have passed Underwriters Laboratories (UL) performance and environmental tests or equivalent test.

(e) System Openness

BMS must support standard protocols used in building technology, including:

- ❖ BACnet and BACnet/SC
- ❖ OPC DA (Data Access) and OPC UA (Unified Architecture)
- ❖ Modbus TCP
- ❖ SNMP
- ❖ KNX and KNX Square
- ❖ S7, S7 Plus and S7 secure communication
- ❖ IEC 61850

(f) Long Term Storage

BMS must be able to store and archive data for a period of more than 10 years, allowing as an option segregation of stored data in different groups that can be tuned individually with different recording frequencies. Remounting of offline archived data must also be allowed.

(g) Validated and Critical Environments

BMS must allow compliance to regional certifications for validated environments, such as GMP Annex 11, US FDA 21 CFR Part 11 or similar. A special technical document verifying the compliance of the system in critical environments must be available.

(h) Building Information Modeling (BIM)

BMS must natively support BIM technology to perform the following actions:

- Display visual and data information from Building Automation components such as room controllers, field devices etc., in a 3D view.
- Display the 3D model of the building:
 - Allow operators to rotate, zoom in and zoom out the mode.
 - Allow manual navigation through the 3D model, using the mouse cursor.
 - Support simplified navigation with single mouse click to enter through doors, windows, and up/down staircases.
 - Allow navigation from a system object via the browser to the associated equipment in the BIM view and vice versa.
 - Allow selection of a BIM equipment and provide current (runtime) values and status properties. Commanding of objects shall be supported as well via the operating pane (such as switching on a pump)
- Display 2D floor plan(s) of the building

- Show the selected room in focus (zoom view)
- Show various room statuses as colored carpets.
- Show current room values (runtime values) directly on the floor plan.
- Allow selection of a room or a segment
- Display room status in the 3D building view
- Display the room operating mode (such as comfort, pre-comfort, etc.)
- Display the presence detectors statuses.
- Display window states (open or closed) in a clear graphical format.
- Display the temperature status of a room.
- Display the positioning state of the blinds.
- Provide a summary of all active events that are present on a selected area (such as a floor)
- Display the datasheet(s) and/or documentation of the selected equipment or field device if relevant properties are present in the BIM data.
- Supported Data formats:
 - IFC4
 - IFC2x3

(i) Automate Recurring Tasks

BMS must take care of recurring tasks to lower the operator's workload. This includes, for example, cyclical report generation triggering, plant release at various conditions, or automatic adjustment of set points or alarm limits.

(j) Reactions

BMS must allow automatically executable actions to be programmed at the management station when set conditions are verified.

Conditions can be time-based, event-based, on change of values or on a combination of some or all. When conditions are met, the system shall execute a pre-configured list of commands.

(k) Scripting

BMS must provide a Script Editor to create scripts based on a known scripting language. The script engine must allow the manual execution of scripts manually by the operator, or automatic execution triggered by the system based configurable conditions. Among others the scripts must support:

- ❖ Commanding of objects
- ❖ Reading attributes of object
- ❖ Subscription to value changes
- ❖ Read/Write text files.
- ❖ Loading of external DLLs
- ❖ Mathematical / logical operations

(l) System-wide Self-monitoring

BMS must be capable of monitoring running applications, printers, and all connected subsystems. The system must report an event in case of an exceptional state.

(m) System Analysis

Detailed analysis on system and user activities must be available in chronological order.

(n) Help Function

The software must include an online help, context sensitive as well as indexed, a glossary, and can be searched by terms or sentences. The help content must be structured according to the following format: Engineering or Operating help.

(o) Migration

BMS must allow a smooth migration of an existing management station. Via its embedded software utilities, it must be able to accumulate existing graphic pages and Trend Objects or datasets, from a legacy management station to the new software.

7.17.13 Operating System for the Building Management System

All data servers, operator stations, etc., for BMS must be compatible with the most current, generally available Microsoft Windows 64-bit operating system.

As a result, the current version of Windows (at least 6 months after release by Microsoft) as well as a minimum of the last Version is supported. Modifications to the customer network must be possible. The BMS must therefore be installable on any common PC or on tested embedded/industrial hardware and offer a multitasking environment where a user can run multiple applications simultaneously.

(a) Software Updates and Upgrades

In order to benefit from new features and from enhanced protection against possible cybersecurity threats.

which must be provided:

- ❖ Permanent protection against cybersecurity threats
- ❖ Availability of the latest software features (system and limits upgrade)
- ❖ Compatibility with the latest version of supported operating systems.
- ❖ Support of the latest versions of the integrated subsystems

(b) System Continuity

Products used must have a label for a global standard that ensures interaction with products from various manufacturers. Products with these labels can also be combined if manufactured at intervals of more than 10 years.

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(c) Standard Hardware for Central Air conditioning System

(Approximately 500-2000 data points)

One client/server system for mid-sized sites (up to 50,000 system objects, total: 1,500,000 in a distributed architecture) with a high data transfer rate is required. The hardware environment must fulfill the following minimal requirements:

- Type: Standard PC
- Processor: Intel Core i7 Xeon (R) 2.93 GHz: 8th generation or later, CPU Mark of 13,000 or higher
 - Single Thread Rating minimum of 2,300 or equivalent
 - Cores: 4 per running system
- Memory: 4 MB Cache with 16GB RAM
- Hard Disc: 1 TB SSD
- Network card: Gigabit speed, 10/100 Mbps Ethernet card
- Graphics card: Mid-range graphics card
- Microsoft (R) Window (R) 10 OS professional enterprises, Web server software, DVD-ROM drive (with RAM), 100/100 Mbbs NIC for Network connection and virus software with 32`` colour graphics monitor or better

Network requirements:

- Local network
- 1000 Mbps up/down
- Latency less than 10 ms
- For the integration of XNET Fire Safety Systems, the server hardware needs to have a PCI slot for the NCC-2F card, USB connection& internal modern, optical mouse, key pad laser jet color A4 printer with above BMS configuration. Window licensed software compatible with the system

7.17.14 Software Requirements

(a) Operating System

The software must be compatible with the following Microsoft operating systems and editions:

- Microsoft Windows 10/11/latest 64-bit (Professional, Enterprise and IoT Enterprise)
- Microsoft Windows Server 2019/2022/latest 64-bit

(b) SQL Server

The software must be compatible with the following Microsoft SQL products:

- Microsoft® SQL Server 2019 (Express, Standard and Enterprise)
- Microsoft® SQL Server 2022 (Express, Standard and Enterprise)

The software must be compatible with the following Microsoft Office products:

- Microsoft Office 365 (Standard, Small Business, Professional, Enterprise)
- Microsoft Office 2019 (Standard, Small Business, Professional, Enterprise)
- Microsoft Office 2016 (Standard, Small Business, Professional, Enterprise)

(c) Virtualization

The software must be compatible with the following virtualization software packages:

VMware®:

- Virtualization platform: vSphere 7.0 Update 3 and 8.0
- High Availability and Fault-tolerant software
- ESXi 7.0 Update 3 managed by vCenter Server Appliance v7.0 Update 3
ESXi 7.0 managed by vCenter Server Appliance v7.0
- ESXi 8.0 managed by vCenter Server Appliance v8.0

Stratus®:

- Virtualization platform: KVM for Linux CentOS v7.0
- High Availability and Fault-tolerant software: EverRun Enterprise v7.8.x, v7.9.x
- Storage: Local disks
- ztC™ Edge 110i: v2.2x, v2.3x

Microsoft

- Virtualization platform: Microsoft Hyper-V 2019 and 2022
- High Availability software: Microsoft Hyper-V Server 2019 and 2022
- Storage: Local disks, Block Storage (iSCSI, Fiber Channel) or Storage Space Direct on server 2019

Nutanix

- Virtualization platform: Nutanix v6.5.x

7.17.15 User Profiles

(a) Individual Views

Individual, specific or user defined views must be adjustable for the plant overview. The views must cover various electrical and mechanical installations or follow geographic or organizational criteria and permit a customized, hierarchy view that depicts the management station, control systems, plant geographic layout as well as relationship of the mechanical facilities.

(b) Simplified Operator Interface

BMS must allow operators to efficiently maneuver the controlled equipment. The navigation within system applications and components is achieved by tiles and via grouping of functionalities.

A simplified operator interface must be assigned to system users that require a simplified approach. The interface can be applied to more than one user. The following functionalities must be by default available for the system Operator:

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- ❖ Managing of System Events (alarm management)
- ❖ Operate the installation via graphic application.
- ❖ Navigate via tiles.
- ❖ Time Scheduler
- ❖ Trend Viewer
- ❖ Log Viewer
- ❖ Report Application
- ❖ Document Viewer
- ❖ Notification

The operating interface must be documented by a workflow driven documentation that helps the operator to use the management station. The document shall be provided in PDF or online help format.

7.17.16 Graphics

(a) Operating interface to CAD system

The user interface must allow users access to various system diagrams and floor plans using graphical depictions, menu selections, and data point assignments.

The graphics software must also permit the import of CAD symbols (DWG, DXF format) or scanned images for use in the system.

(b) Operating Messages

Operating message must be able to be displayed and evaluated on the management level. Graphics must be able to display data point states that are overwritten by a local priority switch. This on data points that were developed to supplying by local override.

(c) Full Graphics Mode

A fully graphics-based management level with ergonomic and freely scalable images must be available. The system must be developed to operating, monitor, optimize, and log all connected automation stations in real time.

(d) Graphics Generation

Operators must be able to add, delete, and edit system graphics and state texts for digital data points from the standard user interface without external or special tools.

(e) Navigation

A hierarchy tree can support as an option navigation to the various graphic images. Graphic displays must include the ability to dynamically zoom and switch among various layers with different information.

(f) In-graphics Commanding

BMS must offer graphic objects, which can be used to command or control the system. At a minimum, sliders, buttons, text boxes, drop-down lists and radio buttons must be included.

(g) Visualize the Quality State in the Plant Graphics

A violation of energy efficiency limit values for measured values of primary plants (e.g. centralized air Conditioning, energy consumption) must also be displayed in the plant graphic directly on the application components or function.

The parameters for monitoring, evaluating, and forming the quality state can be set directly in the plant graphic based on read and write access rights. As an alternative: Make possible the simple navigation to an appropriate user program.

(h) Graphic Symbols and Standards

Plant graphics must meet the ergonomic needs of the operator. The displayed graphic symbols must correspond to the generally valid standard for Central Air conditioning System symbols (DIN EN 62424 (VDE0810-24)) and ASHRAE guidelines. The symbols must be supported as two- and three-dimensional graphics.

The ability is required to create colored floor displays and system diagrams for each mechanical facility including AHUs, chilled water plants and room operator units.

(i) Object-oriented Graphics

BMS must offer dynamic, high-resolution graphics. The graphics must be object-oriented. Each symbol must be able to display several states in the same, consistent format. At the same time, several views must be able to be open concurrently, and all views must be updated dynamically.

(j) Continuous Update and Display

Measured values, set points, user settings, and alarms must be displayed immediately and continuously. State changes must be indicated via symbol, e.g. using animation or changing the color, in general, however, graphic presentation, or text.

7.17.17 Scheduler Programs

(a) Management via central Scheduler Programs

Operate all scheduler programs online from the management level to achieve consistent, transparent operation of all integrated systems and subsystems.

(b) Scheduler Programs

The system must offer the ability to operate schedulers on automation stations as well as support management station-based time scheduling. Each currently used plant image must offer user-friendly scheduler operation.

(c) Scheduling and Override

Providing calendar type formats to simplify time and data planning and override building operation is required. Time definitions must be located on the PC workstation and building controller to ensure scheduling even if the PC is offline.

Providing override access through menus, graphical mouse, or function keys. Providing the following operations at a minimum:

- ❖ Comprehensive support of all BACnet objects for scheduler, calendar, and commands.
- ❖ Daily and weekly schedules
- ❖ Ability to compile multiple data points into a logical command group to simplify scheduling
- ❖ Planning predefined reports.
- ❖ Ability to plan at least 10 years in advance.

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- ❖ Provide filters for schedulers by name, time, frequency, and schedule.
- ❖ Provide sorting schedulers by name and schedule type.

(d) Customized Scheduler Program

The user can customize the schedule defining the operating mode for each plant. Switching times are defined via weekly schedule. Overriding recurring weekly schedules via local or global exceptions as well as operation via any operator unit must be possible.

(e) Customized Calendar

Local or global calendar exceptions must be able to override the plant-specific weekly scheduler program. Equal calendars must be assigned priority over each other. Calendar operation must be possible via all operator units.

(f) Create Calendar Online

Calendar programs must be able to be remotely created online to provide service personnel with a high level of flexibility.

(g) Create Scheduler Online

Scheduler programs must be able to be remotely created online to provide service personnel with a high level of flexibility.

(h) Create Offline and Online Trends

Trend log objects, both offline and online, must be able to be remotely created in order to provide service personnel with a high level of flexibility. This action must be performed directly from the building management system, without accessing directly the automation layer.

(i) Multiple, concurrent Users

Multiple users must be able to work concurrently on various workspaces on the building automation and control system for efficient and comprehensive work. Plants must simultaneously be analyzed and e.g. monitored or operated via a remote station.

7.17.18 Security

(a) Cybersecurity certification

BMS must be implemented in accordance with the internationally recognized standards for industrial security ISA/IEC 62443, developed by the International Society of Automation (ISA) and adopted by the International Electrotechnical Commission (IEC).

❖ The provider organization must have secure development processes certified to IEC 62443-4-1 Maturity Level 3 (ML3) or better.

❖ The building automation and control system must be certified to IEC 62443-4-2 Security Level 2 (SL2) or better.

(b) Cybersecurity Guidelines

Cybersecurity guidelines must be available to support secure commissioning and deployment of BMS. The guidelines must describe how the system needs to be configured to foster secure operation of the products and solutions in the intended operating environment. The cybersecurity hardening guidelines must be maintained throughout the product lifecycle.

i. Cybersecurity Penetration Test

Cybersecurity penetration test results based on Open Web Application Security Project (OWASP) Application Security Verification Standard for systems with sensitive data (OWASP ASVS Level 2) must be available.

The passwords must be assigned to authorized persons to guarantee transparency for tracking or authorization purposes. A minimum of four different rights must be assignable.

- ❖ Administrator.
- ❖ Program and graphics creation.
- ❖ Operation to change or adjust set points.
- ❖ Guest.

ii. The building management control system password management must meet the customer's IT guidelines. In other words, the customer's corporate standard also applies to the BAC system. Therefore, password management and the associated properties must comply with standard Windows log on and "track" the operator on each workstation.

iii. Central set point shift

The set points in the rooms must be adjustable and can be shifted for effective and clear room operation for the rooms as a whole and individually via the building automation and control system.

(c) Alarm Function

The building management station contains an image of the physical data points. Each data point must be alarm-able. Parameterization via operator units must be possible. The alarms either do not require acknowledgment, i.e. they come and go without acknowledgment, or must be acknowledged or reset and acknowledged.

i. Alarm Message

Alarms from the automation station must be displayed on the operator units within 1 second. Alarms must be acknowledged or acknowledged and reset dependent on access rights. Delay times (e.g. feedback supervision, triggering of differential pressure monitor, filter) must be changeable via operator units.

ii. Alarm Suppression

During commissioning, plant servicing or automation station startup, it must be possible to suppress alarms and events from single objects or from entire plants. The suppression must include corresponding undesired reactions.

The BMS shall provide a clear indication in case of an active alarm suppression, and it shall easily be possible to list the suppressed objects.

iii. System Safety

High availability is expected from the building automation and control system. This results in greater data availability, greatly reducing any down times.

iv. Alarm Generation

The BMS must be able to generate alarms based on events that are reaching the management station directly from the field level. The system must also provide a functionality for creating

management station alarms that are configurable and satisfy the needs of event management, even for devices that are not supporting alarming natively.

v.Message Handling

The BMS must support alarms generated at the automation level (substations).

vi.Notification of Alarms

- ❖ Media independent Formats
- ❖ Current alarms may need to be routed independent of media at certain times to a central service (Email, SMS, pagers, and mobile apps).
- ❖ The number of data points that can be configured for remote messaging of alarm conditions as well as the number of remote devices that may receive system messages may not be limited. The system must support the sending of encrypted e-mails.

vii.Multi-level Alarm Escalation

It shall be possible that unacknowledged notifications can be forwarded to additional devices of the same person and/or different groups of people to ensure that notifications are received on time to react properly.

viii.Exclude Recipients

The BMS must be able to exclude recipients, for example, when they are on vacation, so that when excluded, they do not receive any notifications.

ix.Deactivate Notifications

Users can set Notifications to active/inactive to avoid e.g. sending out notifications from buildings where a subsystem change is ongoing, generating alarms which do not need to be forwarded by Email, SMS, or Pager.

x.Import Recipients from Active Directory

It shall be possible that recipients can be imported/exported from/into CSV or XML formatted files. A regular automatic import of Active Directory import into the recipient DB shall be supported too. This helps to reduce the maintenance effort for recipients, when mobile numbers or email addresses change.

xi.Message Optimization

In the situation of event related alarm bursts, the system shall avoid generating notification bursts to allow users to keep the overview in exceptional situations.

xii.Enhanced Message Tailoring

The BMS must allow to tailor the notification message content and layout according to customer needs, using Java scripts for flexible tailoring.

xiii.Unicode UCS-2 Text Support

It shall be possible to use UCS-2 coding to send SMS texts for non-latin 2-byte characters used for Chinese-, Korean-, Cyrillic-, Arabic- and other -languages.

xiv.Dynamic Email Attachments

It shall be possible to add attachments to notifications sent out via email. The attachments can be static or dynamic. In the case of dynamically attachments, the attachment is dependent of the data point in alarm. For example, if a fire alarm needs to be notified, the corresponding email can have an attached graphic of the ground floor with the fire detector in alarm.

xv.Graphical easy Buttons to trigger Notifications.

