

Tender ID	SBI/IFSCBU/20230104
Date	05/01/2023



STATE BANK OF INDIA

INVITES ONLINE E-TENDER

FOR

PROPOSED AIR CONDITIONING WORK FOR IFSC BANKING UNIT, AT 13TH FLOOR,
HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR

FROM

THE EMPANELLED AIR CONDITIONING CONTRACTORS FOR AHMEDABAD CIRCLE UNDER
THE CATEGORY OF WORKS UP TO Rs. 25.00 LAKHS AND ABOVE (AS PER THE LIST
ENCLOSED)

THE LAST DATE OF SUBMISSION OF ONLINE TECHNICAL BID& ONLINE INDICATIVE PRICE
BID: **20.01.2023 UP TO 3:00 PM**

NO PHYSICAL SUBMISSION OF DOCUMENTS REQUIRED EXCEPT PROCESS COMPLIANCE
FORM.

PART - A: TECHNICAL BID

TENDER SUBMITTED BY:

NAME : _____

ADDRESS : _____

DATE : _____

Architect:

M/s. Vijay Sahijwani & Associates

Consulting Architect Engineers, Interior Designers &
Govt. Approval Valuers

55, Sahyadri Apartment, Near Stadium Circle.

Navrangpura, Ahmedabad - 380 009

NOTICE INVITING TENDERS

SBI invites E-tender through its Architect M/s.Vijay Sahiwani & Associates “**Online e-tenders in two bid system i.e. online technical bid and online price bidding**” from the SBI Empanelled Air Conditioning contractors of Ahmedabad Circle for Air Conditioning works for IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR. **Please note that there will be E-reverse auction conducted.**

The details of tender are as under:

S.No.	Description	
1.	Name of work	PROPOSED AIR CONDITIONING WORK FOR IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR
2.	Nature of Work	AIR CONDITIONING Work
3.	Time allowed for completion	45 days from date of acceptance of work order
4.	Tender Fees	NA
	Estimated Project Cost	Rs. 11,50,000=00
5.	Earnest Money Deposit	Rs. 11,500 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 GANDHINAGAR. [Those registered with MSMEUDYAM need not submitted EMD. Instead DD, Valid MSME UDHYAM certificate shall be uploaded]
6.	Initial Security Deposit	2% of contract value Including EMD (Non interest bearing ISD to be submitted by the L1 Bidder)
7.	Total Security Deposit	5% of the final bill amount
8.	Start and end date for downloading of tender documents form Bank's website	05.01.2023 to 20.01.2023 at www.sbi.co.in under<Link><SBI in the news >procurement news.
9.	Last date & time for submission of online Technical bid and Online Indicative Price Bid	20.01.2023 up to 3:00 pm
10.	Address at which EMD & Process compliance form has to be submitted	Deputy General Manager State Bank of India IFSC Bank Unit, 14th Floor, Hiranandani Signature Tower SEZ GIFT CITY Gandhinagar-382355
11.	Date and time of opening of online Technical bid & Online Indicative Price bid at SBI address mentioned at Sr. No.10	20.01.2023 at 03:30 pm

12.	E-Tendering will be conducted by our approved e-tendering consultant	M/s. Antares Systems Limited, Registered Office: #24, Sudha Complex, 3 rd Stage, 4 th Block, Bangalore – 560079, Mr. Kushal Bose MobileNo.: +91 9674758719 e-Mail: kushal.b@antaressystems.com Mr. Pravesh MobileNo.: +91 9044314492 e-Mail: praveshmani.t@antaressystems.com www.tenderwizard.com/SBIETENDER
13.	Date & time for e-reverse auction	Date & time for e-reverse auction Will be Informed to qualified contractor separately
14.	Liquidated Damages	0.50% of contract amount per weeks subject to max. 5% of contract value or final bill value.
15.	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.
16.	Defects Liability Period	12 Months from the date of Virtual Completion
17.	Validity of offer	90 days from the date of opening of Price-bid
18.	Value of Interim Certificate	Rs. 5.75 Lakhs (No advance on materials / plant / machinery or mobilization advance shall be paid under any circumstances)
19.	Insurance	The contractor shall obtain all necessary insurance policies as per the governing laws applicable at the centre & shall require to produce the original policy of Insurance & receipt of the premium as applicable in the matter to the Architect/Bank.
20.	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. Bank will recover 0.5% of the final bill amount towards consumption of water & electricity.
21	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.	
22	The contractor shall read and understand each page of the tender document thereby ensuring the number and sequence of all pages.	
23	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.	

24	The SBI reserve their rights to accept or reject any or all the tenders, either in whole or in part without assigning any reason(s) for doing so and no claim / correspondence shall be entertained in this regard.
25	Tenders received without EMD and 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	In case the date of opening of tenders is declared as a holiday, the tenders will be opened on the next working day at the same time.
27	SBI has the right to accept / reject any / all tenders without assigning any reasons and no correspondence shall be entertained in this regard.
28	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.
29	Bank reserves right to cancel any / all tender sat any stage without assigning any reasons.
30	The Bank reserves the right to accept the tender in full or in part and the tenderer shall have no claim for revision of rates or other condition if his tender is accepted in parts.
31	In case the date of online tendering is declared as a holiday, the online tendering will be conducted on the next working day at the same time.
32	SBI reserves the right to accept or reject any or all the tenders without assigning any reason whatsoever. 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.
33	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.
34	IT'S VACANT PREMISE.

Yours Faithfully,

Deputy General Manager
State Bank of India
IFSC Bank Unit,
14th Floor, Hiranandani Signature Tower
SEZ GIFT CITY
Gandhinagar-382355

LIST OF EMPANELLED AIR – CONDITIONER CONTRACTOR UPTO RS. 25.0 LAKH

SR. NO.	NAMEOF CONTRACTOR & ADDRESS	CONTACT NOS. & EMAIL ID
1.	Pronify Trunkey Solutions, 23E, Laxmi Industrial Estate, Ne Link Ropad, Andheri (west) Mumbai - 400053	9833889913 proinfyturnkeysolutions@gmail.com
2.	CanceptMarketiing Payal Park Society, Near TVS Motors, Opp. Central Excise Building, B/h. Subharnpura Garden, Vadodara 390023	9825041848 / 9909031848 info@concept.net.in
3.	HNCP Enterprise A/B, Someshwar Tenament, Opp, NishanVidyalay, Arjun Ashram Road, Ranip Ahmedabad - 382480	8849696150 hcpenterprise@gmail.com
4.	Sharda Refrigeration 35, Surya Darshan Complex, Rubber Factory Circle, Bhavnagar	9426261853 shardarefrigeration@haoo.co.in

LIST OF EMPANELLED AIR – CONDITIONER CONTRACTOR UPTO RS. 50.0 LAKH

SR. NO.	NAMEOF CONTRACTOR & ADDRESS	CONTACT NOS. & EMAIL ID
1	System Designing, 102 Aggam Complex, Nr. Telephone Ecchange, Vasna, Ahmedabad	9825024651 Sdesign_trs@yahoo.com

LIST OF EMPANELLED AIR – CONDITIONER CONTRACTOR UPTO RS. 100.0 LAKH

SR. NO.	NAMEOF CONTRACTOR & ADDRESS	CONTACT NOS. & EMAIL ID
1	Parnam HVAC Engineering Pvt. Ltd. A405/406, Neelkanth Palace, 4 th . Floor, Nr. Seema Hall, 100 Ft Anandnagar Road, Satellite, Ahmedabad 380015	9979866401 pranamhvac@gmail.com
2.	Chill Air system 1 & 2 Induchacha House, Chhani Road, Jakat Naka Baroda - 390002	9825603471 / 9825083471 chillairsystems@gmail.com

FORM TENDER

To,
Deputy General Manager
State Bank of India
IFSC Bank Unit,
14th Floor, Hiranandani Signature Tower
SEZ GIFT CITY
Gandhinagar-382355

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	PROPOSED AIR CONDITIONING WORK FOR IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR
Earnest Money	Rs. 11,500 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 GANDHINAGAR.
Percentage, if any, to be deducted from Bills and total amount to be retained	10 % from Running Bills, subject to maximum Total 5% of contract amount or actual Final Bill value.
Time allowed for completion of the Works from fourteenth day after the date of written order or date of handing over of the site (whichever is later) to commence the work	45 days

I/We have deposited a sum of **Rs. 11,500/-** 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 sum shall be forfeited by me/us to SBI.

