Tender ID	AHMSAO921

STATE BANK OF INDIA

INVITES ONLINE E-TENDER

FOR

PROPOSED AIR CONDITIONING WORK OF SBI ADMIN OFFICE, SURAT

FROM

THE AIR CONDITIONING CONTRACTORS EMPANELLED FOR AHMEDABAD CIRCLE UNDER THE CATEGORY OF WORKS FROM 25 LAKHS TO 100 LAKHS (AS PER THE LIST ENCLOSED)

THE LAST DATE OF SUBMISSION OF ONLINE TENDERS:
02.06.2025 UP TO 03:00 PM

NO PHYSICAL SUBMISSION OF DOCUMENTS REQUIRED EXCEPT PROCESS COMPLIANCE FORM & EMD

PART – A (TECHNICAL BID)

TENDER SUBMITTED BY:

NAME :

ADDRESS :

DATE :

NOTICE INVITING TENDERS

SBI invites Online tender in two bid system (Online technical bid & sealed price bids) from the Bank's Empanelled air conditioning contractors of Ahmedabad Circle for AIR CONDITIONING Work at SBI ADMIN OFFICE, SURAT.

1	Name of work	SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF TREATED FRESH AIR SYSTEM (TFA), AT SBI ADMIN OFFICE BUILDING, SURAT.
2	Nature of Work	**AIR CONDITIONING WORK**
2.a	Estimated cost of works	**20,30,000/-**
3	Time allowed for completion	**45** (**FORTY FIVE)** Days from date of acceptance of work order or handing over of site whichever is later.
4	Tender Fees	**NA**
5	Earnest Money Deposit	**Rs. 20,000/-** by means of Demand Draft / Pay Order (Valid for a period of 90 days from the last date of submission of the tender) from any scheduled Nationalized Bank drawn in favour of **State Bank of India, payable at SURAT. [Those registered with MSME-UDYAM need not submitted EMD. Instead DD, Valid MSME UDHYAM certificate shall be uploaded]**
6	Initial Security Deposit	2%
7	Total Security deposit	3% of the final bill amount
8	Start and end date for downloading of tender documents form Bank's website	**19.05.2025 to 02.06.2025** at www.sbi.co.in under <Link><SBI in the news> procurement news.
9	Last date & time for submission of on-line technical bid, EMD and online Sealed Price Bid	**02.06.2025 by 03:00 PM**
10	Address at which EMD & Process compliance form has to be submitted.	The Chief Manager (HR & Admin.) State Bank of India, Admin. Office Building, 1st Floor, Dhod Dod Road, Nr Panjarapol, Surat – 395001
11	Date and time of opening of technical bid & Online Price Bid at SBI address mentioned at Sr. No.10	**02.06.2025 at 3:30 PM**
12	E-Tendering will be conducted by our approved e-tendering consultant	**M/s. Antares Systems Limited, Bangalore,** Contact No 91 80 40482000; 91-80-40482114 Mobile : 91 -9674758719, 9674758720
13	Liquidated Damages	0.50% of contract amount per weeks subject to max. 5% of contract value or final bill value.

14	Rates	**Rates quoted shall be inclusive of all existing & future (including variation) taxes, duties, levies, royalties, transportation, other incidental charges, WCT etc. PVA & PVA Clause shall not be applicable.**	
		<u>Note: GST will be paid Extra as per Applicable norms</u>.	
		If any tenderer puts any condition/anything/any taxes extra over and above their quoted rates the tender shall be summarily rejected.	
15	Defects liability period	12 Months from the date of Virtual Completion	
16	Validity of offer	90 days from the date of opening of Price-bid	
17	Value of Interim Certificate	**No Interim payment will be paid. [No advance on materials / plant / machinery or mobilization advance shall be paid under any circumstances]**	
18	**Insurance**	**The contractor shall obtain all necessary insurance policies as per the governing laws applicable at the centre & shall be required to produce the original policy of Insurance & receipt of the premium as applicable in the matter to the Architect/Bank.**	
19	**Water and Electricity**	If contractor is permitted to use SBI source of water & electricity, the SBI will recover @ 0.5% of contract amount from the final bill of contractor. **However further distribution & extension & light fixtures etc. with required MCB switches, switch boards, lamp, tube etc. shall be arranged by the contractor at their own cost within the accepted tender amount. *<u>Bank will recover 0.5% of the final bill amount towards consumption of water & electricity.</u>***	
20	Rates	Rates quoted shall be inclusive of all existing & future (including variation) taxes, duties, levies, royalties, transportation, other incidental charges, WCT etc. PVA & PVA Clause shall not be applicable.	
		Note: GST will be paid Extra as per Applicable norms. If any tenderer puts any condition/anything/any taxes extra over and above their quoted rates the tender shall be summarily rejected.	
21	The tender will be summarily	1. Failed to pay the required tender fee and submit	
	rejected if the Bidder	the proof.	

		2. Failed to submit the original EMD at above	
		office before due date. (or **Valid MSME UDHYAM**)	
		3. Failed to upload Entire tender document, which is	
		downloaded from the website as a proof of	
		accepting the terms and conditions.	
		4. Failed to upload the Scan copy of required	
		documents as mentioned in the documents to be	
		uploaded.	
		5. Partly or fully Modifies, alters or corrects the	
		tender document uploaded by the Bank.	
22	Tenders can be downloaded from the bank's website www.sbi.co.in(link)<SBI In the news<Procurement News>. It shall be responsibility of the contractor to timely submit the technical and financial bid. SBI, in no case shall be responsible for site issues/ delay in tender submission.		
23	The contractor shall read and understand each page of the tender document thereby ensuring the number and sequence of all pages.		
24	No conditions other than mentioned in the tender will be considered, and if given they will have to be withdrawn before submission of final quote, else their bid will be rejected.		
25	Tenders received without EMD & Process compliance form shall be summarily rejected and such tenders shall not be allowed to participate in the Price bid process/ rejected/ not considered.		
26	The Bank will place order as per its requirement and quoting minimum rate for any category does not provide any guarantee for receiving order for that item by the firm who quotes lowest rates.		
27	Bank reserves right to cancel any/ all tenders at any stage without assigning any reasons.		
28	The Bank reserves the right to accept the tender in full or in part and the tenderer shall have no		
	Claims for revision of the Quoted price by any bidder after the tender will not be entertained.		
29	In case the date of tendering is declared as a holiday, the tendering will be opened/ conducted on the next working day at the same time.		
30	SBI reserves the right to accept or reject any or all the tenders, either in whole or in part without assigning any reason(s) for doing so, no claim / correspondence shall be entertained in this regard. For any clarification regarding Tendering procedure, please contact SBI MCB BRANCH SURAT, whose address is mentioned in the NIT or Architect SBI ARCHITECTS AND INTERIOR DESIGNER (M) 9825117854.		
31	For any clarification regarding E-Tendering procedure, System requirements etc please contact **M/s. Antares Systems Limited, Bangalore** , whose address is mentioned in the NIT.		
32	It is vendor's/supplier's responsibility to be well prepared and get ready with E-Tendering		

	procedures & well equipped with all requirements. SBI will not take any responsibility of delay in submission due to EMD, slow internet connectivity, system failures etc.	
33	**ONLY FINAL PAYMENT WILL BE MADE**	

Yours Faithfully,

(For and on behalf of SBI)

The Chief Manager (HR & Admin)
State Bank Of India,
Admin. Office, Surat

LIST OF EMPANELLED AIR CONDITIONER CONTRACTORS

LIST OF EMPANELLED AIR-CONDITIONER CONTRACTOR UPTO Rs.25.0 LAKH

SN	Name, Office Address of the Applicant in Gujarat State including U/T	Contact number & email ID
1	Pronify Turnkey Solutions, 23E, Laxmi Industrial Esate, New Link Road, Andheri (west), Mumbai 400053	9833889913, proinfyturnkeysolutions@gmail.com
2	Concept Marketing, Payal Park Society, Near TVS Motors, Opp. Central Excise Bldg., B/h. Subhanpura Garden, Vadodara-390023	9825041848, 9909031848, info@concept.net.in
3	HCP Enterprise ,A/8 Someshwar Tenament, Opp. Nishan Vidhyalay, Arjun Ashram Road, Ranip Ahmedabad - 382480	8849696356, hcpenterprise@gmail.com
4	Sharda Refrigeration, 35, Surya Darshan Complex,Rubber Factory Circle Bhavnagar 364001	9426261853, thomasvyas@yahoo.co.in

LIST OF EMPANELLED AIR-CONDITIONER CONTRACTOR UPTO Rs.50.0 LAKH

SN	Name, Office Address of the Applicant in Gujarat State including U/T	Contact number & email ID
1	SYSTEM DESIGNING, 102 Aggam Complex Nr. Telephone Exchange Vasna, Ahmedabad - 7	9825024651, sdesign_trs@yahoo.com

LIST OF EMPANELLED AIR-CONDITIONER CONTRACTOR UPTO Rs.100.0 LAKH

SN	Name, Office Address of the Applicant in Gujarat State including U/T	Contact number & email ID
18	Parnam HVAC Engineering Pvt. Ltd. A405/406, Neelkanth Palace, 4th floor, Nr. Seema Hall, 100ft Anandnagar Road, Satellite, Ahmedabad - 380015	9979866401, pranamhvac@gmail.com
22	Chill Air System, 1&22 Induchacha House. Chhani road, Jakat Naka Baroda - 39002	9825603471, 9825083471, chillairsystems@gmail.com

FORM TENDER

To,
The Chief Manager (HR & Admin)
State Bank Of India,
Admin. Office, Surat

Dear Sir,
Having examined the drawings, specification, design 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 at the rates mentioned in the attached Schedule of Quantities and in accordance in all respects with the specifications, design, drawings and instructions in writing referred to in conditions of tender, the Articles of Agreement, Special Conditions, Schedule of Quantities and Conditions of Contract 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

Description of work	**AIR CONDITIONING OF SBI ADMIN. OFFICE, SURAT.**
Earnest Money	**RS. 20,000.00 by means of Demand Draft / Pay Order** (Valid for a period of 90 Days from the last date of submission of the tender) from any scheduled Nationalized Bank drawn **in favour of SBI and payable at SURAT.[Those registered with MSME-UDYAM need not submitted EMD. Instead DD, Valid MSME UDHYAM certificate shall be uploaded]**
Percentage, if any, to be deducted from Bills and total amount to be retained	10 % from Running Bills, subject to maximum Total 3% of contract amount or actual Final Bill value.
Time allowed for completion of the Works from 3 rd day after the date of written order or date of handing over of the site (whichever is later) to commence the work	45 days.

Should this tender be accepted, I/we hereby agree to abide by and fulfill the terms and provisions of the said conditions of Contract annexed hereto so far as they may be applicable or in default thereof to forfeit and pay to SBI, the amount mentioned in the said conditions.

We, hereby, also undertake that, we will not raise any claim for any escalation in the prices of any of the material during the currency of contract/execution/completion period. I/We have deposited a sum of Rs. _____ of the total tender amount as Earnest Money with the State Bank of India which is not to bear any interest. Should I / We fail to execute the Contract when called upon to do so I/ We do hereby agree that this/any sum shall be forfeited by me/us to SBI and any suitable action may be taken by the Bank against us. This may also include debarring of my empanelment for an year or so.

I/we have deposited Demand Draft / Banker's Cheque / FDR for a sum of Rs.18000/- as

Earnest money deposit with the SBI. Should I/we do fail to execute the contract when called upon to do so, I/we hereby agree that this sum shall be forfeited by me/us to SBI.

Yours faithfully,

Signature of contractor With Seal

1) Our Bankers are: i) ii)

The names of partners of our firm are: i) ii)

Name of the partner of the firm Authorized to sign
Or

(Name of person having Power of Attorney to sign the Contract.)
(Certified true copy of the Power of Attorney should be attached)

Yours faithfully,

Signature of Contractors.

Signature and addresses of Witnesses i) ii)

SAMPLE BUISNESS RULE DOCUMENT

ONLINE E-TENDERING FOR AIR CONDITIONING & ALLIED WORK OF
SBI ADMIN. OFFICE, SURAT.

Business rules for E-tendering:

1. Only AHMEDABAD CIRCLE **empanelled AIR CONDITIONING contractors** under appropriate category who are invited by the project Architect/SBI shall only be eligible to participate.
2. SBI will engage the services of an E-tendering service provider who will provide necessary training and assistance before commencement of online bidding on Internet.
3. In case of e-tendering, SBI will inform the vendor in writing, the details of service provider to enable them to contact and get trained.
4. Business rules like event date, closing and opening time etc. also will be communicated through service provider for compliance.
5. Contractors have to send by email, the compliance form in the prescribed format (provided by service provider), before start of E-tendering. Without this the vendor will not be eligible to participate in the event.
6. The Contractors will be required to submit the various documents in sealed Envelope to the office of SBI ADMIN. OFFICE, SURAT at the address mentioned hereinbefore by the stipulated date i.e. (1) Demand Draft of specified amount of EMD (2) **Process compliance form dully signed** Contractors not submitting any one or more documents shall not be eligible to participate in the on-line price bidding.
7. E-tendering will be conducted on schedule date &time.
8. **The e-tendering will be treated as closed only when the bidding process gets closed in all respects for the item listed in the tender.**

(B) **Terms & conditions of E-tendering:**

SBI shall finalize the Tender through e-tendering mode for which **M/s. Antares Systems Limited, Bangalore,** has been engaged by SBI an authorized service provider. Please go through the guidelines given below and submit your acceptance to the same along with your Commercial Bid.

E-tendering shall be conducted by SBI through **M/s. Antares Systems Limited, Bangalore,** on pre-specified date. While the Contractors shall be quoting from their own offices/ place of their choice, Internet connectivity and other paraphernalia requirements shall have to be ensured by Contractors themselves. In the event of failure of their Internet connectivity, (due to any reason whatsoever it may be) it is the bidders' responsibility

In order to ward-off such contingent situation bidders are requested to make all the necessary arrangements/alternatives such as back–up power supply whatever required so that they are able to circumvent such situation and still be able to participate in the E-tendering successfully. Failure of power at the premises of Contractors during the E-tendering cannot be the cause for not participating in the E-tendering. On account of this the time for the E-tendering cannot be extended and SBI is not responsible for such eventualities.

1. **M/s. Antares Systems Limited, Bangalore,** shall arrange to train you nominated person(s), without any cost to you. They shall also explain you all the Rules related to the E-tendering.

You are required to give your compliance on it before start of bid process.

2. BIDDING CURRENCY AND UNIT OF MEASUREMENT: Bidding will be conducted in Indian currency & Unit of Measurement will be displayed in Online E-tendering.

3. BID PRICE: The Bidder has to quote the rate as per the Tender Document provided by SBI their appointed Architects.

4. VALIDITY OF BIDS: The Bid price shall be firm for a period specified in the tender document and shall not be subjected to any change whatsoever.

5. Procedure of E-tendering:

i. <u>Online E-tendering:</u>

(a) The hard copy of the Technical as well as Price Bid is available on the Bank's website during the period specified in the NIT.

(b) Online e-tendering is open to the empanelled bidders who receive NIT from the Architect and qualified for participating in the price bidding as provisions mentioned here in above through SBI approved Service Provider.

(c) The Price-Bid shall be made available online by the Service Provider wherein the contractors will be required to fill-in percentage Above/Below over given Estimated amount.

(d) The Contractors are advised not to wait till the last minute to submit their online item-wise quote in the price bid to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc.

(e) It is mandatory to all the bidders participating in the price bid to quote their rates for each and every item.

(f) In case, contractor fails to quote their rates for any one or more tender items, their tender shall be treated as ***"Incomplete Tender***" and shall be liable for rejection.

LOG IN NAME & PASSWORD: Each Bidder is assigned a Unique User Name & Password by **M/s. Antares Systems Limited, Bangalore,** . The Bidders are requested to change the Password after the receipt of initial Password from M/s. **M/s. Antares Systems Limited, Bangalore** ,All bids made from the Login ID given to the bidder will be deemed to have been made by the bidder.

6. **BIDS PLACED BY BIDDER: Bids** will be taken as an offer to execute the work as specified. Bids once made, cannot be cancelled / withdrawn and the Bidder shall be bound to execute the work at the quoted bid price. In case the L1 Bidder backs out or fail to complete the work **as per the rates quoted,** SBI shall have the liberty to take action as deemed necessary including de-paneling such contractors and forfeiting their EMD and imposing heavy penalty to contractor to recover the losses occurred to the Bank.

7. At the end of the E-tendering, SBI will decide upon the successful bidder. SBI decision on award of Contract shall be final and binding on all the Bidders.

8. SBI shall be at liberty to cancel the E-tendering process/tender at anytime, before ordering, without assigning any reason.

9. SBI shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause.

10. Other terms and conditions shall be as per your techno-commercial offers and other correspondences till date.

11. OTHER TERMS &CONDITIONS:

- The Bidder shall not involve himself or any of his representatives in Price manipulation of any kind directly or indirectly by communicating with other suppliers/ bidders.

- The Bidder shall not divulge either his Bids or any other exclusive details of SBI to any other party.

- SBI decision on award of Contract shall be final and binding on all the Bidders.

- SBI reserve their rights to extend, reschedule or cancel any E-tendering within its sole discretion.

- SBI or its authorized service provider **M/s. Antares Systems Limited, Bangalore** shall not have any liability to Bidders for any interruption or delay in access to the site irrespective of the cause.

- SBI or its authorized service provider **M/s. Antares Systems Limited, Bangalore** is not responsible for any damages, including damages that result from, but are not limited to negligence.

- SBI or its authorized service M/s. **M/s. Antares Systems Limited, Bangalore** will not be held responsible for consequential damages, including but not limited to systems problems, inability to use the system, loss of electronic information etc.

N.B.

- All the Bidders are required to submit the Process Compliance Statement (Annexure-II) duly signed to **M/s. Antares Systems Limited, Bangalore**.

- **All the bidders are requested to ensure that they have a valid digital signature certificate well in advance to participate in the online event.**

PROCESS COMPLIANCE STATEMENT (ANNEXURE II)

(The bidders are required to print this on their company's letter head and sign, stamp before e-mailing)

To,
M/s. Antares Systems Limited, Bangalore,
#24,3rd Stage, 4th Block, Basveshwaranagar, Bangalore- 560079, India
E-mail :kushal.b@anataressystems.com
Contact No.- 91 - 9674758719, 9674758720

AGREEMENT TO THE PROCESS RELATED TERMS AND CONDITIONS FOR THE ONLINE E-TENDERING FOR PROPOSED AIR CONDITIONING WORK OF SBI ADMIN OFFICE, SURAT.

Dear Sir,

This has reference to the Terms & Conditions for the E-tendering mentioned in the Tender document
This letter is to confirm that:

1) The undersigned is authorized representative of the company.
2) We have studied the Commercial Terms and the Business rules governing the E-tendering as mentioned in RFP of SBI as well as this document and confirm our agreement to them.
3) We also confirm that we have taken the training on the E-tendering tool and have understood the functionality of the same thoroughly.
4) We confirm that SBI **M/s. Antares Systems Limited, Bangalore** shall not be liable & responsible in any manner whatsoever for my/our failure to access & bid on the e-E-tendering platform due to loss of internet connectivity, electricity failure, virus attack, problems with the PC, any other unforeseen circumstances etc. before or during the E-tendering event.
5) We confirm that we have a valid digital signature certificate issued by a valid Certifying Authority.
6) We, hereby confirm that we will honor the Bids placed by us during the E-tendering process.

With regards, Date:

Signature with company seal Name:

Company / Organization:

Designation within Company / Organization: Address of Company / Organization:

Scan it and send to this Document on ----------

ARTICLES OF AGREEMENT

(On non-judicial Stamp Paper of Rs. 500/- or as per latest Govt. Rules)

ARTICLES OF AGREEMENT made the _____date of _____between Assistant General Manager, SBI MCB BRANCH, MAJURAGATE, SURAT 395002, hereinafter called the Bank which expressions shall include its successors and assigns of the one part and _____ (name & address of contractor)_____ hereinafter called the "Contractor" which expression shall include the successors and assigns of the other part. WHEREAS the SBI is desirous of AIR-CONDITIONING WORKS and allied work for STATE BANK OF INDIA, ADMIN OFFICE BUILDING, SURAT and has caused drawings and specifications describing the work to be done to be prepared by SBI.

AND WHEREAS the Contractor has agreed to execute upon and subject to the Conditions set forth herein and to the Conditions set forth herein 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 Specifications and included in the Schedule of Quantities at the respective rates therein set forth amounting to the sum as therein arrived at our such other sum as shall become payable there under (hereinafter referred to as "the said Contract Amount.)

NOW IT IS HEREBY AGREED AS FOLLOWS:

1) In consideration of the 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 Specifications and the priced Schedule of Quantities.
2) The Employer shall pay to 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.

   The term "the Architects" in the said Conditions shall mean the **SBI,** or in the event of their ceasing to be the Architects for the purpose of this Contract for whatever reason, such other person or persons as shall be nominated for that purpose by the Employer, not being a person to whom the Contractor shall object for reasons considered to be sufficient by the Employer, PROVIDED ALWAYS that no person or persons subsequently appointed to be Architects under this Contract shall be entitled to disregard or overrule any previous decisions or approval or direction given or expressed in writing by the outgoing Architects for the time being.
3) The said Conditions and Appendix thereto shall be read and construed as forming part of this Agreement, and the parties here to shall respectively bide by submit themselves to the said Conditions and perform the Agreements on their part respectively in the said Conditions contained.
4) The Plans, Agreements and Documents mentioned herein shall form the basis of this

Contract.

5) This Contract is neither a fixed lump-sum contract nor a piece work contract but a contract to carry out the work in respect of the entire building complex to be paid for according to actual measured quantities at the rates contained in the Schedule of Quantities and Rates or as provided in the said Conditions.
6) The Contractor shall afford every reasonable facility for the carrying out of all works relating to AIR-CONDITIONING works, installation of lifts, Telephone, electrical installations, fittings air-conditioning and other ancillary works in the manner laid down in the said Conditions, and shall make good any damages done to walls, floors, etc. after the completion of his work.
7) The SBI reserves to itself the right of altering the drawings and 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.
8) Time shall be considered as the essence of this Contract and the Contractor here by agrees to commence the work soon after the Site is handed over to him or from the date of issue of formal work order as provided for in the said Conditions whichever is later and to complete the entire work within **the specified time** subject to nevertheless the provisions for extension of time.
9) All payments by the SBI under this contract will be made only at Ahmedabad.
10) All disputes arising out of or in any way connected with this agreement shall be deemed to have arisen at Ahmedabad and only the courts in Ahmedabad i shall have jurisdiction to determine the same.
11) That the several parts of this Contract have been read by the Contractor and fully understood by the Contractor.

IN WITNESS WHEREOF THE SBI and the Contractor have set their respective hands to these presents and two duplicates hereof the day and year first hereinabove written.

Signature clause:

_____

SIGNED AND DELIVERED

By the hand of Shri ---------- **Assistant General Manager** of **State Bank Of India**
(Name and Designation)

In presence of _____

1. _____
Address _____

2. _____
Address _____
(Witness)

SIGNED AND DELIVERED by
(If the Contractor is a Partnership Firm or an individual, should be signed by all partners or by duly authorized person on behalf of all partners)

(1) _____
Address _____

(2) _____
Address _____
(Witness)

THE COMMON SEAL OF _____ was hereinto affixed pursuant to the resolution By Board of Directors at the Meeting held on (If the Contractor signs under its common seal, the Signature Clause should tally with the sealing clause in the Articles of Association)

SIGNED AND DELIVERED by
(1) _____

(2) _____

1) _____
Address _____

(2) _____
Address _____
(Witness)

SIGNED AND DELIVERED by _____(If the Contractor has signed by the hand of Power of Attorney , whether a Company or Individual)

(1) _____
Address _____

(2) _____
Address _____
(Witness)

SECTION – 1

INSTRUCTIONS TO THE TENDERERS

1.0 Scope of work

Sealed Tender followed by price bidding (on percentage basis) are invited **by SBI, SURAT** for and behalf of SBI Proposed **AIR CONDITIONING WORKS** of **SBI ADMIN OFFICE, SURAT**

2.0 Site and its location

The proposed work is to be carried out at SBI ADMIN OFFICE, SURAT, GUJARAT-395001.

Tender Documents

2.1 The work has to be carried out strictly according to the conditions stipulated in the tender consisting of the following documents and the most workmen like manner.

Instructions to tenderers

General conditions of Contract

Special conditions of Contract

Additional Specifications

Drawings

Priced bid A

2.2 The above documents shall be taken as complementary and mutually explanatory of one another but in case of ambiguities or discrepancies, shall take precedence in the order given below;

a) Price Bid

b) Additional Specifications

c) Technical specifications

d) Drawings

e) Special conditions of contract

f) General conditions of contract

g) Instructions to Tenderers

2.3 Complete set of tender documents including relative drawings can be downloaded from the website www.sbi.co.in

2.4 The tender documents are not transferable.

3.0 Site Visit:

The tenderer must obtain himself on his own responsibility and his own expenses all information and data which may be required for the purpose of filling this tender document and enter into a contract for the satisfactory performance of the work. The tenderer is requested to satisfy himself regarding the availability of water, power, transport and communication facilities, the character quality and quantity of the

materials, labor, the law and order situations, climatic conditions, local authorities requirement, traffic regulations etc; The tenderer will be fully responsible for considering the financial effect of any or all the factors while submitting his tender. The Bank shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder regardless of the conduct or outcome of the bidding process.

The tenderere is advised to inspect the site and satisfy himself on his own responsibility and his own expenses all the following information and data which may be required for the purpose of preparation and submission of their bids:

i) The location of indoor and outdoor units of the proposed ACs
ii) Required civil work like making opening in the wall,
iii) feasibility for laying the refrigerant pipes and its route
iv) Availability of drain water point at the site
v) Availability of Power near the proposed AC location
vi) Security gate pass requirements
vii) Storage space for the new ACs
viii) Permissible working hours at the site
ix) any other adverse conditions or hindrance to the installation
x) Any demo or presentation is required by Bank before installation
xi) traffic regulations, law & order situations in the area
xii) Whether AC has to be installed in coordination with other agencies like interior etc

4.0 **CLARIFICATION / AMENDEMENTS AND CORRIGENDUM:**

4.1 Bidder requiring any clarification of the bidding document may notify us in writing at the address/by e-mail given in the NIT within the date/time mentioned.

4.2 The clarifications to the queries received or amendments in the tender will be posted on the Bank's website and e-tender portal as a corrigendum/Addendum. No individual communication will be conveyed to the Bidders. The interested parties/Bidders are advised to check the above website regularly till the date of submission of Bid document and ensure that clarifications / amendments issued, if any, have been taken into consideration before submitting the Bid. Such amendments/clarifications, if any, issued by the Bank will be binding on the participating Bidders. Bank will not take any responsibility for any such omissions by the Bidder. Bank at its own discretion, may extend the deadline for submission of Bids in order to allow prospective Bidders a reasonable time to prepare the Bid, for taking the amendment into account.

4.3 Depending upon the site conditions and the Bank's requirements, a pre-Bid meeting, if required, will be held on the date and time specified in the tender which may be attended by the interested Bidders or their representatives and get their queries clarified

4.4 Bank reserves the right to amend, rescind or reissue the tender, at any time prior to the deadline for submission of Bids.

4.5 No request for change in commercial/legal terms and conditions, other than what has been mentioned in the tender or any addenda/corrigenda or clarifications issued in connection thereto, will be entertained and queries in this regard, therefore will not be entertained.

4.6 Queries received after the scheduled date and time will not be responded/acted upon.

5.0 **Earnest Money: RS. 20,000.00**

5.1 The tenderer are requested to submit the Earnest Money as mentioned in NIT

5.2 EMD in any other form other than as specified above will not be accepted. Tender not accompanied by the EMD in accordance with clause 4.1 above shall be rejected.

5.3 No interest will be paid on the EMD

5.4 EMD of unsuccessful tenderer will be refunded within 30 days of award of contract.

5.5 EMD of successful tenderer will be retained as a part of security deposit.

6.0 Initial Security Deposit: 2 %

7.0 Security Deposit:

7.1 Total security deposit shall be 3% of contract value. Deduction from each running bill account will be @ 10% till Total Security Deposit (TSD) reaches to 3% of contract value. The 50% of the Total Security Deposit shall be paid to the contract on the basis of architect's certifying the virtual completion. The balance 50% would be paid to the contractors after completion Defects Liability Period as specified in the contract/WORK ORDER.

7.2 No interest shall be paid on the amount retained by the Bank as Security Deposit.

8.0 BID SUBMISSION

8.1 Only those bidders satisfying the eligibility criteria given in the NIT need to apply. Tenders should be submitted online in the website **https://etender.sbi. Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission. Bidder will be responsible for any delay due to other issues.**

8.2 The bidders should submit their bids online with their valid digital certificate, which confirms that the bidders have read and understood the tender terms and conditions. Claiming ignorance of all the terms and conditions in this tender either before or after the PO is issued or during the progress of the work will not be accepted.

8.3 The bidder shall submit the documents enlisted in the checklist in the NIT in the soft copy format. i.e. scanned copy of the documents either in PDF or JPEG format as required. The BANK will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders. The bidder should see that the bid documents submitted should be free from virus and if the documents could not be opened, due to virus, during tender opening, the bid is liable to be rejected.

8.4 The documents submitted online in the **Technical Bid should NOT contain any price information**. Such Bid, if received, will be rejected.

8.5 The bidder shall submit his quotes online through the PRICE BID in the e-procurement portal. The price bid will be opened only if the Bid is unconditional and the bidder qualifies as per eligibility criteria and meets technical specifications.

8.6 Bank shall conduct e-reverse auction among the qualified bidders and the same shall be communicated to the bidders.(If required)

8.7 No claim for submission of offline bids will be entertained. Such bids will not be considered. If any Bidder submits Bid on behalf of an OEM / brand, the same Bidder shall not submit a Bid on behalf of another OEM / brand.

9.0 PRICE BID : RATES QUOTED BY BIDDER

9.1 The contractor shall satisfy himself before Bidding as to the correctness and sufficiency of his Bid for the works and the rates/ amounts stated in the schedule of quantities and / or the schedule of rates and amount as provided covering all his obligations under the contract and all matters necessary for proper completion of the works expected in this document.

9.2 The rate quoted shall be firm and shall include costs of all materials, loading, transport, unloading, Installation charges, wastage of materials during execution, levies, Octroi(if applicable), local body taxes(if applicable), all type of Insurance Charges, temporary works such as scaffolding, cleaning, overheads, profit, statutory expenses, incidental charges and all related expenses to complete the work etc..

9.3 Unless otherwise provided in the Schedule of Quantities/Specifications, the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the work and No extra charges will be paid over and above the contract amount on account of any other charges (existing or future addition) or on any other account.

9.4 The GST shall be paid extra as applicable.

9.5 Rate Revision in the contract amount is not permitted during the validity period of the contract for any reason including during the extended period, if any.

9.6 Any request for review of the price bid after the bid opening will not be entertained.

9.7 The Bidder shall quote their offers he will be willing to execute the work, in terms of "Specific Percentage Numerical Value" (only up to two decimal places) above (+) / below(-) / at par with the total estimated cost put to bid. The same percentage offer is applicable for each and every item of the work including all sections/sub sections /sub heads of the work.

10.0 **Signing of contract Documents:**

The contractor who accept the standard rates shall be bound to implement the contract by signing an agreement and conditions of contract attached herewith within 15 days from the receipt of intimation of acceptance of the tender by the Bank. However, the written acceptance of the bidder by the Bank will constitute a binding agreement between the Bank and contractor who accept the L-1 rates (Standard Rates) whether such formal agreement is subsequently entered in to or not.

11.0 Completion Period

Time is essence of the contract. The work should be completed in all respect accordance with the terms of contract within the stipulated period from the date of award of work.

11.1 Validity of Tender: As per NIT

If the tenderer withdraws his/her offer during the value period or makes modifications in his/her original offer which are not acceptable to Bank without prejudice to any other right or remedy the Bank shall be at liberty to forfeit the EMD.

12.0 **Photographs:**

The Contractor shall at his own expense supply to the Architects with duplicate hard copies of large photographs not less than 25 cm. x 20 cm. (10" x 8") of the works, taken from two approved portions of each building, at intervals of not more than one months during the progress of the work or at every important stage of construction.

In addition to above, the contractor shall be bound to submit adequate no. of site photographs along with each Running Bill for the project clearing showing major progress of work measured and claimed therein failing which the Architect/ SBI may consider returning the Bill to the contractor and no claim for delay on this account will be entertained.

13.0 **Liquidated Damages:**

The liquidated damages shall be 0.50% per week subject to a maximum of 5% of contract value.

15.0 Rate and Prices:

15.1 In case of Item Rate Tender:

i. The bidder should submit online bid by the authorized person through his digital signature. This estimate should have clear and complete specifications and scope of each item and its estimated quantity. The intending bidders shall quote their rates of each item separately.
ii. The bidder offering Lowest Tender Amount for projects pertaining to Procurement Purchase Contract and Highest Tender Amount for Sales Contracts shall be declared as "Successful Bidder".
iii. ln case, the Lowest Tendered Amount of two or more contractors is same, such lowest contractors will again be asked to submit sealed / online. Revised sealed bid on item rate basis including all sub sections/sub heads as the case may be, but the revised total amount quoted shall, in no case, be higher than the total amount quoted during their initial offer for the project. The lowest tender shall be decided on the basis of revised offers.
iv. The process of online re-bidding amongst Two or more contractors offering same total amount shall continue till L-1 bidder is discovered.
v. ln case, any of such contractor(s) (quoted same tender amount during initial bidding or subsequent re-bidding) refuses to submit revised offer, it shall be treated as "withdrawal of tender/' by the Contractor before acceptance. The earnest money of such contractors shall be forfeited.
vi. ln case all the lowest contractors those have quoted same tendered amount, refuse to participate in online revised bidding process for the project, the EMD of such Contractors shall be forfeited and the tenders shall be re-invited for the project.
vii. The Contractor(s), whose earnest money is forfeited because of non-submission of revised offer, shall not be allowed to participate in the re-tendering process for the said project.
viii. The tenderers should not change the units as specified in the tender. If any unit is changed the tenders would be evaluated as per the original unit and the contractor would be paid accordingly. The tenderer should not change or modify or delete the description of the item. If any discrepancy is observed he should immediately bring to the knowledge of the Architect/ SBI.

The rate quoted shall be firm and shall include all costs, allowances, materials, labours, taxes etc. except G.S.T, which shall be payable / reimbursed as per actual as applicable.

The SBI reserve their rights to accept any tenders, either in whole or in part or may entrust the work in phases or may drop the part scope of work at any stage of the project within its sole discretion without assigning any reason(s) for doing so and no claim / correspondence shall be entertained in this regard.

Signature Of The Contractor With Seal

GENERAL & IMPORTANT NOTES

1 GENERAL NOTES:

(i) Unless otherwise specified in these tender documents mode of measurements specifications etc. shall be as per relevant IS codes.

(ii) Source of materials / samples / brands / makes etc. shall be got approved from the Architects / Bank before using. In case of deviations, decision of the Bank shall be final and binding and shall not be open for arbitration.

(iii) The Architects have their specific role / duties / rights as defined in these tender documents. However, in the event of any dispute arising out of differences between the opinions of the Architects and also their role/ duties/rights, the Banks' decision shall be final & binding on the Architects and the Contractor and shall not be open to arbitration.

(vi) The Contractor will extend full co-operation, support and all required assistance to Architect / Bank for discharging their duties and responsibilities efficiently and effectively.

(vii) The contractor has to supply and adhere to the specific makes and specifications of all the items, which are mentioned in the separate list of approved makes. Any work found not as per the tender specifications and list of approved the contractor has to replace the same without any delay. The contractor is instructed of get approval of all the materials to be used on this site before starting the work. He should provide different sample of material for approval, before execution of work.

(viii) All quantities indicated in the tender are approximate & are likely to change. The contractor must take actual measurement at site and billing shall be done as per the actual measurement of the work done at site.

(ix) Work has to be got executed at site in coordination with various agencies working at site.

(x) The contractor is instructed to get the approval of the materials to be used on this site before starting the work. He shall provide different sample of materials for approval before execution of the work

(xi) All material has to be used in full size/length only. Joints should be avoided as far as possible.

(xii) Making various levels & line out for total layout on site for the items in scope of the work shall be done by the contractor at his own cost.

(xiii) MTC (Manufacturer Test certificate) Where ever applicable shall be arranged & submitted by the contractor. Testing of wood for moisture, knot % etc. shall be carried out by the contractor at his own cost.