The BMS must allow to send out notifications manually, using graphical buttons for triggering. These graphical buttons must be part of normal graphic pages (for example, campus, buildin and ground floor graphics).

7.17.19 Acknowledgment

Operator units for acknowledgement: All alarms (alarms and faults, errors) must be acknowledgeable after issue of individual rights from all connected workstations. For tracking reason, a time stamp and assignment (based on user account) is required. this includes:

- ❖ Local acknowledgement (control cabinet, automation station)
- ❖ Management level
- ❖ Remote operating equipment

a. Alarm Management Strategy

- i.The software must permit configuration of alarm management strategy for each data point. The editor provides a way to edit data points directly, online via the building management system.
- ii.The software for the user interface is also able to make batch changes to data point definitions and attributes to one or more data points selected by the user.

b. Colored Display of Alarms and Events

Incoming alarms must be colored for quick and easy interpretation. Both order and state, as well as alarm priority must be recognizable. The alarm window must be displayed as per operator needs. Alarm window displays must be added to the bid.

c. Alarm Message Content

The message texts must contain all information necessary to allocate and resolve the error. This includes at least the following attributes:

- ❖ Clear text
- ❖ Control cabinet name
- ❖ Plant name
- ❖ Priority
- ❖ Timestamp
- ❖ Time
- ❖ Status (acknowledged, unacknowledged).
- ❖ Instructions on how to resolve the problem must be available in the background.

d. Informational Text and Object Memo

For each system object it shall be possible to configure texts with object specific information and instructions that must be displayed in case of an alarm. In addition, a memo can be attached to any system and used as a reminder or a note to operators.

e. Filter Alarms

- ❖ BMS must offer alarm filtering. Filtering must be possible by alarm lists or priorities.
- ❖ Step-by-step instructions on handling each alarm help the building automation and control system operator to find a solution.

f. Event Management

i.Event Routing and Sorting

Event messages can be displayed on each workstation in a table application and must include the following information: Name, value, event time and date, state, priority, acknowledge information, and alarm counter. The system must also be able to send out an acoustic message appropriate to the event category.

ii.Event Message

Event messages can be displayed on each workstation in a table application and must include the following information on each event: Name, value, event time and date, state, priority, acknowledge information, and alarm counter. Each event must also be able to send out an acoustic message appropriate to the event category.

iii.Event Acknowledgement

- ❖ The user can acknowledge each event directly from the list, suppress the acoustic notification, print or delete it. The interface must also have an option to delete active, acknowledged events until it is reset to the normal state.
- ❖ The user must be able to navigate to information associated with a data point, start an associated graphic or trended graphic diagram, or run a report for a data point selected directly from the event list.

g. Event Treatment

BMS must provide multiple alarm-handling options. These are to be configured in alignment with the standard operating procedures.

h. Fast Treatment

- i. The user must be able to acknowledge each event directly from the event list, suppress the acoustic notification, print or delete it. The interface must also have an option to delete active, acknowledged events until it is reset to the normal state.
- ii. The user must also be able to navigate to information associated with a data point, start an associated graphic or trended graphic diagram, or run a report for a data point selected directly from the event list.

i. Investigative Treatment

From the event list, operators shall have the ability to quickly focus on the source of the event, and all information (live and recorded video streams, recent history, schedules, and so on) related to the event source.

j. Assisted Treatment with Operating Procedures

- i. BMS must have the ability to program operating procedures consisting of a sequence of steps or actions, which the operator must perform. For each step of a procedure, the system shall provide instructions and operating tools. With appropriate permissions, a user shall have the ability to create, view, edit, or delete operating procedures.
- ii. Each operating procedure shall be composed of steps - some of which may be mandatory - for the user to complete (for example, view the graphic of the object in alarm, view live and recorded video streams, or complete an event handling form) while some others shall have the ability to be configured to be executed automatically by the system (for example, send emails to recipients or print on paper the information of the event).

7.17.20 Reports

(a) Report Generation

BMS must support the generation of spontaneous or predefined reports to provide important plant data at any time. The reports must be printable and exportable as a PDF file. The data must be able to be edited in other programs (Microsoft Excel or Microsoft Access) for further analysis.

(b) Standard Report Templates

BMS must support templates to generate detailed reports at little effort. At least three different report templates must be available by default. For example:

- ❖ Report of records at given user defined time intervals
- ❖ Reports to record alarm and fault states
- ❖ Reports to record log entries
- ❖ Reports to record plant and control cabinet states.
- ❖ List of all current data points in an override state
- ❖ List of all disabled data points
- ❖ List of alarm strategy definitions
- ❖ Overall data point report
- ❖ Data point trend data listing
- ❖ Initial value report
- ❖ User activity report
- ❖ Event history report

(c) Customized Report Templates

BMS must permit generated, specific reports as well as individual report templates that may include graphics and trend views.

7.17.21 Remote Operation

(a) User Requirements on Operation

It must be possible to remotely operate and engineer MBS regardless of the location by means of different types of clients. Remote clients must offer the same functionality as those on other workstations. All user functions must be available on installed clients, Windows desktop Apps, or HTML5-based clients via browser. Appropriate Cybersecurity measures must be in place for remote operation.

(b) Dedicated Desktop Installed Client

User must be able to remotely operate and engineer plants regardless of location. The client must operate as a fully installed software installation, locked with a desktop, and prevents in this manner software from being minimized or hidden by other applications.

(c) Windows App Client

User must be able to remotely operate and engineer plants regardless of location. Of course, this openness cannot place the plant security at risk. A Windows App must be loadable by the server PC on the client that operates like an installed application and is automatically updated as soon as new apps are available on the server.

(d) HTML5-based Client

An HTML5-based client must be available to remotely operate the building management system. It must be able to run in a standard HTML5 web browser, on different devices, operating systems and browsers supporting keyboard and mouse operation as well as touch operation.

The HTML5-based client must be identified on BMS via certificates. It must support the following login mechanisms to the building management system:

- ❖ Integrated user accounts, or
- ❖ LDAP users, or
- ❖ External OIDC provider(s)
- ❖ The HTML5-based client must provide at least the following functionality for operation:
 - Event management supporting fast and investigative treatment.
 - Notifications about new events or important system messages
 - Monitoring and operation via graphic pages
 - Commanding object properties
 - Creation and analysis of trend data/trend records
 - Configure and view schedulers.
 - View documents of types of PDF, RTF, TXT and URLs.
 - Generate and review reports.
 - View and filter historical log data

- Manage recipients for remote notifications.
 - ❖ Dark mode to ease work at night or provide higher-contrast display in artificial light.
- User-specific and/or customized workspace settings must be automatically saved per user and for various screen sizes. Those settings must be automatically re-applied at the next session.
- ❖ An HTML5-based desktop application client must be available to remotely operate BMS. It must be easy to download, install, and update, and must run on the supported Microsoft Windows operating systems of BMS.
 - ❖ The HTML5-based desktop application must support multi-monitor environments and a closed mode based on the Microsoft Windows Kiosk Mode, which allows to create stations that are dedicated to the operation of BMS.

7.17.22 Trend data

(a) Trend Data Collection

The system must support the collection of trend log objects. Logging of those objects must be achieved according to the following principles:

- ❖ Using COV (change of value): every time the value is changing, a record is logged into the database.
- ❖ Using time intervals: the record is logged into the database, given a specific and user defined time parameter (time filter). The following time parameters must be supported:
 - Default (no time filter applied)
 - 30 seconds
 - 1 minute
 - 5 minutes
 - 10 minutes
 - 15 minutes
 - 30 minutes
 - 60 minutes
 - 24 hours

(b) Multiple trend views must be possible simultaneously to provide a comprehensive plant overview. Standard plants from medium to higher complexity (as in this project) require a simultaneous display of up to 10 trend curves on the current page view to assess the plants. Multiple trend curves must thus be recorded at the same time.

(c) Freely assign Trend Data

For the greatest possible flexibility, operators must be able to assign and thus record max. 4 additional data points individually for each plant.

The assignment must be carried out from the management station.

(d) Decentralized Data Storage

None of the trend data may be lost during communications failure to achieve gap-free trend documentation. For this reason, all trend data must be created and saved to the automation station. After communications are restored, all values saved on the management station must be updated automatically.

(e) Record History Data, Trend

Vital data points and set points must be saved for each building services plant. The polling time is oriented to the signal type, i.e. analog values are recorded cyclically while digital or multistate values are recorded by event.

(f) Intermediate Storage of History Data

Trend data are collected in the automation station and transferred to the management level after a specific time has expired or a specific amount of data has been recorded. Trend data may not be lost if the management station is unavailable temporarily.

(g) Trend Comparison

The system must offer a time adjusted trend view to run analysis of changed conditions at various times.

(h) Trend Calculations

The system must allow simple calculations between trend data. A special trend calculation workspace must be used to configure the necessary elements for the calculations. The calculation workspace must at least offer:

- User defined descriptions for the trend calculation objects
- Fixed names for each individual trend object
- Mathematical operations, such as + , - , / , * , () , sqrt() , ^
- Align the trend data in a common timestamp with interpolation

The calculations must be presented in the form of reports or can be extracted in XLS for further analysis with external tools.

7.17.23 Communication

❖ The building automation and control system must be extendible to ensure long-term operation and provide all standard interfaces commonly available on today's market.

❖ A native integration with an electrical power network via IEC 61850 protocol must be supported.

7.17.24 Standard BACnet / AMEV

The entire BMS system along with its components must be certified for all relevant standards and applicable guidelines (BACnet 2011 V1.1, BACnet standardized device profiles, BACnet/SC)

7.17.25 BACnet Engineering Data Exchange (EDE)

The building management station must support the import of engineering data, such as data point types, data point addresses and special data point presentation information from an EDE file that

complies with the format described in the document "Description of the EDE Data Fields ", Version of Layout: 2.3, from the BACnet Interest Group Europe (BIG).

7.17.26 Video Status and Commands

The building management station shall be able to provide video controls with:

- ❖ Remote Control of Video Monitors
- ❖ VMS triggers for controlling logic in the VMS and triggering reactions in the building management system.
- ❖ Video Events and Video Event Treatment including video tagging with alarm information.
- ❖ Diagnostic information of Video Devices
- ❖ Video as Operating Procedure step.

7.17.27 Automation level

Building automation stations must be intelligent. They must be autonomous. They must allow to build large systems with highly decentralized small units (DDC).

DDC shall be True IP Based BTL & UL Listed for third party integration. The controller shall have 2-port Ethernet switch and WLAN interface. It should have BTL label (BACNET communications passed the BTL test) and consisting of Dual microprocessor with Storage capacity of 1 GB RAM. It should support Real Time clock with backup of up to 7 Days using super capacitor and should have option for external battery if required. It should Support of the major communication protocols: BACnet/IP, BACnet MS/TP, Modbus IP and Modbus RTU up to 500 points. Cloud connectivity for remote access. Modbus-RTU communication should have inbuilt short circuit protection. Operating voltage shall be AC/DC 24 V. Cybersecurity protection with BACnet Secure Connect communication as BACnet/SC node protocol. Note: 3rd party make integrator is not acceptable.

Building automation stations must be freely programmable and feature graphical programming optimized for building automation and control. The following functions must be possible with it: Control, measure, signal at various priorities and by event, monitor, alarm, count, calculate, schedule, save trend values, and log as per DIN EN ISO 16484-5. BACnet server (building automation stations) certificates must be submitted.

(a) Building automation stations must have:

- ❖ an embedded WLAN interface conforming to IEEE 802.11b/g/n, operating in the frequency band 2.4...2.462 GHz, protected by WPA2,
- ❖ a 2-port Ethernet switch 10Base-T / 100Base-TX, IEEE 802.3 compatible
- ❖ a processor speed of at least 300MHz
- ❖ configurable RS485 interfaces either for integration of Modbus RTU or BACnet MS/TP
- ❖ KNX PL-Link bus connection for sensors, actuators, and control units (including power supply of the devices) with "Plug and Play" connection to field devices with KNX PL-Link

(b) Building automation station I/O

Building automation station must have the ability to expand via I/O modules. Expanded I/O must

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support the following signal types:

- ❖ Passive sensors LG-Ni 1000, 2x LG-Ni1000, Pt 1000 (*75, 385)
- ❖ NTC 10k, NTC 100k
- ❖ Resistance sensors 1000 Ohm, 2500 Ohm, 2650 Ohm, 1000...1175 Ohm (for set point shift)
- ❖ Active sensors DC 0 ... 10 V
- ❖ Current measurement analog DC 0...20 mA or 4...20 mA
- ❖ Binary potential-free contacts for signaling functions.
- ❖ Counter to 25 Hz (electronic switch to 100 Hz)
- ❖ Analog outputs DC 0...10 V
- ❖ Relay outputs for binary controls, changeover contact (NO, NC, pulse)

(c) System design

Manufacturer must prove that they have various scalable building automation stations to ensure optimal building automation station design. Associated system documentation must be added to the bid and included in system evaluation. Documentation must show that the hardware (DDC and I/O modules) is designed optimally for the number of the required data points.

(d) Delineation, primary and system automation to management level

All management level functions must be fully engineered in the building automation station to increase plant availability. Delineation is defined to ensure that no additional engineering is required at the management level (BACnet client).

(e) Delineation, room automation to management level

All management level functions must be fully engineered in the room automation station to increase plant availability. Delineation is defined to ensure that no additional engineering is required at the management level (BACnet client).

7.17.28 Operation concept at automation level

(a) Networkable operator and monitoring unit

Plant operation must be possible both locally and via management level. Operation must allow for access to all values (current values, set points, parameters, and maintenance and fault messages) without special engineering as well as plant-specific composition of vital values. Operation must allow for graphic display of weekday and exception programs, heating curves and trends set up individually.

(b) Graphical plant operation via network-capable touch panel

BMS is operated via a networked touch panel. They must inform the operator without log on using plant graphics on the present state of the plant. Multiple plants must be able to be operate via touch panel. Is must be capable of displaying and acknowledging alarms. The operator should be informed about faults directly by a common alarm display via faults even when the display is switched off. At the same time, functions to control the plant must be supported, so that plants must be able to be graphically operated and displayed using select data points, schedulers as well as trend views. A capacitive display is used to operate. The touch panel as be added as an integral

component of the overall system via a scalable web interface as well as a pleasant form of polished aluminum frames. User name and password is required to run functions that can change to plant settings in order to protect the plant. Authentication must be able to be disabled as an option.

(c) Web operation independent of hardware

Operation must allow for graphic display of weekday and exception programs, heating curves and trends set up individually.

(d) Operation via web browser or mobile clients

Vital functions must be viewable regardless of plant location. To this end, access is required via mobile clients (mobile phone, pocket PC, PDA, etc.) to all actual values and set points, plants and operating states.

(e) Operator intervention via operator units

Plant operators must be able to switch via operator units the plant and individual aggregates and components and deactivate Auto mode via operator units. Read/write access rights must be considered in this regard.

(f) Manual intervention signal

An alarm message must be generated following manual operator intervention as the plants are designed and controlled for highest possible energy efficiency.

(g) Manual intervention (override), switching frequency.

Monitoring, evaluation, and display of switching frequency is required for manual interventions over a defined timeframe. The determined value is monitored to a minimum and maximum and displayed as quality state for breach and/or exceeding thereof. The determined value from the current timeframe is displayed; the value from the previous timeframe is also displayed and made available to the trend data.

(h) Manual intervention (override), runtime

Monitoring, evaluation, and display of runtime is required for manual interventions over a defined timeframe. The determined value is monitored to a minimum and maximum and displayed as quality state for breach and/or exceeding thereof. The determined value from the current timeframe is displayed; the value from the previous timeframe is also displayed and made available to the trend data.

7.17.29 I/O modules

As highly flexible I/O modules are needed for complex and large technical equipment in buildings, they must be composed individually for each plant. To this end, modules must be configurable for various signal types, grouped, labeled per channel with clear text, two-sided readable, and distributed or set across several control cabinets/panels. Building automation stations must allow for flexible expansion of I/O via these modules.

The entire module electronics must be protected by a stable plastic housing against touch and

soiling.

(a) Diagnostic function

A status diagnosis for each channel is required to quickly locate installation or plant errors. The status is displayed by LED or on the module.

(b) LED display

The color of the status LED must be configurable to correspond with message type to provide an easy overview in the control cabinet. Feedback: green, maintenance: yellow, warning: red.

(c) Remote I/O modules.

Remote I/O modules must be able to be used for small plants or parts thereof to keep the size and number of control cabinets/panels as low as possible. The modules must be able to be as far as 200 m from the building automation station. The maximum number of data points edited this way may only be limited by the maximum capacity of the building automation station.

(d) Isolating terminal functionality

The electronic modules must have isolating terminals to simplify hardware tests and commissioning. As a result, connected field devices can be measured at the test plug sockets without module electronics influence. At the same time, the connection terminals must act as cabinet/panel terminal strips. If the tenderer cannot provide proof for this function, all inputs and outputs must be run via separate isolating terminals. The resulting costs must be included in the unit prices.