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 PROPOSED AIR CONDITIONING WORK FOR IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR

Business rules for E-tendering

1. Only AHMEDABAD CIRCLE **empanelled AIR CONDITIONING contractors** under appropriate categories 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 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. Online E-tendering:

- (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 hereinabove 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 fails 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. 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, IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR

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 SBI, on behalf of SBI, having its office at Mumbai here in after called "the Service Provider" of the One Part and

WHEREAS the SBI is desirous of and has caused drawings and specifications describing the work to be done to be prepared by **M/s. Vijay Sahijwani & Associates**, its Architects.

AND WHERE AS the said Drawings numbered _____ to _____ Inclusive, the Specifications and the Schedule of Quantities have been signed by or on behalf of the parties hereto.

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 **M/s.**, 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 bid by submit themselves to the said Conditions and perform the Agreement son 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 Interior Furnishing 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 hereby 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 **GANDHINAGAR**.
- 10) All disputes arising out of or in any way connected with this agreement shall be deemed to have arisen at Gandhinagar and only the courts in Gandhinagar 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

_____ By the (Employer)

Hand of Shri _____

(Name and Designation) In the presence of:

(Signature of Employer)

1) Shri /Smt. ___

(Signature of Witness)

Address _____

(Witness)

SIGNED AND DELIVERED by the

_____ By the
(Contractor)

(Signature of Contractors)

In the presence of:

Shri/ Smt. _____

(Signature of Witness)

Address _____

(Witness

SECTION – 1

INSTRUCTIONS TO THE TENDERERS

1.0 Scope of work

Technical bid followed by price bidding are invited by **M/s. Vijay Sahijwani & Associates, Ahmedabad** for and behalf of SBI for Proposed AIR CONDITIONING WORK for **IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR**

1.1 Site and its location - IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR

2.0 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:

3.1 The tenderer must obtain himself on his own responsibility and his own expenses all information and data that 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 satisfy himself regarding the availability of water, power, transport and communication facilities, the character quality and quantity of the materials, labour, the law and order situation, 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.

4.0 Earnest Money:

4.1 The tenderers are requested to submit the Earnest Money of Rs. 11,500 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 GANDHINAGAR.

4.2 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

4.3 No interest will be paid on the EMD.

5.0 Initial Security Deposit:

5.1 Security Deposit:

Total security deposit shall be 5% of contract value including EMD. Deduction from each running bill account will be @ 10% till Total Security Deposit (TSD) reaches to 5% 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.

5.2 Signing of contract Documents:

The contractor who accepts 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.

6.0 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.

7.0 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.

8.0 Liquidated Damages:

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

9.0 Rate and Prices:

9.0.1 In case of item rate tender:

The bidder should be signed each page of the estimated BOQ by the authorized person and cutting or over writing shall be duly attested by him. Each page shall be totaled and the grand total shall be given. 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 each page of the BOQ shall be signed by the authorized person and cutting or over writing shall be duly attested by him. Each page shall be totaled and the grand total shall be given.

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) Any item mentioned in the BOQ with "TO THE SHAPE" will have measurement of onsite executed to the shape area only.
- (xiii) 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.
- (xiv) 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 contractor shall prepare all loose furniture items at his workshop only & deliver the same to the site at appropriate time as instructed by the Architect/BMs/Bank Officials.**
- (iv) 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) Before starting the work at site, the contractor shall mark out the plan & levels of the false ceiling, partitions etc. in coordination with other agencies on site.**
- vii) 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.
- f) Test report for Toughened Glass.
- 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.
- l) Original receipt of purchase of Corian/plywood/Gypboard and other major materials used in the work from the original manufacturer/authorized dealers/distributors.
- 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 SBI (client) and the contractor, together with the documents referred there in 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.

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

1.0.1 ‘SBI shall mean SBI having its Office at 14th Floor, Hiranandani Signature Tower, SEZ GIFT CITY, Gandhianagr - 382355 and includes the client’s representatives, successors and assigns.

1.0.2 ‘Architects/ Consultants’ shall mean **M/s Vijay Sahijwani & Associates**, Architects & Interior Designers, Ahmedabad.

1.0.3 ‘Site Engineer’ shall mean an Engineer appointed by the SBI at site as their representative for day-to-day supervision of work and to give instructions to the contractors.

1.0.4 ‘The Contractor’ shall mean the individual or firm or company whether incorporation, undertaking the works and shall include legal personal representative of individual or the composing the firm or company and the permitted assignees of individual or firms of company.

The expression ‘works’ or ‘work’ shall mean the permanent or temporary work description in the “Scope of work” and/or to be executed in accordance with the contract includes materials, apparatus, equipment, temporary supports, fittings and things of kinds to be provided, the obligations of the contractor hereunder and work to be done by the contractor under the contract.

1.0.5 ‘Engineer’ shall mean the representative of the Architect/Consultant.

1.0.6 ‘Drawings’ shall mean the drawings prepared by the Architects and issued by the Engineer and refer red 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 value of the entire work as stipulated in the letter of acceptance of tender subject such additions there to or deductions there from as may be made under the provide herein after contained.

1.0.7 ‘Specifications’ shall mean the specifications referred to in the tender and modifications thereof as may time to time be furnished or approved by the Architect/Consultant.

1.0.8 “Month” means calendar month.

1.0.9 “Week” means seven consecutive days.

1.0.10 “Day” means a calendar day beginning and ending at 00 Hrs and 24 Hrs respectively.

1.1.11 "SBI Engineer" shall mean The Civil/Electrical Engineer in-charge of the Project, as nominated by the DGM, SBI, GANDHINAGAR.

1.1.12 The following shall constitute the Joint Project Committee (herein under referred to as JPC) for assessing and reviewing the progress of the work on the project and to issue instructions or directions from time to time for being observed and followed by the Architects Site Engineer / PMC and other consultants / contractors engaged in the execution of the project.

- i) Assist General Manager – (P & E)
- ii) SBI Engineer (Furniture and Electrical) in-charge of the Project.
- iii) Concerned partner of the Architects and their Resident Architect Member.

CLAUSE

1.0 Total Security Deposit:

Total security deposit shall be 5% of contract value. Deduction from each running bill account (if permitted) will be @ 10% till Total Security Deposit (TSD) reaches to 5% of contract value. The 50% of the Total Security Deposit shall be paid to the contractor 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.

