

SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF VARIOUS RATINGS OF SPLIT & CASSETTE
ACS FOR FI&MM IBRAHIMPATNAM (AT 1ST FLOOR OF SHAMSHEERGUNJ BRANCH)

NIT NO : HYD202003686
DATE : 19.03.2020



SBI INFRA MANAGEMENT SOLUTIONS PVT LTD
(WHOLLY OWNED SUBSIDIARY OF SBI)

INVITES TENDERS ON BEHALF OF LHO, HYDERABAD.

IN A TWO BID THROUGH E-TENDERING PROCESS.

**HVAC (AIR-CONDITIONING) VENDORS [Original Equipment Manufacturers only
(OEMS)/ Authorized dealers of specified Makes mentioned in NIT are only eligible to
quote]**

FOR

**SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF VARIOUS
RATINGS OF SPLIT & CASSETTE ACS FOR FI&MM IBRAHIMPATNAM (AT
1ST FLOOR OF SHAMSHEERGUNJ BRANCH)**

The Vice president & Head,
SBI Infra Management Solutions Pvt. Ltd.
Ground Floor, Adj Commercial Branch, SBI LHO campus,
Bank Street, Koti,
Hyderabad – 500 095
Phone:040-23466310/46

NOTICE INVITING TENDER

1.	Name of the Work	SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF VARIOUS RATINGS OF SPLIT & CASSETTE ACS FOR FI&MM IBRAHIMPATNAM (AT 1ST FLOOR OF SHAMSHEERGUNJ BRANCH)
2.	Eligibility of the contractor	OEM/ authorized dealers of Daikin/Mitsubishi/O-General/ Hitachi/LG/Panasonic/ Blue Star / Toshiba.
3.	Estimated cost of work:	Rs.4.5 lakhs plus GST as applicable
4.	Earnest Money Deposit. (EMD)	Rs. 5,000/- all Drafts/BCs shall be in favour of "SBIIMS, Hyderabad". Payable at Hyderabad.
5.	Tender Cost	<p>Rs.1000/-</p> <p>TENDER ID:</p> <p>Up load copy of tender cost(receipt of SBI collect) in etender.sbi. Offline tender cost will be not acceptable and we will treat it as rejected.</p> <p>to be paid through State Bank Collect ONLY as detailed under;</p> <p>1) login https://www.onlinesbi.com</p> <p>2) Select SB Collect from Top Menu, click the check box and "Proceed"</p> <p>3) Select "All India" in "State of Corporate/Institution" & Select "Commercial Services" in "Type of Corporate/Institution" then "Go"</p> <p>4) Select " SBI Infra Management Solutions pvt. Ltd" in Commercial Services Name and "Submit"</p> <p>5) Select "Tender Application Fee" in "Payment Category" and enter the "Tender ID" exactly as given in first page top of this tender(characters in uppercase only).</p> <p>6) Fill up all fields such as email, GST No., Mobile No, Vendor/Firm Name etc and make payment.</p> <p>7) Enclose payment receipt having unique reference Number. along with EMD.</p> <p>Up load copy of tender cost (receipt of SBI collect) in "etender.sbi"</p>
6.	Time of Completion:	30 DAYS.
7.	Date of download of tender documents from Bank's web site http://www.sbi.co.in under "procurement news ".	Up to 26.03.2020
8.	Last date and time for submission of online e-tender. at https://etender.sbi	Date: 26.03.2020by 3.00 P.M.
9.	Date and Time of opening of e-Tenders: (Technical Bid and Price Bid)	Date: 26.03.2020at 3.30 P. M. (IST).
10	Address of opening of tender	Vice President, SBI Infra Management Solutions Pvt. Ltd., Office, Ground floor, Adj to commercial branch, SBI LHO campus, Bank Street, Kothi, Hyderabad – 500 095. Technical Bid of those firms / contractors who do not submit EMD shall be rejected. Representatives of Bidder may be present during opening of Bids. However Bids would be opened even in the absence of any or all the bidder's representatives.

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11	EMD & Tender cost to be submitted at:	EMD should be submitted physically at above mentioned address before due date. Contact: Vice President. 040-23466346. vg.reddy@sbi.co.in
12	Bidder Contact Details.	Bidder to provide following information. 1) Name of Company. 2) Contact Person. 2) Mailing address with Pin Code. 4) Telephone number and Fax number. 5) Mobile Number and E-MAIL.
13	Agency for arranging online bidding.	e-Procurement technologies Limited, Ahmedabad. e-Procurement technologies Limited, Ahmedabad. Primary Contact Numbers:- M:- 9081000427, 9904407997 Sujith Nair:- 079-68136857, sujith@eptl.in 1. Jaymeet Rathod:- 079-68136829, jaymeet.rathod@eptl.in 2. Vinayak Khambe:- 079-68136835, vinayak.k@eptl.in 3. Nadeem Mansuri:- 079-68136853, nadeem@eptl.in 4. Nandan Valera:- 079-68136843, nandan.v@eptl.in 5. Hemangi Patel:- 079-68136852, hemangi@eptl.in 6. Kanchan Kumari:- 079-68136820, kanchan.k@eptl.in 7. Deepak Narekar:- 079-68136863, deepak@eptl.in 8. Anshul Juneja:- 079-68136840, anshul.juneja@eptl.in 9. Salina Motani:- 079-68136831, salina.motani@eptl.in 10. Devang Patel:- 079-68136859, devang@eptl.in Primary Contact person : Ms. Shubhangi Banodiya, Contact No.:- 079-68136826/6824/6868, +91-9879996111 Email: shubhangi@auctiontiger.net Secondary contact person: Mr. Samjad khan Contact No.:- 079-68136868, +91-9265871720 Email: samjad@auctiontiger.net Alternate Contact No.:- Mr. Yashrajsinh Rathod:- 079-68136815, 9879996111, yashrajsinh@auctiontiger.net
14	Initial Security Deposit	2% including EMD..
15	Defects Liability Period	12 Months (Twelve months)
16	Total Security Deposit	5 % of contract value including initial security deposit.
17	Liquidated Damages	0.50% per week subject to max 5% of the value of work
18	Validity	90 days

The SBIIMS reserves the right to accept or reject any or all the tenders without assigning any reason whatsoever.

Vendors should submit make, model number & all specifications.

INSTRUCTIONS TO CONTRACTORS.

1. This tender is for the “ **HVAC (AIR-CONDITIONING) Works** ” for **STATE BANK OF INDIA, OFFICE/ BRANCH IN THE STATE OF TELANGANA AS SPECIFIED IN THE NIT**. It is a two Bid containing Technical and Price Bid.

In their own interest the contractors are advised to use their own specific seals and desist from using currency coins for the purpose. Tenders with incomplete or broken seals are liable to be rejected, the matter solely resting at the discretion of the EMPLOYER / ARCHITECTS. If a Contractor does not quote for one or more items, the Tender will be considered as incomplete and will be rejected.

2. Clients/ Architects reserve to itself the right to accept or reject any tender without assigning any reason for doing so and does not bind itself to accept the lowest or any other tender.

3. General Specifications are for guidance only. The latest ISI codes and Specifications and mode of measurements will be referred to during execution.

4. employer or Client shall mean Vice President, State Bank of India Infra Management Solutions Pvt. Ltd.,

5 Tenders are to be uploaded directly to M/S e-procurement Technologies Limited. E-mail: yashrajsinh@auctiotiger.net.

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1. TENDER FORM

**PROJECT: PROPOSED HVAC (AIR-CONDITIONING) WORKS FOR STATE BANK OF
INDIA, OFFICES/ BRANCH AS SPECIFIED IN THE NIT**

REF : HVAC (AIR-CONDITIONING) WORKS

Dear Sirs,

I/We the undersigned have carefully gone through and clearly understood after visiting the site and the Tender drawings and tender documents comprising of the tender form, Notice to contractors, and conditions for building contract, Special Conditions, Specifications and Schedule of Probable quantities and Draft Agreement prepared by SBIIMS

I/We do hereby undertake to execute and complete the whole or part of the work (as desired by you) at the respective rates which/I/We have quoted for the respective items of the Probable Bill of Quantities and at which rate the items specified in the NIT

I/We are depositing as Earnest Money as specified in the NIT along with this tender for due execution of the work at my/our tendered rates together with any variations which shall be adjusted by the Architects at prices based on our tendered rates. I/We shall deposit further sum equivalent to 2% of tender amount, less EMD paid in the event of my/our tender being accepted, towards initial security deposit.

In the event of this Tender being accepted I/We agree to enter into an agreement as and when required and execute the contract according to your form of Agreement, within 15 days of receipt of work order, in default thereof, I/We do hereby bind my-self/ourselves to forfeit the aforesaid initial security deposit.

I/We further agree to complete the work covered in the said schedule of quantities within 12 months from the 15th day reckoned from the date of issue of the work order to commence the work or on which contractor is instructed to take possession of the site, whichever is later.

I/We agree not to employ Sub-contractors other than those that may be specifically approved by your Architects for this contract work.

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I/We agree to and to get the work, workers, employees (of contractor, Architect & Employer) engaged on the work at site and all materials at site for execution of the work shall be insured comprehensive insurance including fire/accidents/ rain/ floods/riots/CAR policy (contractor's all risk insurance policy) and the insurance shall cover the period from date of start of work to date of actual completion of work plus 3 months. In case part work is taken over by the Employer before final completion of the whole work, such parts may not be covered by the insurance from the date of taking over that part of work by the Employer. Draft Insurance deed will be got vetted by the Architect, before obtaining the same. All the rates quoted by me/ us are inclusive of the same in full and nothing extra shall be claimed anytime on account of any of these.

I/We agree to pay Income tax, to be deducted at source, at the rate prevailing from time to time on the Gross value of the work done, and the rates quoted by me/we are inclusive of same.

Yours faithfully,

Contractor's Signature

Address:

Date:

2. NOTICE TO CONTRACTOR

ADDRESS:

**PROJECT: PROPOSED HVAC (AIR-CONDITIONING) WORKS FOR STATE BANK
OF INDIA, OFFICE/ BRANCHES AS SPECIFIED IN THE NIT
REF : HVAC (AIR-CONDITIONING)**

Dear Sirs,

1. On behalf of our clients, **M/s SBIIMS Hyderabad**, we have pleasure in inviting you to tender for the aforesaid work.
2. *The scope of work broadly as given below is for **Proposed HVAC (AIR-CONDITIONING) for SBI OFFICE/ BRANCH AS SPECIFIED IN THE NIT.***
3. **Tender Documents should be filled and uploaded on the site of M/S e-procurement Technologies Limited. E-mail: yashrajsinh@auctiotiger.net**
4. The tenderer must obtain for himself, on his own responsibility and at his own expenses, all the information which may be necessary for the purpose of filling this tender and for entering into a contract for the execution of the same and must examine the drawings and inspect the site of the work and acquaint himself with all local conditions and matters pertaining thereto.
5. Each of the tender documents page is required to be signed by the person or persons submitting the tender in token of his/their having acquainted himself/themselves with the General conditions etc., as laid down. Any tender with any of the documents not so signed will be rejected.
6. The tender documents must be filled in English and all the entries must be made by hand and written in ink. If any of the documents are missing or un-signed, the tender shall be considered invalid.
7. Each and every one of all erasures and additions/alterations made, while filling the tender, must be attested by initials of the tenderer. Over-writing of figures must be attested by initials of the tenderer. Overwriting of figures is not permitted. Failure to comply with either of these conditions will render the tender void. After submission of the tender no advice or any change in rate or conditions will be entertained. All the rates should be quoted

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both in figures and words. In-case of any discrepancy in rates quoted in words/figures and the amounts, the rate quoted in words shall be taken as final and binding.