(e) Level for manual local priority control

The module must have an optical status message facility to avoid faulty positions.

(f) Monitoring local priority control

The building automation and control system must be able to indicate any intervention via the local priority control. This indication must be well displayed at the management level.

(g) Short-circuit proof

Field devices and motors must be connected directly without requiring coupling relays or other proprietary hardware. All terminals are protected against short circuit and incorrect wiring using AC/DC 24 V. Field device errors must be recognized and displayed reliably to retain high plant availability.

(h) Broken wire interlock

Interlocks (hardware) and fault messages must be designed for possible wire breaks or loose terminals under closed-loop rules, i.e. the building automation station then has status "1" OK (closed monitoring loop) or no fault, and status "0" (interrupted monitoring loop) or fault.

(i) Field device standards

The building automation stations, and I/O modules must support all common sensors (e.g. temperature, humidity) and actuators (valves, damper actuators) without requiring additional conversion hardware. The tenderer must provide proof that the field devices used for the project were tested under the entire system and documented accordingly.

(j) Use of I/O modules on the automation level

Functionality for the I/O system must be implemented on the automation level.

7.17.30 System Integration controller

(a) Integration of third-party systems

The same communication protocol must be used as for the existing technical equipment in the building to integrate third-party systems (refrigeration machines, lighting and building automation and control systems, etc.). Building automation and control systems not offering this integration as specified must include and clearly declare any additional conversion hardware (gateways) in their price.

(b) Open and neutral communication via BACnet

Building automation stations are connected to the management level via communication bus. System structure must allow open, neutral and manufacturer-independent communication. Communications must take place in principle via BACnet even if proprietary communications would be possible based on the building automation stations used. Intermediate OPC servers are not allowed.

(c) Building automation station - Building automation station

Communication must also be standardized even between individual modules and building automation stations. All devices must communicate on the same protocol on the entire primary and room system levels.

7.17.31 Building automation station - Field level

(a) Field device connection

The building automation stations and I/O modules must support all common sensors (e.g. temperature, humidity) and actuators (valves, damper actuators, lighting control, blinds drives) without requiring additional conversion hardware. The tenderer must provide proof that the field devices used for the project were tested under the entire system and documented accordingly.

(b) Connect communicating field devices

Common manufacturers must be integrable to connect third-party devices and subsystems. (e.g. communicating pumps, Modbus subsystems etc.).

7.17.32 Network switches

Layer 2 switch with 16 ports (RJ-45) including SFP modules, rack mountable, SMPS power supply

& other termination accessories (Like Pigtails/LIUs/ Convertors/Splicing equipment ,Patch panel, Patch Cord, etc.) shall be provided as required for BMS DDC Panel Networking. The switch-to-switch distance shall not exceed beyond 80 meters.

7.19 Exclusions

The following works are not covered in AC contractor's scope and will be carried out by other agency without any cost to AC Contractor:

1. Civil works such as construction of Plant room except foundations for all the equipment except for minor civil works.
2. False ceiling work.
3. Under-deck insulation.
4. Water for erection, testing and commissioning
5. Provision of electrical supply at one point in the plant room. Contractor shall make arrangement for necessary switch board, cables etc. for onward tapping.

7.20 Documents submittals before commencement of work

7.20.1 The tenderer, if desires, shall on its own expense arrange to inspect office buildings where the works are to be executed before submission of bid and acquaint himself with the relevant information required for preparing and submitting his bid.

7.20.2 After award of the work, the successful tenderer shall prepare and submit the following minimum drawings for Bank's approval and execution of work. However, such approval from the Bank shall not absolve the contractor from the responsibility of meeting Bank's specifications and requirements and proper functioning of the system:

- a) The drawing indicating the schematic plan for the entire equipment The drawing indicating the location of various equipment in the Central Air conditioning System
- b) cable schedule
- c) Any other drawing or details as required or advised by the Bank
- d) Relevant calculations to showcase the performance of the offered equipment. In case, the performance of any product/ equipment is not found meeting Bank;'s specifications/ site conditions, the same will be rejected and tenderer has to offer another product to meet the performance as per Bank's expectation to fulfil the technical specifications and requirement at site.
- e) After completion of work, the contractor shall submit as executed layout drawing of the entire system on a Pen Drive and three hard copies of the same for records.

7.21 Documents submittals after completion of work

The Central Air conditioning System tenderer, upon completion of the commissioning activity, shall offer the system to the customer for acceptance. For this, the tenderer shall provide the customer with the following documentation:

- a. System schematic diagram(s)
- b. System design drawing(s) for connectivity of all equipment with SCADA system
- c. Factory test reports

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- d. Site test reports for the tests conducted for acceptance of the system
- e. System operating manuals
- f. Original licensed copies of all the software (OS, SCADA, Video analytics, Anti- virus, etc.)

7.22 Training:

The tenderer shall provide training to the Bank's officials and operating staff for proper operation and use of the Central Air conditioning System at each site during handing over

Note: Operator training shall include total two sessions each of two-hour encompassing:

- a. Sequence of operation review
- b. Selection of all displays and reports
- c. Trouble shooting of sensors (determining bad sensors)
- d. Password assignment and modification
- e. Any other related to Air conditioning works

7.23 Final acceptance and Handover-takeover:

(a) The contractor shall also provide certificates from the OEMs of supplied and installed equipment that installation of the respective equipment and the configuration etc. have been executed at site as per OEM standards, technical specifications and site requirement. In the event of failure by the contractor to do so, Bank reserve the right to arrange the visit of OEMs at the risk and cost of the contractor. In case of any observations by any on the OEM, it shall be the responsibility of the contractor to comply and implement the suggestion within the ambit of this contract in a time bound manner.

(b) Checklists and procedures for emergency situations, maintenance operations and procedures shall be included in the manual. The Bank's engineer then shall test and inspect the functioning of various components (e.g., Chiller, condenser and chiller pumps, cooling towers, SCADA system/ BMS/ CPM, valves, pipe, cables etc.) and a joint report shall be prepared. In case of any observations from Bank's side, the same shall be conveyed to the contractor in writing and got attended to by him to the satisfaction of the Bank engineer. The entire system then shall be taken over by the Bank and the defect liability period shall start from the same day.

Important Note:

1. All the products/ components/ sub-systems offered shall be from current line of products from the OEM and a certificate to this extent shall be submitted along with Part I of the tender.
2. For all the active components/ equipment, namely; Chiller units, chiller and condenser pumps, cooling towers, SCADA system/ BMS/ CPM, the OEMs shall provide a certificate, indicating the end of life and end of support in terms of spares etc. The product selected should conform to the tender specified life period. Further, all software provided for the above system, including operating system, client software etc. should be upgraded, if necessary, as and when a new upgrade is released by the developer/ OEM at no extra cost during the tender specified life period of the above system.

Place :

Date :

Seal and Signature of Tenderer

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BMS I/O SUMMARY

S.N O.	DESCRIPTION	Qty	AI	AO	DI	DO	ISP	Field Devices
A	Water Cooled multi Screw Chillers	3						The tenderer shall provide the Software Integration with Chiller Plant Manager (CPM) along with providing a daily report of minimum of these parameters to show the operating condition of each chiller.
1	Chillers – ON/OFF status						3	Integrated Soft Point on Modbus
2	Chiller Enable/Disable					3		PFC from chiller panel to CSM
3	Chiller trip status						3	Integrated Soft Point on Modbus
4	Chiller Evaporator inlet/outlet Water Temperature						6	Integrated Soft Point on Modbus
5	Chiller Condenser inlet/outlet Water Temperature						6	Integrated Soft Point on Modbus
6	Chiller Evaporator side butterfly valve Command					3		230 VAC supply to Actuator from CSM . Supply and Installation of valve in HVAC Scope
7	Chiller Evaporator Side Butterfly Valve Status				3			PFC from Actuator to CSM
8	Chiller Condenser Side Butterfly Valve Command					3		230 VAC supply to Actuator from CSM . Supply and Installation of valve in HVAC Scope
9	Chiller Condenser Side Butterfly Valve Status				3			PFC from Actuator to CSM
10	Chilled Water Header Inlet & Outlet Temp.		2					Immersion temperature sensor.
11	Condenser water Header inlet & outlet Temp.		2					Immersion temperature sensor.
12	CHW & CND Header Flow		1					4-20 mA signal from Flow Meter
13	Chiller Integration	3					70	Integrated Soft Point on Modbus - RS 485
B	Chilled wtr. Pumps	3						

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1	Pump ON/OFF command					3	Potential free contact in Pump Electrical panel
2	Pump ON/OFF status				3		Potential free contact in Pump Electrical panel
3	Pump Auto/ Manual Status				3		Potential free contact in Pump Electrical panel
4	Pump VFD Trip Status				3		Potential free contact in Pump Electrical panel
C	Condenser Pumps	3					
1	Pump ON/OFF command					3	Potential free contact in Pump Electrical panel
2	Pump ON/OFF status				3		Potential free contact in Pump Electrical panel
3	Pump Auto/ Manual Status				3		Potential free contact in Pump Electrical panel
4	Pump Trip Status				3		Potential free contact in Pump Electrical panel
D	Cooling Tower (1 Fan each)	3					
1	CT ON/OFF command					3	Potential free contact in CT Electrical panel
2	CT ON/OFF status				3		Potential free contact in CT Electrical panel
3	CT Auto/ Manual Status				3		Potential free contact in CT Electrical panel
4	CT Trip Status				3		Potential free contact in CT Electrical panel
E	Other Points						
1	Ambient T+Rh Sensor	1	2				0-10 Dc signal from Sensor.
2	Energy Meter Integration	14				140	Integrated Soft Point on Modbus - RS 485
3	UPS Integration	4				40	Integrated Soft Point on Modbus - RS 485
4	PAC units Integration	8				80	Integrated Soft Point on Modbus - RS 485
5	DG sets Integration	2				40	Integrated Soft Point on Modbus - RS 485
6	LT panel EM Integration	2				20	Integrated Soft Point on Modbus - RS 485
7	ACB on LT Integration	7				70	Integrated Soft Point on Modbus - RS 485
8	VCB on HT panel Integration	4				40	Integrated Soft Point on Modbus - RS 485

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9	Spare		2	0	2	2	10	
	TOTAL IO POINTS FOR CHILLER		9	0	35	20	528	
F	AHUs Panel	27						
1	AHU ON/OFF command					1		Potential free contact in AHU electrical panel
2	AHU run status				1			Potential free contact in AHU electrical panel
3	AHU Auto/ Manual Status				1			Potential free contact in AHU electrical panel
4	AHU Trip Status				1			Potential free contact in AHU electrical panel
5	AHU return air temperature	1	1					0-10 VDC signal from Sensor.
6	AHU 3 way valve modulation			1				0-10 VDC signal to valve.
7	AHU VFD modulation			1				0-10 VDC signal to VFD.
	IO POINTS FOR 28 AHUS	28	28	56	84	28	0	
	TOTAL IO POINTS		37	56	119	48	528	

- Note: i) Provision of at least 1000 soft points in addition to the above have to be made for any future requirements**
- ii) The above I/O summary is tentative and subject to change as per actual requirement at site.**
- iii) At the time of Submission of Tender the contractor shall submit the detailed I/O Summary along with the Schematic diagram.**

Place and Date

Seal and Signature of tendere

SECTION VIII

Approved and offered makes of equipment and materials

8.1 List of approved makes of equipment/ materials

Sr. No.	Equipment/ Materials	Manufacturer/ Make
1.	Chiller unit	Trane / Dunham Bush/York/ Carrier/ Kirloskar / McQuay/Daikin/ Blue star/ Voltas
2.	Condenser & Chilled water pumps	Kirloskar / Beacon /Weir/ M & P/ KSB/Max flow/ ITT/ Grundfos/ Armstrong/Wilo
3.	Cooling Tower	Bell /Evapco/ Paharpur/ Baltimore(BAC)/ Classik/ Marley/ Mihir/ Advance/Delta / Himgiri
4.	DDC controllers	Siemens/ Johnson/ Honeywell/ GE/ Schneider/ Delta Controls/ L&T
5.	SCADA SYSTEM	Sauter Race/ Schneider/ Anergy/Johnson Control/ Siemens/ Honeywel/ Beckhoff/ L&T
6.	Network Switches	Cisco / HP / Avaya/ Tyco / Panduit / Molex/allied telesis
7.	Work station PC	HP/ Dell/ Lenovo
8.	LED monitor	LG/ Smsung/ Sony/ Panasonic/ Toshiba/ Hitachi
9.	Three phase motors	Siemens / Kirloskar/ ABB / NGEF / Crompton / Bharat Bijlee
10.	Y-strainer	Emerald /Strainwell/ Socla/ Sant/ Advance
11.	MS pipes	Sail/GST/Jindal/ MSL/ Zenith/ BST/ Tata Steel
12.	Butterfly valve	Audco / Advance / Inter valve / BDK
13.	Check valve	Advance/Audco/ Intervale/ Normax/ Socla
14.	Balancing valves	Advance / Audco / Inter valve / Belimo/ Oventrop/ Honeywell/ Johnson/ Siemens
15.	Flow control valve (pressure independent type)	Danfoss/ Honewell /Belimo/ Oventrop/ Johnson/ Siemens
16.	2-way modulating and on-off valve	Danfoss/ Honewell /Belimo/ Sauter/ Johnson/ Siemens
17.	Suction guide	Emrald/ Anergy/ Armstrong

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18.	Pressure and temperature Gauges	Feibig /Emerald / H Guru / Wika/ Waree/ Forbes Marshal
19.	Pipe insulation (Nitrile rubber)	Armalex / K-flex/ A-flex/ U.P.Twiga/Owen Carning/Armacell/Armasound
20.	Pipe insulation (EPS)	Beardsell/ Malanpur/ Llyods/ Styrene
21.	Temperature sensor/ transmitters	Honeywell/ Johnson/ Siemens/ Scneider
22.	Differential pressure sensor/ Transmitter/ switch	Honeywell/ Johnson/ Siemens/ Scneider
23.	GI Sheets	Tata/ Jindal/ SAIL/ VSP/ Nippon/ Deuro
24.	Aluminium Sheet	Nalco/ Balco/ Hindalco
25.	Fiber Glass Rigid Board	U.P./ Twiga / Owen/ Corning
26.	Welding electrodes	Adwani/ Esab/ Feroline/ L&T
27.	Pipe support	Hitech supports/ Hilti/ Kanwal industries
28.	Paints	Asian / Nerolac/ Berger/ Shalimar
29.	Fire sealant	Birla 3M/ Hilti/ Promat/ GE/ Dow Corning
30.	Vibration Isolators / Flexible bellow	Dunlop / Resistoflex/ Kanwal Industries/ CORI/ Easiflex
31.	Flow Meter	Rockwin / Forbes Marshal/ Belimo/ Johnson/ KRONHE
32.	Actuator	Honeywell/ Johnson/ Siemens/ Belimo/ L&T/ Rotork/ Auma
33.	MCCB	L & T/ GE / Siemens/GE /Legrand
34.	Cables	Cable Corporation of India / Gloster Finolex / Universal/ Polycab/ Ravin/ Lapp/ Geoflex/ National/ RR
35.	Voltmeter / Ammeter	A.E./IMP/Rishab/Enercon/Krycard/C&S
36.	HRC Fuse and Fittings	L & T /Siemens / GE/C&S
37.	Current Transformer	A.E. / Kappa / L & T/Pragati/C&S
38.	Contactors	L & T / Siemens / Snieder/GE /C&S
39.	Starter	L & T / Siemens/GE /C&S
40.	Overload Relays	L & T / Siemens /GE/C&S
41.	Indicating Lights	Siemens / L & T /GE /C&S
42.	Time Delay Device	Siemens / L & T /GE/C&S

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43.	Gate/Globe valve	Leader/Audco/Advance
44.	Vacuum degasser	Alfa technovac/ beacon/trident pneumatic

Note: The Tenderer shall indicate the specific make of material (any one of the make listed above) proposed to be used by them for the said work against each item failing which the Bank reserve the right to choose any one make **or equivalent** out of the above. Ambiguous replies like 'as per manufacturers standard', 'shall be furnished later", 'as per propriety design', 'as per approved makes' etc. shall not be considered as it will not help in evaluation of the bid.

8.2 List of offered makes of equipment/ materials (To be filled in by the Tenderer)

Sr. No.	Equipment/ Materials	Offered Make
1.	Chiller unit	
2.	Condenser & Chilled water pumps	
3.	Cooling Tower	
4.	DDC controllers	
5.	SCADA SYSTEM a) Hardware b) Software	
6.	Network switches	
7.	Work station PC	
8.	LED monitor	
9.	Motors	
10.	Y-strainer	
11.	MS pipes	
12.	Butterfly valve	
13.	Check valve	
14.	Balancing valves	
15.	Flow control valve (pressure independent type)	

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16.	2-way modulating and on-off valve	
17.	Suction guide	
18.	Pressure and temperature Gauges	
19.	Pipe insulation (Nitrile rubber)	
20.	Pipe insulation (EPS)	
21.	Temperature sensor/ transmitters	
22.	Differential pressure sensor/ Transmitter/ switch	
23.	GI Sheets	
24.	Aluminium Sheet	
25.	Fiber Glass Rigid Board	
26.	Welding electrodes	
27.	Pipe support	
28.	Paints	
29.	Fire sealant	
30.	Vibration Isolators / Flexible bellow	
31.	Flow Meter	
32.	Actuator	
33.	MCCB	
34.	Cables	
35.	Voltmeter / Ammeter	
36.	HRC Fuse and Fittings	
37.	Current Transformer	
38.	Contactors	
39.	Starter	
40.	Overload Relays	
41.	Indicating Lights	
42.	Time Delay Device	
43.	Gate/Globe valve	
44.	Vacuum degasser	

Place:

Date:

Signature and Seal of the tenderer

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SECTION IX
Technical Data

(To be furnished by the tenderer in Central Air conditioning System only)

The technical details called for to be furnished by the tenderers without fail. The tenderer not furnishing the data is liable for rejection. Replies like 'as per manufacturers standard', 'shall be furnished later', 'as per propriety design' etc shall not be considered as it will not help in evaluation of the bid and tender will be considered incomplete.