2. IMPORTANT NOTES:

(i) **The contractor's qualified & authorized representative shall remain on site during the entire execution process for coordination with various agencies / Architect / Bank & execution of work.**

(ii) **If the assigned work is in running/working Branch, the contractor should have executed the site erection work in odd hours, Holidays and Sundays.**

(iii) **The site shall be cleaned on day-to-day basis & all debris shall be disposed away at the location beyond the limit as approved by the local authority.**

(v) **Hidden measurements: - It is contractor's responsibility to get the measurement checked immediately on completion of such items. This shall be done before finishing the same The Architect shall be provided with such details well in advance so that the other work is not held up due to last moment action.**

(vi) **The rates quoted shall be inclusive of all taxes, Duties, Octroi, Transportation, Delivery, Installation, Testing, Commissioning etc. complete at the site. No extra will be paid for any kind of taxes. However, the GST will be paid extra as applicable as per actual.**

viii) **The entire job shall be executed in total coordination with the other agencies working on the project & also with landlord, Branch Manager and Bank officials etc.**

ix) **Architect of the project shall be kept informed about the progress of the work at various stages.**

x) **The contractor shall arrange on his own for lighting & plug point with socket & electrical wiring, DB's etc. required during entire execution process. However, supply at point shall be provided by the bank / landlord**

(xi) **Any Hidden item MUST be photographed and need to be sent via e- mail or CD to Architect / Bank**

xii) **BILLING PROCESS:**
The contractor/Architect should take care of the following while submitting the final Bill

The Final Bill Should Contain: -

a) Abstract in tender BOQ format only.

b) Schedules for detailed measurement sheet for all items (in detailed break up).

c) Original insurance policies as per tender terms and conditions.

d) Completion certificate issued by the concerned Architect.

e) Inspection & completion certificates for all types of false ceiling.

g) Copy of LOA etc.

h) All documents shall carry contractor's signature & seal with address. - All documents shall be submitted in 1 + 1 copies.

i) The contractor shall also provide all measurement sheet in soft copy (in Excel format).

j) The contractor shall submit the purchase bill copy of major items used in the project.

k) That extension of time, if any, beyond scheduled date of completion has been granted by the Competent Authority.

m) If any advances paid during the execution of the work.

n) Acceptances form the contractor that "Accepted as full and final settlement of all claims"

o) The total cost of work should be within the sanction amount, if not, revised sanction taken from the Competent Authority to be attached with the Final Bill

IMPORTANT: ALL DOCUMENTS SHALL BE SUBMITTED AT ONCE (NOT IN PIECEMEAL MANNER) ALONG WITH FULL&FINAL BILL &SHALL BE DULY SIGNED BY PUTTING COMPANY'S ADDRESS SEAL

GENERAL CONDITIONS OF CONTRACT

1.0 Definitions:

"Contract" means the documents forming the tender and the acceptance thereof and the formal agreement executed between State Bank of India (client) and the Contractor, together with the documents referred therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Architects/ Bank and all these documents taken together shall be deemed to form one contract and shall be complementary to one another.

1.1 In the contract the following expressions shall, unless the context otherwise requires, have the meaning hereby respectively assigned to them.

1.1.1 'SBI' shall mean State Bank of India (client) a body corporate created under State Bank of India Act 1955,having its Corporate Centre at State Bank Bhavan, Madame Cama Road, Mumbai-400 021 and LHO at Bhadra, Ahmedabad and includes the Client's representatives, successors and assigns.

'Architect/ consultants' shall mean *SBI, Surat - 395001.*

'Project Management Consultant' shall mean ----------Not Applicable ----------

1.1.2 'Site Engineer' shall mean an Engineer appointed by the Bank as their representative to give instructions to the contractor.

1.1.3 'The Contractor' shall mean the individual or firm or company whether incorporated or not, undertaking the works and shall include legal personal representative of such individual or the composing the firm or company and the permitted assignees of such individual or firm or company.

The expression 'Works' or 'Work' shall mean the permanent or temporary work described in the 'Scope of Work' and / or to be executed in accordance with the contract and includes materials, apparatus, equipments, temporary supports, fittings and things of all kinds to be provided, the obligations of the contractor hereunder and work to be done by the contractor under the contract.

1.1.4 'Engineer' shall mean the representative of the Architect/ Consultant.

1.1.5 'Drawings' shall mean the drawings prepared by the Architects and issued by the Engineer and referred to in the specifications and any modifications of such drawings as may be issued by the Engineer from time to time 'Contract value shall mean the value of the entire work as stipulated in the letter of acceptance of tender subject to such additions thereto or deductions there from as may be made under the provision herein after contained.

1.1.6 'Specifications' shall mean the specifications referred to in the tender and any modifications thereof as may time to time be furnished or approved by the Architects/ consultant.

1.1.7 "Month" means calendar month.

1.1.8 'Week' means seven consecutive days.

1.1.9 'Day" means a calendar day beginning and ending at 00 hr and 24 hrs respectively.

CLUASE

1.0 **Total Security Deposit**

Total Security Deposit comprise of
Earnest Money deposit
Initial security deposit
Retention money

a) **Earnest Money Deposit:**

The tenderer shall furnish EMD as specified in the NIT in the form of Demand draft drawn in favor of the State Bank of India on any Scheduled Bank. No tender shall be considered unless the EMD is so deposited in the required form. No interest shall be paid on this EMD. The EMD of the unsuccessful tenderer shall be refunded soon after the decision to award the contract is taken without interest. The EMD shall stand absolutely forfeited if the tenderer revoke his tender at any time during the period when he is required to keep his tender open for acceptance by the SBI or after it is accepted by the SBI the contractor fails to enter into a formal agreement or fails to pay the initial security deposit as stipulated or fails to commence the work within the stipulated time.

b) **Initial Security Deposit (ISD)**

The ISD shall be 2% of accepted value of tender including the EMD in the form of DD drawn in favor of any scheduled bank and shall be deposited within 15 days from the date of acceptance of tender.

c) **Retention Money:**

Besides the ISD as deposited by the contractor in the above said manner the retention money shall be deducted from the running account bill at the rate of 10% of the gross value of work done by the contractor and claimed in each bill provided the total security deposit i.e. the ISD plus retention money shall both together not exceed 5% of contract value. 50% of the total security deposit shall be refunded to the contractor without any interest on issue of Virtual Completion Certificate by the Architect/ Consultant. The balance 50% of the total security deposit shall be refunded to the contractor without any interest within fifteen days after the end of defect liability period provided the contractor has satisfactorily attended to all defects in accordance with the conditions of contract including site clearance.

2.0 **Language**

The language in which the contract documents shall be drawn shall be in English.

3.0 **Errors, omissions and discrepancies**

In case of errors, omissions and / or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications etc., the following order shall apply:

i) Between scaled and written dimension (or description) on a drawing, the latter shall be adopted.

ii) Between the written or shown description or dimensions in the drawings and the corresponding one in the specification the former shall be taken as correct.

iii) Between written description of items in the specifications and description in bills of quantities of the same former shall be adopted.

a) In case of difference between rates written in figures and words, the rate in word shall prevail.

b) Between the duplicate/ subsequent copies of the tender, the original tender shall be taken as correct.

4.0 **Scope of work:**

The contractor shall carryout complete and maintain the said work in every respect strictly in accordance with this contract and with the directions of and to the satisfaction of the Bank to be communicated through the Architect/ Consultant. The Architect/ Consultant at the directions of the Bank from time to time, issue further drawings and/ or written instructions, detail directions and explanations which are hereafter collectively referred to as the Architect/ Consultant's instructions in regard to the variation or modification of the design, quality or quantity of work or the addition or omission or submission of any work. Any discrepancy in the drawings or between the BOQ and/ or drawings and/ or specifications, the removal from the site of any material brought thereon by the Contractor and any submission of any other materials thereof the removal and or re-execution of any work executed by him, the dismissal from the work of any person employed/ engaged there upon.

5.0

(I) **Letter of acceptance:**

Within the validity period of the tender, the Bank shall issue a letter of acceptance either directly or through the Architect/ Consultant by registered post or otherwise depositing at the address of the contractor as given in the tender to enter into a Contract for the execution of the work as per the terms of the tender. The letter of acceptance shall constitute a binding contract between the SBI and the contractor.

(II) **Contract Agreement:**

On receipt of intimation of the acceptance of tender from the SBI/ Architect the successful tenderer shall be bound to implement the contract and within fifteen days thereof. He shall sign an agreement on a non judicial stamp paper of appropriate value.

6.0 **Ownership of drawings:**

All drawings, specifications and copies thereof furnished by the SBI through its Architect / Consultants are the properties of the SBI. They are not to be used on other work.

7.0 **Detailed drawings and instructions:**

The SBI through its Architect / Consultants shall furnish with reasonable promptness additional instructions by means of drawings or otherwise, necessary for the proper execution of the work. All such drawings and instructions shall be consistent with the contract document, true developments thereof and reasonably inferable there from.

The work shall be executed in conformity therewith and the contractor will prepare a detailed program schedule indicating therein the date of start and completion of various activities on receipt of the work order and submit the same to the SBI through its Architect / Consultant.

8.0 **Copies of agreement**

Two copies of agreement duly signed by both the parties (Bank & the Contractor) with the drawings shall be prepared one each for both the parties; a photo copy of such Agreement shall be kept by the Architect.

9.0 **Liquidating damages:**

If the contractor fails to maintain the required progress or to complete the work and clear the site including vacating their office on or before the contracted or extended date or completion without justification in support of the cause of delay, he may be called upon without prejudice to any other right of remedy available under the law to the SBI on account of such breach to pay a liquidated damages as mentioned in NIT

10.0 **Materials, Appliances and employees:**

Unless or otherwise specified the contractor shall provide and pay for all materials, labor, water, power, tools, equipment, transportation and any other facilities that are required for the satisfactory execution and completion of the work. Unless or otherwise specified. All materials shall be new and both workmanship and materials shall be of best quality. The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or any one not skilled in the work assigned to him. Workman whose work or behavior is found to be unsatisfactory by the SBI/ Architect/Consultant shall be removed from the site immediately.

11.0 **Permits, laws and Regulations:**

Permits and licenses required for the execution of the work shall be obtained by the contractor at his own expenses. The contractor shall give notice and comply with the regulations, laws, and ordinances, rules, applicable to the contract. If the contractor observes any discrepancy between the drawings and specifications, he shall promptly notify the SBI in writing under intimation of the Architect/Consultant. If the contractor performs any act which is against the law, rules and regulations he shall meet all the costs arising there from and shall indemnity the SBI any legal actions arising there from.

12.0 **Setting out work:**

The contractor shall set out the work and shall be responsible for the true and perfect setting out the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof and got it approved by the Architect/Consultant before proceeding with the work at any time any error in this respect shall appear during the progress of the works, irrespective of the fact that the layout had been approved by the Architect/Consultant the contractor shall be responsible for the same and shall at his own expenses rectify such error, if so, required to satisfaction of the SBI.

13.0 Protection of works and property:

The contractor shall continuously maintain adequate protection, of all his work from damage and shall protect the SBI's properties from the injury or loss arising in connection with contract. He shall make good any such damage, injury, loss, except due to causes beyond his control and not due to his fault or negligence.

He shall take adequate care and steps for protection of the adjacent properties. The contractor shall take all precautions for safety and protections of his employees on the works and shall comply with all applicable provisions of Govt. and local body's safety laws and building codes to prevent accidents or injuries to persons or property on about or adjacent to his place of works.

14.0 Inspections of work:

The SBI/ Architect/Consultant or their representatives shall at all reasonable times have free access to the work site and/ or to the workshop, factories, or other places where materials are laying or from where they are obtained and the contractor shall give every facility to the SBI/ Architect/Consultant and their representatives necessary for inspection and examination and test of the materials and workmanship. No person unless authorized by the SBI/ Architect/Consultant except the representative of Public authorities shall be allowed on the work at any time. The proposed work either during its construction stage or its completion can also be inspected by the Chief Technical Examiner's organization a wing of Central Vigilance commission.

15.0 **Assignment and subletting:**

The whole of work included in the contract shall be executed by the contractor and he shall not directly entrust and engaged or indirectly transfer, assign or underlet the contract or any part or share thereof or interest therein without the written consent of the SBI though the Architect and no undertaking shall relieve the contractor from the responsibility of the contractor form active superintendence of the work during its progress.

16.0 **Quality of materials, workmanship & Test**

i) All materials and workmanship shall be best of the respective kinds described in the contract and in accordance with the Architect/Consultant's instruction and shall be subject from time to time to such test as the Architect/Consultant may direct at the place of manufacture or fabrication or on the site or in an approved testing laboratory. The contractor shall provide such assistance, instruments, machinery, labor and materials as are normally required for examining, measuring, sampling and testing any material or part of work before incorporation in the work for testing a may be selected and required by the Architect/Consultant.

ii) Samples

All samples of adequate numbers, size, shades & pattern as per specifications shall be supplied by the contractor without any extra charges. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site detailed literature/ test certificate of the same shall be provided to the satisfaction of the Architect/Consultant,. Before submitting the sample/ literature the contractor shall satisfy himself that the material/ equipment for which he is submitting the sample/ literature meet with the requirement of tender specification. Only when the samples are approved in writing by the Architect/Consultant the contractor shall proceed with the procurement and installation of the particular material/ equipment. The approved samples shall be signed by the Architect/Consultant for the identification and shall be kept on record at site office until the completion of the work for inspection/ comparison at any time. The Architect/Consultant shall take responsibility time to approve the sample. Any delay that might occur in approving the samples for reasons of its not meeting the specifications or other discrepancies, inadequacy, delay in furnishing samples of best qualities from various manufactures and such other aspects causing delay on the approval of the material/ equipment etc. shall be to the account of the contractor.

iii) Cost of Tests

The cost of making any test shall be borne by the contractor if such test is intended by or provided for in the condition or specifications or BOQ.

iv) Cost of test not provided for

If any test is ordered by the Architect/Consultant which is either

a) If so intended by or provide for or (in the cases above mentioned) is not so particularized, or though so intended or provided for but ordered by the Architect/Consultant to be carried out by an independent person at any place other than the site of the place of manufacture or fabrication of the materials tested or any Government/ approved laboratory, then the cost of such test shall be borne by the contractor.

17.0 **Obtaining information related to execution of work:**

No claim by the contractor for additional payment shall be entertained which is consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the work or any misunderstanding or the obtaining incorrect information or the failure to obtain correct information relieve him from any risks or from the entire responsibility for the fulfillment of contract.

18.0 **Contractor's superintendence**

The contractor shall give necessary personal superintendence during the execution of the works and as long, thereafter, as the Architect/ Consultant may consider necessary until the expiry of the defects liability period, stated hereto.

19.0 **Quantities:**

i) The bill of quantities (BOQ) unless or otherwise stated shall be deemed to have been prepared in accordance with the Indian Standard method of Measurements and quantities. The rate quoted shall remain valid for variation of quantity against individual item to any extent subject to maximum variation of the contract value by 25%. The entire amount paid under clause 21 hereof as well as amount of prime cost and provisional sums if any shall be excluded.

ii) Variation exceeding 25%: the items of work executed in relation to variation exceeding 25% shall be paid on the basis of provisions of clause 22 hereof.

20.0 **Works to be measured**

The Architect/Consultant may from time to time intimate to the contractor that he requires the work to be measured and the contractor shall forthwith attend or send a qualified representative to assist the Architect in taking such measurements and calculations and to furnish all particulars or to give all assistance required by any of them. Such measurements shall be taken in accordance with the mode of Measurements detailed in the specifications. The representative of the Architect/Consultant shall take the joint measurements with the contractor's representative and the measurements shall be entered in the measurement book. The contractor or his authorized representative shall sign all the pages of the measurement book in which the measurements have been recorded in token of his acceptance. All the corrections shall be duly attested by both representatives. No over writings shall be made in the measurement book. Should the contractor not attend or neglect or omit to depute his representative to take measurements then the measurements recorded by the representative of the Architect/Consultant shall be final. All authorized extra work, omissions and all variations made shall be included in such measurement.

21.0 **Variations**

No alteration, omission or variation ordered in writing by the Architect/ Consultant shall vitiate the contract. In case the SBI/ Architect/Consultant thinks proper at any time during the progress of works to make any alteration in, or additions to or omissions from the works or any alteration in the kind or quality of the materials to be used therein, the Architect/Consultant shall give notice thereof in writing to the contractor or shall confirm in writing within seven days of giving such oral instructions, the contractor shall alter to, 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, stipulations, specifications or contract drawings without previous consent in writing of the Architect/Consultant and the value of such extras, alternations, additions or omissions shall in all cases be determined by the Architect/Consultant and the same shall be added to or deducted from the contract value, as the case may be.

22.0 **Valuation of variations:**

No claim for an extra shall be allowed unless it shall have been executed under the authority of the Architect/Consultant with the concurrence of the SBI as herein mentioned. Any such extra is herein referred to as authorized extra and shall be made in accordance with the following provisions.

a)

i) The net rates or prices in the contract 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 herein.

ii) Rates for all items, wherever possible should be derived out of the rates given in the priced BOQ.

b) The net price of the original tender shall determine the value of the items omitted, provided if omissions do not vary the conditions under which any remaining items of works are carried out, otherwise the prices for the same shall be valued under sub-clause (c) hereunder.

c) Where the extra works are not of similar character and/ or executed under similar conditions are aforesaid or where the omissions vary the conditions under which any remaining items or works are carried out, then the contractor shall within 7 days of the receipt of the letter of acceptance inform the Architect/Consultant of the rate which he intends to charge for such items of work, duly supported by analysis of the rate or rates claimed and the Architect/Consultant shall fix such rate or prices as in the circumstances in his opinion are reasonable and proper, based on the market rate.

d) Where extra work cannot be properly measured or valued the contractor shall be allowed day work prices at the net rats stated in the tender of the BOQ or, if not, so stated then in accordance with the local day work rates and wedges for the district; provided that in either case, vouchers specifying the daily time (and if required by the Architect/Consultant) the workman's name and materials employed be delivered for verifications to the Architect/Consultant at or before the end of the week following that in which the work has been executed.

e) It is further clarified that for all such authorized extra items where rates cannot be derived from the tender, the Contractor shall submit rates duly supported by rate analysis worked on the "market rate basis" for material, labor, hire/ running charges of

equipments and wastage etc. plus 15% toward establishment charges, contractor's overheads and profits. Such items shall not be eligible for escalation.

23.0 **Final measurements:**

The measurements and the valuation in respect of the contract shall be completed within one month of the virtual completion of the work.

24.0 **Virtual Completion Certificate (VCC)**

On successful completion of the entire works covered by the contract to the full satisfaction of the SBI, the contractor shall ensure that the following works has been completed to the satisfaction of the SBI.

a) Clear the site of all scaffolding, wiring, pipes, surplus materials, contractor's labor, equipment and machinery.

b) Demolish, dismantle and remove the contractor's site office, temporary works, structure including labor sheds/ camps and construction of other items and things whatsoever brought upon or erected at the site or any land allotted to the contractor by the SBI and not incorporated in the permanent works.

c) Remove all rubbish, debris etc. from the site and the land allotted to the contractor by the SBI and shall clear, level, and dress, compact the site as required by the SBI.

d) Shall put the SBI in undisputed custody and possession of the site and all land allotted by the SBI.

e) The contractor shall hand over the work in a peaceful manner to the SBI.

f) All defects/ imperfection have been attended and rectified as pointed out by the SBI to the full satisfaction of the SBI.

25.0 **Work by other agencies:**

The SBI / the Architect/Consultant reserve the rights to use premises and any portion of the site for execution of any work not included in the scope of this contract which it may desire to have carried out by other persons simultaneously and the contractor shall not only allow but also extend reasonable facilities for the execution of such work. The contractor however shall not be required to provide any plant or material for the execution of such work except by special arrangement with the SBI. Such work shall be carried out in such manner as not to impede the progress of the works included in the contract.

26.0 Insurance of works:

26.1 Without limiting his obligations and responsibilities under the contract, the contractor shall insure in the joint names of the SBI and the contractor against all loss or damages from whatever cause arising other than the excepted risks, for which he is responsible under the terms of contract and in such a manner that the SBI and contractor are covered for the period stipulated in clause 28 and 29 of GCC and are also covered during the period of maintenance for loss or damage arising from a cause, occurring prior to the commencement of the period of maintenance and for any loss or damage occasioned by the contractor in the course of any operations carried out by him for the purpose of complying with his obligations under clause.

a) The works for the time being executed to the estimated current Contract value thereof, or such additional sum as may be specified together with the materials for incorporation in the works at their replacement value.

b) The constructional plant and other things brought on to the site by the contractor to

the replacement value of such constructional plant and other things.

c) Such insurance shall be effected with an insurer and in terms approved by the SBI which approval shall not be unreasonably withheld and the contractor shall whenever required produce to the Architect/Consultant the policy of insurance and the receipts for payment of the current premiums.

26.2 Damage to persons and property

The contractor shall, except if and so far as the contract provides otherwise indemnify the SBI against all losses and claims in respect of injuries or damages to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the works and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation of damages for or with respect to:

a) The permanent use or occupation of land by or any part thereof.

b) The right of SBI to execute the works or any part thereof, over, under, in or through any lands.

c) Injuries or damages to persons or properties which are unavoidable result of the execution or maintenance of the works in accordance with the contract.

d) Injuries or damages to persons or properties resulting from any act or neglect of the SBI, their agents, employees or other contractors not being employed by the contractor or for or in respect of any claim, proceedings damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the contractor, his servants or agents. Such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the SBI, their employees, or agents or other employees, or agents or other contractors for the damage or injury.

26.3 Contractor to indemnify SBI

The contractor shall indemnify the SBI against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the provision of these sub-clauses of 26.2

26.4 Contractor's superintendence

The contractor shall fully indemnify and keep indemnified the SBI 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 pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claim made under or action brought against SBI in respect of such matters as aforesaid the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expenses to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the SBI 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 Architect/Consultant in this behalf.

26.5 Third party Insurance

26.5.1 Before commencing the execution of the work the contractor without limiting his obligations and responsibilities under clause 26.0 of GCC shall insure against his liability for any material or physical damage, loss, or injury which may occur to any property including that of SBI, or to any person, including any employee of the SBI, by or arising out of the execution of the works or in the carrying out of the contract, otherwise than due to the matters referred to in the provision to clause 26.0 thereof.

26.5.2 **Minimum amount of third party insurance**

Such insurance shall be effective with an insurer and in terms of approved by the SBI which approval shall not be reasonably withheld and at least the amount stated below. The contractor shall whenever required produce to the Architect / Consultant the policy or policies of insurance cover and receipts for payment of the current premiums.

The minimum insurance cover for physical property, injury and death is **Rs. 5 lacs per occurrence with the number of occurrences limited to four**. After each occurrence contractor will pay additional premium necessary to make insurance valid for four occurrences always.

26.6 Accident or Injury to workman:

26.6.1 The SBI shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the contractor or any sub-contractor, save and expect an accident or injury resulting from any act or default of the SBI or their agents, or employees. The contractor shall fully indemnify and keep indemnified the SBI against all such damages and compensations, save and except as aforesaid and against all claims proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

26.6.2 **Insurance against accidents etc. to workmen:**

The contractor shall insure against such liability with an insurer approved by the SBI during the whole of the time that any person are employed by him on the works and shall, when required, produce to the Architect/Consultant such policy of insurance and receipt for payments of the current premium. Provide always that, in respect of any persons employed by any sub-contractor, the contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub contractor shall have insured against the liability in respect of such persons in such manner that SBI is indemnified under the policy but the contractor shall require such sub-contractor to produce to the Architect/Consultant when such policy of insurance and the receipt for the payment of the current premium.

26.6.3 **Remedy on Contractor's failure to insure:**

If the contractor fails to effect and keep in force the insurance to above referred to above or any other insurance which he may be required to effect under the terms of contract, then and in any such case the SBI may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the SBI as aforesaid from any amount due or which may become due to the contractor, or recover the same as debt from the contractor.

26.6.4 Without prejudice to the other rights of the SBI against the contractor, in respect of such default, the employer shall be entitled to deduct from any sums payable to the contractor the amount of any damages, costs, charges, and other expenses paid by the SBI 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 monies 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 payment in respect of the expenditure incurred for rebuilding or repairing of the materials or good destroyed or damaged.

27.0 **Commencement of Works:**

The date of commencement of the work will be reckoned as the date of handing over site or fifteen days from the date of issue of letter of acceptance of the tender by the SBI whichever is later.

28.0 **Time of completion:**

Time is essence of the contract and shall be strictly observed by the contractor. The entire work shall be completed within as specified in the NIT from the date of commencement. If required in the contract or as directed by the Architect/Consultant, the contractor shall complete certain portions of work before completion of the entire work. However the completion date shall be reckoned as the date by which the whole work is completed as per the terms of the contract.

29.0 **Extension of time:**

If, in the opinion of the Architect/Consultant, the work be delayed for reasons beyond the control of the contractor, the Architect/Consultant may submit a recommendation to the SBI to grant a fair and reasonable extension of time for completion of work as per the terms for contract. If the contractor needs an extension of the time for completion of the work or if the completion of work is likely to be delayed for any reasons beyond the due date of completion as stipulated in the contract, the contractor shall apply to the SBI through the Architect/Consultant in writing at least 30 days before the expiry of the scheduled time and while applying for extension of time he shall furnish the reasons in detail and his justification if any, for the delays. The Architect/Consultant shall submit their recommendations to the SBI in the prescribed format for granting extension of time. While granting extension of time the contractor shall be informed the period extended times, which will quality for levy of liquidated damages. For the balance period in excess of original stipulated period and duly sanctioned extension of time by the SBI. The provision of liquidated damages as stated under clause 9 of GCC shall become applicable. Further the correct shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not.

30.0 **Rate of progress:**

Whole of the materials, plant and labor to be provided by the contractor and the mode, manner and speed of execution and maintenance of the works to be of a kind and conducted in a manner to the satisfaction of the Architect/Consultant should the rate of progress of the work or any part thereof be at any time be in the opinion of the Architect/Consultant too slow to ensure the completion of the whole of the work by the prescribed time or extended time for completion the Architect/Consultant shall thereupon take such steps as considered necessary by the Architect/Consultant to expedite progress so as to complete the works by the prescribed time or extended time. Such communications from the Architect/Consultant neither shall relieve the contractor from fulfilling obligations under the contract nor will he be entitled to raise any claims arising out of such directions.

31.0 **Work during nights and holidays:**

Subject to any provision to the contrary contained in the contract no permanent work shall save as herein provided be carried on during the night or on holidays without the permission in writing of the Architect/Consultant, save when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the work in which case the contractor shall immediately advise the Architect/Consultant. However,

the provisions of the clause shall not be applicable in the case of any work which becomes essential to carry by rotary or double shifts in order to achieve the progress and quality of the part of the work being technically required/ continued with the prior approval of the Architect/Consultant at no extra cost to the SBI.

All work at night after obtaining approval from competent authorities shall be carried out without unreasonable noise and disturbance.

32.0 **No compensation for restrictions of work:**

If at any time after acceptance of the tender SBI shall deduct to abandon or reduce the scope of work for any reason whatsoever and hence not required the whole or any part of the work to be carried out, the Architect/Consultant shall give notice in writing to that effect to the contractor and the contractor shall act accordingly. In the matter the contractor 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 work fully but which he did not derive in consequences of the foreclosure of the whole or part of the work.

Provided that the contractor shall be paid the charges on the cartage only of materials actually and bonafide brought to the site of the work by the contractor and rendered surplus as a result of the abandonment, curtailment of the work or any position thereof and taken back by the contractor, provided however that the Architect/Consultant shall have in such cases the opinion of taking over all or any such material at their purchase price or at local current rate whichever is less.

"In case of such stores having been issued form SBI stores and returned by the contractor to stores, credits shall be given to him at the less rate not exceeding those at which were originally issued to the contractor after taking into consideration and deduction for claims on account of any deterioration or damage while in the custody of the contractor and in this respect the decision of the Architect/Consultant shall be final.

33.0 **Suspension of work:**

i) The contractor shall, on receipt of the order in writing of the Architect/Consultant (whose decision shall be final and binding on the contractor) suspend the progress of work or any part thereof for such time and in such manner as the Architect/Consultant may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:

a) On account any default on the part of the contractor, or
b) For proper execution of the works or part thereof for reasons other than the fault of the contractor or
c) For safety of work or part thereof, the contractor shall during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Architect/Consultant.

34.0 Action when the whole security deposit is forfeited

In any case in which under any clause or clauses of this contract, the contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit the Architect/Consultant shall have the power to adopt any of the following course as they may deem best suited to the interest of the SBI.

a) To rescind the contact (of which rescission notice in writing to the contractor by the Architect/Consultant shall be conclusive evidence) and in which case the security deposit of the contractor shall be forfeited and be absolutely at the disposal of SBI.

b) To employ labor paid by the SBI and to supply materials to carry out the work, or any part of the work, debiting the contractor with the cost of the labor and materials (the cost of such labor and materials as worked out by the Architect/Consultant shall be final and conclusive against the contractor.) and crediting him with the value of the work done, in all respects in the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract, the certificate of the Architect/Consultant as to the value of work done shall be final and conclusive against the contractor.

c) To measure up the work of the contractor, and to take such part thereof as shall be unexecuted, out of his hands, and to give it to another contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (of the amount of which excess the certificates in writing of the Architect/Consultant shall be final and conclusive) shall be borne by original contractor and may be deducted from any money due to him by the SBI under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or sufficient part thereof.

In the event of any of above courses being adopted by the SBI the contractor shall have no claim for compensation for any loss sustained by him by reasons of his having purchased or procured any material or entered into any engagements or make any advances on account of, or with a view to the execution of the work or the performance of the contract and in case the contract shall rescind under the provision aforesaid, the contractor shall not be entitled to recover or to be paid any sum or any work thereto for actually performed under this contract, unless, and until the Architect/Consultant will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified.

35.0 **Owner's right to terminate the contract:**

If the contractor being an individual or a firm commit any 'Act of Insolvency' or shall be adjusted an Insolvent or being an incorporated company shall have an order for compulsory winding up voluntarily or subject to the supervision of Govt. and of the Official Assignee of the liquidator in such acts of insolvency or winding up shall be unable within seven days after notice to him to do so, to show to the reasonable satisfaction of the Architect/Consultant that he is able to carry out and fulfill the contract and to give security therefore if so required by the Architect/Consultant.

Or if the contractor (whether an individual firm or incorporated company) shall suffer execution to be issued 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 SBI through the Architect/Consultant or shall charge or encumber this contract or any payment due to which may become due to the contractor there under:

a) has abandoned the contract ; or

b) has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for 14 days after receiving from the SBI through the Architect/Consultant written notice to proceed, or

c) has failed to proceed with the works with such diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or has failed to remove the materials from the site or to pull down and replace work within seven days after written notice from the SBI through the Architect/Consultant that the

said materials were condemned and rejected by the Architect/Consultant under these conditions; or has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this contract to be observed and performed by the contractor for seven days after written notice shall have been given to the contractor to observe or perform the same or has to the detriment of good workmanship or in defiance to the SBI's or the Architect/Consultant's instructions to the contrary subject any part of the contract. Then and in any of said cases the SBI and or the Architect/Consultant, may not withstanding any previous waiver, after giving seven days notice in writing to the contractor, determine the contract, but without thereby affecting the power the SBI or the Architect/Consultant or the obligation and liabilities of the contractor the whole of which shall continue in force as fully as if the contract had not been so determined and as if the works subsequently had been executed by or on behalf of the contractor. And further the SBI through the Architect/Consultant their agents or employees may enter upon and take possession of the work and all plants, tools, scaffoldings, materials, sheds, machineries lying upon the premises or on the adjoining lands or roads use the same by means of their own employees or workmen in carrying on and completing the work or by engaging any other contractors or persons to complete the work and the contractor shall not in any was interrupt or do any act, matter or thing to prevent or hinder such other contractor or other persons employed for completing and finishing or using the materials and plant for the works.

When the works shall be completed as soon thereafter as convenient the SBI or the Architect/Consultant shall give a notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within 14 days after receipt thereof by him the SBI sell the same by public auction after due publication, and shall adjust the amount released by such auction. The contractor shall have o right to question any of the acts of the SBI incidental to the sale of the materials etc.

36.0 Certificate of payment:

The contractor shall be entitled under the certificates to be issued by the Architect/Consultant to the contractor within 10 working days from the date of receipt of certificate to the payment from SBI from time to time. The SBI shall recover the statutory recoveries other dues including the retention amount from the certificates of payments.

They shall provide always that the issue of any certificate by the Architect/Consultant during the progress of works or completion shall not have effect as certificate of satisfaction or relive the contractor from his liability under clause.

The Architect/Consultant shall have power to withhold the certificate if the work or any part thereof is not carried out to their satisfaction.

The Architect/Consultant may by any certificate make any corrections required in previous certificate.

The SBI shall modify the certificate of payments as issued by the Architect/Consultant from time to time while making the payment.

The contractor shall submit interim bills only after taking actual measurements and properly recorded in the M books.

~~The contractor shall not submit interim bills when the approximate value of work done by him is less than Rs 9 lacs and the minimum interval between two such bills shall be one month.~~

The final bill may be submitted by the contractor within a period of one month from the date of virtual completion and the Architect/Consultant shall issue the certificate of payment within a period of two months. The SBI shall pay the amount within a period of

three months from the date of issue of certificate provided there is no dispute in respect of rates and quantities etc.
The contractor shall submit the interim bills in the prescribed format with all details.

37.0 SETTLEMENT OF DISPUTES AND ARBITRATION:

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instruction, orders or these conditions or otherwise concerning the work or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter.

i) If the contractor consider that he is entitled to any extra payment or compensation in respect of the works over and above the amounts admitted as payable by the Architect or in case the contractor wants to dispute the validity of any deductions or recoveries made or proposed to be made from the contract or raise any dispute, the contractor shall forthwith give notice in writing of his claim, or dispute to the concerned ***Assistant General Manager,*** and endorse a copy of the same to the Architect, within 30 days from the date of disallowance thereof or the date of deduction or recovery. The said notice shall given full particulars of the claim, grounds on which it is based and detailed calculations of the amount claimed and the contractor shall not be entitled to raise any claim nor shall the Bank be in any way liable in respect of any claim by the contractor unless notice of such claim shall have been given by the contractor to the ***Assistant General Manager,*** in the manner and within the time as aforesaid. The contractor shall be deemed to have waived and extinguished all his rights in respect of any claim not notified to the ***Assistant General Manager,*** in writing in the manner and within the time aforesaid.

ii) ***The Assistant General Manager,*** shall give his decision in writing on the claims notified by the contractor. The contractor may within 30 days of the receipt of the decision of the ***Assistant General Manager*** submit his claims to the conciliating authority namely the **DGM** for conciliation along with all detail and copies of correspondence exchanged between him and the ***Assistant General Manager.***

iii) If the conciliation proceedings are terminated without settlement of the disputes, the contractor shall, within a period of 30 days of termination thereof shall give a notice to the concerned ***CHIEF GENERAL MANAGER,*** of the Bank for appointment of an arbitrator to adjudicate the notified claims failing which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.

iv) Except where the decision has become final, binding and conclusive in terms of the contract, all disputes or differences arising out of the notified claims of the contractor as aforesaid and all claims of the Bank shall be referred for adjudication through arbitration by the Sole Arbitrator appointed by the ***CHIEF GENERAL MANAGER***. It will also be no objection to any such appointment that the Arbitrator so appointed is a Bank Officer and that he had to deal with the matters to which the contract relates in the course of his duties as Bank Officer. If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid by the said ***CHIEF***

GENERAL MANAGER. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each dispute along with the notice for appointment of arbitrator.

It is also a term of this contract that no person other than a person appointed by such ***CHIEF GENERAL MANAGER*** as aforesaid should act as arbitrator.

The conciliation and arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or reenactment thereof and the rules made there under.

It is also a term of this contract that if any fees are payable to the arbitrator, these shall be paid equally by both the parties. However, no fees will be payable to the arbitrator if he is a Bank Officer.

It is also a term of this contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of parties. The cost of the reference and of the award (including the fees, if any, of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner, such costs or any part thereof, shall be paid and fix or settle the amount of costs to be so paid.

38.0 ROLE OF ARCHITECT / CONSULTANT

38.1. Architect/Consultant's duties are to design, control and supervise the works and to test any materials to be used or workmanship employed in connection with the works, quality control, project scheduling and monitoring and co-coordinating with all other agencies and Civil Contractor, checking of measurements, certification of bills, preparing extra deviation items, preparing minutes of meetings etc.

38.2 Wherever it is mandatory by law that the Architect / Consultant so appointed by the Bank shall be registered with the council of architecture/Competent Authority.

38.3 The Contractor shall afford the Architect/Consultant every facility and assistance for examining the works and materials and checking and measuring time and materials. The Architect/Consultant shall have no power to revoke, alter, enlarge, or relax any requirements of this Contract, or to sanction any day-work, additions, alterations, deviations or omissions unless such an authority may be specially confirmed by a written order of the Bank.

38.4 The Architect/Consultant shall act in consultation with the Bank regarding quality of works, interpretation of drawings, contract documents and finalize the selection of finishing materials. The Architect/Consultant shall check/ record the measurements made by Contractor's representative for all items of works and on completion hand over the records to the Bank.

38.5 The Architect/Consultant shall have the power to give notice to the Contractor or his Engineer In charge about the non-approval of any work or materials and such works shall be suspended or the use of such materials should be discontinued until the decision of the Architect / Consultant in consultation with Bank if required is obtained. The work will from time to time be visited by the Architect/Consultant / Bank 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 work or after the same is completed. Subject to the limitations of this clause, the Contractor shall take instructions only from the Architect / Consultant as the case may be. In other words the contractors shall take total responsibility for the execution of work / items of work by using quality materials and providing best of workmanship to fulfill the true intent of the tender provision.