8. The tender shall be valid for a period of 90 days from the date of opening.
9. TOTAL SECURITY DEPOSIT : shall comprise of:
 - a. Earnest Money deposit
 - b. Initial Security deposit
 - c. Retention money
- 9.1 The intending tenderer shall deposit with **SBIIMS HYDERABAD**, by Demand Draft as specified in the NIT, as a guarantee of good faith, which amount shall be forfeited as liquidated damages, in the event of any evasive/direct refusal or delay in starting the work and or signing the contract. The deposit of the unsuccessful tenderers will be returned, without interest, immediately after a decision is taken regarding the award of the contract. The Earnest money of the successful tenderer will be adjusted towards Security Deposit. A tender not accompanied by Earnest money deposit will not be considered.
- 9.2 **The successful tenderer will have to pay further sum equivalent to 2% of his contract value, less EMD already paid, as initial Security Deposit (ISD) by means of a D.D./Banker's cheque in favour of SBIIMS HYDERABAD within 14 days from the date of issue of work order to commence work. The EMD and Security deposit thus paid shall be held by the State Bank of India as Security deposit, for due execution and fulfillment of the contract, till the completion of the work and defect liability period in all respects and shall not bear any interest.**
- 9.3 Together with the money paid under clause 11.1 & 11.2 above, further retention of 10% of the value of the work done will be deducted from every running bill, till total retention, including EMD and initial SD paid earlier, comes to 5% of the contract value, and same shall be held by the Bank as Total Security Deposit. On the Architect's certifying the completion of work, 50% of the total security deposit shall be released to the contractor along with the final certificate of payment, and the balance amount will be retained in the manner stated elsewhere for a further period of twelve months after the completion date recorded in completion certificate, issued by the Architects and agreed to by the Bank. Also refer condition 23(ii) on Page 7 of Volume 1.
10. Within one month of the receipt of intimation from the Architects of the acceptance of his/their tender, the successful tenderer shall be bound to sign an agreement, on a stamp paper in accordance with the Draft Agreement and conditions of contract attached herewith, but the work order or the written acceptance of a tender by the Employer will constitute a binding agreement between the Employer and the person tendering whether such formal contract is or not signed by the contractor.
11. All compensation or other sums of money payable by the contractors to the clients, under the terms of this contract, may be deducted from the Security Deposit or from any sum that may be or may become due to the contractor on any account whatsoever, and in the event of the Security deposit being reduced by reasons of any such deductions, the contractor shall

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within 15 days of being asked to do so make good in cash or cheque, any sum which have been deducted from his security deposit.

12. The rates quoted by the Contractor shall include all eventualities, such as heavy rain, sudden floods, accidents, fire, riots etc., which may cause damage to the executed work or which may totally wash out the work. Until the completion certificate is issued to the Contractors, neither the Architect nor the clients will be responsible for such damage or wash out of the construction work.
13. Time is the essence of the contract. The work should be completed **within 30 days** from the date of commencement. The date of commencement shall be within ONE day after confirmation.
 - a) The day two weeks from the date of issue of work order.

Or

- b) The day on which the contractor receives the possession of the site which ever is later.

Or

- c) The contractor is asked in writing to take over the possession of the site.

The successful contractor will have to give a CPM/PERT chart of various activities of work to be done so that the work gets completed within the stipulated time. The chart shall be submitted within 15 days from the date of acceptance of the tender.

14. If the contractor fails to complete the work by the Scheduled date of completion or within any sanctioned extended time, he will have to pay liquidated damages at the rate of ½% of contract amount for each week of delay the work remains incomplete beyond the completion(Original/extended date), subject to maximum of 5% of the contract value (without extra items) as per clause 31 of the General conditions of contract.
15. The quantities contained in the Schedule are only indicative. The work as actually carried out and done will be measured up from time to time, for which payment will be made subject to the terms and conditions of contract.
16. The unit prices shall be deemed to be fixed prices. In case of extra items, a record of labour charges paid shall be maintained and shall be presented every month for extra/substituted items regularly to the Architects for checking. The settlement will be made based on figures arrived at jointly and taking into account unit prices of items of work mentioned in the contract assigned to the successful tenderers. In case, of extra items, where similar or comparable items are quoted in the tender, extra rates shall invariably be based on those tender rates to the extent reasonable.

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17. Our clients, SBIIMS, do not bind themselves to accept the lowest or any tender and reserve to themselves the right to accept or reject any or all tenders, either in whole or in part, without assigning any reason whatsoever for doing so.
18. No employee of the bank or SBIIMS is allowed to work as a contractor for a period of two years of his retirement from bank service, without the previous permission of the bank or SBIIMS. This contract is liable to be cancelled, if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of the bank or SBIIMS as aforesaid before submission of the tender or engagement in the contractor's service.
19. The tenderer, apart from being a competent contractor must associate himself with agencies of the appropriate class who are eligible to tender for (1) Electrical (2) Interior (3) Fire fighting systems & (6) Interiors (fixed furniture), as the case maybe.
20. Release of security deposit:
 - i) 50% of the total security deposit will be released along with the final certificate of payments as stipulated under para 9 on page 12 of Volume I, Appendix to General Conditions of contract,
 - ii) Balance 50% of Retention money will also be released as noted under(i) above, subject to submission of a Bank Guarantee, to the satisfaction of SBI for an equivalent amount. This Bank Guarantee shall be valid upto completion of defects/removal liability period plus 3 months.

3. ARTICLES OF AGREEMENT

ARTICLES OF AGREEMENT made the _____ day of _____ 2019
between _____

of _____

(hereinafter called the "Employer") of the one part and _____
of _____ (hereinafter called "The Contractor") of the other
part, where as the Employer is desirous of getting the work of
" _____ " executed and has
caused drawings, conditions of contract, specifications and schedule of quantities etc., describing the
works prepared by SBIIMS.

AND WHEREAS the SAID DRAWINGS numbered as per list attached inclusive of and the
conditions of contract, specifications and schedule of quantities etc., 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 in the Schedule hereto (hereinafter referred to as "Said Conditions") the works shown upon
the said drawings and described in the same specifications and included in the said schedule of
quantities for such sum as may be ascertained to be payable in terms of the Bills of Quantities, and
which sum is estimated to be Rs. _____
(Rupees _____ (hereinafter referred to as "Said
Contract Amount").

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NOW IT IS HEREBY AGREED AS FOLLOWS:

1. In consideration of the said sum 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 in the said drawings and described in the said specifications.
2. The Employer shall pay the contractor the said sum or such sums as shall become payable hereunder at the times and in the manner specified in the said conditions.
3. The term "Architect" in the said conditions shall mean the said **SBIHIMS, Hyderabad**, or in the event of their ceasing to be the Architect for the purpose of this contract, such other person 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 Arbitrator mentioned in the said conditions provided always that no persons subsequently appointed to be the Architect under this contract shall be entitled to disregard or over-rule any previous decision or approval or direction given or expressed by the Architect for the time being.
4. Tender documents containing work order Notice to the Contractor, Conditions of Contract, Appendix thereto, Special Conditions of Contract, Specifications and Schedule of Quantities with the rates entered therein, shall be read and studied as forming part of this agreement and the parties hereto shall respectively abide by and submit themselves to the conditions and stipulations and perform the agreement on their part respectively in such conditions contained.
5. The contract is neither a fixed lumpsum contract or a piece work contract, but is a contract to carry out work in respect of the entire works to be paid for according to actual measured quantities, including variations from BOQ at the rates contained in the Schedule of rates and Probable bill of quantities or as provided in the said conditions.
6. The Employer through the Architect, reserves to himself the right of altering the drawings and natures of the work, of adding/substitution to or omitting any items of work or having portions of the same carried out through alternate agencies without prejudice to this contract.
7. Time shall be considered a the essence of this agreement and the contractor hereby agrees to commence the work soon after the site is handed over to him but within 15 days reckoned from the date of issue of work order to execute the work, as provided for in the said conditions and complete the entire work in **15 days** subject to nevertheless to the provisions for extension of time.

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8. This agreement and contract shall be deemed to have been made in Hyderabad and any questions or dispute rising out of or in any way connected with this Agreement and Contract shall be deemed to have arisen in Hyderabad and only the courts in Hyderabad shall have jurisdiction to determine the same. The limitation period will be 90 days from the date of dispute having arisen.

AS WITNESS our hand this _____ day of _____ 2019

Signed by the said in the presence of:

WITNESS : SIGNATURE

NAME :

ADDRESS :

EMPLOYER

WITNESS : SIGNATURE

NAME :

ADDRESS :

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4. APPENDIX TO GENERAL CONDITIONS OF CONTRACT

1. Earnest Money Deposit (EMD) : As specified in the NIT
2. Initial Security Deposit (ISD) : 2% of contract value including EMD.
3. Period of completion : As specified in the NIT
4. Defects Liability period : As specified in the NIT
5. Agreed Liquidated Damages : ½% of contract amount per week of delay subjected to a maximum of 5% of contract value.
6. Period of final measurement : Three months after completion as recorded in the completion certificate.
7. Minimum value of work to be Executed for issue of interim Certificates for making payment : As specified in the NIT
- 8.a) Retention money from each bill : 10% of gross value of each interim bill, subject to 8(b) below.
- b) Total retention money including Earnest money and initial security Deposit : 5% of the contract value.
9. Release of Security deposit after Virtual completion. : 50% of the total security to be released along with final certificate of payment, but only after removing all his materials, equipment, labour, huts/force, temporary sheds/stores, all his installations, machinery etc., from the site. Balance payment to be released on submission of Bank Guarantee on any Scheduled Bank, Other than SBIIM, and its associated banks in the prescribed manner and valid till the completion of defects liability period of 12 months plus 3 months.
10. Period for honouring certificate : 15 working days from date of Architects certificate of payment for interim bills and 45 working days for final certificate.

WITNESS :

DATE : SIGNATURE OF THE CONTRACTOR WITH DATE

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5. INDEX TO GENERAL CONDITIONS OF CONTRACT

1. Interpretations
2. Scope of Contract
3. Drawings and Specifications
4. Schedule of Quantities
5. Sufficiency of Schedule of Quantities
6. Errors in schedule of Quantities
7. Contractor to provide everything necessary
8. Authorities, Notices, Patent rights and royalties
9. Materials and workmanship to conform to description.
10. The setting out
11. Removal of all offensive matters
12. Opening up works
13. Contractor's superintendence and representative on the work
14. Dismissal of workmen
15. Access to works
16. Employer's representative/PMC
17. Assignment of sub-letting
18. Sub contractors
19. Variations not to vitiate contract
20. Measurement to works
21. Prices of Extras etc., Ascertainment of
22. Unfixed materials
23. Removal of improper work and materials

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24. Defects after completion
25. Certificate of virtual completion
26. Other persons engaged by the Employer
27. Insurance in respect of damage to persons and property
28. Contractor's All risk policy
29. Minimum amount of third party Insurance
30. Commencement and completion
31. Delay and extension of time
32. Damages for Non-completion
33. Failure by contractor to comply with Architect's instructions
34. Architect's delay in progress.
35. Supervision of works
36. Prime cost and provisional sums
37. Certificates and payments
38. Notices
39. Termination of contract by the Employer.
40. Termination of contract by the contractor.
41. Matters to be finally determined by the Architects
42. Settlement of dispute (Arbitration)

SPECIAL CONDITIONS.