<u>9.1</u>	Compressor	Screw
(a)	Manufacturers' Name	
(b)	Model	
(c)	Type of compressor: Screw (Hermetic/Semi-hermetic)	
(d)	No. of compressors per machine (minimum 2 nos.)	
(e)	Capacity of chiller package at specified condition	
(f)	RPM of compressor	
(g)	RPM of drive	
(h)	Type of gear	
(i)	Refrigerant used	
(j)	Quantity of refrigerant used	
(k)	Power consumption (in KW per TR of refrigeration) at operating conditions	
	Full load 100 % (MAX. 0.6030)	
	IKW at 100% load	
	IKW at 75% FL	
	IKW at 50% FL	
(l)	IKW at 25% FL	
(l)	Type of capacity control	
(m)	Range of capacity variation	

<u>9.2</u>	Motor (Compressor)	
(a)	Make of motor	
(b)	Type of motor	
(c)	Motor KW Rated	
(d)	Class of insulation	
(e)	RPM	
(f)	Type of starter	

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(g)	Electrical characteristics (Voltage/frequency with permissible tolerance in +/- %age)	
(h)	Make of starter	
(i)	Full load current (A)	
(j)	Starting current (A)	
(k)	No. of thermistor	
(l)	Overload/ under load/ voltage/ single phase protections provided (Yes or No)	

9.3	Condenser	
(a)	Manufacturers' name	
(b)	Model	
(c)	Number of condensers in each package	
(d)	Fouling Factor FPS	
(e)	Material of tube	
(f)	Water flow rate (LPM)	
(g)	No. of circuits	
(h)	Water In temperature °C	
(i)	Water Out temperature °C	
(j)	Refrigerant condenser °C	
(k)	Whether any sub-cooling circuit is included (Say Yes or No)	
(l)	Heat rejection capacity Kcal/hour	
(m)	Pressure drop (M)	

9.4	Chiller	
(a)	Manufacturer's Name	
(b)	Model	
(c)	Type of chiller	
(d)	Number of chillers in each package	
(e)	Tube material	
(f)	No. of circuits	
(g)	Water flow (LPM)	
(h)	Water temperature IN °C	
(i)	Water temperature OUT °C	
(j)	Pressure drop of water (M)	
(k)	Chilling capacity in Kcal/Hours	
(l)	Whether any super heat provided	
(m)	Fouling Factor (FPS)	

9.5	Overall size of water chilling machine	
(a)	Overall dimension (mm)	

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(b)	Type of vibration isolator	
(c)	Operating weight (Kg)	

9.6	Microprocessor for chilling machine	
(a)	Is microprocessor included?	
(b)	Give salient features of the microprocessor	Enclose separate sheet
9.7	Cooling Tower (CTI Approved)	
(a)	Make of cooling tower	
(b)	Type of cooling tower	
(c)	Model of cooling tower	
(d)	Number of cells	
(e)	Overall dimension in mm	
(f)	Dry weight (Kg)	
(g)	Operating weight	
(h)	Water flow rate (LPM)	
(i)	Approach of cooling tower	Summer
(j)	Range of cooling tower	Summer
(k)	No. of fans	
(l)	Fan power in Kw	
(m)	Fan RPM	
(n)	Drift loss (%)	
(o)	Evaporation loss (%)	
(p)	Thickness of FRP Basin	
	(i) Bottom	
	(ii) Top	
	(iii) Panel	
(q)	Thickness of Louvers	
	Casing materials of Cooling tower	
9.8	Fan Motor	
(a)	Make	
(b)	Type of motor	
(c)	Motor rating in Kw	
(d)	Class of insulation	
(e)	RPM of motor	
9.9	Condenser water pump sets	
(a)	Make	
(b)	Type	
(c)	Model	
(d)	Discharge (LPM)	
(e)	Head (M)	
(f)	Pump power in Kw	
(g)	Efficiency	

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(h)	Type of seal	
(i)	Motor	
	a. Make	
	b. Type of motor	
	c. Motor rating in Kw	
	d. Class of insulation	
	e. RPM of motor	
9.10	Chilled water pump sets	
(a)	Make	
(b)	Type	
(c)	Model	
(d)	Discharge (LPM)	
(e)	Head (M)	
(f)	Pump power in Kw	
(g)	Efficiency	
(h)	Type of seal	
(i)	Motor	
	a. Make	
	b. Type of motor	
	c. Motor rating in Kw	
	d. Class of insulation	
	e. RPM of motor	

Note: - End of support from the OEMs for equipment should not be before December 2040. In support of the above, the tenderers have to submit a certificate from the OEMs of the offered makes and models as per the enclosed proforma, alongwith the tender part I.

Declaration

1. We hereby confirm that the offered equipment hardware and software are as per the tender specifications and deliver the objective and requirement of the Central Air conditioning System stated in the tender.
2. We also confirm that all the cables, I/O outlets etc. are as per tender specifications and other accessories etc. are as per industry standards.

Date: -

Seal and Signature of Tenderer

Place:-

SECTION X
TESTING OF AIR CONDITIONING SYSTEM

10.1 FACTORY INSPECTION

1. Design Conditions:

- (i) Salient features such as model, capacity control, type of lubrication etc. shall be verified against the requirements visually without opening the compressors.
- (ii) Manufacturer's internal test certificates shall be scrutinized to check compliance with the requirements as specified in the contract.
- (iii) Free running test shall be carried out at the speed for which the motor is available with manufacturer but the speed shall not be less than that specified in the tender.
- (iv) During this running test following operations are to be noted :
 - a) Manual operation of capacity control
 - b) Lubrication oil pressure
 - c) Pneumatic test pressure test at 21 Kgf/sq.cm for casing of compressor.
 - d) Vacuum test for the compressor for 0.5mm of Hg.

2. Compressor

- (i) Salient features such as model, No. of cylinders, capacity control, provision of crank case heaters, type of lubrication etc. shall be verified against the requirements visually without opening the compressors.
- (ii) Manufacturer's internal test certificates shall be scrutinized to check compliance with the requirements as specified in the tender.
- (iii) Rate of leak test shall be checked by developing 7kg/sq.cm (gauge) pressure on HP side and 1 kg/ sq.cm on LP side using dry Nitrogen air. The leakage through the valves, shaft seal, cylinder heat gasket etc. should not be more than 0.3 kg/sq.cm per cylinder in 4 minutes time. Alternatively this may be demonstrated through vacuum.
- (iv) Pneumatic pressure test shall be carried out at 22 kg/ sq.cm and by submerging the compressor in water for 1 hour & there shall be no leakage.
- (v) Free running test shall be carried out at the rated speed specified in tender.
- (vi) During this running test following operations are to be noted :
 - (a) Manual loading / unloading of capacity control
 - (b) Lubrication oil pressure
 - (c) Safety valve operation
 - (d) Vacuum test for the compressor for 0.5mm Hg.

3. Condenser

- (i) Salient features like number of tubes, inside diameter of tubes (from which the gauge of the tube can be verified), no. of passes, material of fins, length of condenser, provision of fittings like safety valve, water, gas connection shall be verified during stage inspection. The tube thickness shall be checked.
- (ii) Manufacturer's internal test certificates shall be furnished and it shall be verified as specified in the tender. Pneumatic pressure test at twice the normal condensing pressure for gas side of condenser shall be carried out.
- (iii) Hydraulic test at 10 Kgf/ sq.cm for water side of the condenser shall be carried out.

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4. Testing of Chillers:

The complete unit shall be factory tested at 25%, 50%, 75% and 100% capacity at constant condenser water temperature and witnessed by the Bank Engineer or as given in tender document for performance at the rated conditions by simulating the actual design conditions. All the units shall be tested. All controls and switchgear shall be tested for proper functioning and set of design values. The capacity in TR / kcal/hr shall be calculated from measurements of temperature difference and flow rate of water, in condenser and chiller. The power consumption shall be checked from current measurement of the motor. All calculated and checked results shall match the specified data within tolerances as stipulated by ARI.

All instruments and personnel for tests shall be provided by the contractor. Contractor shall inform the Bank about the chiller testing schedule min. 10 to 15 days before the chiller is ready for factory testing.

10.2 SITE INSPECTION

10.2.1 Functional tests

1. The contractor shall demonstrate trouble free running of the AC equipment and installation for a period of minimum 2 weeks of running.
2. The contractor shall operate, test and adjust the air conditioning system equipment, fans, motors, cooling Towers, BMS etc.
3. The contractor shall enable the plant to be put in a continuous running test for a period of 72 hours after all other tests and adjustments have been made.
4. After the trial run, the AC contractor shall offer the plant for the seasonal test, namely test for summer, winter and monsoon season.
5. The Input KW of the unit / TR at full load shall also be checked against tender specification, if any. Pressure drops across chiller and condenser at specified flow rates shall be checked.
6. 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 \pm 0.2 deg. C.

For over 0 deg. C : 0.2 deg. C \pm 0.1 deg. C.

(c) Pressure Gauge: With the accuracy of $\pm 1\%$ for maximum scale value from 10 to 90%, and $\pm 1.9\%$ 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.

10.2.2 Water System

Minimally, preparation before balancing water system should include collecting the following:

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- (a) Collection of documents:
 - (i) Pump submittal data; pump curves, motor data, etc.
 - (ii) Starter sizes and overload protection information
 - (iii) Control valve Cv ratings and temperature control diagrams
 - (iv) Chiller and heat exchanger information; flow and head loss
 - (v) Terminal unit information; flow and head loss data.
 - (vi) Pressure relief and reducing valve setting
 - (vii) Flowmeter calibration curves
 - (viii) Other pertinent data
- (b) Inspect the system completely to ensure that
 - (i) It has been flushed out, it is clean, and all air is removed;
 - (ii) All manual valves are open or in operating position;
 - (iii) All automatic valves are in their proper positions and operative; and
 - (iv) The expansion tank is properly charged.
- (c) Place controls in position for design flow.
- (d) Examine flow diagram and piping for obvious short circuits; check flow and adjust the balance valve.
- (e) Take pump suction, discharge, differential pressure, Volt, Ampere, Power readings at both full and no flow. For larger pumps, a no-flow condition may not be safe. In any event, valves should be closed slowly.
- (f) Establish a pump curve, and determine approximate flow rate.
- (g) If a total flow station exists, determine the flow and compare with pump curve flow.
- (h) If possible, set total flow about 10% high using the total flow station first and the pump differential pressure second; then maintain pumped flow at a constant value as balance proceeds by adjusting the pump throttle valve.
- (i) Any branch main flow stations should be tested and set, starting by setting the shortest runs low as balancing proceeds to the longer branch runs.
- (j) Open all valves to full open position, including coil stop valves, bypass valves, and return line balancing cocks.
- (k) Check all air vents at high points of water systems and determine all are installed and operated freely. Bleed any air out of systems.
- (l) Check and set operating temperatures of chillers to design requirements.
- (m) Systems are to be balanced by opening all valves, closing all by-pass and setting all mixing valves to full coil flow. Water systems shall be cleared of air. Verify that the system has been properly cleaned, flushed and treated before testing.

Basically, the following tests and adjustments are required.

- (i) Test and adjust all pumps to deliver the proper gpm. Pumps shall operate without objectionable noise or cavitation. Plot actual pump and system performance points on manufacturer's pump curves.
- (ii) Test and adjust correct water flow through chiller, major items of equipment and main water circuits. The balancing valves, provided on the equipment shall be used for adjustment.

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- (iii) Check capacity output of chillers and set water flow rate for proper data.
- (iv) Set pressure drops across coil by-pass to match coil full-flow pressure drop.
- (v) Record and check the following items at each cooling equipment: Flow Rate, Inlet Water Temperature, Leaving Water Temperature, Pressure drop of each coil, Pressure drop across by pass valve, Pump operating suction and discharge pressures and final total discharge head, List of all mechanical specifications of pumps Rated and actual running amperage and KW of Pump Motor.

(r) Water side measurements Instruments:

- (i) Magnetic flow meter
- (ii) Mercury Thermometer
- (iii) Calibrated Pressure Gauge
- (iv) Fluid System Digital Electronic Differential Pressure Meters

(s) Unit capacity in Tons Refrigeration shall be computed from the temperature readings, pressure readings and water flow measurements. Flow measurements shall be preferably through flow meters. Pumps shall be tested for the discharge head, flow and BHP. Where it is not possible to measure the flow, atleast the discharge head and BHP (on the input side) shall be field tested.

(t) Systems shall be balanced for Water flow rates within the following tolerance:

Chilled Water	2% of flow
Other	5% of flow

10.2.4 Pumps

(a) The manufacturer's test certificates with Sr. No., head, discharge will be furnished and verified against contract requirements.

(b) 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.

(c) The following tests shall be conducted at the rated RPM of the pump in the presence of Engineer in Charge for performance as per relevant IS Standards.

- ❖ Discharge Vs Head
- ❖ Discharge Vs Efficiency
- ❖ Discharge Vs BHP
- ❖ Hydraulic tests for casing at 1.5 times of the design pressure

(d) Performance tests shall be conducted at the following operating points.

- ❖ Shut Off - Rated duty point
- ❖ 120% rated capacity.

(e) Actual head shall be calculated and confirmed by the vendor at the time of tendering. The pump head calculation based on the approved shop drawings shall be submitted by the contractor and upgrade the pump & motor to the requirement, without any extra cost to the Engineer in Charge.

10.2.5 Sound Level

Sound pressure level of the pump driver shall be max 85 dbA* measure at 2 m distance from pumps for the duty points.

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

10.2.6 Cooling tower

a) Salient features such as make, model, dimensions, materials used, constructional details, number and size of nozzles, headers, size of tank, etc. should be verified against the requirements. Inspection of cooling tower in knocked down condition would be carried out at the site.

b) Manufacturer's test certificate certifying the capacity of cooling tower and static balancing of fan should be furnished.

10.2.7 Pipes and Valves

(a) All piping shall be tested to hydrostatic test pressure of at least two and half times the maximum operating pressure, but not less than 20 kg/sq.cm, whichever is higher for a period of not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified, retested and approved.

(b) Piping may be tested in sections and such sections shall be securely capped, then re-tested for the entire system.

(c) The Contractor shall make sure that proper noiseless circulation of fluid is achieved through all coils in the system concerned. If proper circulation is not achieved due to air bound connection, the contractor shall rectify the defective connections. He shall bear all expenses for carrying out all the above rectifications including the tearing up and re-finishing of floors and walls if required.

10.2.8 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.

10.3 Testing, Adjusting and Balancing (TAB)

(a) TAB of Air Conditioning (AC) equipment (Chillers, Pumps, Cooling Towers, etc.), Sound levels, Vibrations etc. of AC installation shall be carried out as per "Test & Balance Procedure" by Associated Air Balance Council, USA, or National Environment Balancing Bureau USA, or SMACNA or ASHRAE or ISHRE or BIS codes guidelines and provisions of this Specifications.

(b) The process shall include:

- (i) balancing water Hydronic balancing,
- (ii) adjusting the total system and Equipment
- (iii) Measuring electrical performance of AC equipment,
- (iv) establishing quantitative performance of all equipment,
- (v) verifying automatic control system operation and sequences of operation, and
- (vi) sound and vibration measurement

(c) Report forms. : Test data sheets arranged in logical order for submission and review. They should also form the permanent record to be used as the basis for any future TAB work.

(d) The AC contractor shall provide a minimum but not limited to the following instruments:

- (i) Microprocessor based calculation meter to measure DB and WB temperature, RH and Dew point
- (ii) Pitot tube
- (iii) Electronic rotary vane Anemometer
- (iv) Accubalance flow measuring hood
- (v) Manometer
- (vi) Techo meter
- (vii) Anemometer
- (viii) Sound level meter
- (ix) Vibration analyzer
- (x) Hygrometers
- (xi) Air differential pressure gauges
- (xii) Hydronic Differential pressure gauges
- (xiii) Bourdon tube gauges
- (xiv) Psychometers
- (xv) Flow meters
- (xvi) Any other testing equipment required to carry out the above tests

NOTE:

1. All calibrated instruments for testing shall be provided by the air conditioning contractor. Valid calibration certificates for such equipment shall be submitted before carrying out the tests.
2. Thermometers used for measurement of temperature of water/ refrigerant shall have graduation of 0.1 deg C and shall be got calibrated from N.P.L. or any recognized test house beforehand.
3. Thermometers used in the psychomotor shall have graduations of 0.2 deg C and shall be calibrated as at (2) above.
4. Pressure gauges shall also be got calibrated beforehand from a recognized test house.
5. Orifice type of flow meters shall be used for measuring flow rate through the condensers and chillers.