1.1 Earnest Money Deposit:

Rs. 11,500 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 payable at GANDHINAGAR**. The EMD/ any other amount with the Bank shall stand absolutely forfeited if the tenderer revokes his tender after acceptance of rate at any time the period when he is required to keep his tender open acceptance by the SBI or after it is accepted by the SBI, the contractor fails to enter into a formal agreement or fails to commence the work within the stipulated time.

1.2 Initial Security Deposit (ISD): 2% of contract value Including EMD Non interest bearing ISD to be submitted by the L1 Bidder in the form of DD/BC in favour of "State Bank of India" Payable at GANDHINAGAR".

1.3 Retention Money:

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 plus Retention Money shall both together not exceeding 5% of the contract value including EMD. The 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 contractors without interest within fifteen days after the end of defects 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 the item in the specifications and descriptions in bills of quantities of the same item, the former shall be adopted:
 - a) In case of difference between rates written in figures and words, the rate in words 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/awarded work in every respect strictly accordance with this contract and with the directions of and to the satisfaction Bank to be communicated through the architect/consultant. The architect/consultant at the directions of the SBI from time to time issue further drawings and / or write instructions, details directions and explanations which are here after collectively references to as Architect's / consultant's instructions in regard to the variation or modification of the design, quality or quantity of any work or the addition or omission or substitution work. Any discrepancy in the drawings or between BOQ and / or drawings and/or specifications. The removal from the site of any material brought thereon by the Contractor and any substitution of any other materials therefore the removal and/or re- execution of any work executed by him. The dismissal from the work of any person engaged the re upon.

5.0 i) Letter of Acceptance:

Within the validity period of the tender the SBI shall issue a letter of acceptance directly or through the architect by registered post or otherwise depositing at the 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 bind 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 there of shall sign an agreement in 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 architects / consultants shall furnish with reasonable proper additional instructions by means of drawings or otherwise necessary for the execution of the work. All such drawings and instructions shall be consistent with contract documents, true developments thereof and reasonably inferable there.

The work shall be executed in conformity there with and the contractor 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 the architect/consultant

7.1 Copies of agreement:

Two copies of agreement duly signed by both the parties with the drawings shall be handed over to the contractors.

8.0 Liquidated damages:

If the contractor fails to maintain the required progress in terms of clause 6.0 of GOC 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 at the rate of 0.50% of the contract value which subject to a maximum of 5% of the contract value.

9.0 Materials, Appliances and Employees:

Unless or otherwise specified the contractor shall provide and pay for all materials, labour, 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 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 anyone not skilled in the work assigned to him. Workman whose work or behavior is found to be unsatisfactory by the SBI /Architect/ consultant he shall be removed from the site immediately.

10.0 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 notices 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 the reform and shall indemnify the SBI any legal actions arising there from.

11.0 Setting out Work:

The contractor shall set out the work and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof and get it approved by the architect / consultant before proceeding with the work. If 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 ad shall his own expenses rectify such error, if so, required to satisfaction of the SBI

12.0 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 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 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 bodies' safety laws and building codes to prevent accidents, or injuries to persons or property on about or adjacent to his place of work. The contractor shall take insurance covers as per clause at his own cost. The policy may be taken in joint names of the contractor and the SBI and the original policy may be lodged with the SBI.

13.0 Inspection 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 lying 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.

14.0 Assignment and subletting:

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

15.0 Quality of materials, workmanship & Test:

All materials and workmanship shall be best of the respective kinds described in the contract and in accordance with Architect/consultant instructions and shall be subject from time to time to such tests as the architect/consultant may direct at the place of manufacture or fabrication or on the site or 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 in corporation in the work for testing as 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 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 reasonable 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 in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials / 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 specification or BOQ.

iv) Costs of tests not provided for:

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

a) If so intended by or provided 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 or 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.

16.0 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 nor 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.

17.0 Contractor's superintendence:

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

18.0 Quantities:

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. The entire amount paid under Clause 19, 20 hereof as well as amounts of prime cost and provision sums, if any, shall be excluded.

19.0 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 quantity representative to assist the Architect in taking such measurements and calculation 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 detail in the specifications. The representative of the Architect / Consultant shall take 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 M book should the contractor not attend or neglect or omit to depute his representative to take measurements 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 such measurement.

20.0 Variations:

No alteration, omission or variation ordered in writing by the Architect/consultant vitiates the contract. In case the SBI/ Architect / Consultant thinks proper at any during the progress of works to make any alteration in, or additions to or omission 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 shall confirm in writing within seven days of giving such oral instructions the contract shall alter to, add to, or omit from as the case may be in accordance with such 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, alterations, 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 maybe.

21.0 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.

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

The net prices 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.

Where the extra works are not of similar character and/or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items 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.

Where extra work cannot be properly measured or valued the contractor shall be allowed day work prices at the net rates stated in the tender, of the BOQ or, if not, so stated then in accordance with the local day work rates and wages 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.

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, labour hire / running charges of equipment and wastages etc. plus 15% towards establishment charges, contractor's overheads and profit. Such items shall, not be eligible for escalation.

22.0 Final measurement:

The measurement and valuation in respect of the contract shall be completed within two months of the virtual completion of the work.

23.0 Virtual Completion Certificate (VCC):

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

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

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

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

Shall put the SBI in undisputed custody and possession of the site and all land allot by the SBI

Shall hand over the work in a peaceful manner to the SBI

All defects / imperfections have been attended and rectified as pointed out by the Architects to the full satisfaction of SBI

Upon the satisfactory fulfillment by the contractor as stated above, the contractor is entitled to apply to the Architect / consultant is satisfied of the completion of work. Relative to which the completion certificate has been sought, the Architect/ consultant shall within fourteen (14) days of the receipt of the application for completion certificate, issue a VCC in respect of the work for which the VCC has applied.

This issuance of a VCC shall not be without prejudice to the SBI rights and contractor liabilities under the contract including the contractor's liability for defects liability nor shall the issuance of VCC in respect of the works or work at any site be construction as a waiver of any right or claim of the SBI against the contractor in respect of or work at the site and in respect of which the VCC has been issued.

24.0 Work by other agencies:

The SBI / Architect / consultant reserves the rights to use premises and any portion 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.

25.0 Insurance of works:

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 of 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 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.

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.

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.

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 if insurance and the receipts for payment of the current premiums.

26.0 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 on, 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 damage to persons or property 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 claims, 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.

27.0 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 sub-clause 26.0 of this clause.

28.0 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 to 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.

29.0 Third Party Insurance:

Before commencing the execution of the work the contractor but without limiting his obligations and responsibilities under clause 25.0 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 25.0 thereof.

30.0 Minimum amount of Third Party Insurance:

Such insurance shall be affected with an insurer and in terms approved by the SBI which approval shall not be reasonably withheld and for 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 Lakh 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.

31.0 Accident or Injury to workman:

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

32.0 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 persons are employed by him on the works and shall, when required, produce to the architect / consultant such policy of insurance and receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor the contractor's obligation to insured 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.

33.0 Remedy on contractor's failure to insure:

If the contractor fails to effect and keep in force the insurance 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.

Without prejudice to the others rights of the SBI against contractors. 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 contractors 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 goods destroyed or damaged.

34.0 Commencement of Works:

The date of commencement of the work will be reckoned from the date of award of letter by the SBI

35.0 Time for completion:

Time is essence of the contract and shall be strictly observed by the contractor. The entire work shall be completed within the stipulated period 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.