1. Contractor shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or executing the work, what ever the cause of the delays may be, including delays arising out of modifications to the work entrusted to him or in any subcontract connected there with or delays in awarding contracts for other trades of the project or in commencement or completion of such works in obtaining water and power connections for construction purpose or for any other reason what so ever and the Employer shall not be liable for any claim in respect thereof. The Employer does not accept liabilities for any sum besides the tender amount, subject to such variations as are provided for herein.
2. The successful tenderer is bound to carry out any items of work necessary for completion of the job if such instructions in respect of such additional items and their quantities will be issued in writing by the Architects with the prior consent in writing of the Employer.
3. The contractor must bear in mind that the work shall be carried out strictly in accordance with specifications made by the Architects.
4. The rates quoted in tender shall also include electric consumption charges for power. If no power is available at site the contractor shall have to make his own arrangement to obtain power connection and maintain at his expense an efficient service of electric light and power and shall pay for the electricity consumed. The Employer shall give all possible assistance to the contractor to obtain the requisite permission from the various authorities, but the responsibility for obtaining the same shall be that of contractor.
5. Contractor shall strictly comply with the provisions of safety code in addition to all local rules and regulations.
6. The contractor shall be responsible for the observance of all rules and regulations framed by the government under the contract labour act. The Employer shall be entitled to deduct all losses, damages that he might suffer on account of non-observance of these rules by the contractor, from the amount payable to the contractor.
7. Time shall be considered the essence of this contract. The entire work must be completed within 15 DAYS from the commencement of the work. If the completion of the work is delayed beyond 1 month, a penalty at the rate of ½ % per week over the contract value will be imposed subjected to a maximum of 5%.

If the work is delayed beyond 30 days after the date of completion, the remaining work will be carried out through other agencies at the risk and cost of the contractors under the contract with prevailing market rates.
8. The successful tenderer shall submit the phased programme of execution of different items of work within 2 days after receipt of acceptance letter.
9. Payment will be made as First & Final bill and will be made within a period of TWO weeks after the bill is submitted to the Employer's Office with Architects Certificate.

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10. Before filling in the tender the contractor will check all the drawings and schedule of quantities and will get an immediate clarification from the employer / Architects on item not clearly understood. No claims for any loss or compensation will be entertained on this account.
11. All the work shall be carried out as per detail drawings and specifications or as directed by employer / Architects.
12. The rates quoted in the tender shall be for the finished items of work. They shall include all the charges labour, materials, transportation of material equipment, double scaffolding water and electric charges, tool and plants, marking out and cleaning of site, to do all things necessary to provide complete finished item for work consistent with the specifications attached to this tender document. The rates shall be inclusive of octroi duty, excise duty, packing and forwarding, loading or unloading or any other duties or fees levied by any government, public or local bodies. The rates shall be firm and shall not be subject to exchange variations, labour conditions or any other conditions whatsoever.
13. The calculations made by the tenderer should be based upon the probable quantities of the several items of work which are furnished for the tenderer's convenience in the schedule of quantities, but it must be clearly understood that the contract is not a lumpsum contract, that neither the probable quantities nor the value of individual items nor the aggregate value of the entire tender will form part of the contract and that the employer / Architects do not in any way assure the tenderer or guarantee that the work would correspond thereto.
14. Adequate engineering and technical staff to be appointed at site. HVAC (AIR-CONDITIONING) contractor should inform of their number and qualification. An Approval of employer / Architects should be taken prior to appointing such technical staff on site.
15. **The contractor shall keep the tender submitted by him open for acceptance for a minimum period of three months from the date of its submission.** When once the tender is accepted the rates quoted by the successful tenderer shall be firm the variation in rates of any one or all the items on any account shall not be allowed during the entire duration of the contract.
16. During the execution of work, contractor must check the work with his drawings. The contractor shall be responsible for all the errors in this connection and shall have to rectify all the defects at his own cost, failing which the client reserves the right to get the same rectified at the risk and cost of contractor.
17. No claim for extra item or deviation from specification shall be entertained unless the same is pointed out and accepted as such before the work is taken in hand or within 15 days of work by the successful tenderer.
18. The contractor shall comply with all bye-laws and tax regulations (including GST) of local and other statutory authorities having jurisdiction over the works and shall be responsible for the payment of all the fees and other charges and for giving and receiving of all necessary notices drawings and test certificates.

19. The successful tenders shall properly safeguard against damage or injury to the public and to any property or thing and shall alone be responsible for any such damage and injury to any person or persons or thing arising in connection with its execution of work. The successful tenderer shall protect and hold harmless the employer against any or all claims for any such injury or damage.
20. The work in every respect during the progress and till final acceptance by the employer, including raw materials delivered to the site to be incorporated or used in HVAC (AIR-CONDITIONING) work by the successful tenderer will be at his own risk. Any loss or damage to any such material or work shall immediately be replaced by the successful tenderer at his own expense.
21. The employer shall have the right to direct the contractor to purchase and use the materials from any source for proper execution of work.
22. The employer / SBIIM / Architects or their authorized representatives shall have full power for inspecting the contractor's works or at any place from which the material is obtained. Acceptances of any such materials shall no way relieve the contractor of his responsibility for meeting the requirements and /or analysis not called for in the specifications shall be borne by the employer in case the material or work is found defective or of inferior quality. Tests and /or analysis shall be done in the laboratory approved by the client and the contractor shall permit the SBIIM and or the client's or their authorized representative to be present during any of the tests and /or analysis.
23. **INSURANCE**

The contractor shall indemnify SBIIM up to CAR Policy (Contractor's All Risk Policy) against all claim which may be made against SBIIM by any member of the public or the third party in respect of anything which may arise in consequence thereof and shall at his own expense arrange to effect and maintain up to one month after the virtual completion from an office approved by SBIIM a policy of insurance in the joint names and deposit such policy or policies with SBIIM from time to time during the currency of this contract. The contractor shall also indemnify SBIIM against all claims which may be made upon the SBIIM under the workman's compensation act or any other statute in force during the currency of this contract or at common law in respect of any employee of the contractor or any sub contractor and shall at his own expenses effect and maintain up to one month after virtual completion of the contract from an office approved by SBIIM a policy or policies of insurance in the joint names of SBIIM and the contractor as aforesaid. The contractor shall be responsible for any other thing which may exclude from the insurance policies above referred to and also for any other damage to any property arising out of and incidental to the negligent or defective carrying out of this contract.

He shall also indemnify the employer in respect of any costs, charges or expenses arising out of any claim or proceedings and also in respect of any award of compensation or damage arising therefrom. The employer shall be at liberty and is hereby empowered to deduct the amount of any damages, compensation caused, charges and expenses arising or occurring

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from or in respect of any such claims or damages from any sum or sums due or to become due to the contractor.

24. WORKMAN AT SITE :

The contractors workpeople shall not be allowed to live on the site at any time throughout the contract nor to trespass beyond the limits of the site. The contractor will be held responsible for any acts of trespass by his workpeople.

25. DIMENSIONS :

Figures dimensions are to be taken in preference to scaled dimensions in all cases. Before commencing any work the contractor shall verify all measurements. If any discrepancies are found they shall immediately be brought to the notice of the Architects.

26. DISCREPANCIES

All the items shown on the drawings or specifications are taken to be included in both. Any discrepancies, which occur in either the drawings or specifications, shall immediately be brought to the attention of the Architects.

27. CUTTING AND MAKING GOOD

Where it is found necessary to interfere with finished work in order to execute this contract, the contractor will be required to do all necessary work at his expenses. Only approved hangers and bolts or other metal fixing devices shall be used to secure frames panels and other units in position. Wooden plugs will not be permitted. Holes shall be formed with electric drills whenever possible. Structural members shall not be cut or drilled without prior consent of the client.

28. MAINTENANCE AND GUARANTEE

The whole of the work to be performed under this contract shall be completed to the satisfaction of the Architects / Bank.

The contractor without additional charge to the employer renew or replaces any works which prove faulty from workmanship or materials and fully maintain the whole installations for a period of 6 months after the commencement of defects liability period of the main contract and a sum of 5% of the contract amount shall be retained by the employer for his period.

29. PREVENTION OF SPOIL DUMPING

The contractor shall take all reasonable steps to prevent spoil, rubbish, debris surplus materials etc.. Arising from a work being dumped on an area other than a recognized or approved tipping area and the Contractor will be held responsible for and shall indemnify the employer against any claim or loss arising therefrom.

30. LEAVE PERFECT:

The Contractor shall remove all rubbish and superfluous material from the site of the works with all reasonable speed from time to time and at completion. On no account shall W.C' S or the employer's receptacles to be used for this purpose.

The client reserves its right to clear contractors un cleared debris at contractors own cost without any reasons & not more than one notice will be given for this.

31. SETTLEMENT OF DISPUTES AND ARBITRATION:

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions herein before mentioned and as to the quality of workmanship of materials used on the work or as to any other question, claim, right matter or thing whatsoever in any way arising out of our 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 work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

- (a) 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 contract or raise any dispute, the contractor shall forthwith give notice in writing of his claim, or dispute to **The Vice President, SBI Infra Management Solutions Pvt. Ltd., Circle Office, Ground Floor, Adj to commercial Branch, State Bank of India, LHO premises, Bank Street, Kothi, HYDERABAD – 500 095** 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 bank be in any way liable in respect of any claim by the contractor unless notice of such claim have been given by the Contractor **The Vice President, SBI Infra Management Solutions Pvt. Ltd., Circle Office, Ground Floor, Adj to commercial Branch, State Bank of India, LHO premises, Bank Street, Kothi, HYDERABAD – 500 095** 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 Vice President, SBI Infra Management Solutions Pvt. Ltd., Circle Office, Ground Floor, Adj to commercial Branch, State Bank of India, LHO premises, Bank Street, Kothi, HYDERABAD – 500 095** in writing in the manner and within the time aforesaid.

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- (b) **The Vice President, SBI Infra Management Solutions Pvt. Ltd., Circle Office, Ground Floor, Adj to commercial Branch, State Bank of India, LHO premises, Bank Street, Kothi, HYDERABAD – 500 095** shall give his decision in writing on the claims notified by the contractor. The contractor may within 30 days of the receipt of the decision of **The Vice President, SBI Infra Management Solutions Pvt. Ltd., Circle Office, Ground Floor, Adj to commercial Branch, State Bank of India, LHO premises, Bank Street, Kothi, HYDERABAD – 500 095** submit his claims to the conciliating authority namely the Circle Development Officer, State Bank of India, Local Head Office, Hyderabad for conciliation along with all details and copies of correspondence exchanged between him and **The Vice President, SBI Infra Management Solutions Pvt. Ltd., Circle Office, Ground Floor, Adj to commercial Branch, State Bank of India, LHO premises, Bank Street, Kothi, HYDERABAD – 500 095**
- (c) If the conciliation proceedings are terminated without settlement of the disputes, the contractor shall, within a period of 30 days of termination thereof shall give a notice to the concerned Chief General Manager of the Bank for appointment of an arbitrator to adjudicate the notified claims failing which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.
- (d) Except where the decision has become final, binding and conclusive in terms of the contract, all disputes of differences arising out of the notified claims of the contractor as aforesaid and all claims of the Bank shall be referred for adjudication through arbitration by the Sole Arbitrator appointed by the Chief General Manager. It will also be no objection to any such appointment that the Arbitrator so appointed is a Bank Officer and that he had to deal with the matters to which the Contract relates in the course of his duties as Bank Officer. If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid by the said Chief General Manager. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

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

It is also a term of this contract that no person other than a person appointed by such Chief General Manager as aforesaid should act as arbitrator.