38.6 The Architect/Consultant shall have such other powers and discharge other functions as are specifically provided in this contract including such incidental or consequential powers or duties, subject always to such specific instructions or directions of the Bank, which shall be duly notified to the Contractor.

38.7 The Architect / consultant shall have right to take remuneration loss from the contractor's bill due to non working / completing work in time, & loss due to not clearance the site for other agencies in time. This amount has been deducted from contractor's final bill.

39.0 To define terms and explain plans

The various parts of the Contract are intended to be complementary to one another; but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained therein, the explanations of the Architect/Consultant shall be final and binding. The correction of any errors or omissions of the Drawings and Specifications may be made by the Architect/Consultant, when such correction is necessary to bring out clearly the intention, which is indicated by a reasonable interpretation of the drawings & Specifications as a whole.

40.0 Matters to be finally determined by the Architect / Consultant:

40.1 The Architect/Consultant's decision, opinion, direction, Certificates (except for payments) with respect to all or any of the matter under clauses explained above in condition of contract and the schedule of rates, hereof shall be final and conclusive and binding on the parties here to and shall be without appeal. Bank's instructions (if any), in this regard in case of any urgency, shall also be confirmed / vetted by the Architect/Consultant at the earliest possible.

40.2 Any of the decision, opinion, direction certificate, or valuation of the Architect or any refusal of the Architect to give any of the same shall be subject to the right of Arbitration and review in the same way in all respect (including the provision as to opening the reference) as if it were a decision of the Architect under the following clause.

41.0 Typographical or clerical errors:

The Architect/Consultant's clarifications regarding partially omitted particulars or Typographical or clerical errors shall be final and binding on the Contractor.

42.0 Site visits:

The Architect/Consultant /Bank shall visit the site from time to time at their discretion, or when expressly called upon to do so, to co-ordinate various activities and/or to answer such queries that may be posed at site as on drawings. The contractor / or his specified personal must attend these meetings. Any absence of contractor / his personal without prior notice will not acceptable.

43.0 Address for service

All letters and Notices under or pursuant to these presents shall be hand delivered against acknowledgement or sent by Registered Post with Acknowledgement Due at the respective addresses mentioned below. Any change in the addresses shall be duly intimated by the concerned Party to all others.

Address of Bank:	Name & Address of Architect/Consultant
State Bank of India, Admin. Office Building, Surat	State Bank of India, Admin. Office Building, Surat

44.0 Water Supply

The contractor shall make his own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions:

i. That the water used by the Contractor shall be fit for construction purpose to the satisfaction of the Architect/Consultant.
ii. The Contractor shall make alternative arrangements for the supply of water if the arrangements made by the Contractor for procurement of water in the opinion of the Architect/Consultant is unsatisfactory.
iii. The Contractor shall construct temporary well/tube well in SBI land for taking water for construction purposes only after obtaining permission in writing from the SBI. The contractor has to make his own arrangements for drawing and distributing the water at his own cost. He has to make necessary arrangements. To avoid any accidents or damages caused due to construction and subsequent maintenance of the wells. He has to obtain necessary approvals from the local authorities, if required at his own cost. He shall restore the ground to its original condition after wells are dismantled on completion of work or hand over the well to the SBI without any compensation as directed by the Architect/Consultant.

45.0 Power Supply:

The contractor shall make his own arrangements for power and supply/distribution system for driving plant or machinery for the work and for lighting purpose at his own cost. The cost of running and maintenance of the plants are to be included in his tender prices. He shall pay all fees and charges required for the power supply and include the same in his tendered rates and hold the owner free from all such costs. He has to obtain necessary approvals from the appropriate authorities, if required.

45.1 The bank will not provide / make availability of lift / other means for transportation of goods / workers for floor to floor. The contractor has to arrange his own mean of transportation for this purpose with society's permission. Contractor can avail lift facility by paying society charges if available. Any security deposit / any other charges is levied by society for this purpose, the contractor has to pay it by himself. Bank will not pay any charges for it / take any responsibilities regarding this issue. If bank will get any complaint regarding using common areas / utilities without society's permission the bank will take actions on contractor for it. And if the bank has to pay any amount to society as aforesaid from any amount due or which may become due to the contractor, it will be recover the same as debt from the contractor. The contractor has to produce N.O.C from the society for payment of final bill.

46.0 Treasure trove etc. :

Any treasure trove, coin or object antique which may be found on the site shall be the property of the SBI and shall be handed over to the bank immediately.

47.0 Method of measurements:

Unless otherwise mentioned in the schedule of quantities or in mode of measurement or elsewhere in these documents the measurement will be on the net quantities or work produced in accordance with up to date as per rules laid down by the Bureau of

Indian Standards. In the event any dispute/disagreement the decision of the Architect/Consultant shall be final and binding on the contractor.

48.0 Maintenance of registers:

The contractor shall maintain the following registers as per the enclosed format at site of work and should produce the same for inspection of SBI/Architect/Consultant whenever desired by them. The contractor shall also maintain the records/registers as required by the local authorities/Government from time to time.

i) Register for secured advance
ii) Register for hindrance to work
iii) Register for running account bill
v) Register for labor

49.0 Force Majeure:

44.1 Neither contractor nor SBI shall be considered in default in performance of their obligations if such performance is prevented or delayed by events such as but not to war, hostilities revolution, riots, FURNITURE commotion, strikes, lockout, conflagrations, epidemics, accidents, fire, storm, floods, droughts, earthquakes or ordinances or any act of god or for any other cause beyond the reasonable control of the party affected or prevented or delayed. However a notice is required to be given within 30 days from the happening of the event with complete details to the other party to the contract, if it is not possible to serve a notice, within the shortest possible period without delay.

44.2 As soon as the clause of force majeure has been removed the party whose ability to perform its obligations has been affected, shall notify the other of such cessation and the actual delay incurred in such affected activity adducing necessary evidence in support thereof.

44.3 From the date of occurrence of a case of force majeure obligations of the party affected shall be suspended during the continuance of any inability so caused. With the cause it and inability resulting there from having been removed, the agreed time of completion of the respective obligations under this agreement shall stand extended by a period equal to the period of delay occasioned by such events.

44.4 Should one or both parties be prevented from fulfilling the contractual obligations by a state of force major lasting to a period of 6 months or more the two parties shall each other to decide regarding the future execution of this agreement.

45.0 **Local laws, Acts, Regulations:**

The contractor shall strictly adhere to all prevailing labor laws inclusive of contract labor (regulation and abolition act of 1970) and other safety regulation. The contractor shall comply with the provision of all labor legislation including the latest requirements of all the Acts, Laws, any other regulations that are applicable to the execution of the project.

i) Minimum Wages Act 1948 (Amended)
ii) Payment of Wages Act 1936 (Amended)
iii) Workmen's Compensation Act 1923 (Amended)
iv) Contract labor regulation and abolition act 1970 and central rules 1971 (amended)
v) Apprentice act 1961 (amended)
vi) Industrial employment (standing order) Act 1946 (amended)
vii) Personal injuries (compensation insurance) act 1963 and any other modifications
viii) Employees' provident fund and miscellaneous provisions Act 1952 and amendment thereof
ix) Shop and establishment Act
x) Any other act or enactment relating thereto and rules framed there under from time to time.

46.0 **Accidents:**

The contractor shall immediately on occurrence of any accident at or about the site or in connection with in execution of the work report such accident to the Architect/ Consultant. The contractor shall also such report immediately to the competent authority wherever such report is required to be lodged by the law and take appropriate actions thereof.

47.0 During the execution of work, if any damage shall occur to the works already done, either due to rain or any other circumstances, the same shall be rectified and made good to the entire satisfaction of the Architect/Consultant by the contractor at his costs and risks.

48.0 Testing of Material's etc.: The contractor at his own cost (without any extra cost to the Bank) shall arrange for the laboratory and/or field testing of materials and works as required by the architects/Bank.

SPECIAL CONDITIONS OF CONTRACT

Scope of Work: As defined & explained in these tender documents.

49.0 Dimensions and levels

All dimensions and levels shown on the drawings shall be verified by the contractor on the site and he will be held responsible for the accuracy and maintenance of all the dimensions and the levels. Figured dimensions are in all cases to be accepted and no dimension shall be scaled. Large scale details shall take precedence over small-scale drawings. In case of discrepancy the contractor shall ask for clarification from the Architect/Consultant before proceeding with the work.

50.0 Notice of operation:

The contractor shall not carry out any important operation without the consent in writing from the Architect/Consultant.

51.0 Construction records:

The contractor shall keep and provide to the Architect/Consultant full and accurate records of the dimensions and positions of all new work and any other information necessary to prepare complete drawings recording details of the work as constructed.

52.0 Safety of adjacent structures and trees

The contractor shall provide and erect to the approval of the Architect/ Consultant such supports as may be required to protect effectively all structures and protective guards to trees which may be endangered by the execution of the works or otherwise take such permanent measures as may be required by the Architect to protect the trees and structures.

53.0 Temporary works:

Before any temporary works are commenced the contractor shall submit at least 7 days in advance to the Architect/Consultant for approval complete of all temporary works he may require for the execution of the works. The contractor shall carry out the modifications relating to strength, if required by the Architect/Consultant may require in accordance with the conditions of contract at his own cost. The contractor shall be solely responsible for the stability and safety of all temporary works and unfinished works and for the quality of the permanent works resulting from the arrangement eventually adopted for their execution.

54.0 Temporary roads

The contractor shall provide access road to the site from the nearest main road at no extra cost and as directed by the Architect/Consultant. The contractor shall also be responsible for proper maintenance of this access road and would take all care to see that existing services, if any, are maintained in working order at his own cost. The laying and maintaining the temporary roads within the site area shall be the contractor's responsibility and the contractor shall take such measures that are necessary and as directed by the Architect/Consultant.

55.0 Water, power, and other facilities:

a) The rate quoted by the contractor shall include all expenses that are required for providing all the water required for the work and the contractor shall make his own arrangements for the supply of good quality water suitable for the construction and good quality drinking water for their workers. If necessary the contractor has to sink a tube well/ open well and bring water by means of tankers at his own cost for the purpose. The SBI will not be liable to pay any charges in connection with the above.

b) The rate quoted in the tender shall include the expenses for obtaining and maintaining power connections and shall pay for the consumption charges.

c) The contractors for other trades directly appointed by the SBI shall be entitled to take power and water connections from the temporary water and power supply obtained by the contractor. However the concerned contractor shall make their own arrangements to draw the supply and pay directly the actual consumption charges at mutually agreed rates between them. All municipal charges for drainage and water connections for construction purposes shall be borne by the contractor and charges payable for permanent connections, if any, shall be initially paid by the contractor and the SBI will reimburses the amount on production of receipts.

d) The SBI as well as the Architect/ Consultant shall give all possible assistance to the contractors to obtain the requisite permission from the various authorities, but the responsibility for obtaining the same in time shall be of the contractor.

56.0 Office accommodation

a) The contractors shall provide and maintain all necessary offices, workshops, stores, shelters, sanitary facilities, canteens and other temporary structures for themselves in connections with the work at the site at their own cost after getting the approval from the Architect/ Consultant.

b) A site office for the use of SBI/ the Architect/ Consultant shall be provided by the contractors at his own expenses.

c) All temporary buildings and facilities as mentioned above shall be removed on completion of the work or at any other earlier date as directed by the contractors.

All the expenses for obtaining statutory approvals and maintenance of the above facilities as well as running expenses shall be borne by the contractor at no extra cost. It is also the responsibility of the contractor to obtain statutory approvals for providing the above facilities

57.0 Facilities for Contractor's employees:

The contractor shall make his own arrangement for the housing and welfare of his staff and workmen including adequate drinking water facilities. The contractor shall also make the arrangement at his own cost for transport where necessary for his staff and workmen to and from site of work at his own cost.

58.0 Lighting of works:

The contractors shall at all times provide adequate and approved lighting as required for the proper execution and supervision and inspection of work.

59.0 Fire fighting arrangements:

i) The contractor shall provide suitable arrangement for firefighting at his own cost. For this purpose he shall provide requisite number of fire extinguishers and adequate number of buckets, some of which are to be always kept filled with sand and some with water. These equipment shall be provided at suitable prominent and easily accessible places and shall be properly maintained.

ii) Any deficiency in the fire safety or unsafe conditions shall be corrected the contractor at his own cost and to the approval of the relevant authorities. The contractor shall make the following arrangements at his own cost but not limited to the following.

a) Proper handling, storage and disposal of combustible materials and waste.

b) Work operations which can create fire hazards
c) Access for firefighting equipments.
d) Type, number and location of containers for the removal of surplus materials and rubbish.
e) Type, size, number and location of fire extinguishers or other fire fighting equipments.
f) General housekeeping.

60.0 Site order book:

A site order book shall be maintained at the site for the purpose of quick communication with the Architect/ Consultant. Any communication relating to the works may be conveyed through records in the site order book. Such a communication from one party to the other shall be deemed to have been adequately served in terms of contract. Each site order book shall have machine numbered pages in triplicates and shall carefully maintained and preserved by the contractor and shall be made available to the Architect/ Consultant as an when demanded. Any instructions which the Architect/ Consultant may like to issue to the contractor or the contractors may like to bring to the Architect/ Consultant Two copies of such instructions shall be taken from the site order book and one copy will be handed over to the party against proper acknowledgement and the second copy will be retained for their record.

61.0 Temporary fencing/ barricading

The contractor shall provide and maintain a suitable temporary fencing/ barricading and gates at his cost to adequately enclose all boundaries of the site for the protection of the public and for the proper execution and security of the work and in accordance with the requirement of the Architect/ Consultant and regulations of local authorities. These shall be altered, relocated and adopted from time to time as necessary and removed on completion of the work.

62.0 Site meetings:

Site meetings will be held to review the progress and quality evaluation. The contractor shall depute a senior representative along with the site representative and other staff of approved sub-contractors and suppliers as required to the site meetings and ensure all follow up actions. Any additional review meetings shall be held if required by the Architect/ Consultant.

63.0 Disposal of refuse:

The contractor shall cart away all debris, refuse etc. arising from the work from the site and deposited the same as directed by the Architect/ Consultant at his own cost. It is the responsibility of the contractor to obtain approval from the local authorities concerned to the effect that all rubbish arising out of contractor's activities at the construction site or any other site activities borrow pits has been properly disposed off.

64.0 Contractor to verify site Measurements:

The contractor shall check and verify all site measurements wherever requested by other specialist contractors or other sub-contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness as will not in any way delay the works.

65.0 Displaying the name of the work:

The contractor shall put up a name board of suitable size as directed by the Architect/ Consultant indicating the name of the project and other details as given by the Architect/ Consultant at his own cost and remove the same on completion of work.

66.0 Bar bending schedule:

The contractor shall prepare a detailed bar bending schedule for all reinforced concrete works and got them approved by the Architect/ Consultant well in advance.

67.0 As built drawings:

i) For the drawings issued to the contractor by the Architect/ Consultant. The Architect/ Consultant will issue two sets of drawings to the contractor for the items for which some changes have been made from the approved drawings as instructed by the SBI/ the Architect/ Consultant. The contractor will make the changes made on these copies and return these copies to the Architect/ Consultant for their approval. In case any revision is required or the corrections are not properly marked, the Architect/ Consultant will point out the discrepancies to the contractor. The contractor will have to incorporate these corrections and/or attend to discrepancies either on the copies as directed by the Architect/ Consultant and resubmit to him for approval. The Architect/ Consultant will return one copy duly approved by him.

ii) For the drawings prepared by the contractor,
The contractor will modify the drawings prepared by him wherever the changes are made by the SBI/ the Architect/ Consultant and submit two copies of such modified drawings to the Architect/ Consultant for approval. The Architect/ Consultant will return one copy of the approved drawing to the contractor.

68.0 Approved make:

The contractor shall provide all materials from the list of approved makes at his own cost and also appoint the specialized agency for the waterproofing, anti-termite, aluminum doors and windows and any other items as specified in the tender.

69.0 Procurement of materials:

The contractor shall make his own arrangement to procure all the required materials for the work. All wastages and losses in weight shall be to the contractor's account.

70.0 Excise duty, Taxes, Levies etc.

The contractor shall pay and be responsible for payment of all taxes, duties, levies, royalties, fees, cess or charges in respect of the works including but not limited to sale taxes, tax on works contract excise duty and octroi, payable in respect of material, equipments plant and other things required for the contract. All the aforesaid taxes, duties, levies, fees and charges shall be to the contractor's account and the SBI shall not be required to pay any additional or extra amount on this account. Variation of taxes, duties, levies, etc. if any, till completion of work shall be deemed to be included in the quoted rates and no extra claim on this account will in any case be entertained. If a new tax or duty or levy or cess or royalty or octroi is imposed under as statue or law during the currency of the contract/work the same shall be borne by the contractor.

71.0 Compliance to Bank's/legal norms

71.1 **Notices**

a) The Contractor shall give all notices and pay all fees and shall comply with all Acts and Regulations for the successful completion of the Contract works.

71.2 **Authorities, notices, patents, rights & royalties**

The Contractor shall conform to the provisions of all the statutes relating to the works, and to the Regulations and bye laws of any local Authority, and of any Water, Lighting, Electric supply, and of other Companies or Authorities with whose systems the structure is proposed to be connected, and shall before making any variation from the drawings or specifications that may be necessitated by so confirming, give to the Architect/Consultant written notice, specifying the variations proposed to be made and the reason for making it, and apply for instruction thereon. In case the Contractor shall not within 120 days receive such instructions, he shall proceed with the work conforming to the provision or Regulations or Byelaws in question.

a) The Contractor shall bring to the attention of the Architect / Consultant all notices required by the said Acts, Regulations or Bye-laws to be given to any Authority by the Bank or the Architect/Consultant and pay to such Authority, or to any public Officer, all fees that may be properly chargeable in respect of the works, and lodge the receipts with the Architect/Consultant.

b) The Contractor shall indemnify the Bank against all claims in respect of patent rights, design, trademarks of name or other protected rights in respect of any constructional site, machine work or material used for or in connection with the works or temporary works and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall defend all actions arising from such claims, unless he has informed the Architect / Consultant before any such infringement and received their permission to proceed, and shall himself pay all royalties, license fees, damages, costs and charges of all and every sort that may be legally incurred in respect thereof. All statutory fees, deposits etc paid by the contractor for permanent works to be handed over to Bank which shall be reimbursed to him by the Bank against documentary proof.

c) The Contractor shall assist and co-ordinate with the Architect /Consultant in obtaining all statutory approvals and/or amendments to such approvals as per the rules in force from Municipality and other local bodies. Any expenditure incurred in obtaining such approvals is deemed included in the rates quoted by the Contractor.

72.0 Notices to Local Bodies:

a) The Contractor shall comply with and give all notices required under any law, rule, regulations, or byelaw of parliament, State Legislature or Local Authority relating to works. The Contractor shall before commencing the execution of work issue a certificate to the Bank/ Architect / Consultant that he has obtained all the permissions Registrations and give all the notices as are required to be obtained or given under law particularly blasting permission the Police permission etc.

73.0 MUNICIPAL REGULATIONS:

The whole of the work is to comply with the requirements and byelaws of the concerned Municipal Corporation and local bodies

74.0 Acceptance of tender:

The SBI shall have the right to reject any or all tenders without assigning any reason. They are not bound to accept the lowest or any tender and the tenderer or tenderers shall have no right to question the acts of the SBI. However adequate transparency would be maintained by the SBI.

75.0 Defects after Virtual completion and defects liability period:

Any defect shrinkage, settlement or other faults which may appear within the "Defects Liability Period" which shall be as per NIT from the date of the virtual completion of the work, arising in the opinion of the Architect from materials or workmanship not in accordance with the contract, shall upon the direction in writing of the Architect , 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 then Bank may employ and pay other person /agency to amend and make good such defects, shrinkage, settlement or 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 Bank or may be deducted by the Bank, upon the Architect's certificate in writing, from any money due or may be deducted by the Bank, upon the Architect's certificate in writing, from any money due or that may become due to the contractor, or the bank may in lieu of such amending and marking good by the contractor deduct from any money due to the contractor a sum, to be determined by the Architect equivalent to the cost of amending such work and in the event of the amount retained under clause of GCC, hereof being insufficient, recover the balance from the contractor, together with any expenses the Bank 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 Architect as provided in clauses of GCC the contractor shall be liable to make good in the same manner as if such work or material has been done or supplied by the Contractor and been subject to the provisions of this Contract. The Contractor shall remain liable under the provisions of this Contract notwithstanding the signing of any Certificate or the passing of any accounts, by the Architect.

76.0 ANTI-TERMITE TREATMENT AND WATER PROOFING TREATMENT:

a) Pr-construction soil treatment shall be carried out in co-ordination with the building work and shall be executed in such a manner that the civil works are not hampered or delayed by the anti-termite treatment. The treatment shall be carried out as detailed in IS: 6313 (Part III) latest revision. The water proofing treatment shall be type and specification as given in the schedule of quantities. The anti-termite and water proofing treatment shall be got done through specialized agencies only.

b) The treatment against water-proofing of basement, roofs, water retaining area and termite infestation shall be and remain fully effective for a period of not less than 10 (ten) years to be reckoned from the date of expiring of the defect liability period , prescribed in the contract.

c) The SBI reserves the right to get the quality of treatment checked in accordance with recognize test methods and in case it is found that the chemicals with the required concentration and rate of application have not been applied, or the water proof treatment is done as per specifications, the contractor will be required to do the re-treatment in accordance with the required concentration & specifications at no extra cost failing which no payment for such work will be made. The extent of work thus rejected shall be determined by the Architect.

d) Water proofing and anti-termite termite treatment shall be got done through approved and specialized agencies only.

e) The contractor shall make such arrangement as may be necessary to safe guard the workers and residents of the building against any poisonous effect of the chemicals used during the execution of the work.

f) The contractor whose tender is accepted shall execute Free Maintenance Guarantee agreement Bond in the prescribed form as appended for guaranteeing the anti-termite and water proofing treatment.

77.0 During the execution of work, if any damage shall occur to the works already done, either due to rain or any other circumstances, the same shall be rectified and made good to the entire satisfaction of the Architect/Consultant by the contractor at his costs and risks.

78.0 Testing of Material's etc.:

The contractor at his own cost (without any extra cost to the Bank) shall arrange for the laboratory and/or field testing of materials and works as required by the architects/Bank.

ADDITIONAL CONDITIONS OF CONTRACT

Notwithstanding anything contained herein above the following ADDITIONAL CONDITIONS shall be applicable for this contract / work.

1.0 PRICE VARIATION ADJUSTMENT (PVA):

The rates quoted by the bidder shall remain firm throughout the contract / construction period. PVA & PVA Clause mentioned elsewhere in these documents shall not be applicable.

2.0 WORKING SCHEDULE / BAR CHART:

Detailed working date schedule and bar chart for the work shall be prepared by the contractor and got approved from the Bank / Architect. A detailed flow chart of activities highlighting curing, setting time / period, pot life period / predecessor, successor & critical activities etc. shall also be prepared by the contractor for effective management of work and also to make a realistic bar chart / working date schedule.

3.0 RATES:

It may be noted that it is an item rate contract. Rates accepted by the bank shall be for all levels/height and lead unless otherwise specified in the schedule of quantities and shall be inclusive of all man, labour, supervision, materials, tools, equipment, scaffoldings, water, electricity, taxes, insurances, arrangements, temporary works, over heads, collection & carting away & final disposal of rubbish & debris, regular cleaning of site etc. required to complete the works in all respect to the satisfaction of the architects / Bank and nothing additional or extra shall be paid on these accounts and / or on account of variation in rates / taxes and / or imposition of new tax / levy during currency of contract / work, except for the items, taxes, works etc. for which there is a specific mention for additional payment in these tender documents. The rates shall remain firm throughout the contract period.

4.0 BASIC RATE:

Wherever for any item of work basic rate of materials are specified, the materials of that basic rates as selected by the Bank/Architect at any commercial establishment/ seller of Ahmadabad or nearby centre, if such materials are not available at Ahmadabad, shall be procured and used by the contractor.

Basic rate of any material (Without processing) is the rate offered by seller against Bill and credit period not exceeding 15 days, including any applicable taxes ex-godown. Payments for procurement of materials shall be made by the contractor themselves.

If the basic rate of any material actually used for the work is more or less than the basic rate given in schedule of quantities, in that case adjustments in the rate admissible to the contractor shall be modified by adding or subtracting, as the case is, from the accepted tender rates an amount equivalent to difference in the basic rates plus 15 % of difference of the basic rate.

5.0 BRANDED / FINISHING ITEMS:

Branded items such as tiles, construction chemicals, hardware, sanitary wares and other finishing items shall be used as per the samples selected and approved by the architects / Bank from the brands/makes mentioned in the tender document. If the contractor intend to use an equivalent substitute than, they have to produce necessary documentary evidences establishing the equivalency to the satisfaction of the architect/Bank and shall use the same only after approval of the architect.

6.0 INSURANCE

The contractor shall keep the Bank indemnify from all the claims arising out of damage to workman/person & property of Bank and/or third party and the SBI shall have right to recover the

cost of such damages /claim from any amount due to the contractor. If the claim amount exceeds the amount due to be paid to the contractor, the contractor shall immediately pay such excess amount to the Bank. Decision of the Bank regarding determination of the amount of claim /damage shall be final & binding to the contractor. Being a short period work, the Bank may not be able to check or verify the various insurance policies required to be taken by the contractor and trust that the contractor has obtained all such policies.

7.0 SITE CONDITION & WORKING HOURS.

The tenderer must visit the site and acquaint themselves with the site conditions. It must be noted that the work is to be carried out in the functional branch without hindering the normal functioning of the Branch. The work shall generally be carried out on holidays or after Banking hours only.

The work is to be carried out in vacant premise; therefore the work shall be carried out day & night with prior permission from the society. Contractor must follow the rules and regulation of society and local authorities to work at night. **The Lift shall not be used by Contractor for any propose**.

The contractor has to work in coordination with the other contractors and daily/weekly schedule of working shall be prepared in consultation with the Architects/Banks. Regular updating / modification of such schedule shall be required.

For normal functioning of the Bank/Branch the contractor shall be required to shift the FURNITURE etc and/or relocate the existing and/or new loose and/or fix FURNITURE and/or any other item of works and/or any such materials at new location at times. The contractor shall carry out all such activities with utmost priority and without any additional/extra cost to the bank. The tenderer shall quote the rates inclusive of all such activities/works as may be required as per site conditions. The rates quoted by the tenderer shall be inclusive of all such temporary/semi-permanent works/activities.

8.0 GENERAL:

(i) Source of materials / samples / brands / makes etc. shall be got approved from the Architects /Bank before using. In case of deviations, decision of the Bank shall be final and binding and shall not be open for arbitration.

(ii) The Architects have their specific role/duties/rights as defined in these tender documents However in the event of any dispute arising out of differences between the opinions of the Architects and also their role/duties/rights, the Banks' decision shall be final & binding on the Architects and the Contractor and shall not be open to arbitration.

(vi) Any item mentioned in the BOQ with "TO THE SHAPE" will have measurement of onsite executed to the shape area only.

(vii) The contractor's qualified & authorized representative shall remain on site during the entire execution process for coordination with various agencies/ Architect/Bank & execution of work

(viii) Hidden measurement. It is contractor's responsibility to get the measurement checked immediately on completion of such items. This shall be done before finishing the same & before ceiling boarding done. The Architect shall be provided with such details well in advance so that the other work is not held up due to last moment action.

(ix) MTC (Manufacturer Test certificate) Where ever applicable shall be arranged & submitted by the contractor.

(x) Water & Electricity, if available, shall be provided by the Bank at one point with charges (NIT - point no. 18). However, if the water & electricity could not be provided by the Bank, the same shall be arranged by the contractor at their own cost within the quoted/accepted rate. Nothing extra shall be paid by the Bank on account of not providing the water & Electricity.

(XI) Wherever the specifications are not specified in details the work shall be carried out as per CPWD specifications or Manufacturer's instructions or architects instructions depending upon the site conditions as directed by the Bank/ Architects

(XII) The contractor shall produce the bills / challans / documentary evidences and proof in respect of genuineness of materials used by him when so ever asked/demanded by the Architects/Bank.

9.0 Preventive and Breakdown Maintenance during Warranty Period & AMC:

1. All the Air-conditioners covered in this contract have to be maintained as per the standards of the original manufacturing company during the warranty period as well as AMC
2. The warranty would be on-site and comprehensive in nature and back to back support from the OEM. The vendor will warrant all the spares against defects arising out of faulty design, materials and workmanship etc. during the period of warranty. After the Warranty period of newly installed AC units expires, then these units are to be maintained by the Contractor till the expiry period of AMC.
3. In case of AMC of the existing ACs, the contractor has to repair /service/ maintain the air conditioners under the AMC in as is where condition when handed over to them under AMC is.
4. All required tools and tackles (in good working condition) necessary for carrying out repair and maintenance works of Air Conditioners under AMC have to be provided by the vendor.
5. Professionally qualified personnel who have expertise in the AC supplied by the vendor will be permitted to undertake Preventive Maintenance/repair services during the period of warranty and AMC period.
6. During the term of the contract, the vendor will maintain the equipment in perfect working order and condition and for this purpose will provide the repairs and maintenance services as under:

Type of Service	Warranty Period	AMC
Preventive Maintenance Breakdown Maintenance	Every Quarter Every Quarter Within 48 hours of complaint	Within 48 hours Complaint

Preventive maintenance:

The Vendor shall conduct the following activities under Preventive Maintenance once within first 90 days of the installation of new ACs and once in every quarter thereafter, during the currency of this agreement or on a day and time to be mutually agreed upon. Notwithstanding the foregoing, the Vendor recognizes Bank's operational needs and agrees that Bank shall have the right to require the Vendor to reschedule preventive maintenance from any scheduled time to a date and time not later than 15 working days thereafter.

sr	***activity***
1	Inspection of the AC – IDU and ODU for any abnormality in operation, sound etc
2	Testing the Performance of AC for desired cooling
3	Testing of Gas pressure if necessary and check for any leakages near the check nut etc or diagnose any other fault
4	Checking of current consumption
5	Remove the filter, water service and fix it back after drying
6	Clean the drain tray and drain pipe and remove any choke for free flow of drain water
7	Clean the Evaporator with brush and remove the dirt/dust. Check for any fungus formation or bad smell and wash it with chemical, if required.

8	Lubricating /greasing of all Fans
9	Water washing of Condenser Coil
10	Topping of Refrigerant gas, if required
11	Check the swing motor functions and rectify, if required
12	In addition to the above, any other activity to ensure trouble free operation of AC
13.	Check the temperature setting and operation mode and advise the Branch on the optimum operation levels

This comprehensive Contract includes replacement of all faulty spares. Some of the spares are listed as under:

Compressors	Starting Capacitors
Fan Motors	Running Capacitors
Built – in Timer kit	Relays, Thermostats
Selector switches	Fan Capacitors
contractors (Power / Control)	Gas charging
Micro Swing Motors	Fan blades
Electronic Control Circuitries	Air-Filters
Remote Control Units	Condenser Coils
External Electronic / Analog time switches for timed running of A.C's	Stabilizers
Outdoor unit mounting frames	Cabling from IDU to ODU
Parts of indoor / Outdoor unit enclosures	Existing copper piping from IDU to ODU
Display unit in AC	Existing drain piping from IDU to drain point

Note: The above list is only indicative. However, any parts which are not mentioned in the Tender Schedule of this Contract but required for the smooth and trouble free operation of the AC equipment are also required to be rectified or replaced within the scope of this contract.

10.0 Replacement of Spare parts:

The required spares shall be kept as stock with the vendor for readily replacing the faulty spares, without loss of time or delay. In cases where unserviceable parts of the equipment need replacement, the vendor shall replace such parts, at no extra cost to the Bank, with brand new parts or those equivalent to new parts in performance. Any worn or defective parts withdrawn from the equipment and replaced by the vendor during the warranty period shall become the property of the vendor and the parts replacing the withdrawn parts shall become the property of Bank.

Defective spares compressors / condensers are to be replaced with new compressors / condensers and repairing of the old compressors is not permitted. Whenever new compressors / condensers are used, the Contractor has to produce original invoice and Warranty Card of the new Compressor/ condenser if demanded by the Bank. The compressor/ condenser being replaced should match with the original star rating of the air conditioner.

Only original spare parts/quality approved by the Bank will be permitted to be used for the maintenance during the AMC Period. If duplicate, refurbished or second hand parts are used by the vendor during the AMC, the contract shall be cancelled immediately without any notice period.

It is the responsibility of the Contractor to accurately specify the damaged spare parts to the Bank and to rectification of the fault in A.C under maintenance.

11.0 Response Time on receiving the complaint:

The maximum response time i.e. time required for Vendor's maintenance technicians to report to the Bank after a request call / fax /e-mail is made or letter is written by Bank shall not exceed 48 hours.

1 Apart from regular letter communications, all telephonic/E-mail or Whatsapp communications from Bank are to be treated as formal communication for all practical purposes.

Escalation Matrix: The mobile number, land line number and email ID of the Contractor/Supervisor/Help desk to whom the complaints have to be reported and that of Top Management level is to be provided to Bank for communication purpose. Any change in numbers shall be advised then and there to the Bank.

Time taken for Repairs / Rectification: In case of Minor technical problems same are to be rectified within 3 hours of diagnosing of fault. In case of major technical problems, the same are to be rectified within 24 hours of identifying the problem. In the event of the equipment not being repaired or a workable solution not provided during Warranty period and the AMC period, a penalty as per the penalty clause will be charged to vendor. The vendor may provide temporary equivalent replacement as a workable solution to avoid the above penalty.

Insurance for the Workmen: The technicians deployed under AMC are to be covered by insurance under Workman Compensation Policy through reputed Insurance Companies during the AMC Period. If demanded, Copies of the Insurance Policies are to be submitted to the Bank by the vendor.

Bank is not responsible for any loss of life, damage, injury to the technicians while undertaking the Maintenance activity under AMC contract or during the installation of new AC units. Vendor to ensure that all safety protocols are strictly followed while execution of the work. Vendor shall indemnify the Bank against any claims, damages, compensation for such losses.

12.0 **Increase / Decrease of ACs:**

If Bank decides that the additional number of air-conditioners other than the quantity mentioned in the tender are to be maintained by the Contractor, the contractor shall agree and maintain the ACs till the expiry period of AMC as per the same terms and conditions of the Contract. Proportionate amount of AMC shall be paid by the Bank for the same.

If any units covered under these AMC are removed/dismantled/shifted from this location to another location, the Contract amount as per the unit rate of the Tender will be revised and suitable deductions made from the AMC bills.

The successful Vendor has to rectify the faults or repairs to the AC machines arising due to rat bites also free of cost within the scope of the contract. Vendor should also analyze the site conditions and take efforts to secure the AC equipment from the rodent bites by proper wrapping of the critical components with suitable glass wool packing or any other material and closing the opening made for the AC piping & drains properly to avoid rodent entry.

Details of important programs / functions of the Bank such as Conference, Review Meeting, VVIP functions etc that may be held in the Office will be informed to the contractor and they should assist the Bank in maintaining smooth running of the air-conditioners on that day without failure even if they are held on Bank Holidays. Non-attendance of the technicians on such a day will attract penalty at the discretion of the Bank.

All security and safety regulations and guidelines as per the applicable law are to be followed. All guidelines/directions of Bank's Security Section must be followed.

13.0 **Complaint / Service / Breakdown Register:**

The Bank shall maintain a register at its site in which, the Bank's AC operator / Electrician or any other person identified by Bank shall record each event of failure and / malfunction of the ACs. The Vendor's technician shall enter the details of the air conditioners serviced/ maintained / repaired by him in this register. Additionally, every time a preventive or corrective maintenance is carried out, the Vendor's engineer shall make, in duplicate, a Service call report which shall be signed by him and thereafter countersigned by the Bank's official. One copy of the Service call report shall be handed over to the Bank's official. Spares taken outside the premises also to be recorded with serial number of spare and in and out date and time. The Vendor shall provide replacement equipment if any equipment is out of the premises for repairs.

14.0 **SHIFTING THE AC TO NEW LOCATION OR BRANCH:**

If Bank desires to shift the AC to a new location/floor or department in the same premises or to another branch/office and install it thereof urgently, the Bank shall bear the charges for such shifting and the vendor shall dismantle and reinstall the AC as desired. The terms of this agreement, after such shifting to the alternate site and reinstallation thereof would continue to apply and binding on the vendor. The warranty terms would not be considered as violated due to the above shifting. The vendor, would not unreasonably assume that the causes lie with the shifting activity.

HVAC TECHNICAL SPECIFICATION

CONTENTS

SECTION-I

I. INTRODUCTION

1.1 SITE DETAILS :

The project site is located at SDB, Surat , Gujrat

Site Address -

These specifications cover the design, supply, installation, testing, commissioning, balancing & handing over of Low side HVAC Works for the fit out space.

1.2 SCOPE OF WORKS :

- Ducting Works downstream of Air Handlers
- Ventilation works for Cafe, pantry, toilet, etc.,
- Electrical Works Related to HVAC , VFD for AHUs Starter,
- Coordination with other disciplines(like Electrical , Safety etc..)