36.0 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 of contract. If the contractor needs an extension of time for the completion of 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 reason in detail and his justification if an', 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 time which will qualify for levy of liquidated damages. For the balance period in excess of original stipulated period and duly sanctioned extension of time by the provision of liquidated damages as stated under clause 10.0 shall become applicable. Further the contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not.

37.0 Rate of progress:

Whole of the materials, plant and labour to be provided by the contractor and the mode, manner and speed of execution and maintenance of the works are 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 the. Architect / consultant too Slow to ensure the completion of the whole of the work the prescribed time or extended time for completion the Architect/consultant shall the re upon 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 he will be entitled to raise any claims arising out of such directions.

38.0 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 works 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.

39.0 No compensation or restrictions of work:

If at any time after acceptance of the tender SBI shall decide 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 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 what so ever 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 consequence of the fore closure 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 portion thereof and then taken back by the contractor, provided however that the Architect/Consultant shall have in such cases the option of taking over all or any such materials at their purchase price or a local current rate whichever is less.

In case of such stores having been issued from SBI stores and returned by the contractor to stores, credit shall be given to him at the rates 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 Architect / consultant shall be final.

40.0 Suspension of work:

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 works or any part the offer such time and in such manner as 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 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 default the contractor, or
- c) For safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works the extent necessary and carry out the instructions given in that behalf by the Architect / consultant.

i) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:

The contractor shall be entitled to an extension of time equal to the period of every such suspension. No compensation whatsoever shall be paid on this account.

41.0 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:

To rescind the contract (of which rescission notice in writing to the contractor by - 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.

To employ labour paid by the SBI and to supply materials to carry out the work, or part of the work, debiting the contractor with the cost of the labour and materials cost of such labour and materials as worked out by the Architect / consultant shall 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 manner and at the same rates as if it had been carried out by the contractor under the terms of this contract certificate of architect /consultant as to the value of work done shall be final conclusive against the contractor.

To measure up the work of the contractor, and to take such part thereof as shall 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 (The amount of which excess the certificates in writing of the Architects / consultant shall final and conclusive) shall be borne by original contractor and may be deducted any money due to him by 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 to 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 incase the contract shall be 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 titled to be paid the value so certified.

42.0 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 dye 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:

has abandoned the contract; or 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 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 andrejected bythe 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 contactor 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 of the SBI or Architect's / 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 powers of 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 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, took 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 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 complement and finishing or using the materials and plant for the works.

When the works shall be completed or as soon thereafter as convenient the SBI Or 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 receive thereof by him the SBI sell the same by publication, and after due publication, and shall, adjust the amount realized by such tender. The contractor shall have no right to question any of the act of the SBI incidental to the sale of the materials etc.

43.0 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 certificate to payment from SBI From time to time SBI shall recover the statutory recovering other dues including the retention amount from the certificate of payment. Provided always that the issue of any certificate by the Architect / consultant during progress of works or completion shall not have effect as certificate of satisfaction relieve the contractor from his liability under clause.

The Architect / consultant shall have power to withhold the certificate if the work or in part thereof is not carried out to their satisfaction. The Architect/consultant may by any certificate make any corrections required previous certificate. The SBI shall modify the certificate of payment 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 Measurement books. The Contractor shall not submit interim bills.

The final bill may be submitted by contractor within a period of one month from the date of virtual completion and 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.

The contractor shall submit the interim bills in the prescribed format with all details.

44.0

A. Settlement of Disputes and Arbitration:

Except where otherwise provided in the contract all questions and disputes 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, instructions 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:

If the contractor considers 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 contractor raise any dispute, the contractor shall forthwith give notice in writing of his claim, or dispute to The **DGM IFSC, SBI, GANDHINAGAR** 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 give 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 SBI 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 **DGM IFSC, SBI, GANDHINAGAR** 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 **DGM IFSC, SBI,**

GANDHINAGAR in writing in the manner and within the time aforesaid.

B. Settlement of Disputes and Arbitration:

The **DGM IFSC, SBI, GANDHINAGAR** shall give his decision in writing on the claims notified by the receipt of the contractor may within 30 days of the receipt of the decision of the Submit his claims to the conciliating authority namely the **DGM IFSC, SBI, GANDHINAGAR** for conciliation along with all details and copies of correspondence exchanged between him and the SBI.

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 DGM of the SBI for appointment of an arbitrator to adjudicate the notified claims falling which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.

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 SBI shall be referred for adjudication through arbitration by the Sole Arbitrator appointed by the GM RHOSA who will be of Deputy General Manager rank. It will also be no objection to any such appointment that the Arbitrator so appointed is a SBI, Officer and that he had to deal with the matters to which the Contract relates in the course of his duties as SBI, 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 GM RHOSA of the SBI Such person shall be entitled to proceed with the reference from the stage at which it was let 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 or any accordance modification or reenactment thereof and the rules made there under.

It is also a term of the 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 SBI Officer.

It is also a term of the 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 arbitrators shall, if required to be paid before the award is made and published, be paid half and half by each of the 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.

45.0 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 condition.

- i) That the water used by the contractor shall be fit for construction purposes to the satisfaction of the

Architect /consultant's.

ii) The contractor shall make alternative arrangements for the supply of water if the arrangement made by the contractor for procurement of water in the opinion of the Architect / consultant is unsatisfactory.

iii) In case contractor is permitted to use SBI source of water i.e. Municipal connection, Bore well (existing or new) etc., the SBI will recover as per clause **51.0** of this document from the final bill of contractor.

The contractor shall construct temporary well / tube well in SBI Pvt. Ltd 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 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.

46.0 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, by 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 approval from the appropriate authorities, if required.

In case contractor is permitted to use Bank's source of power supply provided at one point, the SBI will recover as per clause **51.0** of this document from the final bill of contractor.

47.0 Treasure trove etc.

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

48.0 Method of measurement:

Unless otherwise mentioned in the schedule of quantities or in mode of measurement, the measurement will be on the net quantities or work produced in accordance with up to date 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 corrector.

49.0 Maintenance of registers:

The contractor shall maintain the following registers as per the enclosed perform 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 / Govt. from time to time.

- i) Register for secured advance
- ii) Register for hindrance to work
- iii) Register for running account bill
- iv) Register for labour

50.0 Force Majeure:

Neither contractor nor SBI shall be considered in default in performance of the obligations if such performance is prevented or delayed by events such as but not war, hostilities revolution, riots, civil commotion, strikes, lockout, conflagrations, epidemics, accidents, fire, storms, floods, droughts, earthquakes or ordinances or any act of or for any other cause beyond the reasonable control of the party affected or prevents 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.

As soon as the cause of force majeure has been removed the party whose ability 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.

From the date of occurrence of a case off or force majeure obligations of the party affected.

51.0 Water power and other facilities:

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

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

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 connection 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 reimburse the amount on production of receipts.

The SBI as well as the Architect / consultant shall give all possible assistance to the Contractor's to obtain the requisite Permission from the various authorities, but the responsibility for obtaining the same in time shall be of the contractor.

In case contractor is permitted to use Bank's source of water and power supply provided at one point, the SBI will recover @ 0.50% of final bill amount for water and electricity (Combined) from the bill of contractor.

52.0 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 arrangements at his own cost for transport where necessary for his staff and workmen to and from site of work at his own cost.

53.0 Lighting of works:

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

54.0 Firefighting arrangements:

The contractor shall provide suitable arrangement for firefighting at his own cost. 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 this equipment shall be provided at suitable prominent and easily accessible place and shall be properly maintained.