The conciliation and arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or re-enactment 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 Bank 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 settlement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of 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.

32. TERMINATION OF CONTRACT BY EMPLOYER:

If the contractor (being an individual or a firm) commit any " Act of Insolvency ", or shall be adjudged as insolvent, or shall make an assignment or composition of the greater part in number of amount of his creditors, or shall enter into a Deed of Assignment with his creditors, or (being an incorporated Company) shall have an order made against him or pass an effective Resolution for winding up either compulsorily, or Subject to the supervision of the court or voluntarily, or if the official Assignee of the contractor shall repudiate the Contract, or if the Official Assignee or the Liquidator in any such winding up shall be unable, within seven days after notice to them requiring him to do so, to show to the reasonable satisfaction of the Architect that he is able to carry out and fulfill the Contract and if required by the Architect to give a security there for, or if the contractor shall suffer any payment under this contract to be attached by or on behalf of any of creditors of the Contractor, if the Contractor shall assign or sublet the contract without the consent in writing of the Architect first obtained, or if the contractor shall charge or encumber this Contract for any payments due or which may become due to the Contractor thereunder, or if the Architect shall certify in writing to the Employer that in his opinion the Contractor:

- (a) Has abandoned the Contract, or
- (b) Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the work for fourteen days after receiving from the Architect written notice to proceed, or
- (c) Has failed to proceed with the work with such due diligence and failed to make such due progress as would enable the works to be completed within time agreed upon or
- (d) Has failed to remove materials from site or to pull down and replace works within seven days after receiving from Architect written notice that the said materials or work were condemned and rejected by the Architect under these conditions or
- (e) Has neglected or failed persistently to observe and perform all or any of the acts, matters or things required by this Contract to be observed and performed by the Contractor for seven days after written notice shall have been given to the Contractor requiring the contractor to observe or perform the same, or
- (f) Has to the detriment of good workmanship or in defiance of the Architects instructions to the contrary, submit any part of the contract or has used in the permanent works important materials which are substandard and not as per specification fraudulently making the Architect / Employer to believe that it is the specified material.

Then and in any of the said caused the Employer with the written consent of the Architect may, notwithstanding any previous waiver, after giving seven days notice in writing to the Contractor, determine the contract, but without thereby affecting the powers of the Architect or the obligations and liabilities of the Contractor, the whole of which shall continue to be in force as fully as if the contract has not been so determined and as if the works subsequently executed and being executed by or on behalf of the contractor. And further, the Employer with the consent of the Architect by his agents or servants may enter upon and take possession of the works and all plant, tools, scaffoldings, shed, machines, steam and other power utensils and materials lying upon premises or the adjoining lands or roads, and use the same as his own property or may employ the same by means of his own servants and workman in carrying on and completing of the works or by employing any other Contractor or any other person or persons to complete the works and the Contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other Contractor or other person or persons employed for completing and finishing or using the materials and plant for the works, when the work shall be completed, or as soon thereafter as convenient, the Architect shall give a notice in writing to the Contractor, to remove his surplus material and plant and should the Contractor fail to do so within a period of fourteen days after receipt thereof by him, the Employer may sell the same by public auction and shall give credit to the Contractor for the amount so realized. The Architects shall thereafter shall assertion and certify in writing under his hand what (if anything) shall be due or payable to or by the Employer, for the value of the said plant and materials so taken possession of by the Employer, and the expense or loss which the Employer shall have been put to in getting the works to be so completed, and the amount, if any owing to the Contractor and the amount which shall be so certified shall, thereupon, be paid by the Employer to the Contractor or by the Contractor to the Employer as the case may be, and the certificate of the Architect shall be final and conclusive between the parties.

33. The mode of measurements shall be as per IS: 1200.
34. The contractor should co-ordinate with other agencies viz., INTERIOR, ELECTRICAL, Civil, LAN cabling etc.,
35. CONTRACTOR SHOULD WORK AT ODD HOURS, ON HOLIDAYS TO KEEP UP TIME SCHEDULE.
36. The Contractor shall not be eligible for any material advance.

SPECIAL CONDITIONS OF CONTRACT

GENERAL

- 1.1 These conditions are meant to amplify the specifications. If any discrepancy is noticed between these conditions, Specifications, Bill of Quantities and Drawings the most stringent of the above shall apply for execution of the work.
- 1.2 The materials, design and workmanship shall satisfy the specifications contained herein and Codes referred to. Where the technical specifications stipulate the requirement in addition to those contained in the Standard Codes and specifications those additional requirements shall also be satisfied. In the absence of any Standard/Specifications covering any part of the work covered in this tender document, the instruction/directions of Consultant will be binding on the contractor. The contractor shall quote as per specification and shall not be accepted to deviate from the same. No alternative offer shall be accepted for the works.
- 1.3 The scope of this section is to describe materials and systems for Heating, Ventilation & Air Conditioning (HVAC) which form together with the project documents, a complete volume of work and quality description.
- 1.4 All HVAC works shall be of high quality, complete and fully operational including all necessary items and accessories whether or not specified herein. All HVAC works shall be completed in accordance with the regulations and standards to the satisfaction of the Consultants. The general provisions, special provisions and general requirements apply to the entire installation.
- 1.5 During the progress of work completed portion of the building may be occupied and be put to use by the owner but the contractor shall remain fully responsible for the maintenance of Heating, Ventilation & Air-conditioning works till the entire work covered by this contract is satisfactorily completed by him and handed over to the owner.
- 1.6 Contractor shall calculate the capacities for areas and confirm the inside conditions specified in the basis of design. Contractor shall be liable to make do any changes/modifications to the system for achieving the inside conditions without any extra expenditure to the client.

2.0 RATES

- 2.1 The rates quoted shall be deemed to allow for all minor extras and constructional details which are not specifically shown on or given in the specifications but are essential in the opinion of SBIIM / Owner / Consultants to the execution of works to conform to good workmanship and sound engineering practice. The SBIIM /

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Owner/Consultants reserve the right to make any minor changes during the execution without any extra payment.

- 2.2 The Consultants decision to clarify any item under minor changes, minor extras and constructional details shall be final, conclusive and binding on the Contractor.
- 2.3 The rates quoted by the Contractor shall be nett so as to include all the requirements described in the contract agreement and no claim whatsoever due to fluctuations in the price of material and labour will be entertained.
- 2.4 The rates quoted by the Contractor shall include for supplying materials and labour necessary for completing the work in the best and most workmanship like manner to the satisfaction of the SBIIM / Owner/Consultants and which in the opinion of the Consultants cannot be made better. The rates shall be complete in all respects including cost of materials, erection, fabrication, labour, supervision, tools and plant, transport, sales and other taxes, royalties, duties and materials, contingencies, breakage, wastage, sundries, scaffoldings etc on the basis of works contract. The rates quoted shall include all taxes (GST), duties, transport, Insurance's, octroi, or any other levies applicable under the statute.
- 2.5 In case the rates of identical items under different sub-heads/parts are different, the lowest of these will be taken for the purpose of making the payments.
- 2.6 The rates for different items are for all heights, depths, widths and positions, unless otherwise specified against the item. No claim in respect of any leads/lifts for any item specified in the Schedule of Quantities, for which separate items for lead/lift do not exist in that schedule, will be entertained.
- 3.0 AWARENESS OF SITE CONDITIONS AND CARRYING OUT OF SITE INSPECTION PRIOR TO TENDER SUBMISSION
- 3.1 Prior to the preparation and submission of his Tender, the Contractor shall make visits to the site and carry out all the necessary inspections and investigations in order to obtain all information and to make his own assessment of the conditions and constraints at site, including the means of access to it. The Contractor shall make himself aware of all the features of the site and the working conditions and space and shall, in general, be responsible for obtaining all the necessary and requisite information needed for him to prepare and submit his Tender.
- 3.2 Should the Contractor require any clarifications he shall seek these in writing from the Owner before submitting his Tender. At no stage will any extra claims be entertained or allowed on any matter or for any reason arising from or as a consequence of the Contractor's failure to comply with all the requirements stipulated in this Clause.

4.0 WORK AND WORKMANSHIP

To determine the acceptable standard of workmanship, SBIIM / Owner/Consultant may order the Contractor to execute certain portions of works and services under the close supervision of the SBIIM / Owner/Consultant. On approval, they shall be labelled as guiding samples so that further works are executed to conform to these samples.

5.0 ASSOCIATED CIVIL WORKS

5.1 Major Civil works associated with Heating, Ventilation & Air conditioning installation are excluded from the scope of this tender. These shall be executed by other agencies to suit the requirements of Heating, Ventilation & Air conditioning contractor. Minor Civil & finishing works have to be carried by the Air conditioning Contractor.

5.2 RCC/PCC Foundation for units shall be carried out by other agencies.

5.3 False ceiling to cover the ducts and piping in corridor shall be carried out by other agencies.

6.0 ASSOCIATED ELECTRICAL WORKS

6.1 The electrical works included in the scope of this proposal are the main panel in the plant room controlling the Equipment, power and control cabling of various equipment and sub panels for Air handling units and FCU's. Supply, Installation, Testing and commissioning of control cables from field components viz., Thermostats, Pressure cut out, Level Sensing devices, Flow Switches and other control/protection components required for proper sequencing and control of major of equipment shall be carried out by the HVAC contractor.

7.0 PROTECTION OF OTHER CONTRACTOR'S WORKS AND SAFETY OF PERSONNEL AT SITE

7.1 In view of other contractors and agencies being engaged on site and shall be working simultaneously, the Contractor shall ensure at all times that during the execution of his work or during the operations and movements of equipment and supply vehicles and machinery no damage or injury is caused to the work or property or personnel of other contractors and agencies.

7.2 In case of any such loss or damage the Contractor shall take full responsibility for the same and shall bear all cost and expenses thereof. The Contractor shall be responsible and liable for all delays caused due to such damage and or injury and for the

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consequences which the other Contractors and Agencies may have to face or to which they may be subjected to or be accountable for as a result of such delays.

8.0 SAFETY OF MATERIALS AND MEN

The contractor shall provide proper and adequate storage facilities to protect all the materials and equipment including those issued by the owner against damage/theft from any cause whatsoever. The contractor should also protect the personnel/inmates from any mishap, which could occur due to negligence of Air conditioning contractor.

9.0 TOOLS, TACKLES, EQUIPMENT & SCAFFOLDING

Tools, Tackles & Equipment, necessary for the electrical installation and testing, shall be provided by the contractor. The quoted rates shall take into account for providing any such equipment, which may not form part of the installation, but are necessary for the execution of the job Contractor shall be responsible to make his own arrangement to provide scaffolding/supports etc., necessary for his work.

10.0 ACTUAL ROUTE OF PIPE LINES

10.1 The location of the HVAC duct and pipe lines, indicated in the drawing is only indicative. The actual route of HVAC pipelines may differ from the plans according to the details of the building construction and the conditions of executions of the installations.

10.2 The contractor shall supply and install at his own expense all secondary materials and special fittings found necessary to overcome the interference and to supply the modifications on the route of HVAC duct and pipe lines that are found necessary during the work to the complete satisfaction of SBIIM / Owner/Consultants.