If due to any reason, internal load mentioned in the tender specifications is not available, psychometric computations for actual load conditions will be done in the plant, if found satisfactory will be accepted

10.4 Acceptance Test:

a) A comprehensive “Acceptance Test Plan” document, containing various aspects of the ‘Acceptance Test’ to demonstrate all the features of the Central Air conditioning System as envisaged in this tender document and claimed by the contractor shall be held accordingly. The Acceptance Test shall be deemed to be complete only on the issuance of the ‘Acceptance Certificate’ by the Bank to the contractor.

b) Without limiting the scope of the Acceptance Test, the Acceptance Test shall **cover the following tests**, to be carried out in this connection. On evaluation of the Acceptance Test results and if required in view of the performance of the Central Air conditioning System, as observed during the Acceptance Test, the Vendor shall provide necessary solution at his own cost thereof, to ensure the performance of the Central Air conditioning System is meeting the requirement, as envisaged in this document.



Proforma for test results & notes on test instruments and capacity computations

FACTORY ACCEPTANCE TEST

Location :

Make : _____ Test Condition : **100%**
 Model No : _____ Test Date : _____
 Serial No. : _____ Test Time : _____
 Refrigerant : _____ Kgs/lbs Ambient Temp : C

Sl. No.	Item	Test Results	
1.	Ambient conditions	i) D.B.Temp ii)W.B.Temp iii) %RH	- deg C - deg C - %
2.	Compressors (each compressor at 100%, 75%, 50%, 25%)	i.R.P.M ii.Suction pressure iii.Suction temperature iv.Discharge pressure v.Condensing temperature vi.Oil pressure	- Rpm - Kg/sq.cm - °C - kg/sq.cm - °C - kg/sq.cm (psi)

		vii.Current/ Voltage/ PF	
3.	Compressor Motors	i.R.P.M. ii.Rated Capacity iii.Rated Voltage iv.Rated Current v.Starting current vi. Voltage, currents and starting currents: (i)at 100% load (ii) at partial load (a) 75% (b) 50% (c)25% iii) Power factor	- Rpm - HP - Volts - amps - amps - V, A, A - V, A, A - V, A, A - V, A, A - (lag)
4.	Water Chillers (to be recorded at 100%, 75%, 50%, 25% load, but with constant flow for each condenser for clean tube and after 3 months)	i.Refrigerant evaporating pressure ii.Refrigerant evaporating temperature iii.Water flow rate iv.Water temperature Entering Leaving v.Water pressure Entering Leaving vi.Tube condition	- Kg/sq.cm - deg C - LPM - deg C - deg C -Kg/sq.cm -Kg/sq.cm
5.	Condensers (to be recorded at 100%, 75%, 50%, 25% load, but with constant flow for each condenser for clean tube and after 3 months)	i.Refrigerant condensing pressure ii.Refrigerant condensing temperature iii.Water flow rate iv.Water temperature Entering Leaving v.Water pressure Entering Leaving vi.Tube condition	- Kg/sq.cm - deg C - LPM - deg C - deg C -Kg/sq.cm -Kg/sq.cm
6.	Pump sets (to be recorded for each pump)	i.Flow rate ii.R.P.M. iii.Motor current iv.Discharge pressure	- Lit/sec (gpm) - Rpm - Amps - Kg/sq.cm

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		v.Suction pressure	- Kg/sq.cm
7.	Pump motor (to be recorded for each pump)	i.Rated Capacity ii.Rated Voltage iii.Rated Current iv.Actual current v.Starting current vi.Insulation resistance vii.Power viii.Power factor	- HP - V - A - A - A - MΩ - kW - (lag)
8.	Cooling Towers	i.Water flow rate ii.Water temperature Entering Leaving iii.Wet bulb approach iv.Fan motor current v.Fan motor voltage vi.Fan motor R.P.M	- Lit/sec (gpm) - deg C - deg C - deg C - amps - volts - rpm
9.	Controls	Function of each control shall be tested and report furnished	
10.	Electric Motors	i.Insulation resistance ii.Starting current iii.Full load current iv.Voltage v.PF	

Performance Results:

1-Chiller:

The temperatures of inlet and outlet water and water flow shall be measured as for the condenser.

The capacity of chiller in BTU/Hr = Water flow through chiller (Lb/hr) X dT (deg.F)

$$\frac{\% \text{ Capacity}}{\text{Actual Capacity}} \times 100\% = \frac{\% \text{ KW/Ton}}{\text{Actual Kw/Ton}} \times 100\% =$$

$$\frac{\text{Design Capacity}}{\text{Design Kw/Ton}} \times 100\% =$$

$$\text{Heat Balance} = \frac{Q_{\text{evap}} + W_{\text{input}} - Q_{\text{cond}}}{Q_{\text{cond}}} \times 100\% =$$

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The capacity of the plant in TR = $\{ \text{Water flow through chiller (in gpm)} \times dT(F) \} / 24$

Where $dT(F)$ = Temperature of entering water - Temperature of leaving water

2. Condensers:

Heat rejection by the condenser in tons = $(\text{water flow through the condenser} \times \text{temperature difference}) / 24$

The capacity of the plant = Heat rejection by condenser in tons - $\{ (\text{compressor motor KW} \times 3400) / 12000 \}$

3. Compressor

Bhp/ton of the compressor = $\text{Power input in KW} / (0.746 \times \text{compressor capacity in tons})$

4. Cooling Tower

Temperature of hot water, temperature of cold water in the sump and Wet Bulb temperatures shall be measured. The cooling tower efficiency shall be computed as follows.

$N = (\text{Temp. of hot water} - \text{Temp. of cold water}) / (\text{Temp. of hot water} - \text{Ambient Wet Bulb Temperature})$

FACTORY ACCEPTANCE TEST

Location :

Make : _____

Test Condition : **75%**

Model No : _____

Test Date : _____

Serial No. : _____

Test Time : _____

Refrigerant : _____ Kgs/lbs

Ambient Temp : C

	Item	Unit	Design	Actual 1	Actual 2	Actual 3	Average
Chiller	Capacity	Ton					
	Chilled Water in	C					
	Chilled Water out	C					

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	Chilled Water Flow	m3/h GPM					
	Evap. Pressure Drop	KPa					
	Range	C					
	Liquid Type	-					
	Pass Arrangement	-					
Condenser	Condenser Water in	C					
	Condenser Water Out	C					
	Condenser Water Flow	m3/h GPM					
	Cond. Pressure Drop	KPa					
	Range	C					
	Liquid Type	-					
	Pass Arrangement	-					
Motor/ Compressor	Current A	A					
	Power Factor						
	Voltage	V					
	Frequency	Hz					
	Power KW						
	Total KW/Ton						
	Motor Speed	RPM					
	C.O.P.						

Performance Results:

% Capacity

% KW/Ton

Actual Capacity

Actual Kw/Ton

_____ X 100% =

_____ X 100% =

Design Capacity

Design Kw/Ton

$$\text{Heat Balance} = \frac{Q_{\text{evap}} + W_{\text{input}} - Q_{\text{cond}}}{Q_{\text{cond}}} \times 100\% =$$

FACTORY ACCEPTANCE TEST**Location :**

Make : _____

Test Condition : **50%**

Model No : _____

Test Date : _____

Serial No. : _____

Test Time : _____

Refrigerant : _____ Kgs/lbs

Ambient Temp : C

	Item	Unit	Design	Actual 1	Actual 2	Actual 3	Average
Cooler	Capacity	Ton					
	Chilled Water in	C					
	Chilled Water out	C					
	Chilled Water Flow	m3/h GPM					
	Evap. Pressure Drop	KPa					
	Range	C					
	Liquid Type	-					
	Pass Arrangement	-					
Condenser	Condenser Water in	C					
	Condenser Water Out	C					
	Condenser Water Flow	m3/h GPM					
	Cond. Pressure Drop	KPa					
	Range	C					
	Liquid Type	-					
	Pass Arrangement	-					
Motor/ Compressor	Current A	A					
	Power Factor						
	Voltage	V					
	Frequency	Hz					
	Power KW						
	Total KW/Ton						
	Motor Speed	RPM					
	C.O.P.						

Performance Results:

% Capacity

% KW/Ton

Actual Capacity

Actual Kw/Ton

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$$\frac{\text{Design Capacity}}{\text{Design Kw/Ton}} \times 100\% = \text{_____} \times 100\% =$$

$$\text{Heat Balance} = \frac{Q_{\text{evap}} + W_{\text{input}} - Q_{\text{cond}}}{Q_{\text{cond}}} \times 100\% =$$

FACTORY ACCEPTANCE TEST

Location :

Make : _____ Test Condition : **25%**
 Model No : _____ Test Date : _____
 Serial No. : _____ Test Time : _____
 Refrigerant : _____ Ambient Temp : C
 Kgs/lbs

	Item	Unit	Design	Actual 1	Actual 2	Actual 3	Average
Cooler	Capacity	Ton					
	Chilled Water in	C					
	Chilled Water out	C					
	Chilled Water Flow	m3/h GPM					
	Evap. Pressure Drop	KPa					
	Range	C					
	Liquid Type	-					
	Pass Arrangement	-					
Condenser	Condenser Water in	C					
	Condenser Water Out	C					
	Condenser Water Flow	m3/h GPM					
	Cond. Pressure Drop	KPa					
	Range	C					

	Liquid Type	-					
	Pass Arrangement	-					
Motor/ Compressor	Current A	A					
	Power Factor						
	Voltage	V					
	Frequency	Hz					
	Power KW						
	Total KW/Ton						
	Motor Speed	RPM					
	C.O.P.						

Performance Results:

$$\frac{\text{Actual Capacity}}{\text{Design Capacity}} \times 100\% = \frac{\text{Actual Kw/Ton}}{\text{Design Kw/Ton}} \times 100\% =$$

$$\text{Heat Balance} = \frac{Q \text{ evap} + W \text{ input} - Q \text{ cond}}{Q \text{ cond}} \times 100\% =$$

Test Certificate and Maintenance Guarantee

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief, it complies with Indian Electricity rules as amended from time to time.

Electrical installation at _____

Voltage and system of supply _____

	Particulars of work	Nos./Meters	Capacity	Test results *
1				
2				
3				
4				
5				

* Add extra sheets if required.

	Description	Values
	Earthing	
1	Type of material & size of electrode	
2	Number of electrodes	
3	Size of material of earth wire	
	Test results	
1	Insulation resistance for the whole installation	
	(i) Between conductors	
	(ii) Between each conductor and earth	
2	Resistance of earthing electrode or earthing system	
3	Maximum earthing resistance of installation	
4	Insulation resistance at underground cables	
5	Polarity test	

I/We guarantee the installation for a period of twelve months against defective materials and workmanship, the guarantee commencing from the date the installation is taken over by the owner and during the period of guarantee I/we shall rectify or replace defects in material or workmanship free of cost to the owner.

I/We submit herewith six sets of drawings showing the installation and layout as actually executed.

(Signature of Supervisor)

Name _____

Address _____

(Signature of Contractor)

Name _____

Address _____

Section-XI

Check List – Commercial Conditions

Sr. No.	Description	Bank's Terms	Whether acceptable to the tenderer or not (please indicate YES or NO)
1.	Validity	90 days from the date of opening of tender Part-I	
2.	EMD	As per Memorandum	
3.	Insurance	As per tender section III	
4.	Retention Money	As per tender section III	
5.	Bank Guarantee	As per tender section III	
6.	Terms of payment for equipment	As per clause "Terms of payment" Section III: General Instruction to tenderers	
7.	Prices	Firm, inclusive of all taxes, duties, insurance policies, transportation, handling, loading, unloading, testing, levies etc. during the currency of contract.	
8	Technical Specifications	As per Section VI and Section VII (data to be filled completely)	
9.	Defect Liability period	12 months from date of handing over of the entire system.	
10	After-sales service	During the DLP of 12 months from handing over the system to Bank and minimum 14 years thereafter under CAMC as per scope mentioned in this tender.	
11.	Committed period of system maintenance	At least 15 years after handing over of the entire system.	
12.	Terms, Conditions and payment during CAMC	Confirm that the terms, conditions and payment of the CAMC and conditions for renewal of CAMC are acceptable.	
13.	Time allowed for rectification	As per tender Section III	

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14.	Penalty for delay in providing service	As per tender clause section III	
15.	Completion period	As per memorandum	
16.	Liquidated damages	Liquidated damages @0.25% of the contract amount per week of delay subject to maximum of 10% of the contract value for the delayed period.	
17	Drawings and Documents	1. GA Drawing indicating the schematic plan, overall dimensions, SLD with detailed calculation of each equipment design parameters suitable for site requirement. 2. Architectural/Schematic drawing of BMS/SCADA system	
18.	Statuary Approval/ Non Objection Certificate From Local statuary Authorities, if required	Shall Include for 1) Central /Regional Pollution Board 2) Chief Electrical Inspector Any other local statuary Authority 3) Any other local / statutory Authority	
19.	Factory & site Tests	As per tender sections.	

Part II should not contain any terms and conditions but only priced bill of quantity. Terms and conditions, if any, incorporated in Part II, will not valid or considered.

Place:

Date:

Seal and Signature of Tenderer

SECTION XII

ANNEXURES

TO

**VARIOUS SECTIONS
AND SCHEDULES**

**Format for power of attorney for signing of proposal
(On Non-Judicial Stamp Paper of appropriate value)**

Know all men by these presents, We.....(Name of the Tenderer and address of their registered office) do hereby constitute, appoint and authorize Mr. / Ms.(Name and residential address of Power of Attorney holder) who is presently employed with us and holding the position ofas our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our bid for the **“Supply, Installation, Testing and commissioning of Central Air Conditioning for Bank’s Central Office Building at Fort, Mumbai.”** including signing and submission of all documents and providing information / responses to RBI, representing us in all matters before RBI, and generally dealing with RBI in all matters in connection with our proposal for the said Project.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

Note:

Power of Attorney should be properly stamped and notarized. Power of Attorney furnished shall be irrevocable.

Signature/(s) of the Tenderer Name/(s)

Stamp/Seal of the Tenderer

(NB: This guarantee will require stamp duty as applicable in the state, where it is executed and shall be signed by the official whose signature and authority shall be verified.)

Eligibility Criteria forms

Format- 1

Basic Information (To be read with Clause 1 Section III)

1(a)	Name of the Interior Contractor/firm	
2.	Details of registration of the firm : whether Sole Proprietorship/ Partnership firm /Private Limited/ Limited or Co- operative Body etc.	
2(a)	Name of the proprietor or Partners./ directors :	
3(a)	Registered Address:	
3(b)	Address for correspondence	
4(a)	Contact Person	
4(b)	Designation	
4(c)	Telephone:	
4(d)	Mobile no.	
4(e)	FAX/Tele-fax:	
4(f)	e-mail id	
5	GST Registration details and no.	
5(a)	Details of registration of labour, ESI, EPF if any	
6	Number of years of experience of Interior Contractor / Firm of Interior Contractor in the field.	
7	In case the company is subsidiary, the involvement, if any, of the Parent Company in the Bank's proposed work :	

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8	Was the tenderer ever required to suspend the eligible works for a period of more than six months continuously after commencement? If yes, then furnish the reasons thereof.	
9	Has the agency or any constituent partner in case of partnership firm, ever abandoned the awarded works before their completion? If so, give name of the project and reasons for abandonment.	
10	Has the agency or any constituent partner in case of partnership firm, ever been debarred /black-listed for competing in any organization at any time? If so, give details	
11	Has the agency or any constituent partner in case of partnership firm, ever been convicted?	
12.	Whether the agency is involved in frequent civil suit /litigations in the contracts/being executed now. If yes please furnish the details in proforma given below.	Yes / No

Signature of tenderer

Name & Designation

Date and Place

Office Seal

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PREVIOUS WORK EXPERIENCE (To be read with Clause 1 Section III)**List of important similar works executed by the Contractor
(Including works completed on or before January 31, 2020)**

Attach supporting documents

Sl no	Name of similar work and location	Nature of work / items of work involved in the contract	Name of the owner/ client and Architect. Also indicate whether Government or Semi-Government or Private Body with full postal address.	Cost of work		Period of completion			Reason for delay, if any	Whether work was left incomplete or contract was terminated from either side?	Litigation/ Arbitration, if any with details.	Any other relevant information.
				Contract Amount (in ₹ lakh)	Actual value of work done (in ₹ lakh)	Date of commencement of work	Scheduled date of completion	Actual date of completion				
1.	2.	3.	4.	5 a	5 b	6a	6b	6c	7	8	9	10

Signature of the tenderer with seal

Works qualifying Eligibility (To be read with Clause 1 Section III)
Details of similar work/s (qualifying) completed during last five years on or after January 31, 2020
(The work/s costing equal or above the minimum value specified in pre-qualification criteria)

Sr. no.	Name of similar work and location	Nature of work / items (brief description) of work involved in the contract.	Name of the owner/ client and Architect. Also indicate whether Government or Semi-Government or Private Body with full postal address.	Name, e-mail ID, telephone (land line and mobile) nos., Fax no. of the contact executive (the person of tenderer's client who can be contacted by the Bank in case it is so needed).	Cost of work		Period of completion			Reason for delay, if any	Whether work was left incomplete or contract was terminated from either side?	Litigation/Arbitration, if any with details.	Any other relevant information.
					Contract Amount (₹ lakh)	Actual value of work done (in ₹ lakh)	Date of commencement of work	Scheduled date of completion	Actual date of completion				
1.	2.	3.	4.	5.	6 a	6b	7a	7b	7c	8	9	10	11

Signature of the tenderer with seal

CLIENT's CERTIFICATE REGARDING PERFORMANCE OF INTERIOR CONTRACTOR (On Client's Letter Head) (To be read with Clause 1 Section III)

Name & address of the Client :

Details of Works executed by Shri /M/s :

1. Name of work with brief particulars of items involved (as per schedule of quantities) :
2. Whether the framework (i.e. inner metal skeleton) was designed (in-house or get designed from professional/s) or proprietary for its structural fitment, sturdiness, stability, self-supportiveness and safety of the system by the Interior Contractor as per requirement of system :
Yes / No
3. Agreement No. and date :
4. Agreement amount :
5. Date of commencement of work :
6. Stipulated date of completion :
7. Actual date of completion :
8. Details of compensation levied for delay (indicate amount) if any :
9. Gross amount of the work completed and paid :
10. Name and address of the authority under whom works executed :
11. Whether the Interior Contractor employed qualified Supervisor during execution of work :
12. i) Quality of work (indicate grading): Outstanding/Very Good/ Good/Satisfactory/poor
(ii) Amt. of work paid on reduced rates, if any.
13. i) Did the Interior Contractor go for arbitration?
ii) If yes, total amount of claim
iii) Total amount awarded
14. Comments on the capabilities of the Interior Contractor.
 - a) Technical proficiency : Outstanding/Very Good/ Good/Satisfactory/poor
 - b) Financial soundness : Outstanding/Very Good/Good/Satisfactory/poor
 - c) Mobilization of adequate T&P : Outstanding/Very Good/Good/Satisfactory/poor
 - d) Mobilization of manpower : Outstanding/Very Good/Good/Satisfactory/poor

e) General behavior : Outstanding/Very Good/Good/Satisfactory/poor

Signature of the Reporting Officer* with Office seal

Note: (i) All columns should be filled in properly

(ii) * Clients Report/certificate (a) for each of qualifying similar completed works carried out for Government/ public sector companies, the certificate should be signed by the concerned Executive Engineer or an officer in an equivalent or higher rank (b) for each of the qualifying similar completed works carried out for Private companies shall accompany Tax deduction at source, TDS certificate has to be submitted for proving the credentials/contract amount.