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

- a) Proper handling, storage and disposal of combustible materials and waste.
- b) Work operations which can create fire hazards.
- c) Access for fire-fighting equipment.
- 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 equipment.
- f) General housekeeping.

55.0 Site order book:

A site order book shall be maintained at site for the purpose of quick communication between the Architect / Consultant. Any communication relating to the work 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 triplicate and shall be carefully maintained and preserved by the contractor and shall be made available to the architect /consultant as and when demanded- Any instruction which the architect/consultant may like to issue to the contractor or the contractor 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 acknowledgment and the second copy will be retained for their record.

56.0 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.

57.0 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.-

58.0 Disposal of refuse:

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

59.0 Contractor to verify site measurement:

The contractor shall check and verify all site measurements whenever requested other specialists contractors or other sub-contractors to enable them to prepare the own shop drawing and pass on the information with sufficient promptness as will in any way delay the works.

60.0 Displaying the name of the work:

The contractor shall put up a name board of suitable size as directed by the architect/ consultant indicating there in 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.

61.0 As built drawings:

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 some changes have been made. From the approved drawings as instructed by the SBI / Architect / Consultant. The contractor will make the changes made on these copies and return these copies to the architect / Consultant for their approval. In cases 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 incorporated these corrections and / or attend to discrepancies either on copies as directed by the architect / consultant and resubmit to him for approval. The architect / consultant will return one copy duly approved by him.

For the drawings prepared by the contractor:

The contractor will modify the drawing prepared by him wherever the changes made by the SBI / 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.

62.0 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 treatment, aluminum doors and windows and any other item as specified in the tender. The architect/consultant may approve any make / agency within the approved list as given in the tender after inspection of the sample/mockup.

63.0 Procurement of materials:

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

64.0 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 sales tax, tax on works contract excise duty, and Octroi, payable in respect of materials, equipment plant and other things required for the contact. All of 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, fees, levies etc. if any, till completion of work shall be deemed to be included in the quoted rates and no extra amount on this account. Variation of taxes, duties, fees, 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 statutory law during the currency of contract the same shall be borne by the contractor. However, GST will be paid extra.

65.0 Acceptance of tender:

The SBI shall have the right to reject any or all tenders without assigning any reason. They are not to bind 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

66.0 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.

67.0 Safety Codes:

1. First aid appliances including adequate supply of sterilized dressing and cotton wool shall be kept in a readily accessible place.
2. An injured person shall be taken to a public hospital without loss of time, in cases when the injury necessitates hospitalization.
3. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from the ground.
4. 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.
5. 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.
6. 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.
7. No floor, roof or other part of the structure shall be so overloaded with debris or material as to render it unsafe.
8. 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.
9. Those engaged in welding works shall be provided with welders' protective eye shield and gloves.
10. (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.
11. 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.
12. Hoisting machines and tackle used in the works including their attachments anchor and supports shall be in perfect condition.
13. The ropes used in hoisting or lowering material or as a means of suspension shall be durable quality and adequate strength and free from defects.

APPENDIX HEREIN BEFORE REFERRED TO

- 1) Name of the organization Offering Contract : Deputy General Manager
State Bank of India
IFSC Bank Unit,
14th Floor, Hiranandani Signature Tower
SEZ GIFT CITY
Gandhinagar-382355
- 2) Consultants : Ar. Vijay Sahijwani & Associates
- 3) Site Address : **SBI, IFSC BANKING UNIT,
AT 13TH FLOOR, HIRANANDANI
SIGNATURE TOWER, SEZ GIFT CITY,
GANDHINAGAR**
- 4) Scope of Work : Proposed AIR CONDITIONING Work for
**IFSC BANKING UNIT, AT 13TH
FLOOR, HIRANANDANI SIGNATURE
TOWER, SEZ GIFT CITY,
GANDHINAGAR**
- 5) Name of the Contractor : _____

- 6) Address of the Contractor : _____

- 7) Period of Completion : within the stipulated period from the date
of Issue of work order.
- 8) Earnest Money Deposit : **Rs. 11,500/-** 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 favor of **SBI payable
at GANDHINAGAR.**
- 9) Retention Money : As per clause no. 1.4 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.) : **Rs. 5.75 Lakhs** (No advance on material, plant, machinery or mobilization advance shall be paid under any circumstance)
- 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 Certificate (VCC) issued by the project Architect.
- 16) Initial Security Deposit : 2% of the Accepted Value of the Tender Including EMD (Non interest bearing ISD to be submitted by L1 Bidder)
- 17) Total Security Deposit : 5% of the final bill amount or contract value
- 18) Refund of Total Security Deposit : 50% of the Security Deposit Shall be refunded to the Contractor on completion of the work/along with the final bill and balancerefunded only after the Defect LiabilityPeriod is over.
- 19) Period for Honoring Certificate : One Month for RA.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 Tenderer.

Date:

LETTER OF DECLARATION

To,
Deputy General Manager
State Bank of India
IFSC Bank Unit,
14th Floor, Hiranandani Signature Tower
SEZ GIFT CITY
Gandhinagar-382355

Dear Sir,

PROPOSED AIR CONDITIONING WORKS FOR IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR

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 Work for IFSC BANKING UNIT, AT 13TH FLOOR, HIRANANDANI SIGNATURE TOWER, SEZ GIFT CITY, GANDHINAGAR
(b)	Earnest Money	Rs. 11,500/- 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, payable at GANDHINAGAR.
(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.

I/we have deposited Demand Draft / Banker's Cheque for a sum of Rs. 11,500/- 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.

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/buildings proposed (i.e. Institute Building, Staff Qtrs. And Director's Bungalow/Interior work) in phases. We, therefore, undertake that we shall not raise any claim/compensation in the eventuality of Bank deciding to drop any of the work/building/buildings 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 :

SN	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.	<hr style="width: 80%; margin: 0 auto;"/> <hr style="width: 80%; margin: 0 auto;"/> Net Value since previous bill
2.	If ad-hoc payment is made, it should be mentioned specifically.	

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 in Excel format. Excel sheet enclosed

-----	-----	-----
Signature and date of Contractor	Signature and date of Architects Representative (Seal)	Signature and date of Site Engineer

The work recorded in the above-mentioned measurements has been done at the site satisfactorily as per tender drawings, conditions and specifications.

-----	-----
Architect	Signature and date of Site Engineer

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.....
	<u>OBJECTIONS:</u>	
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

<u>STATUTORY DEDUCTION:</u>		
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 DGM

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	Code of Practice for installation and maintenance of Power Cables up to including 33 KV rating (Second and Revision)
IS : 1554 - 1988 (Part – I)	PVC insulated (Heavy Duty) electric cables for working voltages up to 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 Nonreturn 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	Bus Bar trunking system

(Part - II)

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) Breakers IEC 947 - 2	Circuit
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 contactors and motor starters
IS : 13947 – 1993 (Part-V)	Control Circuit Devices
BS : EN:779 – 1993 ASHRAE Hand Books	Filters 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

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

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/ alternate 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

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 characteristics. **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 required 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 or 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.

2 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 and 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 (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

Sl.No.	Max. Duct Size	Hanger Rod Dia	Bottom Rod Dia	Interval
1	0 – 450	6 mm	6 mm	2000-2400
2	451 – 1200	8 mm	6 mm	2000-2400
3	1201 – 2000	10 mm	6 mm	1200-1500
4	2000 & above	12 mm	6 mm	1200-1500

3 Installation

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

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 withstanding 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 paint 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 branches 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 lockformed 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 flyover.