11.0 RATING

Rating of all items shall be appropriate for the conditions on the particular site on which the item will be used. All the equipment shall be fit for continuous work under the most severe conditions of site and shall be rated for the following ambient condition.

- Outdoor temperature 44° C
- Temperature under shade 42° C

12.0 INSPECTION AND TESTING

12.1 The SBIIM / Owner/Consultant reserves the right to request inspection and testing at manufacturer's works at all reasonable times during manufacture of items for this contract. Tests on site of completed works shall demonstrate among other things.

12.2 That the equipment installed complies with specification in all particulars and is of the correct rating for the duty and site conditions.

- 12.3 That all items operate efficiently and quietly to meet the specified requirements.
- 12.4 The contractor shall provide all necessary instruments and labour for testing shall make adequate records of test procedures and readings, shall repeat any tests requested by SBIIM / Owner/Consultants and shall provide test certificates signed by a properly authorized person. Such test shall be conducted on all materials and equipment's and on completed work as called for by SBIIM / Owner/ Consultants.
- 12.5 If it is proved that the installation or part thereof is not satisfactorily carried out then the contractor shall be liable for the rectification and re-testing of the same as called for by SBIIM / Owner/Consultants at the cost of the contractor. The SBIIM / Owner/Consultants decision as to what constitutes a satisfactory test shall be final.
- 12.6 The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere. A test house approved by SBIIM / Owner/Consultants shall carry out all tests.
- 13.0 TESTING
- 13.1 All types of routine and other/tests shall be carried out at the works of the Contractor or the manufacturers of the components. The SBIIM / Consultants shall be free to witness any or all tests, if they so desire.
- 13.2 On completion of the installation, the Contractor shall arrange to carry out various initial tests as detailed below, in the presence of and to the complete satisfaction of the Consultants or his representative. Any defects or short comings found during the tests shall be speedily rectified or made good by the Contractor at his own expense. The initial tests shall include but not be limited to the following:
- 13.3 To operate and check the proper functioning of all electrically operated components viz. Compressor motor, fan, Air handling unit etc as well as other electrical motors.
- 13.4 To test and check the proper functioning of electrical switch gear, safety and other controls to ensure proper functioning.
- 13.5 To check the air distribution system and to provide design airflow in all areas by adjusting the grills, diffusers and dampers for air conditioning.
- 13.6 To check & balance/adjust the water flow in the water circuits for smooth and noiseless flow.
- 13.7 To check the systems against leaks in different circuits, alignment of motor, 'V' belt adjustments, control setting and all such other tests which are essential for smooth functioning of the plant.

- 13.8 On the satisfactory completion of all 'Initial' tests the plant should be considered to the 'Virtually Complete' for the purpose of taking over by the employer.
- 13.9 In addition to the 'Initial' test the Contractor shall also give two or three continuous running tests of the plant, each of (3) three days duration, and each one during the full specified outside conditions (when the ambient 13.8 On the satisfactory completion of all 'Initial' tests the plant should be considered to the 'Virtually Complete' for the purpose of taking over by the employer.
- 13.9 In addition to the 'Initial' test the Contractor shall also give two or three continuous running tests of the plant, each of (3) three days duration, and each one during the full specified outside conditions (when the ambient conditions are close to the specified ambient conditions). The first running test may be taken on the completion of the initial test, provided the ambient temperature and Humidity are near their peak.
- 13.10 The Contractor shall provide all necessary tools, instruments, gauges, flow meter, Anemometer, etc. as may be required for conducting the various tests. He shall also provide necessary lubricant etc and required personnel for the tests.

14.0 SAMPLES AND CATALOGUES

- 14.1 Before ordering the necessary material for these installations, the contractor shall submit Technical data sheets for Compressors, Condensers, Fan Coil Units, Air handling units, Ductable units, Motors, Insulation material, Piping, Valves & all other instruments & controls to the SBIIM / Owner/Consultants for approval. A sample of every kind of material such as pipe, fittings, insulation of ducts etc., shall be supplied.
- 14.2 Also the contractor shall ensure that the dimensional details of the equipment fit into the allotted space provided in the building.

15.0 VENDOR AND SHOP DRAWINGS

- 15.1 The contractor shall prepare and submit to SBIIM / Owner/Consultants for his approval six (6) sets of detailed layout of all HVAC equipment and piping layouts/ducting layouts.
- 15.2 He shall prepare shop drawings incorporating the details given by manufacturers for the items included in his contract and also owner supplied items and any other items which need to be coordinated with other contractors for interfacing.

- 15.3 Before starting the work, the contractor shall submit to SBIIM / Owner/Consultants for his approval in the prescribed manner, the shop/execution drawing for the entire installation.
- 15.4 The SBIIM / Owner/Consultants, reserves the right to alter or modify these, if they are found to be insufficient or not complying with the established technical standards or if they do not offer the most satisfactory performance or accessibility for maintenance. Contractor shall supply in eight (8) sets of all approved shop drawings for execution.

16.0 "AS BUILT"

At the completion of work and before issuance of certificate of virtual completion the contractor shall submit eight (8) sets to SBIIM / Owner/Consultants, layout drawing drawn at appropriate scale indicating the complete system "as installed".

17.0 INSTRUCTION / MAINTENANCE MANUAL

The Contractor shall prepare and produce instruction, operation and maintenance manuals in English for the use, operation and the maintenance of the supplied equipment and installations and submit to SBIIM / Owner/Consultants in (8) copies at the time of handing over.

The manual shall generally consist of the following:

- a) Description of the project.
- b) Operating instructions.
- c) Maintenance instructions including procedures for preventive maintenance.
- d) Manufacturers catalogues.
- e) Spare parts list with prices.
- f) Trouble shooting charts.
- g) Schematic & control wiring diagrams.
- h) Type and routine test certificates of major items.
- I) One (1) set of reproducible 'As Built' tracings on cloth.

18.0 COMPLETION CERTIFICATE

On completion of the HVAC installation a certificate shall be furnished by the contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out.

19.0 GUARANTEE:

At the close of the work and before issuance of final certificate of virtual completion by SBIIM / Owner/Consultants, the contractor shall furnish written guarantee indemnifying the owner against defective materials and workmanship for a period of one year after completion. The contractor shall hold himself fully responsible for reinstallation or replacement free of cost to owner, the following:

1. Any defective work or material supplied by the Contractor.

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2. Any material or equipment supplied by the owner, which is damaged or destroyed as a result of defective workmanship by the contractor.
3. Any material or equipment damaged or destroyed as a result of defective workmanship by the contractor.

20.0 RATE ANALYSIS

At any time and at the request of SBIIM / Owner/Consultants the contractor shall provide details or break-up costs and prices of any part or parts of the works.

21.0 WATER AND POWER

The contractor will make his own arrangement for water and electricity. If arranged by the Owner the same shall be supplied at one point only and the contractor shall be required to make his own arrangement for distribution lines required for the work. Recovery for the same shall be made at the prevailing rates based on the meter readings to be installed by the contractor at the source point. In case the Owner does not provide power/water they should make arrangements for themselves for carrying out the works.

22.0 MAINTENANCE OF PLANT AND TRAINING OF PERSONNEL

22.1 The Contractor shall arrange to provide, at no extra cost, necessary personnel and material to carry out all routine and special maintenance of the plant as required regularly for a period of twelve (12) months from date of handing over including monthly inspection by contractor or his technical representative during the guarantee period.

22.2 The contractor shall train the employer's personnel to operate the plant and carry out routine checks. During the period of installation and testing, if found necessary, the employer shall train such personnel at his works at no extra cost to the Owners.

23.0 PERIOD AND TIME LIMIT FOR VIRTUAL COMPLETION OF WORKS

The period and time limit for Virtual Completion of the Works shall be 8(Eight) calendar months from the date of issue of Work Order to commence works or handing over of site in respect of the award of Contract.

24.0 PROFESSIONAL INTEGRITY AND TEAM SPIRIT

It is the intent of SBIIM / Owner / Architect that this project will be executed in a spirit of team and full professional integrity. Contractor is expected to cooperate with all the agencies involved in the project to fulfil this objective.

25.0 LIST OF APPROVED MAKES

The Contractor shall quote for one of the makes of materials from the list of approved makes. The contractor shall clearly indicate the list of materials proposed to be used by him & enclose the same with the tender.

26.0 WORK PROGRESS REPORT

The Contractor shall provide the following while carrying out the execution/planning of works:

1. Detailed schedule of events with completion date
2. Fortnightly report showing progress of work
3. Program of works for upcoming weeks every fortnightly
4. Updated PERT charts with monthly progress
5. Material flow as well as cash flow scheduling at the beginning of the job. The SBIIM / Owner/Consultant for work scheduling shall approve the same. On completion of detailed engineering the contract shall submit the bill of quantities which will be within a variation of upto 5% of approved drawings from the customer/consultant.

27.0 NOISE CRITERION

- 27.1 All air conditioning equipment and materials (like pumps, chillers, motors, ducts, grilles, acoustic lining etc.) will be selected, designed and installed in such a manner that the inside noise criterion for all conditioned spaces will be in the range NC-30 to NC-35. The noise levels in conditioned occupied spaces due to all air conditioning equipment will not exceed 50 dB at 125Hz when measured at any point in the occupied spaces less than 1.5 meter above floor level and not closer than 1.5 meter from any supply air register or 1 meter from any return air grill.
- 27.2 When taking noise level measurements, the background noise level without the equipment operating shall be at least 7 dB below the actual background noise level when the equipment is in operation.

28.0 DESIGN PARAMETERS

Performance rating of the units shall be based as per the requirement.

Temperature of condensing Refrigerant = 135° F

Compressor speed not exceeding = 2950

Refrigerant = R 32 / R134A / R407 / R410 - Ozone Friendly and Non CFC Refrigerant

Piping shall be sized for the following design Parameters

Maximum flow velocity = 8 Ft/Sec.

Maximum friction = 5 Ft W C/100 Ft.

Design Parameters for duct design shall be:

Maximum flow velocity for A/c ducts = 1500 Ft/Min

Maximum velocity at supply air outlet = 500 Ft/Min

29.0 MODE OF MEASUREMENTS:

Mode of Measurement for payment of items of ducting and piping & their insulation shall be as follows:

29.1 PIPING:

Shall be measured in units of length along the centre line of installed pipes including all pipe fittings, flanges (with gaskets and nuts and bolts for jointing), unions, bends, elbows, tees, concentric and/or eccentric reducers, inspection pieces, expansion loops etc. The above accessories shall be measured as part of piping length along the centreline of installed pipes and no special rates for these accessories shall be permitted. The quoted unit rates for centre line linear measurement of piping shall include all wastage, allowances, pipe supports includes hangers, MS channel, wooden bunches, nuts and check nuts, vibration isolator suspension where specified or required, and cost of excavation, bedding back filling and finishing as required to complete the piping installation as per the specification. None of these items will be separately measured and paid for. However, all valves (gate/globe /butterfly /check-balancing/purge/drain etc.), strainers, orifice plates, temperature gauge, pressure gauges shall be separately measured and paid as per their individual unit rates, which shall also include their insulation as per specifications, piping measurements shall be taken before application of the insulation. The cost shall also include any excavations and making masonry valve chamber with steel cover etc.

29.2 PIPING INSULATION:

Shall be measured in units of length along the centreline of the installed pipe, strictly on the same basis as the piping measurements described above. The linear measurements shall be taken before the application of the insulation, it may be noted that for piping measurements, all valves, orifice plates and strainers are separately measurable and their quoted unit rates shall include the insulation cost in the valve required and as specified.