List of maintaining similar system for last two years ending January 31, 2025* (To be read with Clause 1 Section III)

Sr. no.	Name of the work and location	Nature of work / items of work involved in the contract	Name of the owner and Architect Whether Government or Semi- Government or Private Body with full postal address.	Contract Amount in ₹	Contract period	Penalty levied, if any	Remarks, if any
1	2	3	4	5	7	8	

*Attach supporting documents

Signature of the tenderer with seal

FINANCIAL STATUS (To be read with Clause 1 Section III)

Sr.no.	Details	Financial Year		
		April 1, 2021 to March 31, 2022 ₹ in lakh	April 1, 2022 to March 31, 2023 ₹ in lakh	April 1, 2023 to March 31, 2024 ₹ in lakh
1	Annual financial turn over certified by Chartered Accountant.			
2	Income Tax returns for the year			

Note:

Statement shall be supported by copies of audited financial statements/ accounts of the business of the tenderer duly certified by a Chartered Accountant. The Income Tax Clearance Certificates / Income Tax Assessment orders along with the latest final accounts of the business of the Interior Contractor duly certified by a Chartered Accountant, copied of the Income Tax clearance Certificate/ Income Tax assessment orders along with the latest final accounts of business of the Interior Contractor duly certified by a Chartered Accountant as a proof creditworthiness.

Signature of the tenderer with seal

Form of bankers' solvency certificate from a scheduled bank (To be read with Clause 1 Section III)

This is to certify that to the best of our knowledge and information M/s./Sri..... 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 certificates 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 CGM-I-C, RBI.

2. In case of partnership firm, certificate to include names of all partners as recorded with the Bank

Mandate Form (Banker details)

Madam,

I / We hereby give my / our consent to accept the payments of my / our bills through online e-payment system. My Bank details are as under:-

Particulars	Details
Name of Account holder	
Address of Beneficiary with e-mail	
Telephone / Mobile Nos.	
PAN Card No.	
Bank Name	
Branch Name & Address	
IFSC Code	
Account No.	
Type of A/c (CA/SB/CC)	
Contact details of Person In-Charge of Work (Name, Mobile No and Email Id)	
Registered under GST Act, 2017 (Yes/ No)	
GSTIN	

Composition Taxable (Yes/ No)	
Registered under MSMED Act 2006 (Yes/ No)	
UAN No. (If Registered as MSME)	

***NOTE:** It is mandatory to provide Cancelled Cheque and Copies of PAN Card, GST Registration Certificate and MSME Registration Certificate along with this form.

Signature

(Seal & Name)

Place:

Pro forma of bank guarantee for earnest money deposit/bid security

(On Non-Judicial Stamp Paper of appropriate value)

Place: _____

Date: _____

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of Work **Supply, Installation, Testing and commissioning of Central Air Conditioning System for Bank’s Central Office Building at Fort, Mumbai**

Ref.: NIT/Advt.No. date

WHEREAS The Reserve Bank of India, having its Central Office at Shahid Bhagat Singh Road, Mumbai (hereinafter called the ‘RBI’) has invited tenders for the captioned work (hereinafter called “the said tender”) on the terms and conditions mentioned in the said tender documents. It is one of the terms of invitation of tenders that the tenderer shall furnish a Bank Guarantee for a sum of ₹----- Lakh (Rupees --- only) as Earnest Money Deposit (EMD). M/s. (Name of the Tenderer/Tenderer) _____, (hereinafter called as “the Tenderer/ Tenderer”), who are our Clients/Constituents intend to submit their tender/ Bid for the said work and have requested us to furnish Bank Guarantee to RBI in respect of the said sum of ₹----- (Rupees ----- only) in respect of EMD.

NOW THIS GUARANTEE WITNESSETH

1. We (Name of the Bank) do hereby agree with and undertake to RBI, their Successors, Assigns that in the event of the RBI coming to the conclusion that the Tenderer have not performed their obligations under the said conditions of the tender or have committed a breach thereof, which conclusion shall be binding on us as well as the said Tenderer; we shall on demand by the RBI, pay without demur to the RBI, a sum of Rs. (Rupees only) or any lower amount that may be demanded by the RBI. Our guarantee shall be treated as equivalent to the Earnest Money Deposit for the due performance of the obligations of the Tenderer under the said Conditions, provided, however, that our liability against such sum shall not exceed the sum of Rs. (Rupees only).

2. We also agree to undertake to and confirm that the sum not exceeding Rs. (Rupees only) as aforesaid shall be paid by us without any demur or protest, merely on demand from the RBI on receipt of a notice in writing stating that the amount is due to them and we shall not ask for any further proof or evidence and the notice from the RBI shall be conclusive and binding on us and shall not be questioned by us in any respect or manner whatsoever. We undertake to pay the amount claimed by the RBI within a period of one week from the date of receipt of the notice as aforesaid.

3. We confirm that our obligation to the RBI under this guarantee shall be independent of the agreement or agreements or other understandings between the RBI and the Tenderer. This guarantee shall not be revoked by us without prior consent in writing of the RBI. We hereby further agree that –

a) Any forbearance or commission on the part of the RBI in enforcing the conditions of the said agreement or in compliance with any of the terms and conditions stipulated in the said tender and/or hereunder or granting of any time or showing of any indulgence by the RBI to the Tenderer or any other matters in connection therewith shall not discharge us in any way and our obligation under this guarantee. This guarantee shall be discharged only by the performance by the Tenderers of their obligations and in the event of their failure to do so, by payment by us of the sum not exceeding Rs. (Rupees only).

b) Our liability under these presents shall not exceed the sum of Rs. (Rupees only).

c) Our liability under this agreement shall not be affected by any infirmity or irregularity on the part of our said constituents/clients in tendering for the said work or their obligations there under or by dissolution or change in the constitution of our said constituents.

d) This guarantee shall remain in force up to (six months from the last date of receipt of tender) provided that if so desired by the RBI, this guarantee shall be renewed for a further period as may be indicated by them on the same terms and conditions as contained herein.

e) Our liability under these presents will terminate unless these presents are renewed as provided hereinabove on the or on the day when our said constituents comply with their obligations, as to which a certificate in writing by the RBI alone is the conclusive proof whichever date

is later. Unless a claim or suit or action is filed against us within or any extended period, all the rights of the RBI against us under this guarantee shall be forfeited and we shall be released and discharged from all our obligations and liabilities hereunder.

Yours faithfully,

For and on behalf of Bank.

Authorised Official (with seal)

(NB: This guarantee will require stamp duty as applicable in the state, where it is executed and shall be signed by the official whose signature and authority shall be verified).

Proforma of Bank Guarantee For Performance Security Deposit

(On Non-Judicial Stamp Paper of appropriate value purchased in the name of the issuing bank)

Place : _____

Date : _____

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of work: **Supply, Installation, Testing and commissioning of Central Air Conditioning System for Bank’s Central Office Building at Fort, Mumbai** - Bank Guarantee for performance security deposit/ Retention Money

WHEREAS Reserve Bank of India, having its Central Office at Shahid Bhagat Singh Road, Mumbai, (hereinafter called “the RBI”) has awarded the Contract for the captioned project (hereinafter called the "Contract") to M/s _____ (Name of the Contractor) (hereinafter called "the said Contractor" which expression shall include its successors and assigns). AND Whereas the Contractor is bound by the said Contract to submit to RBI a Performance Security for a total amount of ₹. _____ (Rupees _____ only) (Amount in figures and words) for the due fulfilment by the said contractor of the terms and conditions contained in the contract. We, _____ (Name of the Bank), (hereinafter called “the Bank”), at the request of M/s _____, the contractor, do hereby

undertake to pay to the RBI an amount not exceeding Rs _____ as Performance Guarantee for due fulfilment of the terms and conditions of the contract.

NOW THIS GUARANTEE WITNESSETH

1. We (Name of the Bank) do hereby agree with and undertake to RBI, their Successors, Assigns that in the event of the RBI coming to the conclusion that the Contractor has not performed his obligations under the said conditions of the contract or have committed a breach thereof, which conclusion shall be binding on us as well as the said contractor; we shall on demand by the RBI, pay without demur to the RBI, a sum of Rs. (Rupees only) or any lower amount that may be demanded by the RBI. Our guarantee shall be treated as equivalent to the Performance Guarantee Amount for the due performance of the obligations of the Contractor under the said Contract, provided, however, that our liability against such sum shall not exceed the sum of Rs. (Rupees only).

2. We also agree to undertake to and confirm that the sum not exceeding Rs. (Rupees _____ only) as aforesaid shall be paid by us without any demur or protest, merely on demand from the RBI on receipt of a notice in writing stating that the amount is due to them and we shall not ask for any further proof or evidence and the notice from the RBI shall be conclusive and binding on us and shall not be questioned by us in any respect or manner whatsoever. The Bank shall pay to RBI any money so demanded notwithstanding any dispute/disputes raised by the Contractor in any suit or proceedings pending before any Court, Tribunal or Arbitrator/s relating thereto and the liability under this guarantee shall be absolute and unequivocal. We undertake to pay the amount claimed by the RBI within a period of one week from the date of receipt of the notice as aforesaid.

3. We confirm that our obligation to the RBI under this guarantee shall be independent of the agreement or agreements or other understandings between the RBI and the Contractor.

4. This guarantee shall not be revoked by us without prior consent in writing of the RBI. We hereby further agree that –

a) Any forbearance or commission on the part of the RBI in enforcing the conditions of the said agreement or in compliance with any of the terms and conditions stipulated in the said Contract and/or hereunder or granting of any time or showing of any indulgence by the RBI to the Contractor or any other matters in connection therewith shall not discharge us in any way and our obligation under this guarantee. This guarantee shall be discharged only by the performance by the Contractor of their obligations and in the event of their failure to do so, by payment by us of the sum not exceeding Rs. (Rupees only).

b) Our liability under these presents shall not exceed the sum of Rs. (Rupees only) .

c) Our liability under this agreement shall not be affected by any infirmity or irregularity on the part of our said constituents/clients or their obligations thereunder or by dissolution or change in the constitution of our said constituents.

d) This guarantee shall remain in force up to (60 days beyond the Defect liability period) provided that if so desired by the RBI, this guarantee shall be renewed for a further period as may be indicated by them on the same terms and conditions as contained herein.

e) Our liability under these presents will terminate unless these presents are renewed as provided hereinabove on the or on the day when our said constituents comply with their obligations, as to which a certificate in writing by the RBI alone is the conclusive proof whichever date is later. Unless a claim or suit or action is filed against us within or any extended period, all the rights of the RBI against us under this guarantee shall be forfeited and we shall be released and discharged from all our obligations and liabilities hereunder.

In witness whereof I/We of the Bank have signed and sealed this guarantee on the ----- day of ----- (Month) (Year) being herewith duly authorized. For and on behalf of _____ (Name of the Bank)

Signature of authorized Bank official Name:

Designation Stamp/ Seal of the Bank

Signed, sealed and delivered for and on behalf of the Bank by the above named in the presence of:

Witness 1

Signature

Name

Address

(NB: This guarantee will require stamp duty as applicable in the state, where it is executed and shall be signed by the official whose signature and authority shall be verified).

Details of Service Set up at the place of work (To be read with Clause 1 Section III)

S. No.	Details of service Centre	
1	Address of Service Centre	
2	Contact numbers	
3	Staff strength	
4	Whether spares parts of the system have been stocked	

Undertaking regarding site visit by the Tenderer in order to understand the work and confirmation of technical sufficiency of design to deliver the objective

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of the Work: Supply, Installation, Testing and commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai.

We, _____, the tenderer for the above work confirm that we have visited the site and understood the proper details and the scope of the work for the proposed Central Air conditioning System such as Chillers, Pumps, Cooling Tower, BMS , existing Air handling Units (AHUs)etc.

We have examined the objective, technical specifications and bill of quantities indicated in the tender for the proposed Central Air conditioning System. After examining the same, we confirm that the technical specifications and the bill of quantities set out in the tender are sufficient to implement and deliver the stated objective of the tender. In case of any improvement is required to achieve the stated objective, the same will be provided without any additional cost to Bank.

Yours Faithfully,

(Authorised Signatory)

Name and address of the company with seal

Date:

Annexure 'J'

Schedule of Commercial Deviation:

We confirm that all commercial terms and conditions of the Bank except for deviations listed below.

Sr. No.	Section No.	Clause No.	Deviation proposed
1	2	3	4

Seal & Signature of Tenderer

Name:

Designation: Date

Schedule of Technical Deviations:

We confirm that all technical terms and conditions and specifications of the Bank except for deviations listed below.

Sr. No.	Section No.	Clause No.	Deviation proposed
1	2	3	4

Place:

Date:

Signature of Tenderer with seal

Proforma of Letter of Authorization from the OEM to participate in this Bid
(To be issued by the manufacturer of offered make of equipment on his letterhead)

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Subject: Authorization Letter to M/s _____ for participation in the bid for Supply, installation, testing & commissioning of Central Air Conditioning System for Bank's Central Office Building, Fort, Mumbai

We _____, (name and address of the manufacturer) the manufacturer of _____ having factories at _____ (addresses of manufacturing / development locations) do hereby authorize M/s _____ (name and address of the tenderer) to bid, negotiate and conclude the contract with you against the above-mentioned tender for the above equipment / software manufactured / developed by us.

S. No.	Name of Equipment	Model No.	Country of Origin	End of Sale (MMYY)	End of Support (Should not be before December 31, 2040) (MMYY)

2. In the unlikely event of M/s _____ (name and address of the tenderer) not remaining our authorized dealer/ partner at any time during the next 15 years (committed support period) and refusing to provide

after sales support to you as per the contract conditions, we undertake to extend required after sales support, including supply of spares, either directly ourselves or through any other authorized dealer/ partner.

3. The compliance sheet for the technical specifications for the above products have been confirmed and signed by us.

4. We have agreed with M/s to provide Back-to-Back onsite support for comprehensive maintenance of the above products for at least fifteen years from handing over of the system at their quoted rates.

Yours faithfully,

For and on behalf of

M/s _____(Name of the manufacturer) Signature of authorized signatory:

Name :

Address :

Date :

Designation :

Note: This letter of authority should be on the letterhead of the concerned manufacturer and should be signed by an authorized signatory of the manufacturer

Pro forma of undertaking for maintenance confirmation by the Tenderer

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of work: Supply, Installation, Testing & Commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai

We hereby undertake to maintain the (name of the equipment)_____to be installed by us in your Premises satisfactorily, for a period of not less than 14 years, after expiry of the defect liability/warranty period of one year, under comprehensive annual maintenance service contract at the quoted rates in tender and terms and conditions as per the contract conditions with a provision for annual price revision on the basis of the relevant indices based formula, as provided in the tender document.

In the unlikely event of M/s _____, the Original Equipment Manufacturer, failing to provide support in terms of spares etc. due to technological obsolescence or for any reason, we shall continue to provide all-inclusive service to your satisfaction, by arranging required spares etc. ourselves, within the rate quoted by us for the all-inclusive maintenance contract for the period accepted as above.