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 ductwork, 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 shop

- 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.

Unit Size	SI units in mm							
	W	H	L	A	I	X	Y	

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 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 flexible 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 flexible 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 with 1 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.

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	718X35	730	413

					2		
22"	864	445	279	203	819X40 3	832	413

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 ora 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 thejob 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 SMACNAGuidelines 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 sizeof 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 spacebelow.

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 ampacity (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
- Electrical 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 maintain a quality standard similar to ISO-9002 or Equivalent.

The VAV terminals shall be constructed of not less than 0.8mm gauge 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/m³ 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 coating 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 orequivalent make.
- C. The main objective of the CAV shall be to balance air flow volume in supply / return or exhaustducts.

Construction

- A. Casing and Control blade shall be made from high quality GSS material .
- B. Leaf Spring from SS material, Bellows from Polyurethane 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

Variable Refqrigerant flow System

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.

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.

Outdoor 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 outdoor 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 outdoor 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 40Deg 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 quietoperation 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 setpoint of High temp.
- d. Units will parralely also integrate through the BacNet Interface , into the BMS and both the controlManager and BMS will parralely 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 & IndoorUnits 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 areas 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 Maintenancepurpose.

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 1.5m 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 before 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 Factorymade 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	18.5 g

34.9	1.21	HAR D	18g
38.1	1.32	HAR D	17g
41.3	1.43	HAR D	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, Submittals 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 setpoint of High temp.
- d. Units will parallelly also integrate through the BacNet Interface , into the BMS and both the control Manager and BMS will parallelly 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 ProjectManagers 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
- c) 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 these 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 pre-coated 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 onsite 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 skintype.

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 slope 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 $415 \pm 10\%$ 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 requirements

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 noise, 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

DAMPERS & AIR TERMINAL DEVICES

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 robust 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. Handlocking 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.

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

TypeFire 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 Isited 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 24vsource 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

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 oneroom 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.

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.

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

SI 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 -50°C please contact our technical office.
3	Thermal Conductivity (λ) EN12667(DIN52612)- ENISO 8497(DIN 52613)	@ 0 Deg - 0.033 W/m Deg K @ 20 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 BS476Part 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 EmissionOf 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

SI No	Parameter	Specification
1	Material	Engineered Elastomeric Open Cell Nitrile Rubber Insulation
2	Density	140 - 180 kg / m3
3	Thermal Conductivity (λ) EN12667(DIN52612)- ENISO8497(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 - 20°C please contact our technical office.
5	Fire Class	Class 1 rating. BS 476 part 1
6	Fibre Free	Yes

7	Air Erosion Resistance test Confirming 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 G22UL-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 Synthetic 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 $\pm 5\%$ 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.

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

outputCONTRUCTION

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 distancefrom Noise attenuator
 - iv. length (Metre)
- n. Motor i. manufacturer
 - ii. type
- i. operating speed
- j. motor efficiency and class of insulation.
- k. Electrical Characteristics ($\pm 10\%$ voltage variation).
- l. Type of starter & manufacturer
- m. Type of drive
- n. Material of flexible connection
- o. Type of vibration isolators
- p. Motor operated through VFD, confirm following :
- q. Motors do not get derated
- r. Higher size motor is not required.

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
 HPMOTOR
 (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 .

ELECTRICAL ACCESSORIES

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. Contactor
- m. Current Transformer (cast resin type)
- n. Single phase preventer Change over switch
- o. Push Button
- q. Ammeter & Voltmeter KWH meter
- p. Relay Indication lamp

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 or 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.

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 reimburse 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.

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 equipments 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 be carefully maintained and preserved by the contractor and shall be made available to the Architect/ Consultant as and 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 get them approved by the Architect/ Consultant well in advance.

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 statute or law during the currency of the contract/work the same shall be borne by the contractor.

Compliance to Bank's/legal norms

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.

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.

Notices to Local Bodies:

a) The Contractor shall comply with and give all notices required under any law, rule, regulations, or bylaw 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) Pre-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.

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 expire, 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 is condition when handed over to them under AMC.
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	Every Quarter	Within 48 hours of Complaint
Breakdown Maintenance	Every Quarter Within 48 hours of 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
Contactors (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.

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.

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 rungs 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 an 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 earthing 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 from 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 be 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 $\frac{1}{4}$ to 1 ($\frac{1}{4}$ horizontal 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 1 Meter 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 safely from the ground, or from solid construction except in the case of short duration work which can be done safely 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 $\frac{1}{4}$ 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 to 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 increased 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 to 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.

Technical specifications

INSTALLATION OF AIR CONDITIONERS:

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.

SPLIT TYPE ACs:

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.

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.

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.

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.

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.

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 away to add to the ambience of the Branch. It shall be firmly fixed on the wall / partition.

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.

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.

INSTALLATION OF CASSETTE ACs:

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.

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.

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.

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.

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.

CONCEALING THE PIPES:

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.

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.

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.

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.

MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS

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.

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.

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.

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.

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.

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.

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.

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.

PERIOD OF CONTRACT & EXTENSION OF TIME

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.

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 majeure (or)
- b) By reason of any exceptionally inclement weather (or)
- c) By reason of proceedings taken or threatened by or dispute with adjoining or 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.
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.

PAYMENT TERMS

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.

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

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.

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.

GST as applicable shall be paid extra and the same shall be clearly shown in the invoices.

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.

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

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.

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.

VARIATION IN QUANTITY / SUBSTITUTION OF ITEM

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.

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 there for 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.

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 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.

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

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.

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.

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.

Contractor should not engage child labour in any of the activities in this contract.

The contractor shall not employ person who is not an Indian National.

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.

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.

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

SUBCONTRACTING

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

STORAGE OF MATERIALS

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.

Shelter or stay and other amenities for the labors have to be arranged by the contractor at his own expense and responsibility.

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

TECHNICAL SPECIFICATION FOR THE AIR CONDITIONERS

Supply of split A/C 1.0 tr. (3 star Inverter)

Wall mounted air conditioner shall have 1.0 Tr 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. (3- 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. CONDENSOR MUST BE OF COPPER METAL.

SUPPLY OF SPLIT a/c 1.5 Tr. (3 star, Inverter)

Wall mounted air conditioner shall have 1.5 Tr i.e. nominal 18,000 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. (3- 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

warranty must be given for 5 years from the manufacturer. CONDENSOR MUST BE OF COPPER METAL.

SUPPLY OF SPLIT a/c 2.0 Tr. (3 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. (3- 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 warranty of one year however sealed unit unconditional warranty must be given for 5 years from the manufacturer. CONDENSOR MUST BE OF COPPER METAL.

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.

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/evaporator/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.

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.

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.

supply and installation of fabricated steel supports for outdoor units for (1T.1.5 Tr)

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

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.

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.

Out Door Unit:

The outdoor unit shall be factory assembled, weather proof casing constructed from heavy gauge mildsteel 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.

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.

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.

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.

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.

Piping:

All connections of Refrigerant piping shall be in high grade Copper of Refrigeration quality with EddyCurrent 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.

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.

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°C or 1°C above room dew point temp, whichever is more.

Contractor shall guarantee inside conditions with selected supply air temperature.

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.

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.

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.

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

Central Remote Controller (Option if Specified in BOQ):

A multi-functional microprocessor based centralized controller (central remote controller) shall besupplied as an optional accessory.

The controller shall be able to control upto min. 64 zones of 64 group (each group consisting of max. 16units) 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 2wire 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 allabove 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.