30.0 TESTS AT SITE:

30.1 GENERAL:

The Contractor must perform all inspection and tests of the system as a whole and of components individually as required, under the supervision of the Engineer, in accordance with the provisions of the applicable 'ASHRAE' standards or approved equal and as per site requirements. All tests shall be recorded in the format approved by SBIIM / Consultant/Owner.

30.2 PIPING SYSTEM:

In general pressure tests shall be applied to piping only before connection of equipment and appliances. In no case shall piping, equipment appliances be subjected to pressures exceeding their test ratings. Tests shall be completed and approved before insulation is applied. After tests have been completed, the system shall be drained and cleared of all dust and foreign material. All strainers, valves and fittings shall be cleaned of all dirt, fillings and debris. All water piping shall be tested and proven tight under hydrostatic pressure of 10 Kg/Sq cm, unless stated otherwise in the specifications. The prescribed pressure shall be maintained at least three complete days of Twenty Four hours each.

30.3 ELECTRICAL EQUIPMENT:

All electrical equipment shall be cleaned and adjusted at site before connection of power. The contractor as per relevant IS/IE rules shall carryout the following minimum tests.

Wire and Cable continuity tests.

Insulation resistance test, phase to phase and phase to earth and phase to neutral on all circuits and equipment, using a 1000 volt Megger. The earth resistance between conduit system and earth must not exceed half (0.5)

OHM.

The phase rotation tests Operating tests on all protective relays to prove their correct operation before energizing the main equipment including secondary injection test at site. Operating tests on all starters, circuit breakers, etc.

30.4 PERFORMANCE TESTS:

The installation as a whole shall be balanced and tested upon completion and all relevant information including the following shall be submitted to the Owner.

- i) Air volume passing through each unit duct, grill etc.,
- ii) Differential pressure readings across each filter, fan, coil and through each Pump, Chiller and Condenser.
- iii) Electrical current reading in Amperes of full and average load running and starting together with name plate, current in each electrical motor. Daily records should be maintained of hourly readings, taken under varying degrees of internal heat load and use and occupation, of wet and dry bulb temperatures, upstream 'ONCOIL' of each cooling coil. Also suction temperatures and pressures for each refrigerating unit. The current and voltage draw by each machine. Any other reading shall be taken which the Engineer may subsequently specify.

30.5 MISCELLANEOUS:

The above tests are mentioned here in amplification but not by way of limitation to the provisions of conditions of contract and specification. Duration of the test shall be continuous 72 working hours. Contractor shall carry out three seasonal tests each of 72 hours duration defect liability period of the approved dates. The date of commencement of all tests listed above shall be subject to the approval of the Engineer and in accordance with the requirements of this specification. The contractor shall supply the skilled staff and all necessary instruments and carry out any test of any kind on a piece of equipment, apparatus, part of system or on a complete system if the owner requests such a test for determining specified or guaranteed data as given in the specifications or on any damage resulting from the tests shall be repaired and/or damaged material replaced all to the satisfaction of the Owner. In the event of any repair or any adjustment having to be made giving sufficient notice, in order that P.M.G or his nominated representative may be present. The contractor must inform P.F.G. when such tests are to be made, giving sufficient notice, in order that P.M.G or his nominated representative may be present. Complete records of all tests must be kept and 3 copies of these and location must be furnished to the P.M.G. The contractor may be required to repeat the test as required, should the ambient conditions at the time not given, in the opinion of the P.M.G sufficient and suitable indication of the effect and performance of the installation as a whole or of any part, as required.

31.0 MAINTENANCE

The contractor shall maintain the system in the plant room for a period of 12 months, from the date of successful commissioning of the plant. The contractor shall provide all necessary tools and tackles for maintaining of the plant. In case of poor

workmanship or system breakdown the contractor shall repair/replace the defective parts without any extra expenses to the client. This clause shall be in vogue till the guarantee period of the system.

32.0 The Tenderer shall quote his best competitive price for the job in line with the specification.

33.0 PENALTY

In case the units supplied by the manufacturer is not within the specified limits as per tender schedule he shall compensate the for client the expenses incurred by virtue of power or any other means. Over and above he shall compensate for the expenses incurred in running the plant until it is put back to the rating specified and confirmed by SBIIM / consultants/owner. In case the job is not completed within the stipulated time, the contractor shall be penalized at rate of 0.5% of the total contract value per week of delay up to a maximum of 10% of the total contract value.

34.0 TENDER DOCUMENT

The contractor shall submit the tender document duly signing every page of the document. He shall also submit the technical information totally as per the tender document. In case, any technical information is left unfilled the tender would be summarily rejected without any further intimation to the contractor.

SPECIFICATIONS FOR INDOOR UNITS

A. 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 not exceed 350 mm.

The unit shall be pre charged with first charge of R 32 / R 134A / R 407 / R 410 refrigerant. Additional charge shall be added as per refrigerant piping at site.

The unit must have in built drain pump, suitable for vertical lift of 750 mm.

The unit casing shall be Galvanized Steel Plate / or as per manufacturer's specifications.

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 (288 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.

The unit will be connected in series to a suitable outdoor unit & it must be possible to Operate the unit independently, through corded/ cordless remote specified in the "Bill of quantities". The unit will be further connected to Intelligent Building Management System (To be supplied by other vendors) & it shall be possible to operate the unit through this IBMS system.

The unit shall be supplied with following from the factory with following:

Operation Manual

Installation Manual

Paper pattern for installation

Drain hose/ Clamp metal/ Washer fixing plate/ Sealing pads/ Clamps/ Screws/

Washer for hanging bracket/ Insulation for fitting

B. Wall Mounted Units.

Wall mounted units must be compact & stylish design that does not detract from the Décor of the room.

The unit shall be precharged with first charge of R 32 / R 134A / R 407 / R 410 refrigerant.

Additional charge shall be added as per refrigerant piping at site.

Each indoor unit must have electronic expansion valve operated by microprocessor thermostat based temperature control to deliver cooling/ heating as per the heat load of the room.

The unit must have provision of adding drain pump kit if required & specified. The drain pump must be suitable to lift drain up to 1000 mm from the bottom of the unit.

Unit must be insulated with sound absorbing thermal insulation material, polystyrene/Polyethylene foam. The noise level of unit at the highest operating level shall not exceed 46 dB(A), at a vertical distance of 1.5 m from the grille of the unit.

The unit shall be supplied with Resin Net filter with Mold Resistance. The filter shall be easy to remove, clean & re install.

The unit grille must be washable with soap solution.

It shall be possible to set minimum 5 steps of discharge angle by remote controller.

It shall be possible to fit drain pipe from either side of the unit (Left or right)

The unit will be connected in series to a suitable outdoor unit & it must be possible to Operate the unit independently, through corded/ cordless remote specified in the bill of quantities. The unit will be further connected to Intelligent Building Management System(To be supplied by other vendors) & it shall be possible to operate the unit through this IBMS system.

The unit shall be supplied with following from the factory with following:

Operation Manual
Installation Manual
Installation panel
Paper pattern for installation
Insulation tape/ Clamps/ Screws

A - 1: COPPER TUBING.

The parent material used for air - conditioning system refrigerant tubing should be Copper tubes, tubes and fittings conforming to following specifications:

1. Material composition should be conforming to C-1220 (JIS-H-3300) or C-12200 (ASTM). It should have a minimum Copper content of 99.9 % and Phosphorus content between 0.015 % and 0.040 %. It should have low residue (below 0.038 gm / sq mtr). The material should also be as per the RoHS norms specified by EU; that is, Mercury, Chromium and Lead contents below 1000 ppm, and Cadmium content below 100 ppm.
2. Physical properties of the material should conform to JIS-H-3300 or ASTM-B-68 & B-75, should be tested for Tensile / elongation / hardness / grain size tests as per ASTM B -280.
3. Dimensional tolerance should be as per JIS-H-3300 or ASTM-B-251. The tubes should be tested using non-destructive Eddy current test before the final anneal, as per JIS-H-3300 or ASTM-E-243.
4. Heat treatment should be carried out in non-oxidizing atmosphere to ensure oxygen free and Cuprous oxide-free surface.
5. Proper certificates describing composition and results of all tests carried out must be supplied with each consignment. These certificates, along with check results for dimensional and thickness accuracy are recommended to be carried out for every delivered lot, should be maintained till handing over of the project.
6. Tubes should have 360 degree concentric wall thickness along their entire length.
7. Wall thickness for soft tubes (bright annealed mirror finish) should be 0.8 mm for 1/4", 3/8" & 1/2" tubes, 1.0 mm for 5/8" tubes, 1.2 mm for 3/4" tubes. Wall thickness for hard tubes should be 1 mm for 7/8", 1" and 1 1/8" tubes, 1.1 mm for 1 1/4", 1.2 mm for 1 3/8" and 1.3 mm for 1 5/8" tubes.
8. Wall thickness for elbows and fittings should be minimum 0.2 mm more than corresponding tube / tube size.
9. For 1/4" to sizes up to 3/4", pulley type benders should be used for soft tubes and brazed joints should be avoided as far as possible. Similarly, for half hard tubes of size 3/4" or more, one side expanded tubes must be used and use of couplings should be avoided as far as possible.

A -2 : TUBING DESIGN:

1. Contractor should study the tender / GFC drawings carefully, and should carry out detailed survey of site, relating the drawings with site, and understand the system design and site limitations.
2. Contractor should also collect final architectural and reflected ceiling plans from client and study the drawings for any mismatches with the HVAC drawings received.
3. Contractor should discuss any such mis- matches and any doubts regarding system design with the consultant and get all doubts clarified.
4. Before commencement of tubing work, proper shop drawings must be generated by the contractor, and same should be got approved from the consultant. The drawings must clearly indicate schematic flow diagrams for various circuits, tube sizes, description and quantities for refrigerant joints, indoor and outdoor unit models and room / block / floor names, tube routes, levels for horizontal tubes, details regarding insulation type and thickness and surface treatment for insulation, typical and critical sections and any other details to explain the entire tubing layout to the installer.
5. Tube sizing and routing must be carried out taking into consideration various site constraints and system manufacturer's recommendations.
6. Care should be taken to design tubing as per the manufacturer's recommendation for maximum tubing total length, maximum tubing length after first tapping, vertical height difference between outdoor and indoor units etc. and necessary corrections should be carried out in outdoor unit capacity if required.

A - 3 : REFRIGERANT TUBING INSTALLATION WORK:

1. The installer must first study the shop drawings in detail with respect to the site condition and point out any fouling / alternatives to the agency prepare shop drawing and necessary revisions must be carried out in the drawings, to be approved by consultant.
2. The layout must be marked on the true ceiling and any civil openings required should be marked and got done from concerned agency.
3. Supports as described in BOQ / specifications should be installed, leaving adjustable free length for supports.