1.2 TENDER INSTRUCTIONS

1.0 Tenderer shall note that all electrical power supply will be terminated near outdoor unit and power sockets near all indoor units as required by the supplier. However, all control wiring between the indoor & outdoor units and additional power wiring shall be included within the scope of this work. On completion of the Electrical installation for air conditioning, a certificate shall be furnished by the contractor, counter signed by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local authority

2.0 Tenderers shall guarantee the inside conditions specified in Section II (this will be in addition to the guarantee against defective material and workmanship as required elsewhere in this tender documents). In any case, any supposed deficiencies in the scheme proposed in these specifications will not be accepted as a reason for any deficiency in performance that may be revealed on commissioning and testing of the plant.

3.0 Tenderers shall quote strictly according to the specifications and no deviation is acceptable.

4.0 No terms and conditions stipulated by the tenderers (whether cyclostyled, printed or otherwise) will be accepted. In the event and in case, the tenderers find deviations unavoidable, such deviations shall be with reference to specific clauses in the tender documents. They shall, as far as possible, be so worded that in the agreement, which the successful contractor shall enter into with the Owner's, they can be introduced as amendments.

5.0 Samples of all materials like grilles, diffusers, controls, insulation, premoulded pipe section, control wires etc shall be submitted to the Owner's site representative/Architect/Consultant

prior to procurement. These will be submitted in two sets for approval and retention by Owner's site representative and shall be kept in their site office for reference and verification till the completion of the Project. Wherever directed a mockup or sample installation shall be carried out for approval before proceeding for further installation.

6.0 **PERFORMANCE GUARANTEE**

6.1 After the installation is completed, the contractor should conduct performance tests by keeping the plant running continuously for a period of 72 hours. These tests shall be carried out during both summer and monsoon. During the tests; all readings as shown in the testing Section, shall be taken. From the readings taken during the summer test, the contractor shall also establish the plant capacity.

6.2 Performance tests shall be carried out in the presence of the owner's / consultants representatives. The contractor shall be fully responsible for the performance of the selected equipment (installed by him) at the specified parameters and for the efficiency of the installation to deliver the required end result.

6.3 All the instruments required for carrying out the tests shall be arranged by the contractor at his own cost. Instruments so required shall also include Manometers, Anemometers, Temperature Indicators, Humidity Indicators, and any other instruments that may be required.

7.0 OPERATING INSTRUCTIONS :

7.1 The contractor shall furnish neatly typed set of operating instructions securely framed and glassed. These instructions shall furnish information and guidance on operating pressures, temperatures, etc. Two more copies shall be supplied without framing. In addition the contractor shall without framing. In addition the contractor shall supply suitably bound 3 copies of Operation and Maintenance Manuals. Such manuals should include wiring diagrams, manufacturers' lists of spare parts, part number etc. for facility of ordering.

8.0 TRAINING OF PERSONNEL:

8.1 The contractor shall train the Owner's operating and maintenance staff in the operation, repairs and maintenance procedure during installation and maintenance period. Routine operation of the plant for a period of 30 days (equipment / floorwise) after putting the plant to beneficial use by the Owner will be carried out by the Owner's operating staff along with the Contractor's technicians. Owner's staff will be inducted for necessary training during planning, installation, testing and commissioning of the plant also.

8.2 All testing shall be carried out before the installation is accepted and as and when directed by the Consultants / Owner, by workmen thoroughly experienced in this work.

9.0 Shop drawing, Inspection and testing,

(a) Working and construction drawings

selected vendor shall prepare coordinated shop drawings based on the drawings prepared by Electrical, Plumbing & other contractors to ensure adequate clearances are available for installation of services for each trade. and all work shall be according to approved working drawings. Shop

drawings shall give all dimensions and shall incorporate the requirements of the owner / PROJECT MANAGERS. Approval of drawings does not relieve the vendor of his responsibility to meet the intents of the specifications. All such drawings for approval shall be submitted in 6 copies for Owner/PROJECT MANAGERS team. In addition, the contractor shall submit manufacturer's details and get them approved before ordering. This has to be done whether the materials / equipment are one of the approved makes or not. When the Architect/Consultant makes any amendments in the above drawings, the contractor shall supply two fresh sets of drawings with the amendments duly incorporated along with check prints, for approval

(b)Testing and Inspection

The contractor shall carry out tests on different equipment and system in total as specified in various sections of the tender in the presence of Owner/ PROJECT MANAGERS in order to enable them to determine whether the plant, equipment and installation in general comply with the specifications. All equipment shall be tested after carrying out the necessary adjustments and balancing to establish equipment ratings and all other design conditions. The test data shall be submitted in Acceptance Test Form.

(c) Handing over requirements

The plant shall be handed over after satisfactory testing along with following documents. Detailed equipment data in the approved pro forma
Manufacture's maintenance and operating instructions
Three Set of as built drawings, layouts, piping, ducting, cable routing, Cable schedules etc
Approved test readings of all equipment and installations Inspection certificates
Certificate from the contractor that he has cleared the site of all debris and litter caused by him without violating the EHS norms during the construction. However, contractor has also to periodically clear the site from all the debris which are generated from his part of scope.
Submission of the above documentation shall form a precondition for final acceptance of the plant and installation and final payments.

10.0 HVAC CONTRACTORS SCOPE ALSO INCLUDES

The following important SCOPE is to also be considered included the scope of works:-
a) Receiving of the equipment , lifting the equipment to its desired location via staircase, erection in the
required floor/ terrace floor , and erection on floor/terrace , etc.,
b) All necessary minor civil works related to AC Works such as frames and vibration isolators for outdoor units , Closure of Minor openings pipe openings and closing on terrace, Shafts etc., would be completely under AC Contractors Scope.
Associated civil works like drilling and punching holes and openings, chasing of brick walls, fabrication of supporting structures, cleaning and clearing of all debris like metal pieces, unused ducting, bolts etc due to HVAC installation.
The extent of work services under the contract include all items shown on the drawings, indicated in companion with specifications, notwithstanding the fact that such items have been omitted from the BOQ. All equipment and services which are required to complete the intent of the contract shall also be deemed to be within the scope of the contract.

SECTION II

II. DESIGN DATA

1. Design Criteria

DESIGN CONDITIONS PLANNED

Comfort Space : The conditions in these areas to be maintained is as follows

The space conditions planned with

DB : 23 ±1°c

Critical Space : The conditions in these areas to be maintained is as follows

The space conditions planned with

DB : 22 ± 1°c (Server, Hub Room & UPS, Battery)

2. Location & Climate

The project site is located Surat

2.1 ALTITUDE

Approximately ----- meters above mean sea level.

2.2 SITE DETAILS

Seasons	DB (°F)	WB (°F)	RH (%)
Summer	110	78	24

SECTION -III

CODES & STANDARDS

The installation shall conform in all respects to ASHRAE / SMACNA/Indian Standard Code of Practice for Air conditioning Installation, tender specifications and drawings.

LIST OF BUREAU OF INDIAN STANDARDS CODES

IS : 554 - 1985 (Reaffirmed 1996)	Dimensions for pipe threads where pressure tight joints are required on the threads.
IS : 655 - 1963 (Reaffirmed 1991)	Metal air ducts.
IS : 694 - 1990 (Reaffirmed 1994)	PVC insulated (HD) electric cables for working voltage up to and including 1100 volts.
IS : 732 - 1989	Code of practice for electrical wiring.
IS : 780 - 1984	Sluice valves for water works purposes.
IS : 822-1970 (Reaffirmed 1991)	Code of procedure for inspection of welds.
IS : 1239 (Part - II) - 1992	Mild steel Tubular and other wrought steel pipe fittings.
IS : 1255 - 1983 and Revision)	Code of Practice for installation and maintenance of Power Cables up to including 33 KV rating (Second
IS : 1554 - 1988 (Part – I)	PVC insulated (Heavy Duty) electric cables for working voltages pto and including 1100 volts.
IS : 1897 - 1983(Reaffirmed 1991)	Copper bus bar/ strip for electric purposes
IS : 2379 - 1990	Color code for the identification of pipelines.
IS : 2551 - 1982	Danger notice plate
IS : 3043 - 1987	Code of practice for earthing.
IS : 3103 – 1975 (Reaffirmed 1999)	Code of practice for Industrial Ventilation.
IS : 3837 - 1976(Reaffirmed 1990)	Accessories for rigid steel conduit for electrical wiring.

IS : 4736 – 1986 (Reaffirmed 1998)	Hot-dip zinc coatings on steel tubes.
IS : 4894 - 1987	Centrifugal Fan.
IS : 5133 - 1969 (Part-I) (Reaffirmed 1990)	Boxes for the enclosure of electrical accessories.
IS : 5216 - 1982(Part-I) (Reaffirmed 1990)	Guide for safety procedure and practices in electrical work.
IS : 5312 (Part-I) - 1984 (Reaffirmed 1990)	Swing - check type reflux Non return valves for water works
IS : 5424 – 1989 (Reaffirmed 1994)	Rubber mats for electrical purposes.
IS : 5578 & 11353-1985	Marking and identification of conductors
IS : 6392 - 1971(Reaffirmed 1988)	Steel pipe flanges.
IS : 8623 - 1993	Low voltage switchgear and control gear Assemblies (Requirement for type / partly type tested assemblies)
IS : 8623 - 1993 (Part - II)	Bus Bar trunking system
IS : 8828 - 1996	Circuit Breakers for over current protection For house hold and similar installation.
IS : 9537 - 1981(Part II)	Rigid Steel Conduits for electrical wiring
IS : 10810 - 1988	Methods of test for cables.
IS : 13947-1993 (Part-I)	General rules for low voltage switch gears and control gears.
IS : 13947-1993 (Part-II) IEC 947 - 2	Circuit Breakers
IS : 13947 - 1993 (Part-III)	Switches, disconnectors and fuse for low voltage switch gear and control gear.
IS : 13947 - 1993 (Part-IV)	Low voltage switch gear and control gear for contractors and motor starters
IS : 13947 – 1993 (Part-V)	Control Circuit Devices.
BS : EN:779 – 1993	Filters
ASHRAE Hand Books	American Society of Heating Refrigeration & Air conditioning . Application 2003. Fundamentals 2005. Refrigeration 2006.

Systems & Equipment 2004.
ASHRAE Indoor air quality Standard 62-2007.

IEC Relevant Sections.

Air Conditioning Equipment	
IS 659	Safety Code for air conditioning
IS 660	Safety Code for mechanical refrigeration
IS 3615	Glossary of terms used in refrigeration & air conditioning
IS 5111	Testing of refrigeration compressors
IS 7896	Data for outside design conditions for air conditioning
IS 10617	Hermetic Compressors (Part-I, II & III)
IS 11338	Thermostats for use in refrigeration, air conditioners etc.,
SP 7	National Building Code (Group 4)
IS 3615	Glossary of terms used in refrigeration and air conditioning
IS 7896	Data for outside design conditions for air conditioning for summer months
Noise & Vibration	
IS 2264	Preferred frequencies for acoustical measurements.
IS 3483	Code of practice for noise reduction
IS 3932	Sound level meter for general purpose use.
IS 9736	Glossary of terms applicable to acoustics in buildings.
IS 9901	Measurement of sound insulation in buildings & building elements
IS 9876	Guide to the measurement of air borne acoustical noise & evaluation of its effects on man.
IS 10423	Personal sound exposure meter.
IS 11446	Measurement of air borne noise emitted by compressors units intended for outdoor use.
IS 12710	Glossary of terms used in acoustic emission testing.
IS 4758	Methods of measurement of noise emitted by machines
IS 14280	Mechanical vibration – balancing – shaft and fitment key convention
IS 12065	Permissible limits of noise level for rotating electrical machines.
Pipe & Fittings	
IS 638	Gaskets
IS 1239	Mild steel tubes & fittings
IS 5822	Code of practice laying of electrically welded steel pipes for water supply.
Pump & Valves	
IS 778	Copper alloy gate, globe & check valves for water works purposes.
IS 4854	Glossary of terms for valves and their parts.
IS 5312	Swing check type non return valves.
IS 8092	Code for inspection of surface quality of steel castings for valves, fittings & other piping components.
IS 12969	Method of test for quality characteristic of valves.
IS 13095	Butterfly valves for general purposes.

Refrigerant Gas & Lubricants	
IS 1447	Method of sampling and test for lubricants.
IS 4578	Lubricating oils for refrigeration machinery
IS 10609	Refrigerants – Number – Designation
Sheet Metal Works	
IS 277	Galvanized Steel sheet
IS 513	Cold rolled low carbon steel sheets.
Thermal Insulation	
IS 334	Glossary of terms relating to bitumen & tar
IS 3069	Glossary of terms, symbols & units relating to thermal insulation materials
IS 3144	Mineral wool thermal insulation – Methods of tests
IS 3346	Method of determination of thermal conductivity of thermal insulation materials
IS 4671	Expanded polystyrene for thermal insulation purposes
International Standards	
SMACNA	HVAC Systems – Duct Design
SMACNA	HVAC Air duct leakage test manual
SMACNA	HVAC duct construction standards – Metal & flexible
SMACNA	Rectangular duct construction
SMACNA	Round duct construction
ASHRAE	ANSI / ASHRAE 52.1-1992 Gravimetric & Dust spot procedures for testing air cleaning devices used in general ventilation for removing particulate matter.
ASHRAE	Methods of testing liquid chilling packages.
SMACNA	Energy conservation guidelines.
SMACNA	Energy recovery equipment and systems, air to air
ANSI-UL-555-1985	Fire dampers
ANSI	Scheme for identification of piping system
ASHRAE	Number designation & safety classification of refrigerants
ASHRAE	Practices for measurement, testing & balancing of building, heating, ventilation & air conditioning system.
SMACNA	HVAC Systems – Testing, adjusting & balancing
ASHRAE	Ventilation for acceptance indoor air quality (ASHRAE – 62 Latest)
ASHRAE	Commissioning of HVAC Systems.
ASHRAE	Methods of testing liquid chilling packages as per ASHRAE 30 Latest Standard
AHRI	AHRI 575- Noise level testing for Chiller
ANSI / ASHRAE	Thermal environmental conditions for human occupancy as per ANSI / ASHRAE 55 1992
CTI	Acceptance test code for water cooling towers, mechanical draft, natural draft, fan assistant type evaluation of results and thermal testing of wet and dry cooling towers as per CTI-ATC-105-1990
CTI	Code of measurement of sound from cooling towers as per CTI-ATC-128

ANSI / AMCA	Laboratory methods for testing fans for rating as per ANSI / AMCA 210
UL	Fire dampers as per ANSI-UL-555
ASME	Scheme for identification of piping system as per ANSI / ASME A-13.1

SECTION -IV

TECHNICAL SPECIFICATIONS

SECTION -IV-A

TECHNICAL SPECIFICATIONS FOR SHEET METAL DUCTING WORKS (FABRICATION AS PER SMACNA STANDARDS)

FABRICATION OF DUCT AS PER SMACNA STANDARDS WITH A EXTERNAL PRESSURE OF 500 PA

1 AIR DISTRIBUTION

1.1 SCOPE

The scope of this section comprises supply fabrication, installation and testing of all sheet metal ducts. Supply, installation, testing and balancing of flexible ducts, plenum, and duct silencer. All to be in accordance with these specifications and the general arrangement shown on the drawings.

1.2 DUCT MATERIALS

1.2.1 Raw Materials

Galvanizing shall be Class VII – light coating of zinc, nominal 120 gm/sqm surface area and Lock Forming Quality prime material along with mill test certificates. In addition, if deemed necessary, samples of raw material, selected at random by owner's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense.

In general, above 750mm size ducts, 4 bolt system transverse connectors are mandatory. Equivalent transverse connectors will be approved after necessary submissions. All small ducts will be with minimum of Slip on transverse connectors/ alternately

MS angle, and no C/S/SS cleats shall be used. Ducting shall be fully sealed by sealant to minimize leaks.

1.2.2 Gauges, Bracing by size of ducts

All ducts shall be fabricated from galvanized steel of the following thickness, as indicated below

STANDARD WITH NO INTERMEDIATE BRACING

1.3 FABRICATION STANDARDS & EQUIPMENT

Rect.	Pressure 500 Pa		
Ducts G.S.	Duct Section Length 1.2 m (4 ft)		
Maximum Duct Size (mm)	Gauge	Joint Type	Bracing Spacing
1-450	26	TDF	NIL
451-900	24	TDF	NIL
901-1200	22	TDF	NIL
1201-2100	20	TDF/JTR	NIL
2100 & Above	18	TDF/JTR	NIL

All duct construction and installation shall be in accordance with SMACNA standards. In addition ducts shall be factory fabricated utilizing the following machines to provide the requisite quality of ducts.

1. Coil (Sheet metal in Roll Form) lines to facilitate location of longitudinal seams at corners/folded edges only, for required duct rigidity and leakage free characteristic**s. No longitudinal seams permitted along any face side of the duct.**
2. All ducts, transformation pieces and fittings to be made on CNC profile cutter for requisite accuracy of dimensions, location and dimensions of notches at the folding lines.
3. All edges to be machine treated using lock formers, flanges and rollers for turning up edges.

1.3 DUCT CONSTRUCTION

All ducts shall be fabricated and installed in workmanlike manner, conforming to relevant SMACNA codes.

a) Ducts so identified on the Drawings shall be acoustically lined and insulated from inside as described in the section "Insulation" and as indicated in schedule of quantities. Duct dimensions shown on drawings, are overall sheet metal dimensions inclusive of the acoustic lining where required and indicated in Schedule of quantities. The fabricated duct dimensions should be as per approved drawings and care should be taken to ensure that all connecting sections are dimensionally matched to avoid any gaps.

b) Ducts shall be straight and smooth on the inside with longitudinal seams shall be airtight and air corners only which shall be either Pittsburgh or snap button as per SMACNA practice, to ensure air tightness.

c) All ducts irrespective of sizes shall have DUCTMATE joints. The internal ends of slop joints shall be in the direction of air flow. Care should be taken to ensure that S/SS Cleats are mounted on the longer side of the duct and cleats on the shorter side. Ducts and accessories including insulation within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint.

d) All ducts, over 750 mm duct size for pressure class 1' / 250 Pa (W.G.) and over 550 mm duct size for pressure class 2"/500 Pa (W.G) shall have transverse joints of TDF type as specified in Annexure I.

e) Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7). Air-turns (vanes) shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

f) Ducts shall be fabricated as per details shown on Drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees or angels, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

g) All sheet metal connection, partitions and plenums, required to confine the flow of air to and through the filters and fans, shall be constructed of 18 gauge GSS / 16 Gauge aluminum, thoroughly stiffened with 25 mm x 25 mm x 3mm galvanized steel angle braces and fitted with all necessary inspection doors as required, to give access to all parts of the apparatus. Access doors shall be not less than 45 cm x 45 cm in size.

2 INSTALLATION PRACTICE

All ducts shall be installed generally as per tender drawings, and in strict accordance with approved shop drawings to be prepared by the Contractor.

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

b) All necessary allowances and provisions shall be made by the Contractor for beams, pipes or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and conduits, the ducts shall be

transformed, divided or curved to one side(the require area being maintained) all as per the site requirements.

c) If a duct cannot be run as shown on the drawings, the contractor shall install the duct between the required points by any path available in accordance with other services and as per approval of Consultant/owner's site representative.

d) All ductwork shall be supported using support system brackets bolted directly on the top corner pieces of TDF type transverse joints. Threaded rods anchored from the ceiling are fixed to these brackets each having a slot for minor lateral adjustments.

e) All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with trapeze hangers formed of galvanized steel rods and galvanized steel angle / channel or a pair of brackets, connected by galvanized steel rod under ducts. The spacing between supports should be not greater than 2.4 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel cleat with a hole for passing the hanger rods shall be welded to the plates. Trapeze hanger formed of galvanized steel rods shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash / anchor fastener driven into the concrete slab by electrically operated gun. Hanger rods shall then hang through the cleats ro fully threaded galvanized rods can be screwed into the anchor fasteners.

f) Ducting over furred ceiling shall be supported from the slab above, or from beams after obtaining approval of Owner's site representative. In no case shall any duct be supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractor's work in the building.

g) Where ducts pass through brick or masonry openings, it shall be provided with 25 mm thick phenotherm insulation around the duct and totally covered with fire barrier mortar for complete sealing. The cost of the phenotherm shall be part of ducting & shall not be covered separately in BOM. It can also be executed with a layer of neoprene around the ducting

h) All ducts shall be totally free from vibration under all conditions of operation. Whenever ductwork is connected to fans, air handling units or blower oil units that may cause vibration in the ducts, ducts shall be provided with a flexible connection; located at the unit discharge. Flexible connections shall be constructed of fire retarding flexible heavy canvas sleeve at least 10 cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both sides of the flexible connections. The flexible connection shall be suitable for pressure at the point of installation.

i) Duct shall not rest on false ceiling and shall be in level from bottom Taper pieces shall taper from top.

3 TDF SYSTEM/TDF FLANGES components shall be as follows :

SLIP ON FLANGES

Roll-formed GI section with embedded sealant.

Available indifferent cross – sections to provide a range of rigidity and strength characteristics (see page 2 for the selection of flanges).

CORNERS

To be inserted into the hollow web of the slip-on flange. 4 corner pcs. Are required for each rectangular frame, 8 corner pcs per joint.

SEALANT

To be applied as a thin bead at the interface of duct and TDF corner piece only.

CLEATS

GI Metal Clear 150 mm in length can be snap-fitted or slid over the mating flanges.

GASKET-NEOPRENE / PVC

UV resistant, self-adhesive, 10 mm wide and 4.5 mm thick.

BOLTS, NUTS AND WASHER

Electro-galvanized, square-necked carriage bolts, nuts an washers. Each joint requires 4 sets.

Flange Selection

(Recommended Configurations as per SMACNA – 1995)

TDF Flanges are available in different sizes and identified by its Rigidity / Reinforcement 'Class' as per SMACNA. The proper selection of the right flange depends on the independent parameters :

a) duct static pressure
b) duct size
c) spacing between joint

REFERENCE :

*1 – SMACNA – Sheet Metal and Air conditioning Contractors National Association Inc – "HVAC Duct Construction Standards – Metal and Flexible" – 1995, U.S.A.

*2 – Under SMACNA, alternative configurations of the duct gauge and flange system can be used to obtain an equivalent structural rigidity of the duct system. As shown here, the bracing alternative is usually the more time-consuming and but is generally more economical one on a direct cost basis. Contractors will have to determine the optimum choice for themselves.

*3 – Slip-and-Drive (C and S / SS) cleats are generally used for class connectors in most normal comfort cooling applications. The C class flange will be available from March 2002 onwards. A higher class flange can always be substituted for a lower class (e.g. class "I" for class "H", class "H" for Class "F")

REINFORCEMENT CLASSES FOR ANGLE IRON FLANGES

Under SMACNA – 1995, the approximate Reinforcement Classes for duct assemblies with companion Angle Iron Flanges are :

REINF. CLASS NEAREST MS ANGLE IRON SIZE (NOMINAL)-(MM)

F 25 X 25 X 3
H 40 X 40 X 3
I 40 X 40 X 6

A completely galvanized system consisting of fully threaded rods and bottom brackets, nuts, washers and anchor bolts conformed to SMACNA and DW 142 standards.

Support for Horizontal Duct – Rectangular

	Max. Duct Size	nger Rod Dia	ttom Rod Dia	Interval
	0 – 450	6 mm	6 mm	2000-2400
	451 – 1200	8 mm	6 mm	2000-2400
	1201 – 2000	10 mm	6 mm	1200-1500

	2000 & above	12 mm	6 mm	1200-1500

4 Installation

4.1 The duct fabrication and installation shall generally conform to IS 655-1963 or latest edition.

4.2 The Contractor shall provide and neatly erect all sheet metal work as shown on drawings or as may be required to carry out the intent of those specifications and drawings and this work shall meet with the approval of the Engineer in all its parts and details. Hanger supports (10 mm min.) shall be fixed to the ceiling through expansion fasteners 2 Nos. for each leg. The anchor fasteners shall be of approved make.

All necessary allowances and provisions shall be made by this Contractor for beams, pipes or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work or plumbing or other pipes or conduits the ducts shall be transformed, divided or curved to one side, the required area being maintained, all as approved or directed by the Engineer.

All metal work in dead or furred down spaces shall be created in time to occasion no delay to other contractors on the building.

Ducting over furred ceiling shall be supported from the slab above, or from beams. In no case shall the duct be supported from the ceiling hangers or be permitted to rest on a hung ceiling.

If a duct cannot be run as shown on the drawings, the Contractor shall install the duct between the required points by any path available, subject to the approval of the Owner/ Project Managers.

All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees or angle of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

All joints shall be made tight and all interior surfaces shall be smooth. Bends shall be made within radius not less than one-half of the width of the duct or with scientifically designed interior curved vanes as approved by the Engineer. Two vanes shall be spaced so that the aspect ratio of each of the individual elbows formed by the vanes will be about five to one.

All sheet metal connections, partitions and plenums required to confine the flow of air to and through the filters and fans, shall be constructed from No.18 galvanized iron, thoroughly stiffened with 25 mm x 255 mm angle iron braces and fitted with all necessary doors as required by the Engineer to give access to all parts of the apparatus. Doors shall not be less than 60 cm x 60 cm.

Where metal ducts or sleeves terminate in wood work, brick or masonry openings, tight joints shall be made by means of closely fitting heavy flanged collars.

Doors shall be set in ducts and air plenums for access to pipes, dampers, coils, valves, etc.,

Air handling units shall be connected to duct work by inserting a double canvas sleeve air inlet and air outlet. Each sleeve shall be minimum 150 mm long, securely bonded and bolted to duct and units. Each sleeve shall be made smooth and the connecting duct work rigidly held in line with unit inlet or outlet.

All gaskets shall not be non-hardening neoprene, rubber or approved material. The gasket shall be sufficiently thick to withstand compression and shall be adhered to the metal with adhesives. Exact length should be used and cut pieces shall not be accepted.

All M.S. hanger rods and angle frame work shall be given 2 coats of zinc chromate pains prior to installation. In case the paint is damaged, additional coats shall be applied.

All hangers and supports shall remain free and not enclosed in insulation work.

Note:

1. **Duct running from AHU Room should be properly supported by Angle Supports and stiffeners. Slotted Rail Supports are not accepted.**
2. **If Any Duct pieces gets rusted , it is strictly not accepted. If found duct is rusted entire Supplied item to be rejected.**
3. **Cleats for every duct piece to be provided.**
4. **Lighting or other services supports should not be taken from duct supports.**
5. **Ducts shouldn't be installed from Ceiling supports.**
6. **Duct Pressure test is part of scope.**
7. **Every braches and main duct to be pressure test through calibrated machine.**

Measurement

1. No Extra Cost will be supplied for Splitters/Vanes,Flanges.

2. **Duct Silencers**

a) Material

The outer casing shall be out of min. 20G galvanized steel in accordance with ASHRAE recommendations for high-pressure rectangular ductwork. Seams shall be lock formed on Pittsburgh lock machine.

Interior elements of silencers shall be out of min. 20 G galvanized perforated steel. The inner side of the perforated sheet shall be backed by R P Tissue to prevent fibre fly over.

Acoustic fill shall be fibre glass (not mineral wool) of density not less than 40 Kg/m2 sufficient to obtain specified acoustic performance and shall be packed under 10% compression to eliminate voids due to vibration and settling. Material shall be inert, vermin and moisture proof.

All material of construction and acoustic fill shall be incombustible as per IS 3144.
Air tight construction shall be provided by use of non-hardening duct sealing compound at site by the air conditioning contractor.

b) Acoustic Performance

Silencer acoustic ratings shall include insertion loss and self-noise power levels and shall meet or exceed minimum performance specified by the Acoustical Consultant. Contractor shall provide computer selection for the silencer supplied at site which indicates db reduction at different octave Band frequency.

a. Aerodynamic Performance

i. Static pressure drop through silencers shall not exceed those listed in the silencer schedule at the indicated air flows.

b. Transitions

c) Where transitions are required to adapt silencer dimensions to connecting duct work, they would be supplied by the installing contractor.

a. Smoke Exhaust Duct Work

i.Smoke exhaust duct work internal and external to the building and when indicated shall be manufactured from 1.6 mm black sheet steel continuously welded throughout and shall be shop0 fabricated in as

long lengths as possible with fabricated sections welded on site to ensure air tightness.

ii. Smoke exhaust duct work shall be painted internally and externally with epoxy paint of approved color.

iii. Final connections to the smoke exhaust fan shall be through high resistant double sleeve non-flammable flexible connections.

Green Building Construction norms shall be followed in duct installation –

a) Sheet to be cleared before fabrication;

b) Fabricated duct to have polythene covers on both ends to be removed after whole ducting is installed and shown to PM representative.

c) ALL DUCTING MUST BE CLOSED WITH POLYTHENE WHEN THEY ARE INSTALLED AND THIS IS TO BE FOLLOWED FOR CUTOUTS FOR SUPPLY AIR ,MADE IN DUCTING, TO FOLLOW LEED CONSTRUCTION STANDARDS THE DUCTS SHALL BE CLEANED OUT INTERNALLY,BEFORE ERECTION AND THIS SHOULD BE SHOWN TO PM REP.

d) At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, Ductwork and equipment should be stored in dry and dust free areas prior to installation. Vendor to check good construction practices requirement document attached to this tender , and ensure no deviation from the same.

e) Low VOC adhesives approved by GREEN TEAM of Client , to be used and no non approved Adhesive will be permitted.

3. FLEXIBLE DUCTING

GENERAL

This section involves the supply and installation of **factory fabricated** flexible ducts connected to supply / exhaust air as shown in the drawings.

MATERIAL

The flexible ducts used to tap supply air shall be of high quality thermally insulated duct. The thickness of the insulation shall be 25 mm thick and the density shall be not less than of 16 kg / cum. The inner core of the flexible duct shall be of PVC / tough aluminium material bonded with stainless steel spirally reinforced wire. The outer jacket is made out of very tough spirally reinforced multiple layer aluminium laminated construction.

The flexible ducts proposed to install in the exhaust side shall be of same description as mentioned above but without insulation material having 2 layers of aluminised polyester construction, encapsulates a high tensile steel wire helix.

INSTALLATION PROCEDURE

Flexible ducts shall be cut to the required size to ensure a curved connection between the

Unit Size	SI units in mm						
	W	H	L	A	I	X	Y
4”	254	254	279	267	98	222	22
5”	254	254	279	267	124	222	222
6”	254	254	279	165	149	222	222
8”	305	254	279	165	200	273	222
10”	356	318	330	165	251	324	286
12”	406	381	330	165	302	375	349
14”	508	445	445	165	352	476	413
16”	610	445	445	165	403	578	413
19”	762	445	279	203	718X352	730	413
22”	864	445	279	203	819X403	832	413

main duct and the air terminal plenum. The contractor shall not join any small flexible pieces by any foreign materials before installation. The minimum length of the flexile duct shall not be less than 750 mm in length.

A groove of 2 mm shall be made on the round collars to ensure that the spiral wire inside the flexible duct shall be fitted ahead of the groove. Stainless steel metal clamps, which are made out of 8-mm wide band with lifted edges, shall be used to tighten the connection of the flexible ducts on the round collars of the plenums. On the flexible ducts the clamp is fitted with a flip up and quick lock tightening ahead of ease of fixing. The contractor shall ensure that all the flexile ducts wherever installed shall follow the above procedure. The contractor has to obtain the approval from the consultant / project managers before starting the actual installation.

4. Double Skin Plenum :

45mm thick with puf insulation (factory fabricated)with powder coated of following sizes -Plenum Mouth Size to be coordinated with final Shop drawings for number of openings . Also scope covers for supply and fixing of double reinforced fire rated canvass. The scope also includes necessary hanging arrangements for plenum boxes, plenum cutouts as per HVAC layout . Double skin plenum with1 mm thick sheet for external side and 0.8mm thick sheet for internal side Color of plenum to match to nearest color of AHU body .

Density of PUF 40+/-2 Kg/Cum. Plenum to be supported with MS Angular Supports.

SPILL AIR BOXES

The spill air boxes are to be located at the terminal end of the Flexible duct

Sheet Metal Spill air boxes made out of 26 GI sheet for connecting the diffuser outlet & flexible connection from the main duct

Sizing will be based on the plenum design considerations.

Installation Methodology:

Hanging and Mounting Equipment

Although the basic equipment is generally light enough that it can be supported by the ductwork, it is strongly recommends that all equipment be suspended from the upper most ceiling or a structural element of the building, independent of the false ceiling grid. Suspension devises are field supplied, sized and designed by others. Equipment must be installed in a level horizontal plane. Failure to level equipment properly may prevent proper operation of controls. Provisions for proper support in seismically active regions is the responsibility of others.

Hanger straps may be utilized as an alternate means of suspending the equipment. Do not secure hanger straps to electric heaters, coils or control enclosures. Hanger straps can be mounted directly to the sides and bottom of equipment casing, such that they do not interfere with working components or access panels, using screws that do not penetrate the unit cabinet more than 3/8". When hanging equipment, always use the support method as prescribed for rectangular duct in the job specifications.

Space Restrictions.

Try to ensure that terminals are located for ease of installation, optimum performance, and maintenance accessibility.

Duct Connections

All duct connections should be configured and installed in accordance with SMACNA guidelines and all local code requirements.

Allow a minimum of 1½-duct diameters of straight duct prior to equipment inlet and equipment discharge. The diameter of the inlet duct for round valves must be equal to the listed size of the equipment. The round air valve inlet collar of the equipment is 1/8" smaller then listed size in order to allow the round ductwork to slip over the air valve inlet collar. DO NOT INSERT DUCTWORK INTO AIR VALVE INLET COLLAR. When making ductwork connection to air valve inlet collar and insulating air valve inlet, take caution not to damage or remove the flow sensor connections, which are vital to unit control. Provide insulation around entire inlet collar (all the way to the equipment casing).

Sound Critical Applications

Flexible duct connectors are not recommended on equipment discharge. The sagging membrane of these fittings can cause turbulence and higher air velocities that generate noise. Also, lightweight membrane material allows noise to breakout, which can increase sound levels in the space below.

Electrical

All field wiring must comply with NEC and all local codes. Electrical and/or control wiring diagrams are located on the control enclosure box.

The installing electrician should rotate the incoming electric service by phase to help balance the building electrical load.

Minimum circuit capacity (MCA) designates the maximum operating load of the equipment for sizing wire feeders. Fuse size of the internal fuse if supplied. Maximum Over current Protection (MOP) designates the largest breaker or fuse in the electrical service panel that can be used to protect the equipment.

Use Copper conductors only .

SAFETY

Overload Protection

The actuators are electronically protected against mechanical overload. In the actuator, an electronic circuit maintains the current at a level that will not damage the motor while providing adequate holding torque.

Safety Considerations

The equipment should be designed for safe and reliable operation when installed and operated within its' design specification limits. To avoid personal injury or damage to equipment or property while installing or operating this equipment, it is essential that qualified, experience personnel familiar with local codes and regulations, perform these functions using good judgment and safe practices.

Storage

If equipment is to be stored prior to installation, observe the following precautions:

1. Choose a dry storage site that is reasonably level and sturdy to prevent undue stress or permanent damage to the equipment. Set equipment off ground if in moisture prone areas.

2. Tag and store in a safe place until needed. Cover entire equipment with protective tarp or moisture proof cover. Extend cover under equipment if stored on ground. Secure cover with adequate tiedowns and store indoors. Be sure that piping connections have protective shipping caps installed. Ensure that all linkages are connected properly. Check the linkage that connects the actuator to the damper shaft to ensure that the nuts are tight. While viewing the damper from the discharge of the unit, rotate the shaft fully. The damper should close fully and there should be no gaps between the damper gasketing and the inside of the valve.

CODES & STANDARDS:

- ETL
- NEC
- ARI Standard 880
- Electical device installed within a NEMA 1 wiring Enclosure
- Galvanized steel casing that withstands 125 hour salt spray test as per ASTM B-117
- ½" thick fibreglass insulation complying with UL 181, NFPA 90A, and ASTM C1071
-

VAV SPECIFICATIONS

Variable Air Volume (VAV) units shall be fully pressure independent with velocity Sensor, transmitter, electric actuator, room thermostat, and DDC (direct digital control) Controller, all supplied by the same manufacturer. The unit including all the control components shall be supplied, installed and the complete unit tested at the factory by a qualified VAV manufacturer. A qualified VAV manufacturer shall have at least five years'

experience of manufacturing the products. The warranty of the complete unit including the controls shall be the sole responsibility of the VAV supplier.

The VAV supplier shall demonstrate that they have sufficient local technical support And engineering knowledge to archive the performance. All performance data shall be tested in accordance with Industry Standard for Air Terminals Standard 880 published jointly by Air Diffusion Council (ADC) and Air Conditioning and Refrigeration Institute (ARI). The manufacturer shall maintained a quality standard similar to ISO-9002 or Equivalent.
The VAV terminals shall be constructed of not less than 0.8mm guage galvanized steel, which should be able to withstand salt spray test The VAV casing shall be constructed of 22 gauge galvanized steel, with an internal insulation of 1" @ 48kg/m^3 lined with double side aluminum foil to prevent air erosion which complies with Fire Test BS476 parts 6 & 7 to meet class "O".
The primary air valve damper shall be heavy gauge metal, with peripheral gasket, pivoted in self-lubricating bearings. In the full closed position, air leakage past the closed damper shall not exceed 2% of maximum inlet rated airflow at 3" W.G inlet pressure, as rated by AHRI Standard 880.