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 indoorunits) 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.

Condensate:

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.

9.18 Electrical installation:

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.

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.

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 unlaminated 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 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%.

$\% \text{ Voltage unbalance} = (\text{Max. voltage deviation from avg. voltage}) / (\text{avg. voltage}) \times 100$

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.

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

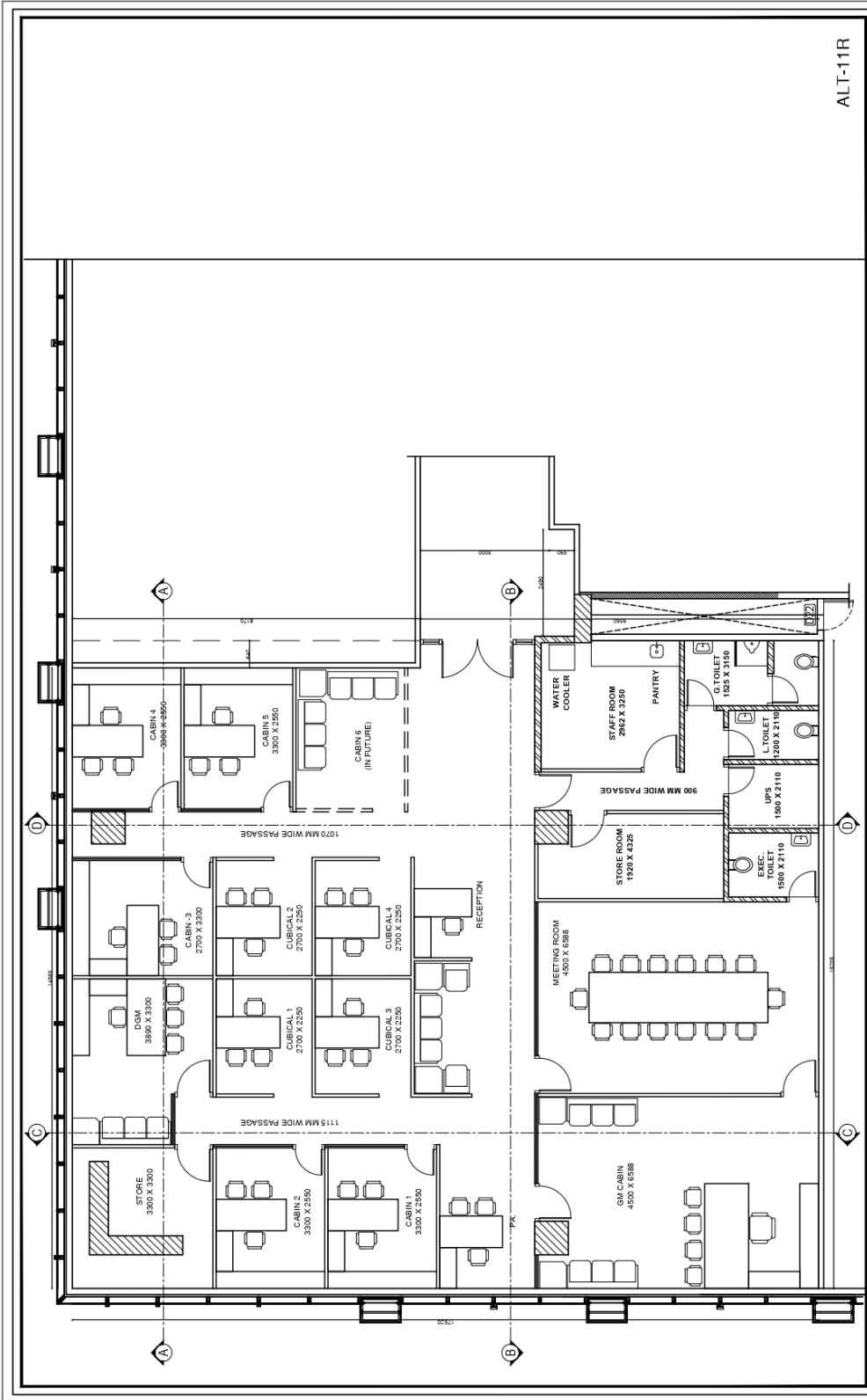
Installation, start-up and servicing of the equipment can be hazardous due to system pressures, electrical components and locations of equipment (roofs etc.).

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.

LIST OF APPROVED MAKES FOR CHILLED WATER
EQUIPMENT AND MATERIALS

ITEM	MAKE
CHILLED WATER Indoor Units	CUBIC/ MIDEA/ BHUTORIA/ CARYAIR
Copper Pipe	Maxflow / Mandev / Totaline / Parasmani
Electric Cable	Polycab/ R R Cable/ Finolex / Havells
Drain Pipe UPVC/CPVC	Astral/ Supreme/ Prince/ Dutron
GI SHEET	JINDAL/ TATA/ AMNS
TFA	ZECO/ EDGETECH/ CITIZEN/ ETA/ VTS
MS PIPE (CLASS C)	JINDAL/ TATA/ASIAN
BUTTERFLY VALVE	AUDCO/ADVANCE
PIPE NITRILE RUBBER INSUALTION Class 'O'	Aeroflex/ Armaflex/ K flex/ ALP
DUCT INSUALTION Class 'O'	Aeroflex/ Armaflex/ K flex/ ALP



ALT-11R

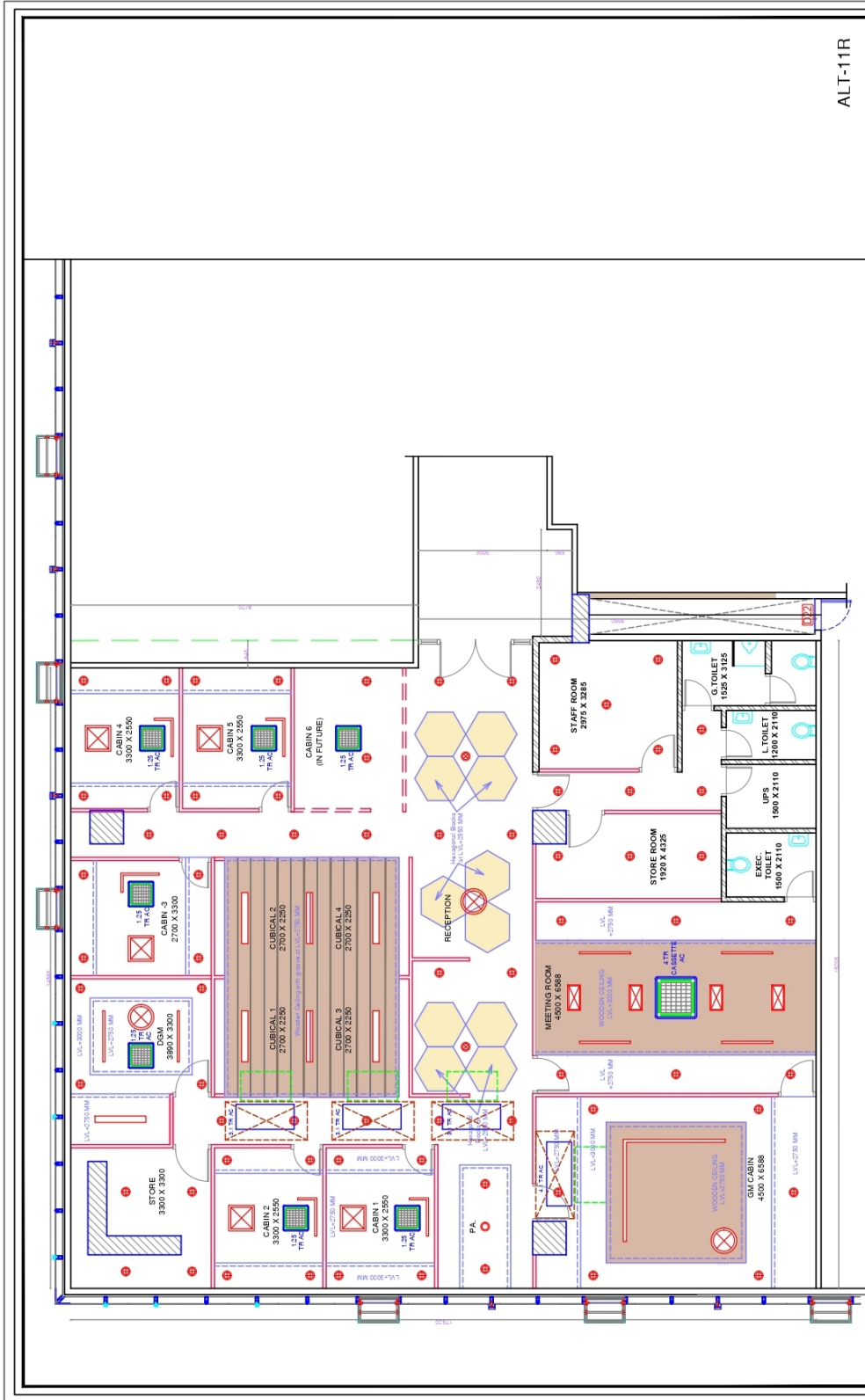
Project Name and Address :
 Proposed FSC Barron at 13th Floor,
 Harmandir Signature Tower, Gandhinagar
 Drawing Title : Interior layout
 Drawing Number : 02
 Date : 03.11.2022
 Scale : 1:40