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4. Before installation, the tubes and tubes must not be removed from their original packing. Proper storage of tubing is a must to maintain the temper of the tubes / tubes. Any abrasion on ends / surface, or any in grace of dirt / dust must be avoided. Proper Polyethylene sheets should be used for covering the tubes and tubes, while wooden pellets and soft expanded Polyethylene / rubber sheets should be used as floor supports.
5. Necessary loops / slopes must be followed as recommended by system manufacturer.
6. Tubes must be cut to required sizes using cutting tools recommended by system manufacturer.
7. Using proper quality of brazing set, Oxygen / Acetylene and Copper brazing rods having minimum 2% Silver content.
8. During brazing, Nitrogen must be filled in the Copper tubing at a mild positive pressure and must be kept bleeding out continuously, to prevent any oxidation of parent material.
9. After tubing work, each circuit should be pressure tested as per the system manufacturer's recommendation and as per the procedure described in the following paragraphs. A certificate mentioning the test pressure, time of first and final pressure readings, make, model, serial number, range and least count of the gauge used, along with a copy of valid calibration certificate must be maintained, duly signed by the inspecting technician, and client /PMC representative.
10. After pressure testing, insulation must be completed as per the material, make and thickness mentioned in the approved shop drawing. The joints of insulation must be sealed by minimum 50 mm wide Aluminium adhesive tape. Care should be taken to avoid any air gaps between tube / tube and insulation sleeves, and between two insulation sleeve joints.
11. Proper tagging must be carried out to trace the tubing to respective indoor and outdoor circuits.
12. The tubes exposed to sunlight must be covered / cladded / treated to prevent damage from UV radiation and bird pecks / tampering, as mentioned in the BOQ. The cladding should be made out of 26 G Aluminium sheet or G.S.S. sheet. While cladding, care should be taken to avoid penetrating the insulation by screws. Short screws Of metallic straps should be used for securing cladding sheets. Instead of cladding, glass cloth, with two coats of protective resin should be used.
13. While charging refrigerant, manufacturer's recommendations must be strictly

followed, and charging must be carried out using proper charging hose, gauge manifold with calibrated gauges and electronic weigh scale. Further leak check using a gas leak detector should be carried out. Charging must be carried out after proper evacuation of the tubing. The quantity of refrigerant to be charged should be calculated by totalizing the liquid tube volume as per the manufacturer's recommendation.

A - 4 : RECOMMENDATIONS FOR PRESSURE TESTING:

Refrigerant tubes carry refrigerant at pressures different from atmospheric pressure. When pressure inside tubes is more than atmospheric pressure, refrigerant may escape to the atmosphere, causing commercial loss due to loss of refrigerant, inefficient system performance or even system breakdown and contamination of surroundings. When pressure inside the tubes is less than atmospheric pressure, such as in case of suction tubes of some low temperature refrigeration machines, or during pump-down cycle of normal air-conditioning systems, leakages in tubes leads to ingress of air and moisture, causing severe system damage. Therefore, it is a must that the refrigerant tubing is thoroughly tested for leakages. Pressure testing for any tubing must be carried out at a pressure higher than the maximum operating pressure within the system. It is recommended that the pressure recommended by manufacturer be followed very strictly. Testing at lower pressures may lead to non-detection of some small leakages, while testing at higher pressures may lead to damage to some factory manufactured components within the system. Generally, for R-410 systems a pressure of around 650psig is used. Nitrogen is the most common gas used for carrying out pressure testing. It has numerous advantages, some of which are listed below:

1. Nitrogen is easily available as a commercial gas packed in easy to handle cylinders.
2. Nitrogen, being the most abundant component of the atmosphere, is safe for leaking out without contaminating the atmosphere.
3. Nitrogen is less costly as compared with other gases.
4. Nitrogen is safe for handling and testing.
5. Nitrogen does not readily react with system components Pressure gauge/s used for testing must be calibrated and a calibration certificate with traceability to a Government(National) Physical Laboratory must be documented. The gauge should be capable of measuring pressure at least 10% above the reading to be recorded.

A - 5 : PROCEDURE FOR CARRYING OUT PRESSURE TEST

- 1) Ensure that the tubing to be tested is properly secured/supported and the openings

have been sealed off as per manufacturer's recommendation.

- 2) Install pressure gauge/s at strategic location/s where it shall not be tampered with,
at the same time, should be easily visible.
- 3) Install a valve and connecting tubing so that the open end of the tube reaches the cylinder outlet without moving the cylinder.
- 4) Connect the tube to the cylinder and after ensuring proper connection, crack open the cylinder valve, keeping an eye on the pressure gauge. Let the pressure rise to around 10 psig.
- 5) Check for proper sealing of all flanged / flare nut joints or valves/ valve glands looking for noise of escaping Nitrogen and seal same.
- 6) Open the cylinder valve again and raise the pressure to 200 psig.
- 7) Check the tube line for major leakages at brazed joints, elbows, valve glands, equipment end connections and tube seams with the help of soap water. Make up the leaks by tightening nuts. If the leaks are in brazed joints, flush out Nitrogen and carry out necessary re-brazing.
- 8) Open the cylinder valve again and increase the pressure to 150 psig less than the final test pressure. Repeat leak check as above.
- 9) Open the cylinder valve again and slowly raise the pressure to the manufacturer recommended pressure. Carry out a thorough leak check.
- 10) Record the pressure and time. Let the pressure stand for 24 hours without tampering. Check the pressure again after 24 hours. If pressure has dropped, the tubing should be checked very thoroughly for minor leakages. It is important to follow this 24 hours period as it gives enough time to detect minute leakages, and it removes the doubt created by thermal expansion of Nitrogen (as after exact 24 hours, ambient conditions are generally same).
- 11) In case of tubing extending to lengths more than 30 m and / or having more than 20 site fabricated joints, the pressure should be recorded after 24 hours as well as after 48 hours, so that all leakages are detected and made up.
- 12) After detecting and making up any leak, the pressure testing must be carried out once again from beginning.

A - 6 : DOCUMENTATION RECOMMENDED FOR ENSURING PROPER QUALITY ASSURANCE:

1. Manufacturer's certificate with every Delivery Challan declaring composition of parent material
2. Signed and approved Shop drawings approved by SBIIM / Client / Consultant, prior to start of work
3. Pressure test report signed by SBIIM / Client / Equipment manufacturer / PMC / Consultant.
4. False Ceiling closure check list duly signed by SBIIM / Client / Equipment manufacturer/ PMC /Consultant.

GENERAL:

ACR GRADE COPPER TUBES AND FITTINGS : SIZES AND SPECIFICATIONS

Tube material Specification :

(CFC- free refrigerant compatible tubes produced using Total loss lubricants)

1. De-oxidized High Phosphorized copper (DHP grade) raw material, with Chemical Composition of Copper = 99.9 % ; Phosphorus = 0.015 to 0.040 %
2. RoHS Compliant
3. 360 degree concentric Wall thickness along the entire length of the tubes
4. Half hard drawn copper tubes should confirm to ASTM B75/ ASTM280 (C12200) / JIS H:3300(C1220) / BS2871 part 3 (C106). Use Half Hard Temper Type for tube sizes above 19.1 mm.
5. Soft copper tubes, bright annealed (mirror finish) should confirm to ASTM B68 / JIS H:3300
6. Super clean quality with low residual content below the permissible levels of 0.038 g/m² for compatibility with use of CFC-free refrigerant.
7. 100 % Eddy Current Tested Tubes are to be used
8. Proper packaging, Storage and Traceability of the tubes.

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Copper tube and Fittings Sizes and Insulation Specifications for CFC-free Refrigerant.

S. No.	OUTER DIAMETER IN INCH & (MM)	WALL THICKNESS IN GAUGE & (MM)	LENGTH IN FEET & (MTRS.)	TEMPER	WEIGHT PER METER (kg.)	SOCKET AND ELBOW THICKNESS IN SWG & (MM)	RUBBER INSULATION THICKNESS
1.	1/4" (6.4 mm)	21 (0.8 mm)	50' (15.24)	Soft	0.1265	18 (1.2mm)	15mm
2.	3/8" (9.5 mm)	21 (0.8 mm)	50' (15.24)	Soft	0.199	18 (1.2mm)	15mm
3.	1/2" (12.7 mm)	21 (0.8 mm)	50' (15.24)	Soft	0.2714	18 (1.2mm)	15mm
4.	5/8" (15.9 mm)	19 (0.99 mm)	50' (15.24)	Soft	0.4241	18 (1.2mm)	15mm
5.	3/4" (19.1 mm)	19 (0.99 mm)	50' (15.24)	Soft	0.5147	18 (1.2mm)	20mm
6.	1/4" (6.4 mm)	21 (0.8 mm)	12' (3.658)	Half Hard	0.1265	18 (1.2mm)	15mm
7.	3/8" (9.5 mm)	21 (0.8 mm)	12' (3.658)	Half Hard	0.199	18 (1.2mm)	15mm
8.	1/2" (12.7 mm)	21 (0.8 mm)	12' (3.658)	Half Hard	0.2714	18 (1.2mm)	15mm
9.	5/8" (15.9 mm)	19 (0.99 mm)	12' (3.658)	Half Hard	0.4241	18 (1.2mm)	15mm
10.	3/4" (19.1 mm)	21 (0.8 mm)	12' (3.658)	Half Hard	0.4164	18 (1.2mm)	20mm
11.	7/8" (22.2 mm)	21 (0.8 mm)	12' (3.658)	Half Hard	0.489	18 (1.2mm)	20mm
12.	1.0" (25.4 mm)	20 (0.88 mm)	12' (3.658)	Half Hard	0.6054	18 (1.2mm)	20mm
13.	1 1/8" (28.6 mm)	19 (0.99 mm)	12' (3.658)	Half Hard	0.7865	18 (1.2mm)	20mm
14.	1 1/4" (31.8 mm)	18.5 (1.1 mm)	12' (3.658)	Half Hard	0.843	16 (1.6mm)	20mm
15.	1 3/8" (34.9 mm)	18 (1.21 mm)	12' (3.658)	Half Hard	1.155	16 (1.6mm)	20mm
16.	1 1/2" (38.1 mm)	17.5 (1.3 mm)	12' (3.658)	Half Hard	1.340	16 (1.6mm)	20mm
17.	1 5/8" (41.3 mm)	17 (1.43 mm)	12' (3.658)	Half Hard	1.594	16 (1.6mm)	20mm

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Use Soft tube only for Indoor Unit Connection

10. **INSULATION TO REFRIGERANT PIPING:**
FR nitrile rubber / cross linked closed cell polyethylene tube insulation of 13mm upto 1" dia pipes and 19mm thick for 1" and above shall be used for copper piping both for suction line and liquid line. All joints shall be sealed with self-adhesive tape or with heat.
11. **COMMUNICATION CABLE AND CONTROL CABLING:**
Communication cable and control cabling: Communication cable and control cabling should be of non-polar shielded 2 core cable shall be laid in 20 mm dia PVC conduits of required size. PVC conduit should be clamped neatly maintaining a distance from power cables, Cable terminations and dressing shall be done properly and neatly.
12. **DRAIN PIPING:**
PVC drain piping shall be used for the drain piping. Proper care shall be taken to lay the drain piping with sufficient slope and should be clamped or supported at 1.5 m interval. All drain pipe joints shall be done with adhesive. Drain piping should be tested for leaks before commissioning. After testing for leaks, drain pipe shall be insulated with 9 mm thick nitrile rubber tube insulation. Insulation shall be finished with self-adhesive black cotton tape.

DUCTABLE SPLIT AIR CONDITIONERS

1.0 GENERAL

All the Duct-able split air conditioners units shall be factory assembled and tested complete in all respects and conforming to Indian/ASHRAE standards. They shall be supplied pre-charged with refrigerant gas and oil ready for installation at site. The Air-cooled split Unit shall be a two piece assembly comprising of the following:

1 CONDENSING UNIT

- a) Hermetically sealed Scroll type compressors with refrigerant cooled motor.
- b) Air-cooled Condenser.
- c) Condenser fan with sufficient air discharging capacity.
- d) Steel structure with sheet metal casing in which the above are mounted.
- e) Automatic capacity control devices along with safety gauges/devices.
- f) Full charge of R-22 along with refrigerant oil.