Yours faithfully,

()

Authorised signatory

(Name and address of the company with Company Seal)

Date:

Proforma of Undertaking / Declaration / Certificate by the Tenderer regarding country sharing land border with India

(To be submitted by tenderers on their letter head duly sealed and signed by the authorized signatory)

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of Work: Supply, Installation, Testing & Commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai

I / We (Name and address, including Country of location of tenderer) have read and understood the contents of the Office Memorandum (OM) F. No. 7/10/2021-PPD dated February 23, 2023 and its subsequent orders / revision issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, Government of India regarding the restrictions on procurement from a tenderer of a country which shares a land border with India.

2. I / We certify that (Name of the tenderer)

- i. is not from a country sharing land border with India, or
- ii. is from a country sharing land border with India and has been registered with the Competent Authority, the certificate of which is enclosed, or
- iii. is from a country sharing land border with India where Government of India has extended lines of credit, or
- iv. is from a country sharing land border with India where Government of India is engaged in development projects. (Strikeout whichever of the above is not applicable).

3. I / We further certify that (Name of tenderer) fulfils all requirements in this regard and is eligible to be considered under the provision of the above referred Office Memorandum and its subsequent orders / revision.

I/We also undertake that even in case of contracts where we are permitted by the Bank/RBI to

sub- contract I/we(Name of tenderer) will not sub-contract any work to a contractor from country(ies) sharing land border with India, unless such contractor fulfils all the requirements contained in the above referred office memorandum / order.

4. I/We..... have read the clause regarding restrictions on procurement from a tenderer having Transfer of Technology (ToT) arrangement. I/We certify that we do not have any ToT arrangement requiring registration with the competent authority."

OR

"I/We..... have read the clause regarding restrictions on procurement from a tenderer having Transfer of Technology (ToT) arrangement. I certify that we have valid registration to participate in this procurement."

5. I/We know and understand that, if this Undertaking / Declaration / Certificate submitted by us is found to be false, the Bank shall be free to reject / terminate our tender / Work Order and that the Bank shall also be free to initiate any legal action in accordance with law including forfeiting of Earnest Money Deposit / Performance Bank Guarantee / Security Deposit and / or debarring us from participating in tenders invited by the Bank in future.

Signature and name of the authorized signatory of the Tenderer with Rubber Stamp

Date:

Place:

Undertaking regarding declaration of debarment by public institution(s)

(To be submitted by the tenderer on their letter head)

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of Work: Supply, Installation, Testing & Commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai

1. I/We (Name of the tenderer) declares that

a) I/we or any of our allied firm* is/ are not debarred / suspended / blacklisted by any public institution / entity in India or any other country as on(last date of submission of bid).

b) I/ We or any of our allied firm* have not made any transgression in respect of the code of integrity (as mentioned in the tender) with any public institution / entity in India or any other country in last three years as on(last date of submission of bid).

c) we will inform the Bank in writing, in case, I/we or any of our allied firm* is/are debarred / suspended / blacklisted by any public institution / entity in India or any other country on or before award of work for the captioned work.

2. I/We(Name of the tenderer) declares that I/we or our allied firm*(Name of the allied firm(s)) is/ are debarred / suspended / blacklisted by(Name and address of public institution in India or any other country) and the same effective upto(date). A copy of such letter is attached for your information and record.

(Seal and signature of the tenderer)

Date

Place

(Note: strike out one of the above two declarations which is not applicable)

*Allied firm: A firm would be termed as "allied firm" if the management is common, or substantial or majority shares are owned by the banned/ suspended firm and by virtue of this it has a controlling voice. Further all successor firms will also be considered as allied firms

**Proforma for Indemnifying the Employer Against Non-Compliance to Contract labor
Rules/ regulations**

(To be submitted by successful tenderer on Non-Judicial Stamp Paper of appropriate value)

To
Smt. K. Nikhila
Chief General manager-in-Charge
Reserve Bank of India
Premises Department, Central Office
Mumbai

Madam,

Name of Work: Supply, installation, testing & commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai

We, M/s (Name of contractor), hereby undertake that we shall comply with all the statutory rules/ regulations with regard to the employment of contract labor and their payment.

We also hereby fully indemnify and keep indemnified the Employer, i.e. Reserve Bank of India, against payments to be made to the contract labor and for the observance of the laws in this regard without prejudice to our right to claim indemnity from our sub-contractors.

Yours faithfully,

For _____

Authorised signatory

Name and Address Of The Contractor:

Sign & Seal of The Contractor:

Date:

Place:

Pro forma for Indemnifying the Employer against Patent Rights

(On Non-Judicial Stamp Paper of appropriate value)

To

Smt. K. Nikhila

Chief General manager-in-Charge

Reserve Bank of India

Premises Department, Central Office

Mumbai

Madam,

Name of Work: Supply, installation, testing & commissioning of Central Air Conditioning System for Bank's Central Office Building at Fort, Mumbai

We, M/s _____ (Name of Contractor) hereby undertake to fully indemnify and keep indemnified the Employer i.e. Reserve Bank of India against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall ourselves pay any royalties, license fees etc. which may be payable in respect of any article or part thereof included in the contract or damages, cost and charges of all and every sort that may be legally incurred in respect thereof.

In the event of any claims made under or action brought against Employer in respect of any such matters as aforesaid, we shall, on being notified thereof, at our own expense, settle any dispute or conduct any litigation that may arise therefrom, provided that we shall not be liable to indemnify the Employer if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

Yours faithfully,

For _____

Authorised signatory

Name and Address of the Contractor:

Sign & Seal of the Contractor:

Date:

Place:

Proforma for disposal of E-waste

To,
Smt. K. Nikhila
Chief General manager-in-Charge
Reserve Bank of India
Premises Department, Central Office
5th Floor, Central Office Building
Shahid Bhagat Singh Marg, Fort,
Mumbai

Dear Sir/ Madam

Name of Work: Supply, Installation, Testing and Commissioning (SITC) of Central Air Conditioning system for Bank's Central Office Building at Fort, Mumbai

We hereby confirm that having understood about the Government Regulations about the disposal of e-waste, we shall dispose all the e-waste collected by us under buyback and subsequently during the maintenance, responsibly through registered producers, re-furbisher or recycler as per statutory guidelines, as amended from time to time. After disposal of e-waste, a certificate from the authorised e-waste disposal agency shall be submitted to the Bank.

Yours faithfully,

For _____

Authorised signatory

Sign & Seal of The Contractor:

Date:

Place

UNDERTAKING OF COMPREHENSIVE ANNUAL MAINTENANCE

The comprehensive annual maintenance contract (CAMC) schedule during 14 years subsequent to the DLP of one year shall be as under:

The service provided during the DLP and CAMC period shall be fully comprehensive and shall include but not limited to all equipment such as chiller unit, pumps, cooling tower, BMS (hardware and software), CPM (hardware and software), labour, consumables material etc. and emergency calls providing and site response within 24 hours.

The maintenance shall also include a minimum monthly preventive maintenance visits by qualified personnel of contractor and minimum quarterly visit for system health check-up. The tentative maintenance schedule shall include, but not limit to the following:

Equipment	Periodicity	Description
1. Chiller	Monthly	<ol style="list-style-type: none"> 1. Perform all function for monthly checks 2. Check refrigerant level, leak test with electronic Leak detector. 3. Inspect level and condition of oil. 4. Check the liquid line sight glasses for proper flow. 5. Check all operating pressures and temperatures. 6. Inspect and adjust, if required, all operating safety controls. 7. Check capacity control, adjust if necessary. 8. Lubricate vane/ linkage/ bearings. 9. Visually inspect machine and associated components, and listen for unusual sound or noise for evidence of unusual conditions. 10. Check lock bolts and chiller spring mount. 11. Review daily operating log maintained by Bank's operating personnel. 12. If any of the above found abnormal, trace and rectify the issues as necessary. Providing written report to the Bank, outlining services carried out, adjustment made, rectification carried out and if the deficiency is of a major nature, arrange with the Bank for shut- down to rectify equipment.

	Quarterly	<ol style="list-style-type: none"> 1. Inspect condenser tubes for fouling. If fouling exceeds original specifications, the contractor shall carry out cleaning of the tubes at his own expense. 2. Cleaning should be as often as necessary (approximately every three months) to keep tubes clean. Exercise care when cleaning the tube, so that the same is not damaged. Under no circumstances this unit be cleaned with acid based cleaner.
	Annually	<ol style="list-style-type: none"> 1. Check all flanges for tightness 2. Change oil in oil sump 3. Replace filter 4. Check oil temperature control 5. Check motor terminals 6. Check connections in starter. 7. Please note that oil filter gasket replacement shall deem to be included in the contract. 8. Check motor earthing, megger motor and connection wiring on each leg 9. Check motor temperature cut-out, tighten motor terminals. 10. Check starter contacts, arc shield, transformers. 11. Check dashpot oil, clean dashpot and replace oil when necessary 12. Test and calibrate overload setting. 13. Inspect, calibrate and adjust to original specifications for all gauges, safety and operating controls including low temperature and high pressure cut-out, oil pressure switch, load limit relay and electrical interlocks.

pumps	Monthly	<ol style="list-style-type: none"> 1. Perform all function for monthly checks 2. Inspect all water pumps 3. Check all seals, glands and pipelines for leaks and rectify as necessary. 4. Re-pack and adjust pump glands as Necessary. 5. Check all pump bearings and lubricate with oil or grease as necessary. 6. Check the alignment and condition of all rubber couplings between pumps and drive motors and rectify as necessary. 7. Check all bolts and nuts for tightness and tighten as necessary.
	Annually	<ol style="list-style-type: none"> 1. Check motor earthing, megger Motor and connection wiring on each leg. Tighten motor terminals 2. Check starter contacts 3. Test and calibrate overload setting.
Cooling tower	Monthly	<ol style="list-style-type: none"> 1. Check for any visible leaks, unusual noises, or vibrations. 2. Inspect the water level and ensure it is within the recommended range. 3. Monitor water temperature and pressure gauges. 4. Check fan operation and ensure proper operation. 5. Walk the perimeter of the tower to inspect balance in the rain zone.
	Quarterly	<ol style="list-style-type: none"> 1. Conduct a thorough inspection of the tower's exterior, including structural integrity, fan blades, and louvers. 2. Check and clean water strainers or filters. 3. Inspect and lubricate fan motor bearings and gearbox oil levels & condition.. 4. Test water quality parameters such as pH, conductivity, and TDS.
	Half Yearly	<ol style="list-style-type: none"> 1. Conduct a comprehensive inspection of the water distribution system, including pipes, valves, and fittings. 2. Inspect fill material for any signs of damage or fouling.

		<ol style="list-style-type: none"> 3. Verify alignment couplings in the fan system. 4. Clean or replace any clogged or damaged spray nozzles.
	Annually	<ol style="list-style-type: none"> 1. Perform a detailed inspection of the entire cooling tower system, including mechanical and electrical components. 2. Check fan blades for cracks, balance and alignment. 3. Weigh selected fill blocks from lower levels & record weights to measure fouling. 4. Inspect and clean water basins and sumps. 5. Check and adjust the water treatment system, including chemical feeders and control equipment. 6. Conduct a thorough cleaning and inspection of water piping and associated equipment.
		<ol style="list-style-type: none"> 1.
Piping system	Monthly	<ol style="list-style-type: none"> 1. Check all piping system for leaks and repair these where they have occurred. 2. Check for damage & deterioration of insulation or sheathings. 3. Rectify as necessary
Consumable materials	As and when required	<ol style="list-style-type: none"> 1. All oils and greases required for lubrication of compressors, fan bearings, motors bearings, pivots and other moving parts. 2. All refrigerant required for topping up. Refrigerant loss if due to manufacturing defect or due to negligence shall be made good by the contractor. 3. All consumable filter elements/ rolls. All chemicals for the correct chemical treatment of the cooling tower and chilled water system. 4. All carbon brushes required to replace worn brushes in electric motors.

		<ol style="list-style-type: none"> 5. All electric contact points required to replace worn electric contact points in switchgears, motor starter gears, electronic control gears and electric relays. 6. All electric fuses required to replace blown fuses. Just before the expiry of the warranty of the contract, the contractor shall carry out a complete system operability test on all the systems or sub-systems as called for in the contract.
BMS/ SCADA system	Quarterly	<ol style="list-style-type: none"> 1. Carry out overall visual inspection of the system. 2. Check for all the settings and set points. 3. Address any issues due to loose / improper connections/ burning of signal cables etc. 4. Checking of all sensors for proper monitoring and calibration of the sensors annually or as per OEM standards/ as required, whichever is earlier.
	As and when required	<ol style="list-style-type: none"> 1. Replace the faulty spares including sensors/ sensing cables/ lugs and terminations etc. 2. Upgradation of software as and when an upgraded version is released by the OEM.

Authorised signatory

Sign & Seal of The Contractor:

Date:

Place

Format of Computerized Measurement Book

भारतीय रिज़र्व बैंक

RESERVE BANK OF INDIA

M.B.No. _____

Page
No. _____

Tender Item No./ Tender Page No.	Full Description of item of work	Measurements				Quantity
		No.	L	B	D/H	

Abstract of cost for Running/Final Bill

Running Bill no:

M.B. No. _____

Page No. _____

Serial No.	Tender Item No.	Description	Quantity	Rate ₹	Unit	Amount ₹
1	2	3	4	5	6	7

Information to be submitted by the Tenderers/ Checklist

General Checklist for the documents to be uploaded

S.No.	Description	Tenderers Confirmation (Yes / No)
1.	Duly seal and signed Tender Part-I	
2.	Proof of EMD submitted for an amount of ₹ -9,50,000/	
3.	Duration of past experience – shall have minimum 5 years of experience in executing the works – copies of work orders	
4	Copies of Audited financial statements and ITRs of last three financial years.	
5	List of offered makes of equipment/ materials (Section VIII)	
6	Technical Data (Section IX)	
7	Check List – Commercial Conditions (Section XI)	
8	Annexure – ‘A’ Format for power of attorney for signing of proposal	
9	Format 1: Basic Info	
11	Format 2: Previous work experience	
12	Format 3: Qualifying works	
13	Annexure – ‘B’ Client’s Certificate Reg. Performance Of Contractor	
14	Format 4: List of maintaining similar works	
15	Annexure – ‘C’ Financial Status	
16	Annexure – ‘D’ Form of Bankers' Solvency Certificate From a scheduled bank	
17	Annexure – ‘E’ Mandate Form (Banker details)	
18	Annexure – ‘H’ Details of Service Set Up At The Place Of Work	
19	Annexure – ‘I’ Undertaking Regarding Site Visit By The Tenderer and confirmation of sufficiency of design	

20	Annexure – ‘J’ Schedule of Techno- Commercial Conditions	
21	Annexure – ‘K’ Schedule of Technical deviation	
22	Annexure – ‘L’ Proforma of Letter of Authorization from the OEM to participate in this Bid	
23	Annexure – ‘M’ Proforma of undertaking for maintenance confirmation by the Tenderer	
24	Annexure – ‘N’ Proforma of Undertaking / Declaration / Certificate By The Tenderer Regarding Country Sharing Land Border With India	
25	Annexure – ‘O’ Undertaking Regarding Declaration of Debarment By Public Institution(S)	
26	Annexure – ‘P’ Undertaking indemnifying employer against non-compliance with statutory and labor laws	
27	Annexure – ‘Q’ Undertaking indemnifying employer against patent rights	
28	Annexure – ‘R’ Undertaking for disposal of E-waste – old/ obsolete/unserviceable items	
29	Annexure –S Undertaking for Comprehensive Annual Maintenance Contract	
30	Copies of TDS certificates in case of works completed with private organisation.	
31	Copies of GST registration certificate and PAN details	
32	Technical literature of the various components.	