The VAV boxes shall be of Pressure Independent type, complete with a microprocessor DDC controller, damper, damper actuator, cross flow velocity sensor with differential pressure transmitter, thermostat and in-built step down transformer.

The damper shall be of heavy gauge metal, with peripheral gasket that is non-combustible, pivoted on self-lubricating bearings. In the fully closed position, air leakage through the closed damper shall not exceed 2% of the nominal catalogue airflow rating at 750 Pa (3 ins. wg) inlet static pressure. All control components shall be mounted inside a protective metal shroud. The static pressure drop across the terminal unit shall not be more than 35 Pa (0.14in.wg) at the design air flow. The pressure independence shall be achieved using a differential pressure type velocity sensor on a feed forward loop control.

Flow star-The air flow sensor shall be of a cross configuration located at the inlet of the assembly and shall have multiple pickup points, designed to average the flow across the inlet of the assembly. The air flow sensor shall amplify the sensed air flow signal.

Differential pressure airflow sensor shall traverse the inlet using equal cross sectional area or log-linear traverse method along two perpendicular diameters. Single axis sensor shall not be acceptable for duct diameters 6" or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.03" w.g. at an air velocity of <= 450 FPM

All CFM requirements shall be catered by a single VAV box and combination of VAV boxes to meet a single CFM requirement is not acceptable.

Internal insulation shall be at least 25mm (1 in), 32kg/cu.m density fibre-glass c/w a layer of aluminum foil to prevent erosion. The combination of insulation and coasting shall comply to B.S. 476 Part 6 & 7.

Constant Air Volume BOX

General

A. The design, construction, material and finishes of all the units shall be suitable for the locations, climatic and operating conditions indicated in this specification and drawings.

B. These shall of the Pressure Independent constant air volume boxes and shall be a of TROX or equivalent make.

C. The main objective of the CAV shall be to balance air flow volume in supply / return or exhaust ducts.

Construction

A. Casing and Control blade shall be made from high quality GSS material .
B. Leaf Spring from SS material, Bellows from Polyeurathene material.
C. It shall be mechanically powered and no external power supply shall be required, which shall include a control damper, regulator spring and low friction, silicon free damper element.
D. The volume flow range shall be in 4:1 range.
E. The CAV shall operate in the differential pressure range of 50 to 1000 Pa.
F. The external scale for the volume flow adjustment at site shall be provided and it should give accuracy of +/- 4%.
G. A lip seal shall be there to ensure a snug fit between the CAV and the GI duct.
H. It should have the provision to be installed in any orientation.
I. The air flow above 5000CFM as there is constraint on the mechanical CAV sizing , the EASY VAV boxes can be programmed to work as CAV. These shall be electrically operated

Section-IV-C

1.0 Variable Refgrigerant flow System

1.1 System Description

Scope of Work:

The scope of the work listed in this tender, is to provide an air conditioning Variable Refrigerant Flow (VRF) system for some locations in the Floor and to this end, the following system considerations have been provided in the tender. The Office space, as identified in the schedule of units will be air-conditioned by VRF systems.
Unit configuration for the area to be cooled is available in the unit schedule and also detailed in the drawings.

1.2 GENERAL SPECIFICATIONS AND REQUIREMENTS

Power supply

Power will be made available at 415V 3 ph / 230V single ph, 4 wire, 50 HZ earthed neutral system and all equipment shall be suitable for the above power supply with variation of + / -10 %. All equipment shall operate at this voltage and any equipment operating at other than this Power supply shall be provided with necessary transformer by the successful bidder.

VRF AC Contractors SCOPE of work will include-

Supply, Shifting & Installation of various equipment as per the relevant Specification & Drawings, unloading, receiving, inspection, storing, transportation to work site, handling, assembling, cleaning, mechanical erection, assisting main contractor in associated civil works which are required for AC system, Installation, testing and commissioning and handing over in working condition of all items covered below but not limited to it:

AC High side works

a) Supply and Installation of AC Units.
b) Connection of electrical power to units from power supply point(indoor unit will need to be connected by the VRF vendor /outdoor unit cable termination is the scope of the VRF vendor).

AC Low side works

a) Refrigerant piping and cabling between indoor and outdoor unit.
b) Condensate drain piping to nearest drain.

AC CONTRACTORS SCOPE ALSO INCLUDES

The following important SCOPE is to also be considered included the scope of works:-

a) Structural frame (Supply Design)work as necessary for the mounting the outdoor units also would be under contractors scope. Before installation of the framework, all necessary details

pertaining to above framework needs to be furnished to the Structural Consultants of the Base Building & then based on the approval, execution should follow.

b) Receiving of the equipment , lifting the equipment to its desired location via staircase/crane, erection of indoor units in the required floor , and erection of outdoor units on terrace , etc.,

c) All necessary minor civil works related to AC Works such as frames and vibration isolators for outdoor units , Closure of pipe openings on terraces etc., would be completely under AC Contractors Scope.

d) Associated civil works like drilling and punching holes and openings in concrete floors, slabs, chasing of brick walls, fabrication of supporting structures, cleaning and clearing of all debris.

The extent of work services under the contract include all items shown on the drawings, indicated in companion with specifications, notwithstanding the fact that such items have been omitted from the BOQ. All equipment and services which are required to complete the intent of the contract shall also be deemed to be within the scope of the contract.

TECHNICAL SPECIFICATIONS

General specification for VRF System.

The system selected is a modular system, with number of indoors connected to centrally located outdoor units, as per detail designing given in the tender. The outdoor units for all the system shall be air cooled type and mounted on terrace of the building. Indoor units in various areas shall be as per enclosed drawings/ Bill of Quantities.

All the VRF air conditioners shall be fully factory assembled, wired, internally piped & tested. The outdoor unit shall be pre-charged with first charge of **R 410 A/R 407 c** refrigerant. Additional charge shall be added as per refrigerant piping at site. All the units shall be suitable for operation with 415 V + 10%, 50 Hz + 3%, 3 Phase supply for outdoor units &220 V + 10%, 50 Hz + 3%, 1 Phase supply for indoor units.

The VRF system shall provide stable, trouble free & safe operation, with flexibility of operating desired indoor units. The outdoor units must be capable of delivering exact capacity proportional to the number of indoor units switched on & the heat load in the air conditioned area. The proportional operation shall be achieved by varying speed of the scroll compressor in the outdoor units.

The operation of the VRF system shall be through independent wired remote controllers as specified. The entire system shall have the feature of Centralized control and Monitoring system through central controller unit.

Specification of Outdoor units.

Out doors units of the VRF system shall be compact air cooled type & shall have a minimum of 3.0 COP.
Electrical scanner/ Analyzers (to analyze the electrical power incoming) are required as part of the outdoor unit and each Unit should have the capability to switch off when excessive or under voltage is detected by the scanner.(Scanner Not mandatory if it is not mentioned in Boq)

All the compressors of the out door units must be hermetically sealed scroll type. The varying speed compressor shall be of highly efficient hermetic scroll type and equipped with Inverter capacity, capable of changing the delivered capacity in accordance to the cooling load requirement.

Anti Corrosive treatment for Al fins of Condenser Coils is mandatory. The treatment should be suitable for areas of high pollution.

The coils shall be pressure-tested at the factory for a pressure of at least 30 Kg/sqcm (440 psi).

The outdoor units must be suitable for distances up to 150 m refrigerant piping between outdoor unit & the farthest indoor units, total piping of 500 m for all the indoor units. Allowable level difference between outdoor unit & indoor units shall be 35 m in case of outdoor unit on top. Allowable level difference between various indoor units connected to one out door unit shall be up to 25 m.

The outdoor unit shall employ system of equal run time for all the compressors, within each outdoor unit.

The outdoor units shall be suitable to operate within an ambient temperature range of – 5 Deg C to 40 Deg C, in cooling mode.

Air cooled condenser shall have Axial Flow, upward throw fan, directly coupled to fan motors with minimum IP 55 protection. The outdoor unit condenser fan shall be able to develop external static pressure as required even is a small duct is attached for discharge. Refrigerant control in the out door unit shall be through Electronic Expansion Valve.

Noise level of outdoor units shall not exceed 65dB (A) at a distance of 1.5 m from the unit.

The condenser fan shall be multi speed to allow for ambient control and also allow for night time quiet operation of the outdoor unit.

Out door units shall be complete with following safety devices:
· High pressure switch
· Fan driver overload protector
· Over current relay
· Overload Protector

The Control Manager unit offered by vendor should offer,through programming,

a. Auto sequencing for equal run time between working and standby units.
b. Auto start of non working unit when working unit fails.
c. Auto start of both working and standby units if temperature in the room breaches programmed set point of High temp.
d. Units will parallely also integrate through the BacNet Interface , into the BMS and both the control Manager and BMS will parallely be available to Client for control and monitoring of the VRF units.

MAIN FEATURES FOR THE VRF SYSTEM:

The Outdoor unit shall incorporate high static condenser fans & suitable for ducted discharge.

- The COP of the VRF System shall not be less than 3.3 at ARI conditions.
- The unit shall have automatic test operation.
- The unit shall have low noise feature.
- The compressor used shall be high performance, low noise scroll compressor.
- Night time quiet operation feature.
- Intelligent control system suitable for connecting Outdoor units & Indoor Units suitable for integration with BMS System using BACNET interface.
- AC Contractor should provide ELCB isolator if make of system is toshiba/Daikin.

Wired Remote Controller for Ducted Units.

Wired remote controller shall be supplied for ceiling mounted ducted type units as specified in the "Bill of Quantities".

The controller must have large crystal display screen, which displays complete operating status.

The digital display must allow setting of temperature with 1 Deg C interval.

Remote shall be able to individually program by timer the respective times for operation start and stop within a maximum of 72 hours.

Remote must be equipped with thermostat sensor in the remote controller that will make possible more comfortable room temperature control.

The remote must constantly monitor malfunctions in the system & must be equipped with a "self diagnosis function" that let know by a message immediately when a malfunction occurs.

It shall be possible to wire the remote up to 50 RMT.

CORDLESS REMOTE FOR CASSETTE/HI-WALL AC

The Cassette/Hi-Wall Unit shall be offered Cordless remote with all functions as available in the wired remote.

Specifications for Indoor Units

Ceiling Mounted Duct type units-

These units shall be ceiling suspended with suitable supports to take care of operating weight of the unit, without causing any excessive vibration & noise. The cold air supplied by these units will be supplied to the area to be air conditioned, through duct system specified in the tender.

The indoor unit must have electronic expansion valve operated by microprocessor thermostat based temperature control to deliver cooling as per the heat load. The unit casing shall be Galvanized Steel Plate.

Unit must be insulated with sound absorbing thermal insulation material, Glass Fiber. The noise level of unit at the highest operating level shall not exceed 49 dB(A), at a vertical distance of 1.5 m below the units with duct connected to the unit.

The unit must be able to develop external static pressure of 20-25 mm, at the specified air quantities with MERV 8 Filters.

The units upto 5tr should have should have an inbuilt drain pump. Larger units shall have external pumps integrated separately.

Ceiling Suspended Unit with AHU Kit

The capacities of Customized indoor Units with Ceiling Suspended factory fabricated ducted CS U are as below .The Indoor unit to be with internal lly insulated with 42±3mm thick acoustic PUF insulation OF 48KG/CUM. The indoor unit can be direct/ belt driven with three speed motor of suitable capacity. The ESP of CSUs to be with 15-20mm ESP of Wg Pr. Utilisation of ACs as per Schedule of Equipment and approval of architects.Quoted rate also includes suitable prefilter with 20micron capacity for CSU's.

Cost for Providing Drain tray below unit is part of Scope.

Cost for providing Starter panel, AHU kit Cabling upto Isolator box will be HVAC Contractor Scope.

HVAC Vendor to Co-ordinate with FA vendor to provided WLD cable for drain tray leakage.

HVAC Vendor to Co-ordinate with Interior team for providing trap door below unit for Maintanence purpose.

HVAC vendor to install AHU kit above ceiling with out hampering other services.

Cassette type indoor units.

These units shall be installed between the bottom of finished slab & top of false ceiling.
The maximum allowable height for the cassette type units shall be 300 mm.
The unit must have in built drain pump, suitable for vertical lift of 750 mm.
The unit casing shall be Galvanized Steel Plate
Unit must be insulated with sound absorbing thermal insulation material, Polyurethane foam. The noise level of unit at the highest operating level shall not exceed 42 dB(A), at a vertical distance of 1.5 m from the grille of the unit.
Unit shall have provision of connecting fresh air without any special chamber & without increasing the total height of the unit (300 mm maximum).
The unit shall be supplied with suitable decorative panel.
The unit shall be supplied with Resin Net filter with Mold Resistance. The filter shall be
easy to remove, clean & re install with MERV 8 filters.
The unit shall be capable of both 4 way and 3 way throw configurations as required for site.
The unit will be connected in series to a suitable out door unit & it must be possible to operate the unit independently, through cordless remote specified in the “Bill of quantities”.

Hi-Wall type indoor units.

These units shall be installed Side Wall for proper Air circulation.
The unit must have Separate drain pump, suitable for vertical lift of 1000 mm.
The unit casing shall be Galvanized Steel Plate
Unit must be insulated with sound absorbing thermal insulation material, Polyurethane foam. The

noise level of unit at the highest operating level shall not exceed 38 dB(A), at a vertical distance of 1.5 m from the grille of the unit.
The unit shall be supplied with Resin Net filter with Mold Resistance. The filter shall be easy to remove, clean & re install with filters.
The unit will be connected in series to a suitable out door unit & it must be possible to operate the unit independently, through cordless remote specified in the "Bill of quantities"

GENERAL
This section details the supply and application of thermal insulation for REFRIGERANT PIPING and drain piping.

MATERIAL
The Consultants / Architects reserves the right to require that the weights, dimensions, etc., of the materials supplied be measured and shown to conform to the values specified.

For Thermal Insulation for ref pipes, it is proposed to use closed cell elastomeric foam structure flexible thermal.

Thermal Insulation to be of specified thickness of INSULATION manufactured as per ASTM C 209 water absorption (0.2% by volume) & which should also meet BS 476 for Fire performance (Class O). Thermal conductivity 0.036 w/m.k @20 deg c.

The material should have thermal conductivity not exceeding 0.0431 W/Mk.

The maximum surface temperature of material shall withstand is 80 deg C. The refrigerant pipe insulated shall be using concentric sleeved insulation.

REF PIPING NITRILE RUBBER OPTION

Suction line below 1 inch 13mm
Suction line above 1 inch 19mm
Liquid line to be insulated by 13mm

All exposed Insulation shall have UV coating done as standard
Uv coating specification

COVER WITH 7 MIL GLASS CLOTH AND FINISH WITH UV PROTECTIVE COATING OF PIDILITE LAGCOAT - 2 COATS Or ARMACHECK GC

Drain piping should be insulated with 6mm sleeve insulation.

CABLE TRAY SYSTEM

1.0 General

The tray system shall generally be routed under the ceiling slabs and only above the false ceiling. The contractor shall supply all labor, material and accessories for the completion of this installation strictly in accordance with the specification laid as under, illustrated in drawings and shown in the schedule / bills of quantities.

2.0 Design

Standard perforation/Closed shall be provided in cable trays at both axis i.e. : horizontal & vertical. The cable tray system shall be designed in the standardized modular system and comprise of basic modules of trays, fittings and accessories. Each modular shall be fabricated from prime quality mild steel sheet and then hot dip galvanized of 60 microns.

Modular of 90 degree elbows, t joints and double, T joints shall be used for horizontal changes in the direction of cable runs while hinged connectors shall be used for vertical branch off. The branch off joints should be such as to allow for angle connection to be easily bolted to them by means of button head screws. End plates shall be used to closed off unevenly cut faces of the cable trays and protect the cables from damage. Where required barriers shall be used to permit power cables and cables and cables of all modules shall be subject to the prior approval of the engineer be fore mass production is taken hand. The cable tray shall have standard lengths of 2440 mm.

The following standard shall be used:
Cable tray width upto 300 mm – thickness of metal sheet 1.2 mm (18 SWG)
Cable tray width upto 600 mm – thickness of metal sheet 1.6 mm (16 SWG)
Cable tray width over 600 mm – thickness of metal sheet 2.0 mm (14 SWG)

The cable trays shall be fabricated out of 2 mm thick sheet steel using proper jigs and fixtures.

All accessories such as bends, tees etc., shall also be manufactured at the tray manufacturer's works. These shall not be fabricated at site.

Perforated cable trays shall be covered on top using 1.6mm thick CRCA sheet covers retained in position by screws.

Wherever the cable trays run vertically through the shaft, fire barriers shall be provided at every floor at no extra cost. Cable tray sections shall be joined by fishplates.

The accessories like bends, reducers, etc., shall be installed at the required locations.
The trays shall be supported at regular intervals of not more than 1.5 to 2 Mtrs using threaded Factory made supporting system of approved design.

REFRIGERANT PIPING:

a) The specifications that follow cover the requirements of piping of refrigerant- 410 A/R 407c.
Copper pipe should be de Oxidized Phosphorous seamless and suitable for R410 A refrigerant & tested as per JIS H3300/IS10773 : 1995. It should have **clean inner surface and capped before delivery.**

Size (mm)	Thick (mm)	TYPE	Gage
6.4	0.8	HARD	21g
9.5	0.8	HARD	21g
12.7	0.8	HARD	21g
15.9	1	HARD	19g
19.1	1	HARD	19g
22.2	1	HARD	19g
25.4	1	HARD	19g
28.6	1	HARD	19g
31.8	1	HARD	18.5g
34.9	1.21	HARD	18g
38.1	1.32	HARD	17g
41.3	1.43	HARD	16g

b) Only copper piping/tubing of Refrigeration quality shall be used. Soft copper tubing can be employed for sized upto and including 22mm (7/8") OD. For larger sizes, hard drawn pipes in straight length shall be used. Wall thickness of all piping shall conform to type L save that tubing of sizes 6.4mm (1/4") OD and 9.5mm (3/8") OD shall have a minimum nominal thickness of 0.76mm (0.030")

and 0.81mm (0.032”) respectively. All piping/tubing shall be new fresh clean and dry.

c)Supports, clamps, saddles, hangers etc., or adequate strength should be provide as required to support the piping adequately and to minimize vibration. Necessary isolation material like rubber, felt, spring, etc., should also be provided as an additional measure to limit transmission of noise and **vibrations.**

d) Refrigerant piping shall be carried out giving due consideration the need to ensure oil return and to avoid liquid slipover into the compressors. Accordingly, the piping shall include necessary loops, slopes, etc., to achieve these objectives.

e) While installing the piping adequate clearance between pipes should be provided for insulation, wherever insulation is called for.

f) All pipes will be laid on trays (similar to cable trays). All trays shall be made of GI trays, complete with 8mm rod supporting at 1m intervals. These trays can be used to lay refrigerant pipes and cables together. Refrigerant piping on the terrace shall be covered with 26G GI U type tray hats. Pipes laid in the shaft will be laid on equal spaced clamp ladders. Further UV coating shall be provided to insulation where insulation is exposed to sun.

g) On completing the erection, the system shall be pressure testes with drynitrogen. The test pressure shall be as under for R-410 A/R407c. at 550 psig.

h) Drawing a vacuum shall then dehydrate the system.

i) All pipe work should be carried out with refrigerant quality copper tube and where bends are required these should be completed using wither a proprietary bending tool or radius fittings., The minimum thickness of pipe should be 22 SWG for soft pipes and 16/18 SWG for Hard Pipes.

CONDENSATE DRAIN PIPING.

25mm/32mm/40mm/50mm Drain piping as specified in BOM, shall be of CPVC minimum 2.5 mm thickness (SAMPLE to be approved before installation) piping with thermal insulation as specified in Insulation specification schedule, shall be used with necessary fittings.

ELECTRICAL WORK

This section covers specifications for electrical work including type of cables, power wiring, control wiring, and earthing.

The electrical equipments shall be suitable for operation on 415/240 V, 50 hz,earthed neutral, three / single phase AC supply.

The entire electrical installation shall conform in all respects to the latest relevant Indian Standard.

All cables will be 3 / 3-1/2 / 4 core PVC insulated sheathed armoured cables having Voltage Grade 1100 / 6600 and conforming to IS: 1554

The sizing and selection of cable shall be made taking into consideration the maximum rating current of the equipment, permissible voltage drop, ambient temperatures and the applicable derating factors.

The electrical power cable / earth will be provided near the Outdoor Unit by the electrical vendor and from thereon it shall be the responsibility of the AC vendor to distribute the power inside the module. (If it is a twin module, single point will be provided & from thereon, vendor will need to distribute to the two outdoors).

Power will be provided near the indoor unit and ac vendor will need to connect from there on.

Single Phase wiring in conduit with On/ off switch will be provided by VRF vendor , from Indoor Unit Power point to Drain pump , without extra cost. Interlock of drain pump of unit with indoor unit , shall be done without extra cost, wherever add on drain pumps (not integral with unit) are provided.

Cabling shall be laid in cable trays where exposed , as specified in therefrigerant piping schedule Cables shall be terminated using glands with cable sockets.

CONTROL WIRING

For control wiring inside the panel boards and field control wiring, copper conductor of size 1.5/2.5 sqmm having voltage grade of 1100 / 6600 shall be used. Runs of control wires within the panel board shall be neatly bunched and suitably supported / clamped on to the steel members of the panel. Numbered ferrules shall be provided for easy identification of control wires. The control wires shall be drawn in conduits or alternatively multicore armoured cables shall be used.

EARTHING

Earth lead of GI/Copper wire/strip shall be taken and shall be of adequate cross section.

All communication cable should be laid in Conduit and on trays as specified in the refrigerant piping schedule.

Testing, Submitals And Measurements

TESTING SCHEDULE

The Contractor shall submit to The Engineer, one month prior to the date of commencement of the tests, six (6) copies of the complete test procedures to be used. The procedure, method of calculation etc., shall be as listed in the technical specifications and approved by The PM before any test is carried out. Six (6) copies of the test results shall be furnished to The PM for his approval.

The Contractor shall supply skilled staff and all necessary instruments and carry out tests of any kind on a piece of equipment, apparatus, part of system or a complete system if The Consultant requests such a test, for determining specified or guaranteed data as given in the specifications or in the schedule of equipment filled in by The Contractor.

Any damage resulting from the tests shall be repaired and/or damaged material replaced, all to the satisfaction of The PM. In the event of any repair or adjustment required to be made, other than the normal running adjustment, the tests shall be void and shall be recommended after the adjustments or repairs have been completed. The tests shall not be void due to circumstances beyond The Contractor's control.

The following readings shall be taken during the testing of the plant. All instruments required for

testing shall be provided by the contractor. The readings shall be taken in the presence of the owners / consultants or their representatives and Duly signed by all concerned. A copy of the test readings along with detailed calculations for capacities shall be submitted to the owners/consultants

1. AMBIENT AIR CONDITIONS
Dry bulb temperature : deg C
Wet bulb temperature : deg C
Relative humidity : %

2. INSIDE CONDITIONS: To be taken for every indoor unit the VRF system readings to be taken once in 2 hours for 2 days during normal hours Inside room conditions

Dry bulb temperature : deg C
Wet bulb temperature : deg C
Relative humidity : %
Air quantity from unit
Following reading/ data shall be generated as a part of handing over of the VRF air conditioning system, apart from the handing over data for air side & indoor design conditions.
Indoor Units
Indoor unit operation – On/ off from remote
Indoor unit operation – On/ off from Group Controller
Indoor unit set point control from Group Controller

The Group Control Manager unit offered by vendor should offer, through programming, AND SHOWN IN TESTING TO PROVIDE

a. Auto sequencing for equal run time between working and standby units.
b. Auto start of non working unit when working unit fails.
c. Auto start of both working and standby units if temperature in the room breaches programmed set point of High temp.
d. Units will parallely also integrate through the BacNet Interface , into the BMS and both the control Manager and BMS will parallely be available to Client for control and monitoring of the VRF units.
e. Restart time of compressor to be shown as less than 3 mins during changeover
from EB to DG and Vice versa.

VRF SYSTEM WILL BE DEEMED TO BE HANDED OVER ONLY AFTER ABOVE IS SUCCESSFULLY SHOWN TO USERS, INCLUDING BMS INTEGRATION OF THE VRF SYSTEM.(If required in future)

Training of Clients personnel for operation of the IDU/ ODU and Central control and Monitoring at central Monitoring system should be done free of cost at the clients premises before handover of the system. This should be done for 2 full days.

AC Contractor Submittals Required at Completion of Work:

a) Three copies of the completed Air Balancing Report shall be submitted by Contractor for Project Managers review and acceptance.

b) As built drawings :- Six copies shall be submitted by Contractor for Project Managers review and acceptance.

c) Operation and Maintenance Manuals for the AC equipment installed

Guarantee certificate for the AC equipment installed.

e) Certified Quantity documents of all measurable quantities as accepted by the Project Managers. Documentation as specified by the Project manager, will super cede the details listed above.

Big Foot Mounting System

The plant supports shall consist of a galvanized steel frame supported by adjustable leg and feet assemblies. The frame dimensions should be designed to take the weight with minimal deflection, using ANSYS finite element analysis (FEA) and should be manufactured from hot dip galvanized carbon steel: BS EN 10219-1 to a welding standard: BS EN ISO 15614. The galvanizing standard to be BS EN ISO 1461 with salt mist testing to BS EN 60068-2-52.
The feet shall be 305/450mm square made from Nylon 6 B601L 30% glass fibre filled. These shall have mats underneath made from SBR-recycled rubber, bound using a ratio of high quality moisture curing polyurethane pre-polymer to BS 7188 and BS 5696-3
The leg assembly should be adjustable up to 105mm so that the frame can accommodate unevenness of the roof surface.

Painting, Tags, Nameplates
All steel works in connection with supports for pipes, cable trays etc., exposed to the elements are to be painted with two coats of Low VOC primer (for ferrous material) And Low VOC Etch Primer (for non-ferrous material) and two coats of Low VOC Enamel paint of grey color or equivalent color or as approved by Architect. Identification bands (3 inch thick), colour codes (refer BS 1710 : 1984) and directional flow arrows shall be painted on piping or insulation at frequent intervals indicating the unit services and the fluid conveyed. Lettering shall be in English. Identification of ductwork, colour codes, directional flow arrows and application of symbols shall be carried out in accordance with SMACNA. Internal surfaces of ducts at the grille or diffuser terminals and connections visible to occupants in rooms shall be painted with two coats of matte black paint (synthetic enamel –Low VOC)

METHOD STATEMENTS

AC vendor shall provide method statements for all major activities such as ducting / refrigerant and drain piping /cabling and testing for Consultants and PM approval before shop drawing approval

SECTION –IV-D
AIR HANDLING UNITS

SCOPE

The scope of this section, comprises the supply, erection, testing and commissioning of double skin construction air handling units, conforming to these Specifications and in accordance with requirements of drawings and of the Schedule of Quantities.

GENERAL

The Supplier shall supply and assemble double skinned Central Station air handling units. Each AHU shall be factory built,modular type with field assembled casing sections, complete with fans,motors, V-belt drives with wire guard, cooling coils, valves chamber and drain section , structural mountings, Vibration isolators and all the other related accessories as required. The unit shall be horizontal Draw-thru to suit AHU room size subject to the

acceptance by the Consultant.

CAPACITY

The air handling capacities, maximum motor horse power and static pressure shall be as shown on Drawings and in Schedule of Quantities. The Physical Size of the selected unit shall be suitable for the space allocated on the drawings and in equipment schedule.

CASING

Double skinned panels shall be 40+/-2 mm thick Double Skin Panels shall be made of 0.6mm Pre-coated GSS on outside and 0.6mm Galvanised sheet inside with CFC – FREE P.U.F insulation of 42 (+/- 5%) kg/Cu M injected in between with an internal gasket between the skins to interrupt the thermal bridge of the panel. Outer sheet of panels shall be made of galvanised precoated sheet of 0.6mm thickness to ensure mechanical strength as per class D1 of EN 1886,air leakage as per class L1 of EN 1886,thermal bridging of minimum TB2 class and thermal transmittance of minimum T2 class as per EN 1886.

The entire framework shall be mounted on an aluminium alloy or galvanized steel (depending on size) channel base as per manufacturer's recommendation. Panels shall be assembled together to form an enclosure that is capable of low air leakage potential, conforming to class A of EN 1886 Hinges shall be made of die cast aluminum / hard nylon with stainless steel pivots, handles shall be made of hard nylon and be operational from both inside and outside of the unit. Units supplied with various sections shall be suitable for on site assembly with continuous foam gasket. All fixing and gaskets shall be concealed.

Units shall have hinged, quick opening access door in the fan section and also in filter section where filters are not accessible from outside. Access doors shall be double skin type.

Condensate drain pan shall be fabricated from 18 gage stainless steel sheet externally insulated with 13mm thick closed cell nitrile rubber insulation (For coastal area insulation thickness 19mm) with multiple slpe to facilitate fast removal of condensate.

MIXING BOX

AHU's requiring mixing boxes as specified in Schedule of Quantities shall be complete with fresh and return air aluminium dampers.

THERMAL BREAK PROFILE

AHU's such as TFA units, AHU with mixing box having return air ducted shall be provided with thermal break profile as indicated in schedule of quantities. Also these AHU's shall be provided with 40 +/- 2 mm thick panel.

DAMPER

Dampers shall be opposed blade type. Blades shall be made of double skinned aerofoil aluminium sections with integral gasket and assembled within a rigid extruded aluminium alloy frame. All linkages and supporting spindles shall be made of aluminium or nylon, turning in teflon bushes. Manual dampers shall be provided with a bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorised operation. Damper frames shall be sectionalised to minimise blade warping. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

MOTOR AND DRIVE

Fan motors shall be high efficiency (EEF 1) totally enclosed fan squirrel cage induction motor with IP-55 protection. and shall be 415±10% volts, 50 cycles, three phase, class F insulation. Motors shall be especially designed for quiet operation and motor speed at 50 Hz shall not exceed 1440 rpm. Drive to fan shall be provided through belt-drive arrangement. Belts shall be of the oil-resistant type. For three stage filtration AHUs, belt drive shall not be used and direct driven plug fans shall be used. Frequency converter (VFD) shall be supplied by the AHU manufacturer for all AHUs with direct driven fans.

Codes and Standards

The design, materials, Manufacture, inspection of the AHU's supply comply with all currently applicable status, regulations, codes and standards in the locality where the equipment is to be installed. In particular, the AHU's shall confirm of the following standards:

ARI 410 Coils	Forced Circulation Air Cooling and Air heating.
BS EN 1886	Mechanical & thermal performance of casing.
AMCA 210	Laboratory methods of testing fans for sound & Performance rating
IEC 60204-1:2005/ EN 60204-1:2006	Safety of machinery- Electrical Equipment of machines part 1 general requiements

AHU Casig should be certified as per EN-1886 standard. The units should conform to the following parameters

Mechanical Strength of Casing	Class 2A
Casing air Leakage	Class B
Filter by-pass leakage	Class 9
Thermal Transmittance	T2
Thermal bridging	TB4

FAN

Fans shall be backward curved plenum/plug fan for Floor Mounted /TFA units and Ceiling Suspended unit with Forward Curved Direct Driven Fan so as to give maximum efficiency for given duty condition. In case of Plug fan, the entire fan with casing will be certified by a reputed 3rd party internationally acclaimed certifying body like Eurovent, or ARI or AMCA, and the entire Fan + Motor assembly will be balanced at supplier's works before despatch . Fans driven by variable frequency drive shall be backward inclined irrespective of static pressure value. Fans shall be selected for minimum efficiency of 75% Fan casing shall be made of galvanised steel sheet. Fan wheels shall be made of galvanised steel in case of forward curved , MS epoxy coated in case of backward curved DIDW fans and MS epoxy coated/composite material in case of plug fans.Number of Fans shall be one upto 15000 cmh, two in case of 18000-30000 cmh, three in case of 40000 & 50000 cmh and four in case of 65000 cmh. Fan shaft shall be grounded C40 carbon steel and supported in self-aligning plummer block operating less than 75% of first critical speed, grease lubricated bearings. Fan wheels and pulleys shall be individually tested and precision balanced dynamically. Fan motor assembly shall be statically and dynamically balanced to G6.3 grade as per relevant ISO/AMCA standard. Computerized fan selection print outs shall be submitted along with the offer.

Motors shall be mounted inside the AHU casing on slide rails for easy belt tensioning, and be totally enclosed, fan cooled, to be class `F' insulation. Motors shall drive heavy duty V-belt, constant pitch, drive selected at 110% of motor horsepower.

Both fan and motors assemblies shall be mounted on a deep section aluminium alloy or galvanised steel (depending on size) base frame.

Rubber anti vibration mounts shall be provided for isolating the unit casing. Frame retardant, waterproof silicone rubber impregnated flexible connection shall be provided at the fan discharge.

VARIABLE FREQUENCY DRIVES WITH STARTER PANEL

- The VFD shall be of the type of HVAC SERIES which should be suitable for operation on 3 phase, 415 V supply.

- It shall be capable of operating continuously at nominated full load rating with expected variations of +/- 10% in the supply voltage and +/-2% in the supply frequency.

- The VFD shall utilize the Voltage Vector Control technology for converting the fixed voltage and frequency to a variable voltage and frequency.

- IP21 Enclosure and built in LCD Display.

- The drive shall support both RTU MODBUS/ BACNET MS/TP Communication. The Drive shall have a swinging choke for superior harmonic reduction and built in category C2 EMC filter.

- Minimum of Two Independent PID loops built in the drive with Real Time clock.

VFD Specifications.

The VFD package as specified herein and defined on the VFD schedule shall be enclosed in a UL Type enclosure Environmental operating conditions: -15 to 40° C (5 to 104° F) continuous. Altitude 0 to 3300 feet above sea level, less than 95%, non-condensing All circuit boards shall be coated to protect against corrosion.
The Drive shall have Protection classes of IP21 or IP54.

Ratings:

The Drive shall be rated to operate from 3-phase power at 380VAC to 480VAC, +10% /-15%, 48Hz to 63Hz. The Drive shall employ a full wave rectifier to prevent input line notching and operate at a fundamental (displacement) input power factor of 0.98 at all speeds and nominal load. The Drive efficiency shall be 98% or better at full speed and load. An internally mounted AC line reactor or DC choke shall be provided to reduce input current harmonic content, provide protection from power line transients such as utility power factor correction capacitor switching transients and reduce RFI emissions. When a DC choke is utilized it shall be of swinging choke design to mitigate harmonics substantially more than conventional choke designs and shall provide equivalent to 5% impedance.

All VFDs shall have the following standard features:

All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.
The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, relay output, and / or over the serial communications bus.

Static and Dynamic Performance:

Open loop static speed regulation shall be 0.5 % to 1% of rated motor speed. When motor speed feedback is provided from a suitable encoder, closed loop speed regulation shall be 0.1% of motor nominal speed. Dynamic speed accuracy shall be less than 1%-sec with 100% torque step open loop and 0.5%-sec closed loop with 100% torque step.

Torque control response time shall be less than 10 ms with nominal torque. In the torque regulating mode, torque regulating accuracy open loop shall be +/- 5%; torque regulating accuracy closed loop shall be +/- 2%;Operator Control Panel (Keypad)

Each VFD shall be equipped with a front mounted operator control panel (keypad) consisting of a backlit, alphanumeric, graphic display and a keypad with keys for Start/Stop, Local/Remote, Up/Down and Help. Two (2) Softkeys will be provided which change functionality depending upon the position within the parameter hierarchy or state of panel.

All parameter names, fault messages, warnings and other information shall be displayed in complete English words or Standard English abbreviations to allow the user to understand what is being displayed without the use of a manual or cross-reference table.

The Display shall have contrast adjustment provisions to optimize viewing at any angle.
The control panel shall provide a real time clock for time stamping events and fault conditions.
The control panel shall include a feature for uploading parameter settings to control panel memory and downloading from the control panel to the same Drive or to another Drive.
All Drives throughout the entire power range shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating.

The keypad is to be used for local control, for setting all parameters, and for stepping through the displays and menus.

The keypad shall be removable and insertable under Drive power, capable of remote mounting, and shall have its own non-volatile memory.

The standard operator panel shall provide a start-up, maintenance and diagnostic assistants that guides a new user through initial start-up and commissioning of the Drive as well as provide indications for maintenance and help to diagnose a fault. In addition, a PID assistant, Real-time Clock assistant, Serial Communications assistant, and Drive Optimizer assistant shall be included. A Drive Optimizer assistant permits the user to choose Drive set-up for low nose, drive & motor efficiency or motor control accuracy.

During normal operation, one (1) line of the control panel shall display the speed reference, and run/stop forward/reverse and local/remote status. The remaining three (3) lines of the display shall be programmable to display the values of any three (3) operating parameters. At least twenty-six (26) selections shall be available including the following:

- Speed/torque in percent (%), RPM or user-scaled units
- Output frequency, voltage, current and torque
- Output voltage, power and kilowatt hours
- Heatsink temperature and DC bus voltage
- Status of discrete inputs and outputs
- Values of analog input and output signals
- Values of PID controller reference, feedback and error signals.

I/O Capabilities:

Six (6) digital inputs 12 to 24VDC PNP and NPN, all independently programmable with at least twenty-five (25) input function selections. Inputs shall be designed for "dry contact" inputs used with either an internal or external 24 VDC source.