Architect
 VJVN SHAWMILL ASSOCIATES
 MUMBAI (INDIA)
 PHONE : 79601904
 CIVIL Registration Number : C0260943

Submitted for

COMMERCEMENT OF INTERIOR WORKS

NOTE:
 1. Do not scale the drawings.
 2. All dimensions are in millimeters.
 3. All dimensions are to face.



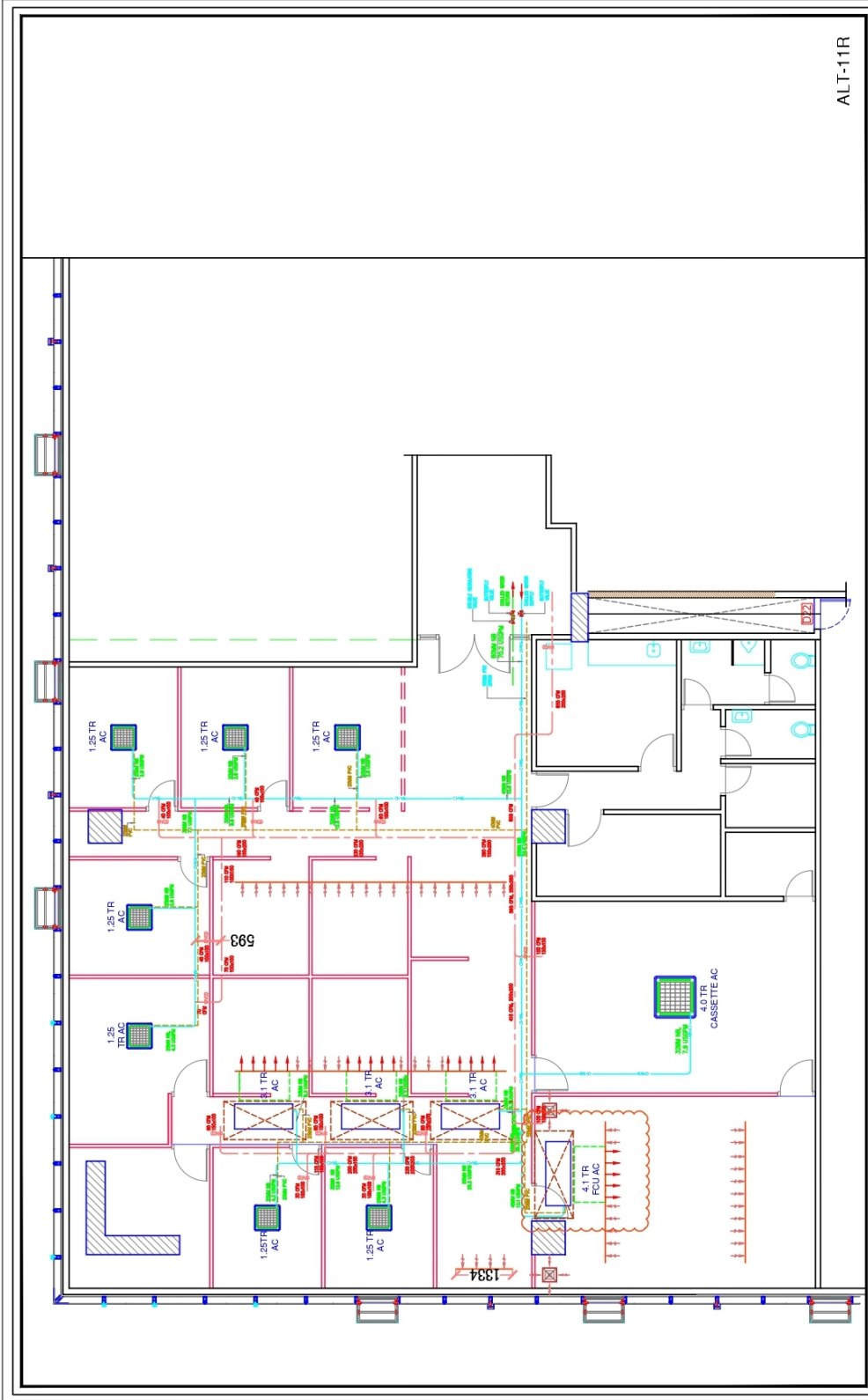
ALT-11R

Project Name and Address :
 Proposed FSC Barrack at 13th Floor,
 Harmandir Signature Tower, Gandhinagar
 Drawing Title : False Ceiling Layout
 Drawing Number : 03
 Date : 03.11.2022
 Scale : 1:40

Prepared by:
 Vigneshwaran K S
 Checked by:
 Vigneshwaran K S
 Approved by:
 Vigneshwaran K S
 Scale: 1:40

Submitted for
 COMMENCEMENT OF
 INTERIOR WORKS

Note:
 1. Do not make any changes to be
 2. All dimensions are in mm
 3. All dimensions are as shown



Project Name and Address :
 Proposed FSC Block at 13th Floor,
 Ramasami Signature Tower, Gandhinagar
 Drawing Title :
 Drawing Number :
 04
 Date :
 03.11.2022
 Scale : 1:40

Approved By :
 VISHVAJEE Kulkarni/ASSOCIATES
 MUMBAI/REGD/ENR/1804/2018
 PROFILE: 7/AB/10/04
 CIVIL Registration Number - C100249184

Submitted for approval

Submitted for COMPLETION OF INTERIOR WORKS

Note:
 1. Do not make any changes to be
 2. All the dimensions are in mm
 3. All the units are in sqm