Authorised signatory

Sign & Seal of the Contractor:

Date:

Place

SECTION - XIII

Un-price Bill of Quantities

Name of Work: Tender for Supply, Installation, Testing and Commissioning (SITC) of Centralized Air Conditioning system at Bank's Central Office Building, Fort, Mumbai

Sr. No.	Description of items	Qty	Unit
1	WATER COOLED MULTI COMPRESSORS SCREW CHILLERS		
1.1	Supply, installation, testing and commissioning (SITC) of AHRI certified and ECBC compliant water cooled packaged screw (with multiple compressors) chiller of 350 TR (actual) capacity of specified design conditions and conforming as per technical specification mentioned in the tender.	3	Sets
1.2	SITC of Automatic condenser Tube Cleaning and of suitable size including screen graphical , injection/collection pump, actuator based valves and complete with all accessories This system combine for three chiller Units as per specification mentioned in the Tender	1	set
2	Work station, SCADA system and Chiller Plant Manager		
2.1	Supply, Installation, Testing and Commissioning of Client Workstation for Centralised Air Conditioning System with required operating system, mouse and keyboard complete as per detailed specifications and integration of 32`` colour graphics LED Monitor to view and monitor the various equipment of schematic Diagrams. It should be controlled through window licensed Software including supply of all required connecting cables, connectors, any other required hardware, software licenses etc. compatible with BMS platform to complete the job as per detailed technical specifications mentioned in the tender.	1	No
2.2	Supervisory Control and Data Acquisition (SCADA) system: Supply, Installation, Testing and Commissioning of SCADA system with required hardware, software, operating system, anti-virus software, , optical fibre cable, all required licenses, Back up (program and DDC) etc. as per detailed technical specifications mentioned in the tender.	1	No
2.3	Direct Digital Controllers (DDC) Panel SITC of True IP Based BTL & UL Listed DDC for integration and programming for following equipment with required hardware, software, network and communication such as Ethernet ports, CAT6 cable, licences, etc. all complete and as per technical specification mentioned in the tender.		
a.	DDC for CPM (Chiller/pump/CT/UPS/PAC/DG/ACB/VCB/EM Seq. DDC Controller + Chiller Integrator + Panel) (300 soft ports and 100 hard ports)	1	Job

b.	DDC for AHU's (22 port)	7	Nos
2.4	SITC of 3-phase , 4-wire energy meter system at the existing panel including CT, VT, Modbus Communication Module, remote monitoring software and necessary connection by providing required hardware (for Cooling Towers, CHW and CDW Pumps) etc. all complete and as per technical specification mentioned in the tender.	5	Nos
2.5	SITC of following Sensors and flow meter for Air conditioning System all complete and as per technical specification mentioned in the tender.		
a.	Immersion temperature sensor 100 mm Pt1000 with Brass Thermowell.	4	Nos
b.	Outside air temperature + humidity sensors for measuring outside air temperature. It shall have sun shield and rain protection.	1	No
c.	Duct Temperature sensor with PT1000	28	Nos
d.	Magnetic Flow Meter (common Chilled water header , NB 300 mm)	1	No
e.	Pressure Transmitters (for Chiller Pressure)	6	Nos
f.	Differential Pressure Transmitters (for Filter/Cooling Tower)	6	Nos
g.	Vibration Sensors (for Chiller Unit Monitoring)	3	Nos
h.	Others as required	1	lot
2.6	Control Cables Supply, Laying, Testing and Commissioning of the following multi core/ Shielded Twisted Pair (STP) control cable for BMS Connectivity for Chiller Plant Integration with Building Management System (BMS) with glands, lugs, terminals, earthing material (Earth Bars, Earth Wires, etc.) etc. all complete and as per technical specification mentioned in the tender.		
a.	2 Core, 1 Sq. mm Cable, Shielded, Armoured, twisted pair cable	3000	mtr
b.	4 Core, 1 Sq. mm Cable, Shielded, Armoured , twisted pair cable	2000	mtr.
c.	CAT 6 Cable	500	mtr
2.7	Cable trays		
a.	Supply, installation of GI perforated cable trays having size: 100 mm x 50 mm x 1.6 mm complete with tees, right angle bends, suspenders, fixing accessories etc. all complete and as per technical specifications mentioned in tender.	400	mtr.
b.	Supply, installation of GI perforated cable trays having size: 50 mm x 40 mm x 1.6 mm complete with tees, right angle bends, suspenders, fixing accessories etc. all complete and as per technical specifications mentioned in tender.	800	mtr

2.8	Network Switch Supply, installation, testing and commissioning of Layer 2 switch with 16 ports (RJ-45) including SFP modules, rack mountable, SMPS power supply & other termination accessories complete as required for BMS DDC Panel Networking and as per technical specifications mentioned in tender.	1	Job
3	CHILLED WATER PUMPSETS SITC of End suction / Horizontal Split Casing type chilled water pump set for air conditioning system. Complete with TEFC motor, base plate, mechanical seal, coupling with guard, gauges etc. for flow and operating head and insulation of pump set body with electrical/ control cable connection, hardware, paint as per approved drawing etc. shall be BMS Compatible as per technical specifications mentioned in the tender.	3	sets
4	CONDENSER WATER PUMPSETS SITC of End suction / Horizontal Split Casing type condenser water pump set for air conditioning system. Complete with TEFC motor, base plate, mechanical seal, coupling with guard, gauges etc. for flow and operating head and insulation of pump set body with electrical/ control cable connection, hardware, paint as per approved drawing etc. and shall be BMS Compatible as per technical specifications mentioned in the tender.	3	sets
5	COOLING TOWERS		
5.1	Design, Supply, installation, testing and commissioning (SITC) of CTI-136 certified and ECBC compliant Induced draft, counter flow Cooling tower. Shall be rectangular/ square with fan TEFC/ IE3 motor IP65 rating, PVC fills, drain overflow, quick fills, float valve, equalizer connection drift rate drift eliminator, UV protected high efficiency, low clog uPVC virgin PVC type, with capacity suitable for 3 x 350TR chiller plant of specified design conditions and conforming as per technical specification mentioned in the tender.	3	sets
5.2	Fabrication, Supply, Installation and Commissioning of GI structure for Cooling Tower platform, CHW & CDW pipe, tanks etc. suitably painted with one coats of red oxide and two coats of primer with synthetic enamel paint unless otherwise specified etc. all complete and as per technical specification mentioned in the tender. .	12000	Kg
6	CHILLED WATER PIPING:		
6.1	INSULATED CHILLED WATER PIPING (Nitrile Rubber insulation)		
	Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the Central Air conditioning System as per technical specifications mentioned in the tender.		
a	300 mm dia. having 38 mm (or 19 mm x 2nos) thick insulation	80	mtr

b	250 mm dia. having 38 mm (or 19 mm x 2nos) thick insulation	35	mtr
c	200 mm dia. having 38 mm (or 19 mm x 2nos) mm thick insulation	50	mtr
e	SITC motorized butterfly valve 200 mm and actuator	3	Nos.
6.2	DRAIN PIPING: SITC of drain PVC pipeline including all necessary fittings such as bends, tees, supports, hangers, clamps etc. all complete as per technical specifications mentioned in the tender.	140	mtr
6.3	INSULATED VALVES SITC of following valves, strainers, gauges in the chilled water pipeline duly insulated with the same specifications as the connected piping and adequately supported as per technical specifications mentioned in the tender.		
a.	BUTTERFLY VALVE (MANUAL and Motorized) SITC of following sizes of insulated butterfly valves all complete with insulated flanges, bolts, etc. as per technical specification mentioned in the tender		
i.	300 mm dia. Manual valve	2	Nos
ii.	200 mm dia. Manual valve	9	Nos.
iii	200 mm dia. Motorized valve with actuator units	3	Nos
b.	BALL VALVE FOR DRAIN: SITC of following sizes of ball valves for drain complete with required flanges, bolts, etc. as per technical specification mentioned in the tender		
i.	40 MM	2	Nos
ii.	25 MM	10	Nos
c.	BALANCING VALVE SITC of insulated balancing valve of size 200 mm dia. with built in measuring facility complete with insulated flanges, bolts, etc. as per technical specification mentioned in the tender	3	Nos
d.	NON-RETURN VALVE (NRV) SITC of insulated NRV of size 200 mm dia. complete with insulated flanges, bolts, etc. as per technical specification mentioned in the tender	3	Nos
e.	Industrial Type Pressure Gauge SITC of Industrial type pressure gauge (0-25 Kg/sq.cm) with Syphon and valve and all mounting accessories as per technical specification mentioned in the tender.	12	Nos
f.	Industrial Temperature Gauge SITC of Industrial type temperature gauge (0-50 deg. C) with valve and all mounting accessories as per technical specification mentioned in the tender.	6	Nos.

g.	Suction Guide/ Strainer for Pumps SITC of Suction Guide/ Strainer for Pumps with all accessories as per technical specifications mentioned in the tender	3	Nos
h.	Flexible pipe connectors Providing and fixing in position 200 mm NB flexible connection on pipes with guide bolts.PN 20 rating as per technical specifications mentioned in the tender	12	Nos
i.	Miscellaneous		
i.	Supply, installation, testing and commissioning of Automatic Air vents 15/25mm dia.	5	Nos
ii.	Supply, installation, testing & commissioning of Test point for measuring Pressure and temperature.	10	Nos
iii.	Supply, installation, testing & commissioning of Chilled Water Line Flow Switch	3	Nos
iv.	Supply, installation of MS flanges suitable for pipe dia of 200 mm NB for water cooled chiller.	6	Nos
v.	Supply, installation of Spool pieces in 200 mm dia chilled water line	6	Nos
7	Condenser Water Distribution System		
7.1	Supplying, laying/ fixing, testing and commissioning of following nominal sizes of condenser water piping for the Central Air conditioning System as per technical specifications mentioned in the tender.		
a	350 mm dia.	140	mtr
b	300 mm dia.	30	mtr
c	250 mm dia.	70	mtr
d	100 mm dia.	36	mtr
7.2	Condenser pipeline coating Supply & Applying of high build Fiberglass Reinforced Plastics (FRP) condenser pipeline coating as detailed in technical specifications mentioned in the tender.		
a	350 mm dia.	35	RMT
b	100 mm dia.	36	RMT
7.3	Valves without insulation SITC of following valves, strainers, gauges for PN16 pressure rating in the condensed water pipeline with the same specifications as the connected piping and adequately supported as per technical specifications mentioned in the tender.		
a.	Butterfly valve (manual and motorized) SITC of following sizes of butterfly valves all complete with flanges, bolts, etc. as per technical specification mentioned in the tender.		
i.	350 mm dia. manual valve	2	Nos

ii.	250 mm dia. manual valve	9	Nos
iii.	100 mm dia. manual valve	2	Nos
iv.	50 mm dia. manual valve	6	Nos
v.	40 mm dia. manual valve	6	Nos
vi	250 mm dia motorized valve with actuator	3	Nos
b.	Ball valve for drain: SITC of 25 mm NB of ball valves for drain complete with required flanges, bolts, etc. as per technical specification mentioned in the tender	6	Nos
c.	Balancing valve SITC of insulated balancing valve of size 250 mm dia. with built in measuring facility complete with insulated flanges, bolts, etc. as per technical specification mentioned in the tender	3	Nos
d.	Non-return valve (NRV) SITC of insulated NRV of size 250 mm dia. complete with insulated flanges, bolts, etc. as per technical specification mentioned in the tender	3	Nos
7.4	Industrial Type Pressure Gauge SITC of Industrial type pressure gauge (0-10 Kg/sq.cm) with Syphon and valve and all mounting accessories as per technical specification mentioned in the tender.	12	Nos
7.5	Industrial Temperature Gauge SITC of Industrial type temperature gauge (0-50deg.C) with valve and all mounting accessories as per technical specification mentioned in the tender.	6	Nos
7.6	Suction Guide/ Strainer for Pumps SITC of Suction Guide/ Strainer for Pumps with all accessories as per technical specifications mentioned in the tender	3	Nos
7.7	Flexible pipe connectors Supply and fixing in position the following Flexible connection on pipes with guide bolts. (Rubber Bellows) suitable for PN 16 rating 250 mm NB	12	Nos
7.8	Miscellaneous		
a	SITC of Automatic Air vents - 15/25mm dia.	5	Nos
b	SITC of Test point for measuring Pressure and temperature.	10	Nos
c	SITC of Condenser Water Line Flow Switch	3	Nos
d	Supply, installation of MS flanges suitable for of 250 mm dia NB for condenser line.	6	Nos
e	Supply, installation of Spool pieces in 250 mm dia condenser water line	6	Nos
8	Electrical works		

8.1	SITC of heavy duty XLPE insulated, FRLS PVC sheathed armoured, 1.1 KV grade aluminium/copper conductor cables on walls /ceiling/ trays etc. as required including necessary hardware required for clamping namely spacers, saddles, screws, nuts, bolts, etc. Cable sizes covered etc. as per technical specifications mentioned in the tender		
a.	3.5 Core x 240 Sq.mm aluminium conductor Power cable with continuous 12.97 sq.mm (8 Swg) GI earth wire - For Chiller unit	450	mtr
b.	3 Core x 25 Sq.mm copper conductor Power cable with continuous 5.48 sq.mm (12 Swg) GI earth wire - For CHW pump	500	mtr
c.	3 Core x 16 Sq.mm copper conductor Power cable with continuous 5.48 sq.mm (12 Swg) GI earth wire - For CDW pump	260	mtr
d.	3 Core x 6 Sq.mm copper conductor Power cable with continuous 5.48 sq.mm (12 Swg) GI earth wire - For Cooling tower	300	mtr
8.2	Supply and Installation of Standard double compression type cable glands made of Nickel Cadmium plated brass, heavy duty Aluminium/ Copper lugs palm type - crimping of lugs on each core of cable, providing ferrules on either end of cable and connection to the terminals in respective equipment for following cable sizes as per technical specification mentioned in the tender.		
a.	3.5 Core x 240 Sq.mm aluminium conductor cable	12	Sets
b.	3 Core x 25 Sq.mm copper conductor cable	44	Sets
c.	3 Core x 16 Sq.mm copper conductor cable	9	Sets
d.	3 Core x 6 Sq.mm copper conductor cable	6	Sets
e.	2 Core, 1 Sq mm FRLS Cable, Shielded, Armoured, twisted pair cable	250	Sets
f.	4 Core, 1 Sq mm FRLS Cable, Shielded, Armoured , twisted pair cable	300	Sets
9	Earthing		
9.1	Providing 600 x 600 x 3.15 mm thick copper plate earthing as per IS 3043 and complete with soil treatment, masonry chamber, watering pipe with funnel, test link heavy duty FRP cover etc. as per technical specifications mentioned in the tender.	3	Nos
9.2	Supply and fixing of Copper earth strip on wall/ceiling/existing trenches with necessary spares and saddles at 300 mm intervals.		
a	50 mm x 6 mm copper Strip	50	RMT
b	25 mm x 3 mm Copper Strip	200	RMT
c	8 SWG Copper wire including soldered termination with copper lugs	300	RMT
10	Cable Trays Supply, erection of following sizes cable trays as per technical specifications mentioned in the tender.		
a	450 mm x 62.5 mm x 2.0 mm Ladder Cable Tray	60	RMT
b	300 mm x 50 mm x 1.6 mm Perforated Cable Tray	90	RMT

c	225 mm x 50 mm x 1.6 mm Perforated Cable Tray	60	RMT
11	Civil works: Dismantling and construction of new Concrete Foundations required for foundations of the chiller units and following pumps etc. all complete and as per technical specification mentioned in the tender. :		
a.	Chiller Units	3	Sets
b	CHW Pumps Alteration	3	Sets
c	CDW Pumps Alteration	3	Sets
	Total Capital cost (S No. 1-11)----- (A)		
12	Rebate for dismantling and taking away the old equipment under buyback scheme Dismantling and taking away the existing chiller package consisting of the following equipment under buyback:		
a.	Chiller package: Centrifugal compressors - 1 nos (Semi Hermetic) Make: Kirloskar McQuay Model: WSC 079 Motor: Reliance Electric - 230 kW hermetic sq. cage Condenser - 1 nos. Make: Kirloskar McQuay Model: C3012 Chiller- 1 no. Make: Kirloskar McQuay Model: E3012 Type: flooded, shell & tube	3	Sets
b.	Condenser pump set: Make: Beacon Model: SDB 125x150 Type: Horizontal Split Case Capacity: 4500 LPM Motor: Crompton Greaves - 30 kW	4	Sets
c.	Chilled water pump set: Make: Beacon Model: SDCC 125x150 RD Type: Horizontal Split Case Capacity: 3000 LPM Motor: Crompton Greaves - 37 kW	4	Sets
d.	Cooling tower Make: Canara, Capacity: 350 TR, Motor: 15 HP, rpm: 570 along with supporting structure	3	Nos.
e.	Dismantling and taking away the existing chiller and condenser water pipings and their auxiliaries, Make: Jindal, Dia: 350, 300, 250, 200mm	1	LS
f.	Dismantling and taking away of existing power and control wires / cables including its accessories such as terminations, nut-bolts, insulation etc.	1	LS
g.	Control Console panel	1	Nos.
h.	Auxilliary parts such as various valves, strainers and other material that come out of the entire work	1	LS
	Total Rebate----- (B)		
13	Annual maintenance contact		

13.1	All-inclusive comprehensive Annual maintenance contract rate for complete 3 nos. chiller packages, including condenser and chiller pumps, and cooling towers inclusive of all spare parts, consumables and labour for servicing and repairs as per scope mentioned in the tender.	1	Per annum
	Total cost per annum----- (C)		
13.2	Charges for Providing services for day-to-day operation and Routine Maintenance of entire new system by rendering services of five AC operators. (i.e., Central Air Conditioning Plant) as per the detailed scope of work and terms and conditions mentioned in the tender document.	12	Months
	Total cost per annum----- (D)		
13.3	All-inclusive comprehensive maintenance service charges for existing (3x300TR, Make: Kirloskar McQuay Model: WSC 079) chiller units only inclusive of all spare parts, consumables and labour for servicing and repairs as per technical specification mentioned in the tender. .	1	Per chiller per month
	Total cost per annum----- (E)		

Total Cost of Ownership, TCO = A - B + F1*C + F2*D + E

A = Capital cost of the proposed equipment of Central AC System

B = Buyback amount quoted for removing and taking away the old equipment

C = Amount quoted for Comprehensive Annual Maintenance Contract (CAMC) charges for New system per annum

D = Amount quoted for deputing AC operators charges for operation of new system per annum

E = Amount quoted for Comprehensive Annual Maintenance Contract (CAMC) charges for three existing chiller Units per annum.

F1=NPV factor=10.35589

F2=NPV factor=12.22980

Note:-

1. Price bid in excel sheet format, as provided by the Bank, shall be uploaded by the tenderer on MSTC portal.
2. While uploading the price bid, excel sheet should not be changed / modified by the tenderers except for filling their rates in yellow highlighted cell.
3. The excel sheet uploaded must be in "Excel 97-2003" format only.
4. The tender will be evaluated based on total cost of ownership (TCO) as mentioned in Section III of the tender.