Three (3) relay contact digital outputs, all independently programmable with at least thirty (30) output function selections. Relay contacts shall be rated to switch a maximum two (2) Amps rms continuous current at a maximum switching voltage of 30VDC or 250VAC. Function selections shall include indications that the Drive is ready, running, reversed and at set speed/torque. General and specific warning and fault indications shall be available. Adjustable supervision limit indications shall be available to indicate programmed values of operating speed, speed reference, current, torque and PID feedback. An optional relay expansion card shall be available to provide three (3) additional relay outputs. This option card shall be integrally mounted.

Two (2) analog inputs, each selectable for 0VAC - 10VAC or 4mA - 20mA, and independently programmable with at least ten (10) input function selections. Analog input signal processing functions shall include scaling adjustments, adjustable filtering and signal inversion. If the input reference (4-20mA or 0-10V) is lost, the VFD shall give the user the option of the following: (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The Drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus.

Two (2) analog outputs providing 0 (4) to 20mA signals. Outputs shall be independently programmable to provide signals proportional to at least twelve (12) output function selections including output speed, frequency, voltage, current and power.

Serial Communications

The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet).

All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2).

DRIVE OPTIONS – Options shall be furnished and mounted by the drive manufacturer as defined on the VFD schedule. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

SECTION -IV-E

1.0 DAMPERS & AIR TERMINAL DEVICES

1.1 VOLUME CONTROL DAMPERS

Provide splitter damper in each supply take-off. Make turning vanes, dampers, deflectors, splitters of same material of ducts. Splitters shall be full depth of branch duct and 1 1/2 times branch width.

Dampers shall be placed in ducts and at every branch of supply or return air duct connection whether or not indicated on the drawings, but shall be provided for the proper volume control and balancing the system.

All duct dampers shall be made out of extruded aluminium channels with roboust construction and tightly fitted. They shall be provided with suitable links, levers and quadrant as required for their proper operation, control or setting to any desired position. Dampers and their operating devices shall be made robust, easily operable and accessible through suitable access doors in the ducts. Every damper shall have clear indication showing the damper position at all the times. Dampers shall be placed in ducts and at every branch (whether or not indicated on the drawings) for the proper volume control and for balancing the system.

Construction:

- Frame: 1.2 mm thick galvanized steel sheet.
- Frame size: 12.5 mm depth and standard flange height of 25mm
- Blades: Double skinned high quality extruded aluminium aerofoil profiles-18G.
- Bearing pins: Electro plated square steel rod of size 12.7 mm x 12.7 mm.
- Bushings: Self-oiling nylon bushings of internal square size.
- Bearing pin connecting quadrant: Electro plated square steel rod of size 12.7 x 12.7mm.
- Blade linkage: Steel / aluminium linkage.
- Blade stopper: 20 mm x 20 mm aluminium angle.

Description:

- Frame is constructed from galvanized steel sheet. Joints are welded and protected by aluminium spray coating.
- Blades are coupled by external concealed linkage, which can provide either parallel or opposed blade operation.
- Linkage rods are coupled with hand locking quadrant with open and close marking. Hand locking quadrant frame is marked to show exact position of damper.
- Structure is available with flanged edges and are supplied un drilled as standard.
- Dampers without flanges available as option for duct insertion purpose. Flanged edges with drilled holes are also available.

• Available in square and rectangular sizes.
• Designed for use in heating, ventilating and air conditioning systems.

Accessories:

Motorized dampers: Volume control dampers will be supplied with actuators of client's choice. The dampers can also be provided with an extended linkage to fix the motor at the site.

Standard sizes:

• Available in square and rectangular sizes.
• Sizes available from 100 x 100 mm with an increment of 25mm.
• Non standard sizes available as option.
• Blades open fully or to any angle depending on the air velocity. Blades stay in position of opening without fluctuating when there is constant air-flow. Blades closes quietly when the airflow stops.
• Designed to maintain a constant pressure level inside pressurized rooms by relieving excess air when it exceeds the desired limit.
• Generally installed on diesel generator, plant rooms ventilation system and exhaust ducting.
• Available in square and rectangular sizes.

Standard finishes:

• Natural anodized aluminium finish.
• Powder coated colour finish as per RAL colour codes.

Butterfly damper connection to flexible ducts and flexible duct connection to spill air box shall have GI Clamp/ equal approved clamp option as agreed by consultants.

1.2 FIRE DAMPERS

Motorized Fire dampers carrying test certificate.G.I.16G . The Dampers should be UL listed , the damper should be suitable for automation purpose will be controlled by actuator. The fire damper should be multi blade blade motorised fire &smoke damper with spring return actuator. The damper shall be of at least 1.5/2 hr fire rating .The damper should be in concurrence with UL 555.

1.Fire Damper- Curtain Type

Fire Rated- 3 Hours

UL Classified fire damper made of 1.5 mm thick(16G) GI sheet with 275 GSM coating outer frame with 0.9mm thick (20 gauge) GI sheet 275 GSM coating interlocking formed blades with SS springs secured in to the frame duly welded/riveted etc. complete with UL listed fusible link made in USA-165 degree F held in place with GI strap and hooks. Single section/multiple sections.

Fusible link

- Fusible link-UL listed 165°F or 212°F made in USA. Optional
- GI sleeve 1.2mm thick GI sheet-275GSM coating with 350mm wide sleeve duly secured to the damper-square/rectangular/spigot
- Flanges-TDS/TDC

Fire Rated- 90 minutes

UL Classified fire damper 90minutes rated made of 1.5 mm thick(16G) GI sheet with 275 GSM coating outer frame with 3 V-groove blades 1.5mm thick duly secured with required stiffeners, SS jamb seal, bearing, blade axle linkages cams etc. Complete with 1.2 mm thick GI 275 GSM sleeve 400mm wide as standard as per UL listed electrical cable/terminal connectors/GI metal conduits and

with enclosure type thermoelectric tripping devices 165°F UL listed-all factory fitted and tested with indicative labels-single or multiple sections.

Accessories

- Actuators- UL listed with Torque to suit Damper size
- TRD- Enclosure type UL listed-make model

Optional

- Electronic Control panel for fire damper actuator
- Flanges-TDS/TDC

2. Motorized Fire Damper

Motorized Fire dampers carrying test certificates as per CBRI /UL standards shall be used for this project. The damper shall consist of outer frame, damper blades, fusible trip, linkage, The blades & outer frame shall be formed out of Minimum 1.6 mm thick GSS. Dampers shall have a CBRI fire rating of 120 minutes .Fast acting Actuators of spring return type installed with the damper are mandated . Proof of certification must be shown before installation.

Note: Vendor to cross check the actuator torque for particular dampers with the damper & actuator manufacturers.

3.Motorised Fire and Smoke Damper- Class ii-250 °F

Fire Rated- 90 minutes

UL Classified fire and smoke damper 90minutes rated class II made of 1.5 mm thick(16G) GI sheet with 275 GSM coating outer frame with 3 V-groove blades 1.5mm thick duly secured with required stiffeners,SS jamb seal,bearing,blade axle linkages cams etc. Complete with 1.2 mm thick GI 275 GSM sleeve 400mm wide as standard . Each 3V grove blade will be fixed with UL lsited rubber gasket and all the joints will be completely sealed as HILTI-USA make silicone fire stop sealant on both side of the assembly as per UL Procedure with UL Listed electrical cable/terminal connectors/GI metal conduits and with enclosure type thermoelectric tripping devices 165°F-Belimo model BAE65US-UL listed-all factory fitted and tested with indicative labels-single or multiple sections.

Accessories

- Actuators- UL listed with Torque to suit Damper size
- TRD- Enclosure type UL listed-make model

Optional

- Electronic Control panel for fire damper actuator
- Flanges-TDS/TDC

FIRE DAMPER WIRING

Power will be need to be provided to the fire damper actuator panel by the HVAC vendor from the 24v source in the plant rooms . The actuator being spring return type , the ACTUATOR shall lose power in case of fire and the actuator should close the damper

AHU panel and fire panel to be interlocked by AC vendor

2 AIR TERMINAL DEVICES

2.1 GENERAL

Provide Air Terminal Devices of sizes & type as shown in the drawings. All the accessories like adapter box with an extended round collar to connect the flexible duct as shown in the drawings shall be within in the scope of contractor.

All supply and return air grilles and diffusers shall be as per the approved list furnished in the document. Consultants / Project Managers reserves right to choose the best. The grille shall be provided with powder coated paint of approved color. Further, the contractor shall submit a sample of grilles & diffusers for the approval.

SUPPLY AIR CURVED LINEAR BAR GRILLE

Construction:

• Frame: High quality extruded aluminium profile with 30mm flange width as standard. 12, 16, 24mm flange widths are optional.
• Face bars: High quality aluminium profiles of 00, 150 – 1 way throw and 150 – 2 way throw.
• Bar spacing: 12mm as standard. 6mm as option
• Grille width: 50mm to 300mm with increments of 50mm.
• Length: 1 meter as standard
• Double Deflection grill or Single deflection type.

Description:

• Frame and face bars are of high quality extruded aluminium profiled construction with the advantages of corrosion resistance and rigidity.
• Horizontal face bars with 00, 150 – 1 way throw and 150 – 2 way throw are fixed rigidly to the frame with 8-mm pipes.
• Vertical aluminium aerofoil blades are fixed at the rear side of the frame bu nylon bushings. These blades can be adjusted manually and individually in the vertical plane to obtain optimum air distribution.
• For perfect unbroken appearance of continuous runs, alignment strips are provided with no additional cost.
• Supply and return air curved linear bar grilles are available up to a length of 3 mts with a minimum radius of curvature of 1 meter.
• Available without damper. Dampers can be provided to use in plenum boxes as option.
• Foam gasket is sealed around the back of the frame as option to avoid air leakage.
• Supplied with C clamps for concealed fixing.

Standard Finishes:

• Natural anodized aluminum finish.
• Powder coated color finish as per RAL color code.
• Flexibility of finish available.

SUPPLY AIR LINEAR SLOT DIFFUSER:

Construction:

• **Frame & Blades:** High quality extruded aluminium profiles.
• **Damper:** Hit and miss damper.
• **Slot width:** 20mm as standard. 16 mm, 25 mm and non-standard sizes available as option.

• **Number of slots available:** 1,2,3,4,5,6,7,8
• **Length**: Up to 5.8 mt available in a single piece.
• Optional Accessories**: Plenum box unlined, internally insulated or externally insulated.**

Description:

• Frame and deflection blades are made of high quality extruded aluminium profiled construction with the advantages of corrosion resistance and rigidity.
• Air distribution can be changed vertically or horizontally by means of deflection blades without changing the air flow rate. These blades can be fully adjusted from face opening.
• Air flow rate can be adjusted by fixing hit and miss damper at the rear side of the diffuser. Damper blades are adjusted from the face opening.
• Dampers are designed in a unique way that it can be used as an equalizing grid.
• Positive alignment of adjacent sections can be made by using alignment strips.
• Foam gasket is sealed around the back of the frame as option to avoid air leakage.
• Suitable for installation for ceiling and stills.

Standard Finishes:

• Natural anodized aluminium finish.
• Powder coated color finish as per RAL color code.
• Flexibility of finish available.

DOOR GRILLE WITH SINGLE FRAME:
Construction:

• **Frame:** High quality extruded aluminium profiles with 30mm flange width as standard. 12, 16, 24mm flange widths are optional.
• **Blades**: High quality extruded aluminium profiles.
• **Blade pitch:** 15mm

Description:

• Frame and blades are of high quality extruded aluminium profiled construction with the advantages of corrosion resistance and rigidity.
• Inverted "V" type horizontal blades are fixed rigidly to the frame.
• Blades are spaced at a distance of 15mm.
• Grilles are made to with stand heavy use to which door grilles are subjected.
• Frame is fabricated to suit door thickness of 30mm to 60mm.
• Structure provides around 55% free area for air transmission.
• Used in facilities such as offices, hospitals, schools and toilets for transfer of air from one room to another room.
• Fire rated door grilles are available with ½ and 1 hour fire rating with additional cost.

Standard finishes:

• Natural aluminium anodized finish.
• Powder coated colour finish as per RAL colour codes.
_ Flexibility of finishing is available.

RETURN AIR LINEAR BAR GRILLE
Construction:

• Frame: High quality extruded aluminium profile with 30mm flange width as standard. 12, 16, 24mm flange widths are optional.
• Face bars: High quality aluminium profiles of 00, 150 – 1 way throw and 150 – 2 way throw
• Bar spacing: 12mm as standard. 6mm as option
• Grille width: 50mm to 300mm with increments of 50mm.
• Length: 1 meter as standard. Available from 0.2 mt to 5.8 mt in a single piece.

Description:

• Frame and face bars are of high quality extruded aluminium profiled construction with the advantages of corrosion resistance and rigidity.
• Horizontal face bars with 00, 150 – 1 way throw and 150 – 2 way throw are fixed rigidly to the frame with 8-mm pipes.
• For perfect unbroken appearance of continuous runs, alignment strips are provided with no additional cost.

_ Total structure is manufactured by mechanical assembly, assuring rigidity and to maintain straight-line appearance.

2.3 SIZING

Grilles / Diffusers shall be sized within limits of sound pressure level NC-25 curve as a typical room having average room attenuation of 8 dB.

2.4 CONSTRUCTION

All supply air diffusers shall be of Powder coated extruded aluminium sections and removable core type. Volume control dampers shall be provided for all diffusers.

Return air diffusers shall be identical to supply air diffusers except that they do not incorporate volume control dampers.

SECTION -IV-F

1 THERMAL AND ACOUSTIC INSULATION

GENERAL:

Scope of this specification comprises of supplying, installing, testing and commissioning of insulation on duct, copper and drain piping and duct lining.

This specification covers the technical requirements and essential particulars for the supply, application and finishing of the composite thermal insulation for cold equipment, piping systems, air-conditioning ducts, etc. The scope of supply of the contractor shall include, but not be limited to, the following items:

- Insulation material as specified in Boq
- Finishing and cladding/covering, 5 mil fiber glass cloth with one coat of enamel paint.
- Angles, clamps, on PUF gutties chilled water pipes shall be supported.
- Any material as may be required for making the installation of insulation material complete and safe from mechanical damages.

The following are some of the codes and standards relevant to this specification:

EN 14304/ DIN EN 8497	For Flexible Elastomeric Foam Insulation material.
IS 14164	Industrial Application and finishing of Thermal Insulation Materials at Temperatures above (-) 80° C and up to (+) 700° C
BS 5970	Thermal Insulation of Pipework and Equipment (in the Temperature Range (-) 100° C to (+) 870°

SPECIFICATIONS

Thickness of the insulation shall be supplied as per Boq line item.

a. Closed Cell Duct/Ceiling insulation-Thermal

Sl No	Parameter	Specification
1	Material	Microcellular Closed cell Elastomeric Nitrile Rubber Insulation Closed cell Elastomeric Nitrile Rubber Insulation covered with Interwoven glass fabric for mechanical protection
2	Temperature Range	+116 Deg C to - 200 Deg C *For applications at temperatures lower than -50ºC please contact our technical office.
3	Thermal Conductivity (λ) EN12667(DIN52612)- ENISO 8497(DIN 52613)	@ 0 Deg - 0.033 W/m Deg K @ 2 0 Deg - 0.035 W/m Deg K
4	Water Vapour Diffusion Resistance (µ) EN12086 (DIN 52615)	Moisture Resistance Factor > 10,000
5	Fire Propagation (Accordance with BS476 Part 6/7)	Total Index Performance: less than 12 Sub Index : less than 6
6	Fire Performance BS476 Part 6	**Class "O" IMO A 653 (16)**
7	Reaction to Fire	Self Extinguishing ,does not drip
8	Resistance to Building Material	Very good
9	Ozone Depletion Potential	Zero
10	Health Aspects Emission Of Volatile Organic Compound (VOC)	VOC /SVOC Free
11	Health Aspects	Dust and Fibre free CFC/HCFC Free
12	F M Global Approval	F M Global Approved
13	UL 94	Approved
14	Nominal Density	50 kg/ m3 + 10%
15	Tolerance	+ 1 -1.5 mm
16	Colour of Covering	Black
17	Thickness of covering	6-7mil or 200 gsm / sqm + 10%
18	UV Resistance	Excellent, ASTM G 797

b. Open Cell Duct Insulation-Acoustic

Sl No	Parameter	Specification
1	Material	Engineered Elastomeric Open Cell Nitrile Rubber Insulation
2	Density	140 - 180 kg / m3
3	Thermal Conductivity (λ) EN12667(DIN52612)-ENISO 8497(DIN 52613)	@ 20 Deg - 0.047 W/m Deg K
4	Temperature Range	+ 105 O C to -20 deg c * *For applications at temperatures lower than -20ºC please contact our technical office.
5	Fire Class	Class 1 rating. BS 476 part 1
6	Fibre Free	Yes
7	Air Erosion Resistance test Conifirming to ASTM Standard C 1071-05(section 12.7)	Pass
8	Ozone Depletion Potential	Zero
9	Reaction to Microbial growth Fungi resistance ASTM G21. Bacterial Resistance ASTM G22 UL-181	Does not support fungal and bacterial growth. Confirms to standards
10	Health Aspects Emission Of Volatile Organic Compound (VOC)	VOC /SVOC Free
11	Health Aspects	Dust and Fibre free CFC/HCFC Free
12	F M Global Approval	F M Global Approved
13	UL Approved	Yes. UL 94
14	Tolerance	+ 1 -1.5 mm
15	UV Resistance	Excellent, ASTM G 797

Duct/Ceiling Adhesive:

Type: Specially Blended Sythetic Rubber Based Adhesive(Liquid)

Use: Metal, Air Duct, Slabs and Pipe Sections

Features:
Highly compatible with Nitrile rubber
Excellent bonding to Porous and Non Porous surface
Chemical Resistant

Excellent Heat Resistant
UV Resistant

Technical Data:

Temperature: -25 Deg C to 90 Deg C
Chemical Resistance- Excellent
Water Resistance- Excellent
UV Resistivity- Excellent
Insulation properties- Excellent
Coverage- 6 to 8 m2/litre
VOC Level- Low VOC. Voc< 400 gm/litre, Conforms to LEED standards for ACR Application.

Installation: Foam Insulation must be installed in accordance with manufacturer's instruction. All joints should be butted firmly against each other, seal all joints with 75mm wide reinforced aluminium tape. Insulate each duct separately, flanges should be insulated with a 120mm wide strip of insulation material, ensuring joints are sealed with 75mm reinforced aluminium foil tape. All supporting hangers should be lined with the same insulation material to avoid excess compression of insulation.(refer manufacturer's instruction).Ensure no air pockets during the installation of the insulation to the duct. Any minor surface cuts should be covered with aluminium foil tape.

External thermal insulation shall be provided as follow:
The thickness of Nitrile rubber shall be as shown on drawing or identified in the schedule of quantity.
Following procedure shall be adhered to:

- Duct surfaces shall be cleaned to remove all grease, oil, dirt, etc. prior to carrying out insulation work.
- Measurement of surface dimensions shall be taken properly to cut closed cell elastomeric rubbers sheets to size with sufficient allowance in dimension.
- Material shall be fitted under compression and no stretching of material shall be permitted.
- A thin film of Synthetic Rubber based adhesive shall be applied on the metal surface and then on the back of the insulating material sheet.
- When adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. Also care should be taken to prevent the trapping of air bubbles between metal sheets and insulating material sheet.
- All duct flanges should be covered properly with a 150mm wide strip of insulation sheet after gaining uniform height by applying multiples layer of 75mm wide strip of insulation sheet from the both side of flanges.
- All longitudinal and transverse joints shall be sealed with adhesive tapes of 50mm (wide) x 3mm (thick). (as recommended by Manufacturer).
- The adhesive shall be strictly as recommended by the manufacturer.
- The detailed Application specifications are as per the manufacturer's application manual.
- Adhesive should be as recommended by Manufacturer.

INSTALLATION OF DUCTS EXPOSED DIRECTLY TO SUNLIGHT:

For installations exposed to sunlight specified thickness of insulation sheet with a factory applied black glass fabric covering of 200gsm ±5% should be installed with application procedure same as Indoor installation and apply two coats of epoxy paint/ Starbond or equivalent after giving 36 hours curing time for the adhesive apply manufacturer's recommended UV/Mechanical Protection. No locally available separate glass fabric shall be allowed for UV protection treatment. Please refer the separate detailed guidelines on UV/Mechanical Protection.

2.1 THICKNESS

♦	INITIAL DUCTING UPTO VAVS	:	Refer BOQ
♦	AFTER VAVS	:	Refer BOQ

REFER RELEVANT DRAWINGS FOR FURTHER DETAILS ON INSULATION.

Installation Procedure:

- Clean duct surfaces to remove all grease, oil, dirt etc prior to carrying out insulation work.
- Cut insulation material to proper size with sufficient allowance in dimension
- The wall surface shall be cleaned and required surface preparation shall be done for applying adhesive.
- Rubber based contact adhesive recommended by the manufacturer shall be used.
- Foam sheets shall be cut to require size and a thin layer of adhesive shall be applied to both the surfaces; Insulation and inside duct.
- When it is tack dry, it is applied / stuck with enough pressure to the walls/ceiling. Minimum 5 fasteners with washer (of G.I Sheet 2.5 inch x 2.5 inch) / square meter, 4 at corners & 1 at centre shall be put immediately after sticking with the help of adhesive. The length of the fastener shall be minimum 75 mm.
- The acoustic lining of walls shall be terminated approximately 15cm above the finished floor to prevent damage to insulation due to accidental water logging in plant / AHU Rooms.

NOTE:

- As per manufacturer recommendations Seams/Flange joints can be insulated with strips of Insulation sheet.
- Adhesive, UV/Mechanical protection paint to be used, shall be strictly as per insulation manufacturer's recommendations.
- The installer shall be trained and proficient in applying insulation.

UNDERDECK INSUALTION-

The exposed roof shall be insulated with 50 mm thick 'TF' quality expanded polystyrene with 85/20 grade hot bitumen and GI screw washer & GI diagonal wires.

Roof Insulation of specified 13/19mm thickness of Elastomeric rubber insulation of class "o type manufactured as per ASTM E 84 test & which should also meet NFPA 90A supplementary materials for air distribution system which should not absorbs less 0.2% water by volume (ASTM c 209), should not support microbial growth (ASTM C1071, G21, G22) and should emit objectionable odors (ASTM C 665) and should have thermal conductivity of 0.27 (R - 2.78 in 3.4" thickness) and water vapor permeance of 0.10.

- Clean the roof surface to be insulated. Please note the insulation should be carried out before any white washing is done on the roof.
- Drill holes on the roof @ 1000 x 500 mm grids for fixing screws. Draw 1 mm dia GI wire from the above screws thus fixed.
- Stick the insulation to the roof.

All joints of the Insulation material should be further covered with 50 mm wide 3 mm thick self adhesive tape made of similar material & Black Cotton Tape shall not be used.

No extra quote for flange insulation between duct pieces. Cost for Flange insulation is part of scope in insulation.

Note: Underdeck insulation to be done prior to other ceiling services works.

Section-IV-G

Ventilation Units

General

Fans shall be of the type, size, arrangement and capacity as indicated in the schedule and/or as shown on the drawings.

- Unless specified, fan performance rating data shall be tested accordance with AMCA Standard 210-85(Air Moving and Conditioning Association), ANSI/ASHRAE Standard 51-1985 "Laboratory Methods of Testing Fans for Rating". Sound ratings shall conform to AMCA Standard 300-85, "Reverberant Room Method for Sound Testing of Fans".
- A computer printout of fan performance rating corresponding to the AMCA licensed data, with corrected ratings for altitude and temperature, fan operating speed, bearing life, etc. shall be submitted for approval.
- All fans shall be dynamically trim-balanced to ISO1940 and AMCA 204/3 - G2.5 quality grade after assembly. A computer printout with the vibration spectrum analysis shall be attached to the fans.
- Fan motors shall comply in all respects with continuous rating in accordance with IEC34 or equivalent. Motor bearings shall be of ball or roller type, grease or lubricant sealed for life. Fan and drive shall be earthed to prevent accumulation of static charge.
- Fans shall be installed at staircase or lobby where fresh air intake is free from any obstruction and shall be energized only by fire alarm system. Fan shall be of Axial Flow Fan or DIDW Centrifugal Fan. Protective grille at the suction of the fan is required.
- Fans for elevated temperature (Smoke Extraction Fans) with components rated for high temperature (250C,2Hrs) service, with belt drive assemblies exposed to the air stream are not acceptable.
- For Smoke Extraction Fans where motor is in the air stream with electrical/electronic temperature limit switch for motor protecting shall not be used.
- Anti-condensation heater is recommended to be installed for all Pressurization and Smoke Spill Fans, and the control circuit shall be arranged such the way that the heater is off when the starter is on and vice versa. Heaters shall be wired from the respective local motor control panel or motor control console.

- Fan should be of G.S.S. , the Steel sheet should be JFE Galva zinc (Base metal cold rolled), JIS G3302, SGCC with Z22 (minimum coating weight on both sides @ 220 g/m2) zinc coating & Zero Spangle, skin passed, chromate and dry.
- If fan is open to atmosphere, Fans shall be with pure polyester powder coating for minimum thickness of 60 microns.

BELT DRIVEN FANS

1. Fan impellers shall be driven by V-belts with the pulley keyed to the shaft and retained by taper-bushes.
2. Motor mounting plate shall be supported using four threaded rods for belt tensioning. Belt tunnel shall be sealed from the air stream and belt guards with proper ventilation should be provided.

CENTRIFUGAL FANS

• Fans, Aerofoil, forward or backward curved, SISW or DIDW, shall be licensed to bear the AMCA Air and Sound Certified Ratings Seal. The test standard used shall be ANSI/AMCA 210-85, ANSI/ASHRAE Standard 51-1985 “Laboratory Method of Testing Fans for Rating” and AMCA 300 “Reverberant Room Method for Sound Testing of fans”.
• All fans shall be dynamically trim-balanced to ISO1940 and AMCA 204/3 - G2.5 quality grade after assembly.
A computer printout with vibration spectrum analysis shall be attached to the fans.
• Fans shall be oven-baked with polyester coating for minimum thickness of 60 microns, unless the housing scroll and side frame is constructed from galvanized steel sheet (G.I.), Stainless Steel, Aluminum and etc.
• Fans housing shall be of an appropriate thickness to prevent vibration and drumming. The fan scroll shall be attached to the side plate by means of continuous lock seam or intermittent spot welding. The wheel and inlet cone shall be aerodynamically designed and constructed to provide maximum performance and efficiency as published by the manufacturer.
• Fans must be physically capable of operating safely at every point of rating at or below the “minimum performance” limit for that class as defined in AMCA standard 99-2408-69 “Performance Class of Operating Limits for Centrifugal Fans”.
• Shafts sizes shall be carefully calculated and designed such that the maximum operating speed (RPM) shall not exceed 75% of the first critical speed. For any application that is not a standard product from catalogue of the fan manufacturer detailed calculation of critical speed characteristic shall be submitted for approval.
• Shafts shall be made of carbon steel (C45) machined and polished to tolerance of standard ISO 286-2 – grade g6. Protective coat of anti-rusting shall be applied to all bare surfaces of the shafts at the factory.
• Bearings shall be of self-alignment (concentric) type with adaptor sleeve bearing. Bearings of eccentric locking collar with grub screw type are not acceptable. Bearing shall be maintenance free with permanently lubricated sealed ball bearing type. Bearing life shall be at least 75,000 hours based on basic rating life, L10 of ISO 281 standard. Calculation sheet of Bearing Life shall be submitted for approval.
• Motor installed shall be of a minimum 130% of the fan power absorbed (Brake horsepower) and shall have sufficient torque available for starting and continuous operation.
• Belts and pulleys shall be sized for a minimum 150% of the installed motor horsepower. The belt speed shall not exceed 30m/s. The pulley shall be of Taper Lock SPZ, SPA, SPB or SPC type. Conventional type of pulley is not acceptable. Both fan and motor pulley shall be balanced to the quality grade G.2.5.

• Fan outlet velocity shall not exceed 10% of the main duct air velocity designed (0.1" per 100 ft or 1 Pascal per meter duct length). Pressure Loss is as referred to in SMACNA Standard, unless otherwise specified.
• A computer printout on fan performance rating corresponding to the AMCA licensed data, with corrected rating for altitude and temperature, fan operating speed, bearing life, etc. shall be submitted for approval.

CABINET FANS

• Fan contained within cabinet shall be licensed to bear the AMCA Air and Sound Certified Rating Seal.
• Fan shall be of DIDW Forward or Backward curved with fan scroll, belt drive or direct drive assembled within a cabinet.
• Cabinet shall be constructed of Galvanized Steel material.
• Cabinet shall be of "Panel Construction", assembled together by means of fasteners for easy of dismantling for service and maintenance. Welded cabinets are not acceptable.
• Cabinet design shall be capable of adding acoustic insulation (i.e. double skin arrangement) if requested for noise reduction.

DIRECT DRIVE TYPE
• Fans shall be of DIDW Forward Curved centrifugal type with fan scroll within a cabinet.
• Fan speed shall not exceed 1450 RPM.
• Motor shall be for power supply 220~240V/50Hz/Single Phase.

PROPELLER FAN
• Fans shall be of the ring-mounted type and the blades constructed from heavy gauge metal. An aerodynamically designed bell mouth constructed from heavy gauge metal shall be provided. The fan speed shall not exceed 1400RPM at 50Hz operation.
• Propeller fans shall be direct driven type, the motor either a single-phase capacitor start-run or a three phase squirrel cage induction type. The motor shall have inbuilt inherent protection against overloading. Motor with shaded pole or centrifugal switch type is not acceptable.
• Bearings shall be maintenance free permanently lubricated type. Fans shall be complete with wire guards. External grilles, fan chambers and volume control damper shall be provided where indicated in the specification drawings.

RECTANGULAR IN LINE FAN

Fan should be with **acoustic lining of casing with 15mm open cell lining / or Double skin**, fitted with an FC DIDW fan installed in a galvanized steel scroll.. Flexible anti-vibration joints shall be provided to arrest vibration being communicated to other equipment connected to the Inline fan.

ALL FANS SHALL HAVE SPEED REGULATORS FITTED / Except where 3 phase(4000cfm/40mm fan)

All fans shall be provided with opposed blade damper in GSS construction at fan for air balancing at the inlet of the fan and should be part of the cost of the fan.

Necessary support for the fan /Canvass / transition piece from fan inlet / inlet damper–outlet dimensions , to duct sizes , shall be part of vendor scope without extra cost.

All In line Fans inside False ceiling of occupied areas shall be selected for Max noise of 55Db at operating point. In line Fans not in occupied areas, can be selected up to 65Db Rating.

Circular Inline Fans for 1000 cfm or less output

CONTRUCTION
All circular in line fans are to be manufactured from high grade corrosion resistant pressed galvanized sheet steel.

OPERATING TEMP RANGE
- 40degC to +40degC

MOTOR

Enclosed, single phase, 230V, 50Hz external rotor type are required , motors to be included with sealed for life ball bearing assemblies and Class B, IP44 protection with an internal automatic reset safety thermal overload protection device as standard.

ALL FANS SHALL HAVE SPEED REGULATORS FITTED IF SINGLE PHASE

Return Air Booster Axial Fans

Booster Fan for Return Air Collection. Fan should be **axial type** inclined type heavy duty class I Blades, with bird mesh. Axial fan with 3phase TEFC motor with IP55 protection & class F insulation complete with adjusting brackets,base,direct driven gaurd,vibration spring isolators and epoxy painted all as per specs.. Suitable rating of motor to be provided by supplier with suitable starter **.. Scope also covers 5 rmt of power cabling armoured type from nearest power isolator provided by electrical team. Booster to be installed insidethe AHU Rooms near return air ducts.**

i.CENTRIFUGAL / AXIAL FLOW FANS **Centrifugal Fans** **Axial Flow Fan**

GENERAL

a. Manufacturer
b. Type
c. Bearings
d. Casing Material
e. Impeller Material
f. Shaft Material
g. Vibration Isolators
h. Fan Size and Model
j. Fan speed
k. Fan efficiency
l. Noise level
m. Noise attenuator
   - i Manufacturers
   - ii. Type
   - iii. DB reduction guaranteed at 2 M & 3 M distance from Noise attenuator
   - iv. length (Metre)

n. Motor i. manufacturer
   - ii. type
   - iii. operating speed

iv. motor efficiency and class of insulation.
v. Electrical Characteristics (±10% voltage variation).
vi. Type of starter & manufacturer

p. Type of drive
q. Material of flexible connection
r. Type of vibration isolators
s. Motor operated through VFD, confirm following :
   i. Motors do not get derated
   ii. Higher size motor is not required.

7.2	**OPERATING DATA**	**Centrifugal**	**Axial Flow**
	FAN MODEL		
	FAN CFM		
	FAN OUTLET VELOCITY (FPM)		
	SP (MM)		
	FAN RPM		
	NOISE LEVEL (DB)		
	DB REDUCTION BY ATTENUATOR		
	RESULTANT NOISE LEVEL (DB)		
	BHP		
	LIMIT LOAD HP		
	MOTOR (HP)		
	FULL LOAD CURRENT (AMPS)		
	STARTING CURRENT (AMPS)		

VARIABLE FREQUENCY DRIVES WITH STARTER PANEL

- The VFD shall be of the type of HVAC SERIES which should be suitable for operation on 3 phase, 415 V supply.
- It shall be capable of operating continuously at nominated full load rating with expected variations of +/- 10% in the supply voltage and +/-2% in the supply frequency.
- The VFD shall utilize the Voltage Vector Control technology for converting the fixed voltage and frequency to a variable voltage and frequency.
- VFD to have transformer 240V .

Make of the following :

a. Motor Control Centre (Electrical Panel)
b. Vacuum circuit breaker
c. Air circuit breaker
d. MCCB
e. MCB
f. Rotary switch
g. Soft Starter
h. Auto-transformer Starter
j. Automatic Star Delta Starter
k. Direct on line Starter
l. contractor
m. Current Transformer (cast resin type)
n. Single phase preventer
p. Push Button
Change over switch
q. Ammeter & Voltmeter
KWH meter
r. Relay
s. Indication lamp
t. Cables
u. Wires
v. Variable Frequency Drive.

VARIABLE SPEED FREQUENCY DRIVE FOR AHU & FANS

a. Make / Country of Origin
b. Model No.
c. Type
d. Motor Rating
e. Rated Current
f. Maximum Output
g. PID Controller
h. Interface with BAS.
i. Harmonic filter built in (Confirm)
j. Fault Indication.
k. Dimensions (mm)
l. No. of Steps
m. Operating Weight

SECTION -V
MEASUREMENTS

SHEET METAL WORK

DUCTING

1. All sheet metal ducting work will be measured in terms of final sheet area installed in Sq. meters.
2. No Special measurement of vanes, splitters, duct, dampers deflectors, access doors etc. which are required to be installed in the duct work will be made a the same shall be deemed to be part of ducting work

INSULATION :

A. Ducting Insulation

Duct insulation will be measured on the basis of center line of insulation and not the outer line of insulation.

No special measurement shall be made for insulation of "flanges".

No special measurement shall be made for insulation of bends, transformation pieces, tap offs, elbows, etc. All such insulation shall be treated as standard duct insulation. Insulation items shall include all accessories and finishes as specified. No separate measurement will be made for such items.

Duct fittings such as bends, elbows, tap offs, collars, transformation pieces etc. shall be treated as ordinary duct pieces with their length measured along their center line.

No duct support, stiffening, member etc. Shall be measured separately. All such supports/hangers, shall form part of the duct work.

Equipment connections such as canvas/rein shall be deemed to be part of the duct work and no separate measurement will be allowed.

For insulation of the walls in the AHU rooms measurement of covered area will be made on the finished surface covering the walls.

Drain Pipe Insulation : This will be measured as per bare pipe installed .

GRILLES

All grilles will be measured in terms of effective areas.

Example: 600 mm X 150 mm grilles will be measured as 0.09 Sq. meter.

C. DIFFUSERS

Diffusers will be measured in terms of diameter of each diffuser in centimeter of in terms of area of diffuser, or per square meter area of each diffuser when viewed from outer flange to flange

D. DAMPERS

All duct dampers shall be measured separate in terms of effective area.

Fire dampers, if provided will be measured in terms, of effective area in sq meters.

Safety Code:

The Contractor should follow the following General safety Guidelines while executing the work

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

2. All personnel at site should be provided with Helmets and Safety Boots with some identification Mark. Visitors also should be provided with helmets. It should be ensured that these are used properly.

3. No children or physically challenged persons shall be allowed to enter the workplace and shall not be utilized for any service during execution of the work.

4. First Aid Box should be kept at site with all requisite materials appliances including adequate supply of sterilized dressing and cotton wool shall be kept in a readily accessible place.

5. An injured person shall be taken to a public hospital without loss of time, in cases when the injury necessitates hospitalization.

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

7. Smoking is strictly prohibited at workplace

8. No one is allowed to work at or more than three meters height without wearing safety belt and anchoring the lanyard of safety belt to firm support preferably at shoulder level. Chinstrap of safety helmet shall be always on and safety boot is worn. one should be allowed to inspect / work at a height without safety belt.

9. Preferably the work shall be carried out during the daytime. However, adequate illumination at workplace shall be ensured in case any work is carried out at night.

10. Usage of eye protection equipment shall be ensured when workmen are engaged for grinding, chipping, welding and gas-cutting. For other jobs eye protection has to be provided as per the need.

11. Ladders being used at site shall be adequately secured at bottom and top. Ladders shall not be used as work platforms. No portable single ladder shall be over 8 meters in length. The width between the side rails shall not be less than 30 cm. (clear) and the distance between two adjacent running's shall not be more than 30 cm. When a ladder is used an extra labour shall be engaged for holding ladder.

12. Debris, scrap and other materials to be cleared from time to time from the workplace and at the time of closing of work every day. Dismantled Material shall not be thrown from the height and shall be properly disposed off to prevent any injury to public/staff.

13. The excavated material shall not be placed within 1.5 meters of the edge of the trench half of the depth of trench whichever is more. All trenches and excavations shall be provided with necessary fencing and lighting.

14. Excavated pits for earthing, cable laying shall be barricaded till the backfilling is done. Safe approach to be ensured into every excavation.

15. Every opening in the floor of a building or in a working platform 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 meter.

16. No floor, roof or other part of the structure shall be so overloaded with debris or material as to render it unsafe.

17. All electrical connections shall be made using 3 or 5 core cables, having a earth wire. Other than electricians no one is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.

18. Inserting of bare wires for tapping the power from electrical sockets is completely prohibited and plug tops of suitable capacity only shall be used. Tapping of power by cutting electric cables in between must be avoided. Proper junction boxes must be used.

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

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

21. All the Gas cutting, sharp tools, flammable materials and tackles shall be stored properly and safely when not in use.

22. Workers employed on mixing and handling material such as asphalt, cement, mortar, concrete and lime shall be provided with protective footwear and rubber hand gloves.

23. All the pressure gauges used in gas cutting apparatus shall be in good working condition and in case of any leakages, the same shall not be used. Those engaged in welding works shall be provided with welders' protective eye shield and gloves. Connectors and hose clamps are used for making welding hose connections.

24. (i) No paint containing lead or lead products shall be used except in the form of paste readymade paint.
    (ii) Suitable face masks should be supplied for use by the workers when the paint applied in the form of spray or surface having lead paint dry rubbed and scrapped.

25. Overalls shall be supplied by the contractor to the painters and adequate facilities shall be provided to enable the working painters to wash during cessation of work.

26. Hoisting machines and tackle used in the works including their attachments anchor and supports shall be in perfect condition.

27. The ropes used in hoisting or lowering material or as a means of suspension shall be durable quality and adequate strength and free form defects.

28. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can done safely from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well as suitable footholds and handholds

shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1 (¼horizontal and 1 vertical).

29. Scaffolding or staging more than 3.5 meters above the ground or floors, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 meter high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

30. Working platforms, Gangways, and Stairways should be so constructed that they do not sag unduly or unequally, and if the height of the platform or the Gangway or the Stairway is more than 3-5 meters above ground level or floor level they should be closely boarded, should have adequate width and should be suitably fenced, as described.

31. Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 Meters in length while the width between side rails in rung ladder shall in no case be less than 30cms for ladder upto and including Meters in length. For longer ladders this width should be increased at least 6mm for each additional 30cms. Uniform step spacing shall not exceed 30cms.

32. Adequate precautions shall be taken to prevent danger from electrical equipments. For electrical on line work gloves, rubber mats, and rubber shoes shall be used.

33. All trenches 1.2 Meters or more in depth shall at all times be supplied with at least one ladder for each 30 meters length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 1Meter above the surface of the ground. The sides of the trenches, which are 1.5 meters or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated materials 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 cuttings shall be done from top to bottom. Under no circumstances undermining or under cutting shall be done.

34. Before any demolition work is commenced and also during the process of the work:-
    (a) All roads and open areas adjacent to the work site shall either be closed or suitably protected;

    (b) No electrical cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.

    (c) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so over-loaded with debris or materials as to render it unsafe.

    (d) All necessary personal safety equipment as considered adequate by the site Engineer should be kept available for the use of the persons employed on the site and maintained in a condition suitable for immediate use; and the contractor should take adequate steps to ensure proper use of equipment by those concerned.

(e) Workers employed on mixing Asphaltic materials, Cement and lime mortars shall be provided with protective footwear and protective goggles.

(f) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes shall be provided with protective goggles.

(g) Those engaged in welding works shall be provided with Welder's protective eye-shields.
(h) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

(i) When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes so opened shall be cordoned off with suitable railing and provided with warning signals and boards to prevent accident to the public.

35. Use of hoisting machines and tackle including their attachments, anchorage and support shall conform to the following standard or conditions:-

(a) These shall be of good mechanical construction, sound material and adequate strength and free from patent defect and shall be kept in good repairs and in good working order.

(b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

(c) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in-charge of any hoisting machine including any scaffold, winch or give signals to the operator.

(d) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension the safe working load shall be ascertained by adequate means.

(e) Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of hoisting machine having a variable safe working load, each safe working load of the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

(f) Motor, gearing, Transmission, Electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards, hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced.

36. All scaffolds, ladders and other safety devices, mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.

37. (i) These and all other necessary safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

(i) To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the labor officer, Engineers of the Department or their representatives.

(ii) Notwithstanding the above clauses, there is nothing in these to exempt the contractor from the operations of any other Act or rule in force in the Republic of India.

SCAFFOLDS

i) Suitable double type steel H frame scaffolds or suitable alternative arrangements shall be provided for workmen for all works that cannot be done safety from the ground, or from solid construction except in the case of short duration work which can be done safety from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450 mm and a maximum rise of 300mm. Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than ¼ to 1(1/4 horizontal and 1 vertical).

ii) Scaffolding or staging more than 4 m above the ground floor, swung or suspended from an overhead support or erected with a stationary support shall have a guard rail properly bolted, braced or otherwise secured, at least 1 m above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened so as to prevent it from swaying from the building or structure.

iii) Moving or Suspended type scaffolding specifications: Instead of Double type H frame steel scaffolding, if any Contractor desires to use suspended type of scaffolding or any other type of arrangement, they may do so but it should be supported by the full specifications, methodology and other relevant details in order to study and approve the same by the Consultant. No such arrangement of scaffolding will be altered unless the same is approved by the Consultant / Bank.

iv) Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4 m above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in (ii) above.

v) Every opening in the floor of a building or in 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 1m.
Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as prevent persons slipping into the excavations.

vi) Safe means of access shall be provided to all working places. Every ladder
Shall be securely fixed. No portable single ladder shall be over 9m in length while the width between side rails in rung ladder shall in no case, be less than 290mm or for ladder up to and including 3m in length. For longer ladders the width shall be increases at least 20mm

for each additional meter of length.

OTHER SAFETY MEASURES

i) All personnel of the contractor working within the plant site shall be provided with safety helmets. The welder's goggles while welding works and all metal workers shall be provided with safety gloves. Persons employed in metal cutting and grinding shall wear safety glasses. For polymer application suitable hand gloves and other safety equipment / devices shall be provided.

ii) Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

EXCAVATIONS & TRENCHING

i) All trenches, 1.25 m or more in depth shall at all times be supplied with at least one ladder each 3 m in length or fraction thereof. The ladder shall be extended from bottom of the trench to at least 1 m above the surface of the Ground, Sides of trenches which are 1.5 m or more in depth shall be stepped back to give suitable slope or securely held by timber bracing so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5m of the edges of the trench or half of the depth of the trench whichever is more. Undercutting shall be done.

ii) The Contractor shall take all measures on the site of the work to protect the public from accidents and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to any such persons or which may with the consent of the contractor, be paid to compromise any claim by any such person.

DEMOLITION.

i) Before any demolitions / chiseling / breaking work is commenced and also During the process of the work:

a) All roads, open areas adjacent to the work site shall be suitably protected as directed by providing covered sturdy shed for thoroughfare of the staff, customers and public.

b) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.

c) All practical steps shall be taken to prevent danger to persons employed from the risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

PERSONNEL SAFETY EQUIPMENTS.

All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the person employed on the site and maintain in a condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by those concerned.

a) Workers employed on mixing asphaltic materials, Cement and Chemicals/ Polymer shall be provided with protective footwear, goggles and hand groves as per the requirements etc.

b) Those engaged in white washing and mixing or stacking of cement Bags or any materials shall be provided with protective goggles.

c) Those engaged in welding works shall be provided with welder's Protective eyesight lids.

d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

e) When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.

f) The contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form, Where ever men above the age of 18 are employed, on the work of lead painting the following precautions should be taken:

i. No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

ii. Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.

iii. Overalls shall be supplied by the contractor t the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

iv. When the work is done near any public place where is risk of drawings all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

(G) INJURY TO OR DEATH OF A PERSON

The Contractor shall be liable for and shall, indemnify the Employer against any expense, liability, loss, claim or proceedings whatsoever arising under any statute or at Common Law in respect of personal injury to or death of any person whomsoever arising out of or in the course of or caused by the carrying out of the Works.

APPENDIX HEREIN BEFORE REFERRED TO

1	Name of the organization Offering Contract	:	**CHIEF MANAGER (HR & ADMIN.), SBI ADMIN OFFICE BUILDING , SURAT 395001**
2	Consultants	:	**SBI**
3	Site Address	:	STATE BANK OF INDIA, ADMIN. OFFICE BUILDING, SURAT
4	Scope of Work:	:	Proposed AIR CONDITIONING & ALLIED works for SBI ADMIN OFFICE BUILDING, SURAT
5	Name of the Contractor	:	_____ _____ _____
6	Address of the Contractor	:	_____ _____ _____
7	Period of Completion	:	45 days from the date of Issue of work order.
8	Earnest Money Deposit	:	**Rs. 20,000/- (OR Valid MSME UDHYAM certificate)**
9	Retention Money	:	As per clause no.1d. of general Conditions
10	Defects Liability Period	:	Twelve Months from the date of Virtual Completion
11	Insurance to be undertaken by the Contractor at his cost (Contractor's all risk policy)		125% of Contract Value
12	Liquidated damages	:	0.5% of the Contract amount shown in the tender per week subject to max. 5% of the contract value or actual final bill value
13	Value of Interim Bill (Min.)	:	No Interim payment will be paid
14	Date of Commencement	:	From the date of work order issued to the Contractor/ or the day on which the Contractor is instructed to take possession of the site whichever is earlier.

15	Period of Final Measurement	:	2 Months from the date of Virtual completion.
16	Initial Security Deposit	:	2% of the Accepted Value of the Tender.
17	Total Security Deposit	:	5% of the final bill amount including ISD
18	Refund of initial Security Deposit comprising of EMD and ISD	:	50% of the Security Deposit shall be refunded to the Contractor on completion of the work and balance refunded only after the Defect Liability Period is over.
19	Period for Honoring Certificate	:	One Month for R. A. Bills

20 The final bill will be submitted by the Contractor within one month of the date fixed for completion work and the Bill shall be Certified within 3 months from the date of receipt of final bill provided the bills are submitted with all pre-requisite documents/test reports etc. prescribed in the tender.

Signature of Tenderers.

Date:

LETTER OF DECLARATION

To,

The Chief Manager (HR & Admin)
State Bank Of India,
Admin. Office, Surat

PROPOSED AIR CONDITIONING WORKS FOR SBI ADMIN OFFICE BUILDING, SURAT, GUJARAT 395001

Having examined the terms & conditions, drawings, specifications, design 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 and affecting the quotation, I/We hereby offer to execute the works specified in the said memorandum within the time specified in the said memorandum on the item rate basis mentioned in the attached schedule and in accordance in all respect with the specifications, design, drawings and instructions in writing referred to in conditions of Tender, the articles of agreement, conditions of contract and with such conditions so far as they may be applicable.

MEMORANDUM

(a)	Description of work	**Proposed AIR CONDITIONING WORKS AT SBI ADMIN OFFICE BUILDING, SURAT, GUJARAT 395001**
(b)	Earnest Money	**Rs. 20,000/-** by means of Demand Draft / Pay Order (Valid for a period of 90 days from the last date of submission of the tender) from any scheduled Nationalized Bank drawn in favour of **State Bank of India, payable at SURAT. [Those registered with MSME-UDYAM need not submitted EMD. Instead DD, Valid MSME UDHYAM certificate shall be uploaded]**
(c)	Time allowed for completion of work from the date of issue of work order.	45 days from the date of commencement as per tender.

Should this tender be accepted, I/we hereby agree to abide by and fulfill the terms and provisions of the said conditions of Contract annexed hereto so far as they may be applicable or in default thereof to forfeit and pay to SBI, the amount mentioned in the said conditions.

Should I / We fail to execute the Contract when called upon to do so I/ We do hereby agree that suitable action shall be initiated against us by SBI. This may also include debarring of my empanel for an year or so.

We understand that as per terms of this tender, the SBI may consider accepting our tender in part or whole or may entrust the work of various jobs/ works proposed (i.e. piping work, cabling work, drain pipe work, supply of machines work, servicing of existing work etc) in phases. we also understood that the bank have right to add extra quantity in any work or remove certain items from proposed work.

We, therefore, undertake that we shall not raise any claim/compensation in the eventuality of Bank deciding to drop or adding any of the work (proposed in tender documents) from the scope of work of this tender at any stage during the contract period. Further, we also undertake to execute the work entrusted to us in phases as per L-1 rates/standard rates accepted by us/on our approved rates and within the stipulated time limit without any extra claim for price escalation as provided

for in Clause 9.0.1 “Instructions to Tenderers” of this tender.

We, hereby, also undertake that, we will not raise any claim for any escalation in the prices of any of the material during the currency of contract/execution/completion period.

Yours faithfully,

Signature of contractor With Seal

PROFORMA FOR RUNNING A/C BILL
TABLE - XIII

i. Name of Contractor/ Agency :

ii. Name of Work :

iii. Sr. No. of this Bill:

iv. No. & Date of previous Bill :

v. Reference to Agreement No. :

vi. Date of Written order to commence :

vii. Date of Completion as per Agreement :

S.No	Item Description	Unit	Rate (Rs.)	As per Tender		Up to Previous R.A. Bill		Up to Date (Gross)		Present Bill		Remarks
				Qty	Amount (Rs.)	Qty	Amount (Rs.)	Qty	Amount (Rs.)	Qty	Amount (Rs.)	
1	2	3	4	5	6	7	8	9	10	11	12	13

Note:

1.	If part rate is allowed for any items, it should be indicated with reasons for allowing such a rate.	Net Value since previous bill
2.	If ad-hoc payment is made, it should be mentioned specifically.	

Sign & Seal of contractor.

CERTIFICATE

The measurements on the basis of which the above entries for the Running Bill No.---- ---------- were made have been taken jointly on ---------- and are recorded at pages ---------- to ---------- of measurement book No.----------.

----------	----------	----------
Signature of Contractor and date	Signature of Architects Representative and date with (Seal)	Signature of Site Engineer and date

The work recorded in the above-mentioned measurements has been done at the site satisfactorily as per tender drawings, conditions and specifications.

----------	----------
Architect	Signature of Site Engineer and date

TABLE - XV

MEMORANDUM FOR PAYMENT

R/A BILL NO.

1.	Total value of work done since previous bill (A)	Rs.....
2.	Total amount of secured advance due since Previous Bill (B)	Rs.....
3.	Total amount due since Previous Bill (C) (A+B)	Rs.....
4.	~~PVA on account of declaration in price of Steel, Cement and other materials and labour as detailed in separate statements enclosed.~~	~~Rs.....~~
~~5.~~	Total amount due to the Contractor	Rs.....

OBJECTIONS:

i)	Secured Advance paid in the previous R/A	Rs.....
ii)	Retention money on value of works as per accepted tenders up to date amount Rs.	Rs.....
	Less already recovered	Rs.....
	Balance to be recovered	Rs.....
iii)	Mobilization Advance, if any	Rs.....
(a)	Outstanding amount (principal + interest) as on date	Rs.....
(b)	To be recovered in this bill	Rs.....
iii.	Any other Departmental materials cost to be recovered as per contract, if any	Rs.....
iv.	Any other Departmental service charges to be recovered if any, as per contract (water, power etc.) enclose statement.	Rs.....

The bill amount to Rs. ---------- (both figures and words) has been scrutinized by us after due checking of the measurements of work as required and is recommended for payment.

Date: ----------

Signature of Architect
with Seal

The bill amount to Rs.----------certified by Consultants has been scrutinized by me after due test checking of measurements of works as required and is recommended for payment for an amount of Rs.....

Date : ----------

Signature of Banks/ SBI Engineer

STATUTORY DEDUCTION:

i)	Total Amount due (E)	Rs. ----------
ii)	Less I.T. Payable	Rs. ----------
iii)	Less S.T. Payable	Rs. ----------
	Net Payable	Rs. ----------

This figures given in the Memorandum for payable has been verified and bill passed for payment ---
---------- (in words and figures)

Date:----------

Signature of the CM (GB)

Sign & Seal of contractor.

Technical specifications

1.0 INSTALLATION OF AIR CONDITIONERS:

1.1 The Contractor shall carry out and complete the AC installation work as per standard specifications / as stipulated in this contract and OEM's recommendations and to the satisfaction of the Bank . The Bank with approval of Bank issue further written instructions, detailed directions and explanations with respect to the specifications, quality or quantity of works or the addition or omission or substitution of any work.

2.0 SPLIT TYPE ACs:

2.1 Wherever split A.C. are planned in the new buildings, necessary openings in wall may be provided by use of 75 mm PVC pipe sleeves at suitable locations for taking refrigerant pipes and cable to outdoor unit, so as to avoid unnecessary cutting / damage to walls at a later stage. The slope of sleeve of PVC pipe should be towards exterior to avoid seepage of water into the room. This opening should be sealed properly after installation to avoid entry of vermin, rodents and rain water.

2.2 If the Split ACs are installed in the existing buildings, the opening shall be made with suitable drilling equipment with slope towards the exterior wall side for free flow of drain water and avoid seepage of rain water inside. The opening shall be packed with glass wool and finished with cement to avoid entry of rodents through the opening.

2.3 For condensate drain, 25/32/40 mm PVC/ HDPE pipe be provided as per the site condition and taken to nearest drain or up to the stack for collection & disposal of condensate. The slope of such pipe also should be downwards. As far as possible, joints should be avoided in this pipe.

2.4 The length of connecting refrigerant pipes between outdoor and indoor unit be kept to minimum feasible at site. However, it should not exceed 9 m, as the efficiency of the unit gets severely affected on increase of distance. Where the OEM specifies more than 9m for the specific model being used, the refrigerant pipe may be increased.

2.5 The refrigerant pipes should be taken along the walls/ columns etc. duly clamped to their surface by saddles. If walls etc. are not available, tray be used to support the refrigerant pipes. No opening shall be made in the concrete roof to run the refrigerant pipe to avoid damage to the water proofing and leakage of water from the terrace. Where bending of refrigerant pipes is required, proper pipe bending tool should be used to avoid pinching of pipes.

2.6 The indoor unit shall be fixed on the wall or partition as per the direction/ instructions of the Bank. Care should be taken while fixing on the partition to ensure the holding capacity of the partition, to avoid the IDU from falling and getting damaged or causing injury. The installation of IDU shall be done in such a way to add to the ambience of the Branch. It shall be firmly fixed on the wall / partition.

2.7 The ODU shall be fixed in the external wall or in the terrace with suitable size MS supports fixed firmly with anchor fasteners or as specified in the BOQ.

2.8 If number of ODUs are installed in the terrace or external wall, the sufficient distance (vertical and horizontal) between ODUs shall be maintained to ensure optimum and efficient dissipation of Hot air to the atmosphere and to avoid short circuiting of the hot air between ODUs.

3.0 INSTALLATION OF CASSETTE ACs:

3.1 While installing Cassette type IDU's, the contractor has to check the distance between the roof and the false

ceiling and ensure that the sufficient height is available for fixing the IDU as per the layout and any hindrance like sewerage pipe lines, electrical cables etc. Support to hang the IDU to be provided in the roof with threaded rods of suitable size, as per recommendation of OEM. The length of the rod shall be of sufficient length to make finer adjustments while balancing the IDU.

3.2 The drain pipe of the Cassette AC units shall be covered with the insulation and sealing tape to avoid leakage of water. As far as possible, Contractor should use full length of drain and refrigerant pipe for installation to avoid leakage of water or refrigerant gas.

3.3 The refrigerant pipes from the IDU to the nearest wall should be duly fixed with the slotted angle supports or trays of suitable size firmly fixed with the threaded rods to the ceiling.

3.4 To avoid rodent menace, the contractor shall close all openings made by him and also provide sufficient protection to the PCB, other parts of the IDU. No claim for additional amount towards rectifying the IDU on account of damages caused by rodents will be entertained during the warranty period or AMC period.

3.5 If the works involves, some architectural features in the false ceiling, the contractor shall consult the interior contractor and BANK Engineers before installation of cassette ACs to avoid any damage or any hindrance to the proposed architectural features.

4.0 CONCEALING THE PIPES:

4.1 The contractor shall give due notice to the Employer whenever any work like copper piping, cabling, acoustic insulation of the ducts or any work is to be concealed in the wall/false ceiling/partitions or finished up or otherwise becoming inaccessible later on, in order that the work may be inspected and correct dimensions taken before concealing.

4.2 If the Contractor has concealed the items without informing BANK Engineer, the same shall be opened up for measurement and made good to the original finishing at the contractor's expenses. If the contractor refuses to do so, then the same will not be considered for measurement and no payment may be made for such materials.

4.3 The contractor shall not execute any extra work other than the Bank's or BANK's written instruction. No works, for which rates are not specifically mentioned in the price bid, shall be taken up without written permission of the Bank.

4.4 It is the responsibility of the Contractor to arrange/provide the tools, ladder, stands or any other gadgets or supports required for the execution of the work at site and Bank will not provide or entertain such requests.

5.0 MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS

5.1 All the works specified and provided for in the specifications or which may be required to be done in order to perform and complete any part thereof shall be executed in the best and most workman like manner with materials of the best and approved quality of the respective kinds in accordance with the particulars contained in and implied by the specifications and as represented by the drawings or according to such other additional particulars, and instructions as may from time to time be given by BANK during the execution of the work and to his entire satisfaction. The Contractor shall use only products bearing ISI marking in the work for those materials for which no makes are mentioned in the tender.

5.2 No refurbished, second hand and spurious materials should be used. If required, the contractor has to submit the details of the source of his purchase of materials to BANK. BANK reserves its right to enquire and collect data from the supplier to confirm the authenticity of the materials. BANK has the right to stringent

action against the contractor, as deemed fit, in addition to suspend / cancel the contract.

5.3 Contractor should get approval of the samples of materials in advance with BANK's Engineer before use of the same in the work. Should be contractor desire to substitute any specified materials with "Equal" or "Other approved" etc., he/they must obtain the specific approval of the Bank in writing for any such substitution, well in advance.

5.4 Samples of all materials to be used must be submitted when so directed by BANK. If required, the contractor shall have to carry out tests on materials in approved materials testing laboratories or as prescribed by BANK at his own cost to prove that the materials etc., under test conform to the relevant I.S Standards or as specified in the specifications. The necessary charges, transporting, testing etc., shall have to be borne by the contractor. No extra payment on this account will be entertained.

5.5 If the contractor has used any material which is not complying with the specifications, or the workmanship is bad or the material used is substandard or second hand etc, Bank shall during the progress of the work have power to order the removal and substitution of the material or proper re-execution of the work within a reasonable time. In case the contractor refuses to comply with the order, BANK shall have the power to employ other agencies to rectify or re-execute the work at the cost and risk of the contractor.

5.6 Any damage (during the work) to any part of the work or to the premises for any reasons due to rain, storm or neglect of contractor shall be rectified by the contractor in an approved manner at no extra cost.

5.7 Should the work be suspended by reason of rain, strike, lock-outs or any other cause, the contractor shall take all precautions necessary for the protection of work and at his own expenses shall make good any damage arising from any of these causes.

5.8 All expenses consequent thereon or incidental thereto as certified by BANK shall be borne by the contractor or may be deducted from any money due to or that may become due to the contractor. No certificate, shall relieve the contractor from his liability in respect of unsound work or bad materials.

6.0 PERIOD OF CONTRACT & EXTENSION OF TIME

6.1 Time is the essence of the contract. The Contract shall be executed within the stipulated period in the NIT. No request for extension will be entertained and the bidder has to plan and mobilize his resources for the satisfactory completion of the project within the time period agreed in the tender.

6.2 If in the opinion of the Employer, the work is delayed due to the following reasons not attributable to the contractor, the employer shall make a fair and reasonable extension of time, for completion of the Contract works

a) By force majure (or)
b) By reason of any exceptionally inclement weather (or)
c) By reason of proceedings taken or threatened by or dispute with adjoining or neighboring owners of public authorities arising, than through the Contractor's own default (or)
d) By the works not referred in the Schedule of Quantities or specifications (or)
e) By reason of civil commotion, workmen strike or lock-out (or)
f) In consequence of the Contractor not having in due time, necessary instructions from the Employer for which he shall have specifically applied in writing ahead of time, giving reasonable time to prepare such instructions

6.3 In case the work is held up for any site conditions not attributable to the contractors or for any decisions instructions / want of details from Employer or for any of the conditions, the contractor shall be allowed

reasonable extension of time by the employer but any claim for idle labour shall not be entertained by the employer. Contractor's quoted rates should include for all such contingencies.

7.0 PAYMENT TERMS

7.1 For the SITC of ACs

i) No advance payment.

ii) No part payment. For certain works, part payment will be considered if stipulated in the NIT.

iii) Payment shall be made by way of Electronic fund transfer and the bill will be paid by the Branch.

iv) Bidder should furnish details of the bank a/c no, IFSC code along with their invoices.

7.2 For the AMC (clause will after the free AMC period and if bank want to continue with the same vendor)

i) No advance payment.

ii) Quarterly payments will be released after the end of the quarter subject to deductions for shortfall in services

iii) Field reports of the PM and breakdown maintenance reports shall be enclosed to the Invoices

7.3 Part/Interim payment is paid as per the payment terms mentioned in the NIT. All the interim payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed, and shall not preclude the requiring of bad, unsound, and imperfect or unskilled work to be removed and taken away and reconstructed, or re-erected or be considered as an admission of the due performance of the contract, or any part thereof in any respect or the accruing of any claim, nor shall, it conclude, determine or affect in any way the power of the Employer under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract.

7.4 If the Bank has supplied any materials or goods to the contractor, the cost of any such materials or goods will be progressively deducted from the amount due to the contractor in accordance with the quantities consumed in the work.

7.5 GST as applicable shall be paid extra and the same shall be clearly shown in the invoices.

7.6 Statutory deduction towards income tax and other taxes as and when directions from statutory bodies are received will be made at the time of making payments. Currently, I.T. will be recovered @ 2 % plus surcharge or as applicable as per Government Rules. GST-TDS as per applicable rates will be deducted, wherever applicable.

7.8 GST:

a. It is the responsibility of the bidder to ensure that the GST is valid and active. Payments will not be made to inactive or invalid GST invoices.

b. Reimbursement of GST will be made only on submission of proper GST invoice as per applicable GST provision. Non-GST invoices will not be accepted. The contractor should comply with the following.

c. Contractor should have GST Registration Number

d. Invoice should specifically disclose the amount of GST levied at applicable rate as per GST provision

e. In case of Correction in the bills after scrutiny, contractor should submit fresh bills for payment

f. Contractor should timely file his GST return in accordance with GST provisions to enable the bank to claim the credit of GST paid to the contractor

7.9 The works will be paid for as "measured work" on the basis of actual work done and not as "lump sum" contract, unless otherwise specified.

7.10 All items of work described in the schedule of quantities are to be deemed and paid as complete works in all

respects and details including preparatory and finishing works involved, directly related to and reasonably detectable from the drawings, specifications and schedule of quantities and no further extra charges will be allowed in this connection. In the case of lump-sum charges in the tender, in respect of any items of work, payment will be made for the actual work done, on the basis of lump sum charges, as will be assessed by BANK.

8.0 VARIATION IN QUANTITY / SUBSTITUTION OF ITEM

8.1 The Schedule of Quantities unless otherwise stated shall be deemed to have been prepared in accordance with the Standard Procedure shall be considered to be approximate and no liability shall attach to the employer for any error which may be discovered therein.

8.2 The Employer reserves the right to increase or decrease or delete or omit or execute only a part or the whole or any excess thereof, as per the site requirements, without assigning any reason therefor at the time of allotment / execution of work. Contractor will be paid for the actual work done at the site. No variation shall vitiate the contract.

8.3 The tender rates shall be fixed and applicable for any increase or decrease in the tendered quantities. Nothing extra will be paid by the Bank on account of omission / deletion of items or decrease in the quantity of items. The Bank shall not entertain any claim whatsoever from the contractor on this account. Payment will be made on actual measurement of the work done. All measurements shall be as per relevant I.S. standards

8.4 Bank reserves the right to order more quantities than what is mentioned in this tender (at the same rate and terms and conditions) either at the same site or other sites as per the need within the validity of this tender.

8.5 The price of all additional items/non-tendered items will be worked out on the basis of rates quoted for similar items in the contract wherever existing. If similar items are not available, the rates for such items will be derived as per standard method of rate analysis based on prevalent fair price of labour, material and other components as required with 15% towards contractor's profit and overheads.

9.0. CONTRACTOR'S EMPLOYEES

9.1 The Contractor shall employ technically qualified / having appropriate skill and competent persons fully trained and adequately experienced technicians, who are medically fit. They should be free from any contagious diseases. The technicians shall be well mannered and properly dressed with shoes etc.

9.2 The contractor shall provide necessary training on safety measures while executing the work wherever necessary so as to avoid accident. The Bank shall not be responsible for any accident occurred or damage incurred or claims arising there from during the execution of work. The contractor shall also provide all risk insurance policy including third party insurance as may be necessary to cover the risk.

9.3 The contractor / firm shall be held responsible for any misdeeds / misbehavior of their employees within the premises. Bank is not responsible for any damages or claims on account of the misbehavior / misdeeds of his employees. For this purpose, any person supplied by the contractor to be engaged on the work on regular basis or as an alternate arrangement, under the direct order or control of the Employer or his representative shall be deemed to be a person employed by the contractor.

9.4 Contractor should not engage child labour in any of the activities in this contract.

9.5 The contractor shall not employ person who is not an Indian National.

9.6 The technician shall not over stay in the Bank premises or in the odd hours or holidays unless or otherwise required by the Branch for specific reasons like maintenance, repair works etc.

9.7 In respect of all labour employed directly or indirectly on the work for the performance of the contractor's part of work, the contractor at his own expense, will arrange for the safety provisions as per the statutory provisions, B.I.S recommendations, factory act, workman's compensation act, CPWD code and instructions issued from time to time.

9.8 The Contractor's workmen will not have any right whatsoever to get absorbed in the Bank. The Contractor shall be responsible for all the claims of the employees of the Contractor and shall not make and claim whatsoever against the Bank. The Contractor shall be responsible for all statutory requirements e.g. ESI, PF, labour registrations, Insurance coverage etc. The operator is responsible for compliance of all the rules & safety regulations etc.

Minimum wages as prescribed by the Labour Act shall be payable to the operator(s) by the contractor as the case may be. The Contractor shall bind himself and keep the Employer saved harmless and indemnified against claims if any of the workmen and all costs and expenses as may be incurred by the Employer in connection with any claim that may be made by any workmen.

10.0 WORKING HOURS AT THE SITE

As instructed by Bank. Contractor to ensure that the routine operations at the site are not affected by the contract work. If required, they have to work on the Bank Holidays in coordination with other agencies and Bank. The details is described in ADDITIONAL CONDITIONS OF CONTRACT - 7.0

11.0 SUBCONTRACTING

11.1 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 underlet the contract or any part, share or interest therein nor, shall take a new partner, without written consent of the Employer and no subletting shall relieve the contractor from the full and entire responsibility of the contract or from active superintendence of the work during their progress

12.0 STORAGE OF MATERIALS

12.1 The contractor shall store their materials like AC machines, copper pipes, wires, refrigerant gas cylinders, tools etc in the site with the permission of the Bank. However, the contractors shall be responsible for the custody and security of all materials and equipment at site. No claim for loss or theft will be entertained by the Bank.

12.2 Shelter or stay and other amenities for the labors have to be arranged by the contractor at his own expense and responsibility.

12.3 On completion of the works, the contractor shall remove all tools, surplus materials, rubbish and temporary works of every kind and leave the whole of the site and the works clean and in a workmanlike condition to the satisfaction of the Bank

13.0 TECHNICAL SPECIFICATION FOR THE AIR CONDITIONERS

13.1 **Supply of split A/C 1.0 tr. (5 star Inverter)**

Wall mounted air conditioner shall have 1.0Tr i. e nominal 12.000 BTU/capacity per hour at the ambient of 40 degree centigrade capacity. Unit shall have maximum 45/46 dB noise level at the distance of 1 MT for outdoor/indoor units. The unit shall be suitable for 230 volts power supply. With temperature indicator and remote for operation. (5- Star Inverter AC high wall type split A/C).

The air filter shall be easy to maintain and preferable showing the status of choking. Every unit shall be supported by unconditional warrantee of one year however sealed unit unconditional warrantee must be given for 5 years from the manufacturer. CONDESOR MUST BE OF COPPER METAL.

13.2 **SUPPLY OF SPLIT a/c 1.5 Tr. (5 star, Inverter)**

Wall mounted air conditioner shall have 1.5 Tr i.e. nominal 20,000 BTU/capacity per hour at the ambient of 40 degree centigrade capacity. Unit shall have maximum 45/46 dB noise level at the distant of 1 MT for indoor/outdoor units. The units shall be suitable for 230 volts of power supply. With temperature indicator and remote for the operations. (5- star, Inverter A/C high wall type split A/C)

The air filter shall be easy to maintain and preferably showing the status of choking. Every unit shall be supported by unconditional warrantee of one year however sealed unit unconditional warrantee must be given for 5 years from the manufacturer. CONDESOR MUST BE OF COPPER METAL.

13.3 **SUPPLY OF SPLIT a/c 2.0 Tr. (5 star, Inverter)**

Wall mounted air conditioner shall have 1.5 Tr i.e. nominal 24,000 BTU/capacity per hour at the ambient of 40 degree centigrade capacity. Unit shall have maximum 45/46 dB noise level at the distant of 1 MT for indoor/outdoor units. The units shall be suitable for 230 volts of power supply. With temperature indicator and remote for the operations. (5- star, Inverter A/C high wall type split A/C)

The air filter shall be easy to maintain and preferably showing the status of choking. Every unit shall be supported by unconditional warrantee of one year however sealed unit unconditional warrantee must be given for 5 years from the manufacturer. CONDESOR MUST BE OF COPPER METAL.

13.4 **Installation of split 1 Tr & 1.5 Tr**

Total work comprising of unpacking till commissioning of each units indoor as well as outdoor. Connecting the pipes & electrical cables/wires. With necessary support & fabricating for hanging the unit from ceiling. Installation shall be done with the control panel.

The installation of A/C. charging towards installation testing and commissioning of split and cassette A/C. this includes nitrogen flushing, pressure testing, attending leakages, loading, unloading, gas charging and panel fittings.

13.5 **Extra copper pipe** :

a) The contractor shall have to provide extra length of copper pipe with proper lagging to make the perfect job of insulation. All the copper pipe shall be without joints and proper flare-up shall be done with tools and tackles for excellent workmanship. No dent shall be allowed while bending the pipe of laying it on connecting it to machine/evaporate/condenser. High grade of foam insulation shall be provided. Entire piping shall be done over the false ceiling and do not compromise any aesthetic look. THIS IS THE LENGTH OTHER THAN SUPPLIED for 1.0 & 1.5 TR. A/C with manufacturer kit.

b) Then contractor shall have to provide copper pipe with proper lagging to make the perfect job of insulation. All the copper pipe shall be without joints and proper flare- up shall be done with tools and tackles for excellent workmanship. No dent shall be allowed while bending the pipe of laying it or connecting it to machine/evaporator /condense. High grade of foam insulation shall be provided. Entire piping shall be done over the false ceiling and do not compromise any aesthetic look. Size of copper shall sleeve insulated with saddling and clamping.

13.6 **Wiring**

SPLIT UNIT TO OUTDOOR UNIT

The A/C contractor has to get the wiring from the MCB unit provided by the electrical contractor in house. All the wiring shall be of approved make only.

The wiring shall pass through ISI approved conduits as mentioned in approved list of materials. Any drilling of

the wall for getting copper pipe or wiring shall be sealed and finished by the A.C contractor. Size of the wires shall be 3x 2.5 sq. m. m. for A.C contractor for each & every A.C unit.

13.7 **Drain water piping** :-

Condensed water in the interior of the banking hall shall be drained outside/toilet block through gravity-slop. The entire piping shall be 25 M.M. ISI approved pipes to carry condensed water. All the piping shall be maintainable and testing shall be done before connecting.

13.8 supply and installation of fabricated steel supports for outdoor units for (1T.1.5 Tr)

13.9 **Civil work**

The A/C contractor has to complete entire branch/ office the zari work/ all type of Civil Work for AC installation in the wall and coordinate with the civil/ Furniture/ Electrical contractor while doing flooring/ Ceiling to run the drainage/ Copper pipe etc. finishing has to be done by the A/C contractor with required labour &materials.

14.0 VARIABLE REFRIGERANT FLOW SYSTEM

14.1. Scope:

The scope of this section comprises the supply, erection, testing and commissioning of Variable Refrigerant Volume System conforming to these specifications and in accordance with the requirements of Drawings and Schedule of quantities.

14.2. Type:

Unit shall be air cooled, variable refrigerant volume air conditioner consisting of one outdoor unit and multiple indoor units. Each indoor unit having capability to cool independently for the requirement of the rooms. All indoor units shall be provided with isolation valves so that a particular unit can be isolated and removed for servicing, while system keeps functioning in normal way.

It shall be possible to connect multiple indoor units on one refrigerant circuit as shown in the drawings or as indicated in schedule of quantities. The indoor units on any circuit can be of different type and also controlled individually. Following type of indoor units shall be connected to the system:

- Ceiling mounted cassette type.
- Wall Mounted Split type
- Compressor installed in outdoor unit shall be equipped with capacity control mechanism and capable of changing the rotating speed / mass flow rate of refrigerant by scroll engaging / disengaging mechanism to follow variations in cooling. Outdoor unit shall be suitable for mix-match connection of all type of indoor units.

The refrigerant piping between indoor units and outdoor units shall be extended upto 100m with maximum 50 m level difference without any oil traps. Oil recovery system shall be managed without disturbance to normal operation cycle of the system / compressor.

Both indoor unit and outdoor unit shall be factory assembled, tested and filled with first charge of refrigerant before delivery at site.

14.3. Out Door Unit:

The outdoor unit shall be factory assembled, weather proof casing constructed from heavy gauge mild steel panels with powder coated finish.

All outdoor units above 5 HP rating shall have minimum two number scroll compressors.

In case of outdoor units with multiple compressors, the operation shall not be disrupted with failure of any compressor.

The noise level shall not be more than 60 dB (A) at normal operation measured horizontally 1m away and 1.5 m above ground level.
The outdoor unit shall be modular in design with possible future expansions.
The unit shall be provided with microprocessor control panel.

14.4. Compressor:

The compressor shall be high efficiency scroll type and capable for capacity controlling. It shall change the speed / refrigerant mass flow rate in accordance to the variation in cooling load requirement. Refrigerant mass flow rate can be changed by speed modulation of compressor / mechanical control system. System shall incorporate liquid sub-cooling mechanism with liquid injection at intermediate pressure.
The inverter used, shall be IGBT (insulated gate bipolar transistor) type for efficient and quiet operation.
All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated. Forced lubrication may also be employed.
Oil heater shall be provided in the compressor casing.

14.5. Heat Exchanger:

The Heat Exchanger shall be constructed with copper tubes mechanically bonded to aluminum fins to form a cross fan coil and larger surface area.
The fins shall have anticorrosion treatment for Heat Exchanger Coil. The treatment shall be suitable for areas of high pollution, moisture and salt laden air.
The casings, fans, motors etc. shall also be with anticorrosion treatment as a standard features.
The unit shall be provided with necessary number of direct driven low noise level propeller type fans arranged for vertical / horizontal discharge. Each fan shall have a safety guard.

14.6. Refrigerant Circuit:

The Refrigerant Circuit shall include an liquid receiver /accumulator, liquid & gas shut off valves and a solenoid valve. All necessary safety devices shall be provided to ensure the safety operation of the system.

14.7. Safety Devices:

All necessary safety devices shall be provided to ensure safe operation of the system.
Following safety devices shall be part of the outdoor unit: high pressure switch, low pressure switch, fuse, crankcase heater, fusible plug, over current protection for inverter, and short recycling guard timer.

14.8. Piping:

All connections of Refrigerant piping shall be in high grade Copper of Refrigeration quality with Eddy Current Testing and material test Certificates.
All connections, tees, reducers etc. shall be standard make fittings.
Insulation of cold lines shall be carried out with Armaflex / K-Flex insulation sheets and tubes of appropriate thickness so that condensation does not occur.
For individual Piping 50 / 100 mm wide Aluminum Tape shall be used at joints of Piping with Bands for identification.
For outdoor piping, the finish shall be woven GRP Mat finished with colored Epoxy paints to withstand outside ambient conditions and UV Radiation.

14.9. Oil Recovery System:

Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigerant piping.
System shall be designed for proper oil return to compressor along with the distribution of oil to individual compressor.
The refrigerant piping shall be extended upped 100 M with 50-M level difference without oil traps.

14.10. Indoor Units:

Units shall be factory assembled, wired, piped and tested.
Units shall have DX coils with copper tubes and bonded aluminum fins for highly efficient heat transfer.
Units shall have Centrifugal fans for adequate amount of Air circulation and low Noise.
Units shall have inlet filters, which are easily cleanable and replaceable.
All components of Units are easily accessible for connection, repairs and maintenance.
Units shall have very low noise.
All units with Factory manufactured Units, Grills shall have auto swing feature for proper Air distribution.
All unit shall be controlled by electronic Expansion Valves only.
All units mounted inside the ceiling shall have fans capable of sustaining duct connections, and special filters if necessary.
Visible indoor units shall have wireless remotes. Price of the same shall be included in cost of unit by default.
Concealed indoor units shall have sensor mounted on supply air grilles / diffusers which can be controlled with wireless remotes unless specified.
Anticorrosion treatment for avoiding corrosion of coils.
All units shall have adequate insulation or Lining to avoid condensation.
Cooling coil and refrigeration parameters shall be designed in such a way that supply air temperature shall not be less than 14^0C or 1^0C above room dew point temp, whichever is more. Contractor shall guarantee inside conditions with selected supply air temperature.

14.11. Ceiling Mounted Cassette Type Unit (Multi-Flow Type):

The unit shall be ceiling mounted type. The unit shall include pre-filter, fan section and DX-coil section. The housing of the unit shall be powder coated galvanized steel. The body shall be light in weight and shall be possible to suspend from four corners.
Unit shall have a external attractive panel for supply and return air. Unit shall have four way supply air grilles on sides and return air grille in centre.
Each unit shall have high lift drain pump, fresh air intake provision (if specified), low gas level detection system and very low operating sound.

14.12 Ceiling Mounted Ductable Type Unit:

Unit shall be suitable for ceiling mounted type. The unit shall include pre filter, fan section & DX-coil section. The housing of unit shall be light weight powder coated galvanized steel. The unit shall have high static fan for ductable arrangement.

14.13 High Wall Mounted Units:

The units shall be high wall mounted type. The unit shall include pre-filter, fan section & DX-coil section. The housing of unit shall be light weight powder coated galvanized steel.
Unit shall have an attractive external casing for supply and return air.

14.14. Ceiling Mounted Concealed type units:

Unit shall be suitable for ceiling mounted type. The unit shall include pre filter, fan section & DX-coil section. The housing of unit shall be light weight powder coated galvanized steel. It shall be slim and quite in operation

14.15. Central Remote Controller (Option if Specified in BOQ):

A multi-functional microprocessor based centralized controller (central remote controller) shall be supplied as an optional accessory.
The controller shall be able to control upto min. 64 zones of 64 group (each group consisting of max. 16 units) or 128 nos. of indoor units with the following functions.

- Temperature setting for each zone, or group, or indoor unit.
- On/Off as a zone or individual unit.
- Indication of operating condition.
- Select ON of all operation modes for each zone..
- The controller shall have wide screen liquid crystal display and shall be wired by a non polar 2 wire transmission cable to a distance of 1000m away from the indoor unit.

- The controller shall be integrated to BAS system thru software for monitoring & controlling of all above parameters including start/ stop of each indoor / outdoor unit. All necessary interface cards / units should be supplied as a part of the system to integrate to the BAS Software.

14.16. Unified On/Off Controller (Option if Specified in BOQ):

Unified ON / OFF controller shall be supplied as an optional accessory.

The controller shall be able to control minimum 2 groups (each group containing maximum 16 indoor units) or 128 nos. of indoor units with the following functions.

- On / Off as a zone or individual unit.
- Indication of operation condition of each group.
- Select one of 4 operation modes

The controller shall be wired by a non-polar 2 wire transmission cable to distance of 1 km away from indoor unit.

The controller shall be integrated to BAS system thru software for monitoring & controlling of all above parameters including start/ stop of each indoor / outdoor unit. All necessary interface cards / units should be supplied as a part of the system to integrate to the BAS Software.

14.17. <u>Condensate</u>:

25mm dia uPVC pipes, 40mm dia uPVC headers & fittings shall be used for condensate, from Evaporator Unit to drain point. The joints shall be properly sealed so that there is no water leakage. U-trap shall be provided. Additional insulation drain tray shall be provided below the Evaporator Unit, if required.

Mounting

All indoor units shall be mounted with Brackets, Hangers etc. with proper size anchor Fasteners.

<u>9.18 Electrical installation</u>:

For Variable Refrigerant flow systems, power will be provided near outdoor unit location. HVAC Contractor to provide suitable distribution panel along with 3-phase power to outdoor units and single phase power to all indoor units fed by these outdoor units. Power / control cabling along with supports shall be included.

15.0 INSTALLATION:

PRE-DELIVERY INSPECTION

This applies to the condensing and indoor units both.

1. Open packing carefully ensuring unit in 'upright' position.
2. Check the unit thoroughly for dents, paint discrepancies, fins damage, pinching of tubes etc. Check coil / copper tubes for any dents, pinching or cuts, especially near tube sheets. Ensure all parts / components, electrical wiring and connections are visibly in order.
3. Rotate fan / blower for any bearing or touching noise.
4. Check and test fans / blower as per the rated supply for Indoor and Outdoor if possible.
5. Check coil and piping for leaks.
6. If any damage is found, rectify / take the necessary action and repack the unit in 'upright' position.

RIGGING

These units are designed to be handled by forklift trucks or crane. Use the unit skid for placing on terrace the forks of the lift-truck or by using crane.

PLACEMENT

Outdoor Units are shipped mounted on wooden members & Indoor unit packed in carton box. These should be removed only when the unit is in its final position.

15.1 LOCATION AND MOUNTING:

A. CONDENSING UNIT

Location

Locate the unit so that airflow through the condenser coil is unrestricted. Provide clearance for wiring and piping. There should be ample space for service requirements.

Install the outdoor unit in well-ventilated space. The unit should be installed in a location so as to minimize refrigerant and drain pipe length.

Mounting

The unit should be mounted to prevent corrosion of sheet steel base on

(a) Prefabricated angle iron frame, and minimum 200 mm raised PCC blocks

These should be designed to take care of vibratory operating loads.

Placement area must be level and strong enough to support operating weight of the unit. Check that the unit is mounted level to ensure proper oil return to compressor.

Units mounted on walls must be provided with a platform having space for service (if otherwise not easily accessible for service).

B. INDOOR UNIT

Location

These units are designed especially for applications where units & piping are above the false ceiling.

Locate unit ensuring adequate space for supply / return air, service purposes and connections.

The location of the unit should be such that there is no ingress of fresh air as this would cause condensation / sweating. Location should be near a drain point for easy drainage, and in a location to simplify refrigerant piping.

Pipe Routing

Liquid line should be suitable for flare connection & Suction line is suitable for brazed connection. Adaptors are given on Suction line & Discharge line in outdoor Unit for refrigerant charging and evacuation operations. Flare connections are provided because they allow easy connection / disconnection / reuse without additional piping / brazing work.

Indoor units have connection suitable for brazing in suction line and quick lock valve in liquid line. Start refrigerant piping from outdoor unit first and connect indoor unit last. Run the piping along walls / floors or on wooden beading with saddle / clamps and boxed up for protection. Clamp and run pipes neatly and straight using unlamented good copper tubing.

The pipes should run as straight as possible, avoiding unnecessary turns and bends. for other length, pipe sizes. Extra refrigerant charge for extra pipe length should be considered. If brazing is done to connect two tube lengths, it should be carried out using proper flux and brazing rod (7.25% Phosphorus, rest copper) with a constant purge of nitrogen through the piping to maintain a clear system.

All connections must be leak tight.

Clamping

Clamping is necessary to prevent vibrations from being transmitted. When passing the pipes through walls, opening should be sealed to minimize vibration transmission. Some slack in pipes between structure & unit should be left.

Insulation

Insulate Suction & liquid line properly. This is necessary safety. Use tubular foam of for liquid line and for Suction line. As specified in Insulation specs.

FIELD ELECTRICAL CONNECTIONS:

Do the field wiring as per wiring diagram. Never bypass any electrical protections provided in the unit. Recommended wire size for main power supply cable is 4 core 6 mm2 Copper.

Unbalanced 3 -phase supply voltage

Never operate unit when supply voltage unbalance is more than 2%.
% Voltage unbalance = (Max. voltage deviation from avg. voltage) / (avg. voltage) x 100

PRE-PRESSURE TEST:

However, in case of leaks in the refrigerant circuit or breaking of joints etc., the valves have to be back seated and the entire system of indoor and outdoor units with piping has to be pressure tested, evacuated and charged.
After pressurizing the system, do the following:

SOAP TEST:

Apply soap solution at all flare connections and brazing point. If bubbles appear at some points, then tighten the flare nut or braze the leaking points (after releasing the gas from the system). No bubbles should finally appear.

PRESSURE DECAY TEST:

After soap test, note the pressure and leave the system pressurized for 30 minutes. Note the pressure again. There should be no pressure decay, recheck for leaks, remove them and do the pressure decay test again.

CHECK PRIOR TO START-UP:

Do not attempt to start the unit following steps have been completed:
1. Check that unit is properly located and mounted.
2. Check that piping has been done as per the recommended practice.
3. Check that the insulation is adequately sized and properly applied on the piping.
4. Check that condensate drain pipe has been properly installed and insulated.
5. Be sure there are no refrigerant leaks.
6. Check the refrigerant standing pressure with a pressure gauge connected on the liquid valve gauge port. Check if the charge is complete with R-22 charged.
7. Check tightness of all electrical connections.
8. Check the protective device (MCB or fuse switch) from which the supply is given to the unit.
9. Electrical power supply must agree with unit nameplate rating. Check that field wiring electrical switches and voltage stabilizers (in the case of low voltage power supply) are properly sized for the unit. Check and ensure that 3-phase voltage unbalance is less than 2%.

START-UP AND OPERATION:

Actual start-up / full-fledge d testing should be done only under supervision of a qualified person.

1. Make main power connections. If reverse phase indication is there on the Display Panel, then interchange two of the phases. Make sure display panel shows healthy supply.
2. Switch on the ON/OFF switch of the controls; the unit will start on its previous setting.
3. In this Wiring 'HP'& 'LP' are in series when either of two is removed wire from the electrical panel. Compressor, Evaporator Blower fan will go off simultaneously. '& Display Panel will show 'HP/LP'. Please check to ensure its HP and LP working.
4. Run unit according to Remote Control features as described.

16.0 SPECIFICATIONS

VARIABLE REFRIGERANT FLOW (VRF) SYSTEM:

The system shall be air-cooled, direct expansion type central air conditioning system consisting of one Variable Refrigerant Flow Condensing unit (Outdoor Unit) and one or more Evaporator (indoor) units. The condensing unit shall be located on the building terrace ensuring unobstructed airflow.

The evaporating units are selected to suit the cooling load of the area to be air conditioned.

The condensing unit shall be capable of assessing the requirement of liquid refrigerant volumetric flow of each evaporating unit at all times by means of a sophisticated sensors & microprocessor controller and generating the required total volume of refrigerant liquid for supply to each evaporator units.

Factory-assembled Outdoor condensing unit should be with hermetically sealed scroll / twin rotary type fixed speed compressor in combination with compressor having Inverter type Refrigerant flow control technology, air cooled draw through type condenser coil of copper tubes mechanically bonded to aluminum fins, low noise axial fan (not more than 60dB), safety and high/low pressure cut outs, weather proof housing constructed from galvanized powder coated steel, an efficient oil separation system for stable operation with long refrigerant piping,

Vendor to furnish the details of expected oil carry over/return system.

Condensing Unit (Outdoor Unit)

The condensing unit shall be capable of assessing the requirement of liquid refrigerant volumetric flow of each evaporating unit at all times by means of a sophisticated microprocessor controller and generating the required total volume of refrigerant liquid for supply to the evaporator units.

The condensing unit shall be a factory-assembled unit housed in a sturdy weatherproof casing constructed from rust proof galvanized powder coated steel panels. The noise level of the unit shall not be more than 70dB (A) measured horizontally 1 m away and 1.5 m above base level.

The compressors shall be hermetically sealed scroll type and inverter driven variable speed type, capable of changing the capacity in accordance to the cooling load requirement.
The condenser coils shall be constructed out of copper tubes mechanically bonded to aluminum fins. The surface of the condenser coil shall be coated with suitable chemical coating to prevent deterioration due to coastal climate.
All necessary safety devices shall be provided to ensure safe operation of the system.

Unit should be equipped with a highly efficient oil separation system to ensure stable operation with long refrigerant piping.

The VRF condensing unit shall be located in open on a terrace with adequate clearance from nearby objects to ensure unobstructed air flow and easy approach for maintenance.

Indoor Units (Evaporating Units):
Each unit shall be selected as the requirement of the cooling load and interior layout in the respective space to be air-conditioned. The unit shall be equipped with an electronic expansion valve, which can communicate with the VRF controller in the condensing unit. Wall /Ceiling suspended evaporator unit having 3 or 4 rows deep cooling coil, low noise centrifugal supply air fan with external static pressure capacity up to 40 mm, insulated casing, insulated drain tray, easy to clean return air filter low noise and vibration free operation.

The cassette unit should be serviceable from bottom & should have built-in drain pump having maximum drain lift of 60cm. Each unit will have a fresh air port to draw fresh air through connected flexible duct opened to atmosphere.

Each unit shall be equipped with electronic expansion valve, cord/cordless type Remote Control to maintain & set room temperature & other parameters. Option of centralized, individual & group control should also be provided.

The fan shall of the dual suction multi blade type and statically and dynamically balanced to ensure low noise and vibration free operation.

Each indoor unit shall be equipped with corded / cordless local control unit for setting the operating parameters. The address of the indoor unit shall be set automatically in case of individual and group control. Option of centralized control should also be achievable.

Controls shall be provided to maintain the set room temperature within close tolerance limits.

Air Cooled Type DX (Non-VRF) Units:
The condensing unit shall consist of compressor, condenser coil & fan, refrigerant piping, refrigerant controls, local control panel, control wiring etc., all assembled in a weather proof powder coated cabinet in compact layout.

Cabinet shall be fabricated out of heavy gauge galvanized sheet steel properly formed for closet fit and structural rigidity. All access panels shall be so constructed as to be quickly and easily removable. All sheet metal surface shall be finished in baked enamel paint or powder coating. Cabinet shall be fully insulated for acoustic insulation.

Air-cooled condenser coil shall be made from copper tubes and aluminum fins bonded to the tubes. Condenser fans shall be propeller type. The entire air-cooled condensing unit shall have sheet metal housing suitable for outdoor installations.

Compressor shall be of the hermetic scroll type or rotary type, with suction and discharge valves, gas cooled motor, horizontal or vertical shaft balanced and mounted on vibration absorbers to provide quiet, free floating operation. Compressor shall be provided with overload protection and single phasing protection.

Interconnecting Refrigerant Piping & Wiring:
The refrigerant piping interconnecting to indoor & outdoor units shall be of copper and shall be joined by brazed type joints. Refrigerant pipes shall be insulated as per specification. Wiring interconnecting the indoor and outdoor unit shall be done with PVC insulated copper conductor flexible wires of appropriate rating.

The set of two refrigeration lines and the wires shall be bundled together.
All pipe supports/clamps shall be painted with red oxide primer followed by 2 coats of synthetic enamel

finish paint.
The piping and wiring shall be laid such that it does not spoil the aesthetics of the premises, and is safe, secure and approachable for repair/replacement.

Supports & Brackets
The equipment's shall be properly supported with brackets, hangers, platforms, base frame etc. depending upon the type, location and capacity of the unit.

The supports shall be GI slotted angle and GI threaded rods. The outdoor condensing units shall be properly supported on MS duly painted with anti-corrosive rubber paint frame work / platform with anti-vibration rubber pads on PCC blocks or properly grouted to the RCC Slab / brick walls using bracket.

The ceiling suspended evaporator indoor units shall be supported using anchor fasteners and GI threaded suspension rods. The wall-hung evaporators shall have GI stenciled back plate for mounting the unit, grouted to the wall / beam using anchor fasteners.

Drain Piping
The drain piping shall be made out of rigid UPVC pipes of 10 Kg/cm2 class. The piping shall be supported by clamping on MS angle 25mm x 3mm running continuously below the pipe.

The drain pan shall be connected to rigid UPVC pipe by braided UPVC flexible pipe with appropriate adapters. All pipes support/clamps shall be painted with red oxide primer followed by two coats of synthetic enamel finish paint.

Piping Insulation
All Refrigerant piping shall be insulated with 19 mm Thick Closed cell elastomeric Nitrile Rubber Insulation. Drain piping shall be insulated with 6mm Thick Nitrile Rubber or Polystyrene Insulation.

Insulating material in tube form shall be sleeved on the pipes. On piping, slit opened tube from insulating material shall be placed over the pipe and adhesive shall be applied as suggested by the manufacturer. Adhesive must be allowed to tack dry and then press surface firmly together starting from butt end and working towards centre.

Measurement of Insulation
Piping insulation will be measured as per length of the pipes.

STANDARDS
The following standards shall be applicable for equipment
a) IS : 4283 Hot air fans
b) IS : 8272 Industrial cooling fans (man coolers)
c) IS : 1391 Room Air conditioners
d) IS : 8148 Packaged Air conditioners
e) IS : 2997 Air circulator type electrical fan and regulator
f) IS : 1169 Electrical pedestal type fans and regulators
g) IS : 374 Electrical ceiling type fan and regulator

12.0 SAFETY CONSIDERATIONS

Installation, start-up and servicing of the equipment can be hazardous due to system pressures, electrical components and locations of equipment (roofs etc.).

Only trained, qualified installers and service mechanics should install start-up and service this equipment.

Trained service personnel should perform all operations except basic maintenance.

When working on the equipment, follow all safety codes. Use proper tools, tackles and necessary instruments. Use safety glasses, gloves, boots, valves and regulators etc. Be sure power to the equipment is off before performing maintenance or service.

GENERAL & IMPORTANT NOTES

1 GENERAL NOTES:

(i) Unless otherwise specified in these tender documents mode of measurements specifications etc. shall be as per relevant IS codes.

(ii) Source of materials / samples / brands / makes etc. shall be got approved from the Architects / Bank before using. In case of deviations, decision of the Bank shall be final and binding and shall not be open for arbitration.

(iii) The Architects have their specific role / duties / rights as defined in these tender documents However in the event of any dispute arising out of differences between the opinions of the Architects and also their role/duties/rights, the Banks' decision shall be final & binding on the Architects and the Contractor and shall not be open to arbitration.

(i) The Contractor will extend full co-operation, support and all required assistance to Architect / Bank for discharging their duties and responsibilities efficiently and effectively.

(ii) The contractor has to supply and adhere to the specific makes and specifications of all the items, which are mentioned in the separate list of approved makes. Any work found not as per the tender specifications and list of approved the contractor has to replace the same without any delay. The contractor is instructed of get approval of all the materials to be used on this site before starting the work. He should provide different sample of material for approval, before execution of work.

(iii) All quantities indicated in the tender are approximate & are likely to change. The contractor must take actual measurement at site and billing shall be done as per the actual measurement of the work done at site.

(vii) Work has to be got executed at site in coordination with various agencies working at site.

(viii) The contractor is instructed to get the approval of the materials to be used on this site before starting the work. He shall provide different sample of materials for approval before execution of the work

(i) All material have to be used in full size/length only. Joints should be avoided as far as possible.

~~(ii)~~ Any item mentioned in the BOQ with "TO THE SHAPE" will have measurement of onsite executed to the shape area only.

(iii) Making various levels & line out for total layout on site for the items in scope of the work shall be done by the contractor

(iv)

(xv) MTC (Manufacturer Test certificate) Where ever applicable shall be arranged & submitted by the contractor. Testing of wood for moisture, knot % etc. shall be carried out by the contractor at his own cost.

2 IMPORTANT NOTES:

(i) The contractor's qualified & authorized representative shall remain on site during the entire execution process for coordination with various agencies / Architect / Bank & execution of work

(ii) The site shall be cleaned on day to day basis & all debris shall be disposed away at the location beyond the limit as approved by the local authority.

(iii) Hidden measurement. It is contractor's responsibility to get the measurement checked immediately on completion of such items. This shall be done before finishing the same & before ceiling boarding done. The Architect shall be provided with such details well in advance so that the other work is not held up due to last moment action.

(iv) The contractor shall coordinate with landlord for the locations of outdoor units & must inform Architect / bank / Electrical contractor about the power requirement to outdoor or indoor units

(v) The contractor must submit the detailed catalogue of each type machine as per BOQ along with technical bid.

(vi) The contractor must complete all low side on top most priority.

(vii) Before starting the contractor shall mark out the locations of outdoor & indoor locations of each machine, route of various types of piping, caballing, wiring etc. & submit the same to the architects for the approval. The approval of the drawing by the Architect shall in no way relieve the contractor from the responsibility of providing a complete and satisfactory installation and achieving and maintaining the stipulated design conditions. Any errors, omissions and shortfalls shall be rectified, and made good free of cost to the owner regardless of the fact that the installation may in the first place have been carried out as per the approved drawings.

(viii) The contractor shall mark the return air passage, location of machines with exact dimensions size of trap door requirement, Ducting drawing, Insulation, Acoustic insulation, on drawing & also on site (slab) before starting the work. The contractor shall design exact system of Air-conditioning installation as per the site requirement & the machine configuration & submit the same in auto cad format to the architects for approval purpose.

(ix) The tender shall be quoted in 1 name only without division of high side & low side work differentiation. Order shall be placed to one party (company itself or its authorized dealer) only & shall be billed for F.O.R. site

(x) The rates quoted shall be inclusive of all taxes, Duties, Octroi, Transportation, Delivery, Installation, Testing, Commissioning etc. complete at the site. No extra will be paid for any kind of taxes.

(xi) Guarantee: As given by the manufacturer but minimum one year from the date of successful commissioning. for the compressor the guarantee should be minimum five years

(xii) All A.C. units shall be with high ambient rotary / twin rotary / scroll compressor and shall carry 5 years warranty on compressors

(xiii) The entire job shall be executed in total coordination with the other agencies working on this Project & also with landlord, bank etc.

(xiv) Architect of the project shall be kept informed about the progress of the work at various stages

(xiv) All outdoor units shall be installed at the location recommended by the bank / architect / landlord

(xvi) The contractor must get the checked measurement of all hidden items i.e. refrigerant pipe, electrical caballing, drain pipe etc. before the false ceiling boarding is done or putting final finishes.

(xvii) The contractor shall arrange on his own for lighting & plug point with socket & electrical wiring, DB's etc.

required during entire execution process. However supply at point shall be provided by the bank / landlord

(xviii) Any Hidden item MUST be photographed and need to be sent via social media or CD to Architect / Bank

(xvv) Billing Process:

Along with final bill the contractor must submit:

- Abstract in tender BOQ format only
- schedules for detailed measurement sheet for all items (machine wise break up)
- separate as built drawings (Min. A3 size) marking exact locations of all works executed on site e.g. Location of outdoor & indoor units with numbering, route of refrigerant pipe, drain pipe, electrical caballing etc. with numbering W.R.T. the measurement sheet.
- detailed break up of fabrication work W.R.T. to various types of sections as per std. steel table
- original insurance policies as per tender terms within 3 days from the date of LOA
- completion certificate duly signed by the branch head / bank official
- testing & commissioning reports duly filled & for each machine duly signed by the client
- delivery challans for each machine duly signed by the client
- copy of LOA etc.
- All documents shall carry contractor's signature & seal with address.
- All documents shall be submitted in 1 plus 1 copies.
- The contractor shall also provide all measurement sheet in soft copy (in Excel format) & As built drawing in ACAD format

IMPORTANT: ALL DOCUMENTS SHALL BE SUBMITTED AT ONCE ALONG WITH FINAL BILL & SHALL BE DULY SIGNED BY PUTTING COMPANY'S ADDRESS SEAL.

LIST OF APPROVED MAKES FOR HVAC EQUIPMENT AND MATERIALS

Sl. No.	Details of the Items	Manufacturer's name
1.	**Package / Ductable units**	**Daikin, Hitachi, Carrier, Voltas**
2.	**Propeller Fans**	**Crompton**
3.	**Electric Motors**	**Crompton / Siemens/Bharat Bijlee**
4.	**Ventilation AHU**	**Suvidha / Cariyaire/Citizen/Cherub**
5.	**GI Sheet**	**Sail/TATA/ Jindal**
6.	**Grilles/Diffuser**	**Caryaire/Ravistar//Dynamic**
7.	**MS Dampers/Louvers**	**Tristar/ /Cherub**
8.	**Control Cables**	**Grandlay/Batra Henlay/Kalinga**
9.	**Power Cable**	**ICC/Polycab**
10.	**Nitrile rubber Insulation for ref pipe insulation**	**Eurabatax/Aeroflex/Totaline**
11.	**Flexible Duct Connection**	**Airflow/Pyroguard**
12.	**Gaskets**	**Neoprene rubber**
13.	**Adhesives**	**Fevicol / Superlon**
14	**Vibration Isolator**	**Resistoflex/Dunlop**
15.	**Filters/Air Showers**	**Dyna/Thermadyne/Cherub**
16.	Polyethylene for duct insulation	Supreme/Trocellene/Totaline
17.	Centrfugal / Axial fan	Flaxt/ PAF/ Chakshu
18.	Refrigerant Pipes	Rajco/Parasmani
19.	Casstte Units,VRV/VRF and Wall Mounted Split AC Unit	**Hitachi/ Daikin/ Mitsubishi Electric/ Mitsubishi Heavy Indu./Toshiba/ O General/ Voltas / Carrier/Blue Star**

ITEM	MAKE
Condensing Unit	HITACHI / BLUESTAR / TOSHIBA / CARRIER / MITSUBISHI ELECTRIC / MITSUBISHI HEAVY
VRF	HITACHI / BLUESTAR / TOSHIBA / CARRIER / MITSUBISHI ELECTRIC / MITSUBISHI HEAVY
AHU	ZECO/ EDGETECH/ CITIZEN/ ETA/ HUMIDIN/ JPC/ ETHOS
Copper Pipe	Maxflow/ Mandev/ Totaline
Copper Pipe Insulation	Aeroflex/ Armaflex/ K flex
Electric Cable	Polycab/ R R Cable/ Finolex
Drain Pipe	Astral/ Supreme/ Prince
VFD	DANFOSS/ ABB
TFA	ZECO/ EDGETECH/ CITIZEN/ ETA/ HUMIDIN/ JPC/ ETHOS
GI SHEET	JINDAL/ TATA / AMNS
Expanison Valve	Danfoss/ Sanhua/ Sporlon
DRIER	Danfoss
MS PIPE	JINDAL/ TATA
DUCT INSUALTION	ARMAFLEX/ AEROFLEX/ K FLEX
VAV Boxes	CONAIRE/ Dynacraft / Cosmos

Sign & Seal of contractor.

BILL OF QUANTITY (NOT TO BE FILLED)

BOQ FOR SUPPLY AND INSTALLATION OF TREATED FRESH AIR SYSTEM FOR SBI ADMIN OFFICE BUILDING, SURAT					
SR. No.	**Description of Item**	**Unit**	**Qty**	**Rate**	**Amount**
				Rs.	**Rs.**
A)	**PART 'A'**				
1	Supply, Installation, Testing and commissioning of DX Double Skinned Treated Fresh Air Handling Unit of 'AL' sections having thermal break profile with GI powder coated panels of double skinned construction internally insulated by rigid 43 mm thk PU foam having sandwich type access door, SS 304 drain pan, belt pully drive set, vibration pads and required distributors for expansion valve (a) Suitable DIDW Centrifugal backward curve belt driven Fan having Fan section (b) Filter section with required quantity of of HDP washable filters of EU-4 filteration capacity (c)Manually operated SA damper in Al construction (d) DX copper coil of 6 RD,12 FPI of suitable size (e) TEFC, squirrel cage induction motor (IE-2 Rated) of suitable HP with guards & to be supplied of appropriate capacity including assembly of AHU at site For Capacity				
1.1	2000 CFM	Nos.	2		
2.2	11.0 Tr Condesnor Unit (Minimum Twin Circuit) with Expasnion Valve kit	Nos.	2		
	TOTAL PART 'A'				
B)	**PART 'B'**				
1	**Refrigerant Piping and Expansion Valve Kit**				
	Supply & Installation of interconnecting Refrigerant copper pipe size insulated with 19 mm thick closed cell electrometric nitrile class 'O' type rubber tubular insulation between each set of AHU & outdoor units ,all piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger.				
2.1.1	Supply and Installtion of approved hard Copper Pipe with Insulation as per the specifications	RMT	80		
2.1.2	Installation, testing and commissioning of All Expansion Valve kit/ Multi kit and Accessories for above System as specified	Nos.	2		
2	**Drain Piping**				

2.2.1	Supply & Installation of 25 MM/32 MM Rigid UPVC piping complete with fittings,supports and duly insulated with 6 mm thick closed cell nitrile class 'O' rubber insulation.	RMT	50		
3	**Control & Transmission Wiring**				
2.3.1	Providing & fixing control cum transmission wiring of 3 core x 1.5 sqmm Shielded/Seathed flexible control cable between AHU Panel to Outdoor unit as per the specifications with necessorry supports which has to be liad in PCV Conduit.	RMT	160		
4	MS Stand for Outdoor/Indoor Units including supports required	KG	300		
5	**TFA AHU Electrical Starter Panel**				
	Design,Supply Installation testing and commissioning of below mentioned Electrical Panel with necessary control , interlocking and power cabling within the AHU room, Starter including auto manual selector switches, overload spp, phase indications, 4 Nos. non polarized NO-NC contacts for tripping on signal from fire dampers/Fire alarm panels. Panel build as per IP-55 rating in approved manner, termination of cables with approved cable glands within the AHU room or AHU loaction marked area(Cable from starter/Panel to AHU Motor is in client's scope. The AHU & VRF units should be controlled with wired Remote control)				
2.5.1	300 CFM to 2000 CFM	Nos.	2		
6	**Ducting Work**				
	Air distribution ducting made out of G.I. sheet including collars, class VIII conforming to IS 655 including supports, bracing, flanges, turning vanes, fasteners, rivets, gaskets, nuts & bolts, etc. complete at every 2.4 m c/c & at bends etc. as per specifications.				
2.6.1	0 - 750 mm : 24 Gauge	SQM	345		
2.6.2	Plenum : 22 Gauge	SQM	50		
2.6.3	SITC of Insulated Flexible Duct 6/8"	RMT	50		
2.6.4	SITC of PVC Duct 6/8" (Insulation to be done as per item no. 2.7.1 billing will be done seperately)	RMT	150		
7	**Insulation Work**				
2.7.1	Supply & Installation having 19 mm thick closed cell nitrile class 'O' rubber insulation with aluminium sheet/foil on Supply/Return Ducting	SQM	550		
8	**Accoustic Work**				

2.8.1	Duct Insulation applied inside of duct work with 25mmm thick rigid fiber Glass 48 Kg/Cum density covered with RP tissiue and finished with 26 G Al./GI perforated sheet or equivalent Accoustic.	SQM	50		
9	**Supply / Return Air - Diffuser/Grille**				
2.9.1	Supplying and fixing of supply air square diffusers of powder coated aluminium with OBD (aluminum volume control collar damper anodized in matt black shade) as per specifications complete as required.	SQM	1		
2.9.2	Disc Valve of 4"	Nos.	25		
2.9.3	Disc Valve of 6"	Nos.	5		
10	**Volume Control Duct Damper**				
2.10.1	Supply, installation, testing and balancing of galvanized steel construction opposed blade volume control duct dampers, blades & casing both to be of as per approved drawings and specifications.	SQM	2		
11	**Canvass Connection**				
2.11.1	Supply and Fixing of flexible Rexin connection	SQM	2		
13	Civil Work (Will be in client Scope)	Lot	1		
14	Supply and Installation of CO2 Sensors as per approved Make	Nos.	7		
	TOTAL PART 'B'				
	Total PART 'A + B' Excluding GST				
	GST is Applicable @28% On Part-A GST is Applicable @18% On Part-B				

[1] Rate quoted shall include all Taxes such as Sales Tax, VAT, Excise, Octroi, etc. including transportation charges. Excluding GST [GST will be Paid Extra as per Applicable Norms]

[2] 1 Years of M/C warranty with 6 free services and 5 years warranty for compressor shall be provided by the supplier.

[3] The Standard installation charges for the high wall split A.C shall include 5 meter Each of Refrigerant pipe, Electrical Wiring [Copper Pipe and Electric cable total length for all new AC machines shall be measured and standard Length for all the new AC machines shall be deducted and difference shall be paid]

[4] All Civil work such as Masonry work slice breaking away and making good of walls, floors slab etc. Required to be executed in the A.C system installation is the part of the scope of project. (Rate quoted shall included in Low side work items)

[5] The Entire Job Shall be Executed in Total Co. Ordination with the Other Agencies Working on this Project more particularly with the False Ceiling and Electrical work.

Sign & Seal of contractor.