2 EVAPORATOR UNIT

- a) Direct expansion-cooling coil.
- b) Inter connected Seam less copper refrigerant piping.
- c) Centrifugal fan with motor.

3.0 CONDENSING UNIT (OUT-DOOR UNIT)

The condensers should be fitted with in built circuit breaker or external weather proof isolater with encloser of required capacity.

3.1 COMPRESSOR

The Scroll compressor shall be Hermetically sealed in design. The compressor shall be a direct shaft mounting of the refrigerant cooled hermetic motor.

2.1.1 EXTERNAL

The compressor housing shall be made of gas tight steel shell which is made up of two shells, these shells are welded together to form a Hermetic (Airtight) seal. One shell is fitted with a suction tube and a Glass-matic terminal used for supplying power to the motor, fitted inside the compressor shell and the other is fitted with a discharge tube. The shell also acts as an oil sump.

2.1.2 INTERNAL

The internal parts shall be accurately machined for installation of the required parts. The Impellers, valve plate and connecting shaft shall all be made of Aluminum alloy having high compressive strength.

LUBRICATION

The oil pump formed by drilling number of holes on the surface shall do the lubrication of the bearing. One end of the crankshaft shall be always dipped in the oil.

CONDENSER COIL

The condenser coil shall be internally grooved copper tube with split aluminum fins. The condenser shall be fitted with a fan of propeller type. The condenser shall be built on an air-cooled design using outside ambient air up to 45°C to condense the refrigerant. The condenser coils shall be constructed of 12 mm OD integrally enhanced Seam less copper tubes arranged in staggered rows. This shall have a minimum of 3 rows to provide proper heat rejection. The copper tubes shall be mechanically expanded into lanced and rippled Aluminum fins of minimum 0.1mm thick with 13 fins per inch.

CONDENSER FANS

The condenser fans shall be of propeller type with the motor directly fitted to the shaft of the fan. The fan shall have a minimum of 6 blades for delivering maximum air quantity of air without any motor overloading. The fan blade should be either moulded unbreakable plastic or die cast aluminum material. The motor shall be of TEFC construction and shall be of IP 55 protection with resistant to high ambient.

REFRIGERANT PIPING

The refrigerant piping interconnecting all the condensing unit and the evaporator unit shall be of Seam less copper with tube dia as required and having a wall thickness of minimum 2mm and able to withstand pressure up to 450 PSI. Necessary gas mufflers, flexible connections on discharge and suction side shall be provided to reduce vibration / noise of refrigerant/compressor.

SAFETY DEVICES

The condensing units shall be provided with all necessary safety devices, which are essential for proper operation of the equipment. These shall not be limited to the scope of this specification and shall have all safety devices required for optimum operation of the unit. The following minimum safety devices are suggested:

- a. Low voltage cutout
- b. Low evaporating cutout
- c. In-built internal overload
- d. Pressure relief valve
- e. Low pressure cutout
- f. High condensing pressure cutout
- g. Motor overload trip/protection

MOTOR

Motor shall be squirrel cage constant speed, suitable for 220+ 10 % volts, 50 Hz, 1phase power supply. Motor speed shall not exceed 1450 RPM. The fan and motor combination selected for particular requirement shall be for the most efficient type so that sound level and energy consumption is minimal. Motor conduit box shall be mounted on exterior of the casing. Wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit.

EVAPORATOR UNIT

FAN

Fan impeller and housing shall be fabricated from heavy gauge steel. Fan wheels shall be of double width, double inlet forward-curve multi-blade type enclosed in Housing and mounted on a common shaft. Fan housing shall be made of die-formed steel sheets with streamlined inlets and guide vanes to ensure smooth airflow into the fans. The fan shall be belt driven with pulley having belt-tensioning arrangements. All rotating parts shall be statically and dynamically balanced. Fan speed shall not exceed 1500 RPM and maximum fan outlet velocity shall be 450 meters per minute (1500 FPM). The average air quantity for the air handling units shall be 400 CFM per TR of refrigeration. However the fan should be facilitated with capacity adjustment for lower or higher air quantities as per individual air requirements as the site demands. Stretch less V-Belts should be used. The fan shall be able to deliver the desired air quantity with sufficient static pressure for carrying out the ducting and also be able to add fresh air.

COOLING / COILS

Cooling coils shall have 12.5 to 15 mm dia copper tubes min. 24 gauge thick, with aluminum fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across each coil shall not exceed 150 meters per minute. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21 Kg / Sq. cm. air pressure while submerged in water. Tubes shall be hydraulically expanded for minimum thermal contact resistance with the fins. Fin spacing shall be 13 fins per inch. (4-5 Fins/CM.). The units shall be fitted with minimum 3-row coil for giving the cooling effect.

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STEEL STRUCTURES

The evaporator unit shall be assembled on formed corrosion resistant galvanized sheet metal steel sections which shall be pre treated and finished with epoxy painting/polyester powder coating. The steel structure shall be sturdy enough to withstand transport without getting distorted and when stationary handle the equipment load. There should be proper encasing of unit with acoustic lining in all inside to reduce noise level of the equipment.

MOTOR

Motor shall be squirrel cage constant speed, suitable for 220+ 10 % volts, 50 Hz, 1phase power supply. Motor speed shall not exceed 1450 RPM. The fan and motor combination selected for particular requirement shall be for the most efficient type so that sound level and energy consumption is minimal. Motor conduit box shall be mounted on exterior of the casing. Wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit.

PERFORMANCE

The performance of the unit shall be proved at site at the time of installation and also the power consumption should not exceed the confirmed rating through out the period of service of the equipment. The company shall stand guarantee for the aforesaid condition and shall compensate the client in case the power consumption proved at site is more than the stipulated power. The rate of compensation shall be as indicated in penalty clause as given earlier in the conditions of contract.

The contractor shall submit along with the tender the rating charts of the machines offered indicating the percentage capacity, power consumed, rated amperage, locked rotor amps and also inrush currents of equipment at maximum ambient conditions.

PAINTING

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the finish over the adjoining shop painted surfaces.

TESTING

Cooling capacity of various Unit models shall be computed from the measurements of airflow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements meters shall be accurately calibrated. The temperature gauges shall be mercury-in glass thermometers. Computed results shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

SHEET METAL WORK

Sheet metal ducting required for air distribution system is shown in drawings forming part of these specifications. These drawing indicate the duct sizes and configuration required to meet design air distribution requirements and also to provide the Contractor with necessary data for bidding; they are not meant to serve as working drawings which will have to be prepared by the successful contractor, giving due attention to the structural features of the building and to other site requirements, as well as partition layouts, lighting and false ceiling patterns etc, and for which approval has to be obtained from the Architects/Owners.

1. GSS sheets shall be used for ducting. Only new, fresh, clean (unsoiled) and bring sheets shall be used.

2. The thickness of the sheets to be used shall be as shown in the table below:

2.2 RECTANGULAR DUCT

Dimensions of Ducts (mm)	Guage - G. I.	Guage - Aluminum.	Type of Joints.	Type of Bracings.
Upto 600	24	22	G. I. Flange at 2.5 Center.	Cross Bracings.
601 to 750	24	22	22 x 225 x 3 mm angle frame with 6mm dia nuts and bolts.	25 x 25 x 3 mm MS angles bracing at 1500mm from joints.
750 to 1000	22	20	25 x 25 x 3 mm angle frame with 6mm dia nuts and bolts.	25 x 25 x 3 mm MS angles bracing at 1500mm from joints.
1001 to 1500	22	20	40 x 40 x 5 mm angle frame with 8mm dia nuts and bolts.	40 x 40 x 3 mm MS angles bracing at 1500mm from joints.
1501 to 2250	20	16	50 x 50 x 3 mm angle to be cross braced diagonally with 10mm dia nuts and bolts at 125 center.	40 x 40 x 3 mm MS angle bracing at 1200mm from joints or 40 x 40 x 3 mm MS angle diagonal bracing.

Sheet metal ducts shall be fabricated as per ISI Standards/SMACNA out of galvanized steel sheets. Sheets used shall be produced by hot dip process and galvanizing shall be Class VI - Light Coating of zinc nominal 185 gm/sq. m.

2.3 HANGERS FOR DUCT

Duct Size (mm)	Spacing (M)	Size of MS angle (mm x mm)	Size of rod - dia (mm)
Up to 750	2.5	40 x 3	10
751 to 1500	2.0	40 x 3	12
1501 to 2250	2.0	50 x 3	15
2251 & above	2.0	50 x 3	15

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The fabrication of the ducting including details of transverse joint connections, bracing, seams, etc., for longitudinal joints etc., will be generally as per ISS-655-1963, the intent being to obtain duct pieces that are robust and rigid enough to preclude flutter, buckling etc., and to avoid air leakage's

Angle iron flanges shall be used

All supports for ducting shall be provided by the successful contractor, MS angles, rods and other sections shall be used as required for the purpose. The supports shall be taken independently to the building structure, in other words they should not be tied on to supports for light fixtures.

All bolts, nuts, rivets, washers, etc., used for duct joints shall be of GI and not MS.

All duct joints shall be made tight and the interior surfaces shall be smooth. Necessary gaskets of rubber or similar material shall be used to secure tightness of joints.

ALL MS angles, flats, etc., used for flanges, stiffening etc., shall be finished with two coats of Red Oxide and one coat of Black paint. These requirements shall apply to supporting arrangements / members also.

Minimum thickness of structural members employed for supports shall be as per IS 800.

Where ducting is supported from ceiling/ roof slab, Anchor grip bolts shall be used to fasten the suspension rods (for duct supports) to the ceiling/ roof slab.

All civil works involved including the drilling of holes for fixing the grip bolts and any chipping and finishing of the ceiling/ roof slab, if found unavoidable, shall be carried out by the successful contractor at no extra cost.

Elbows, bends, offsets, etc. should be fabricated with a width to radius ratio of not less than 1.0 to 1.5. Alternately, turning vanes should be provided at intervals so chosen that the aspect ratio of the various sections so formed by the vanes will be at least five.

Turning vanes shall be provided at branch take-offs and collars wherever possible. Similarly, straightening vanes shall be provided in all the collars unless and except in case where conditions at site do not permit their installation.

All supply air diffusers shall be of powder coated extruded aluminum 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.

Supply air grilles shall be double deflection type & powder coated extruded aluminum construction. They shall be complete with volume control dampers of aluminum mounted on grilles. The vanes at the front shall be horizontal while those at the rear shall be vertical. The width of the perimeter flanges shall be 32 mm. The vanes shall be 3 mm thick and 25 mm deep.

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Return air grills shall also be Powder coated extruded aluminum construction. They shall incorporate (only) horizontal vanes, which shall be fixed. The perimeter flanges shall be 32 mm width. The vanes shall be 3 mm thick and 25 mm deep. The pitch of vanes shall be 20 mm.

All dampers shall be louvered dampers (of GI) of robust construction and tightly fitted in epoxy painted MS angle iron frame. They shall be provided with suitable links, levers and quadrants as required for their proper operation, control or setting in any desired position.

Dampers and their operating devices shall be made robust, easily operable and accessible through suitable access doors in the ducts/ false ceiling. Where required, dampers shall have an indicating device, clearly showing the damper position at all 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.

All sheet metal connections, partitions and plenums required to confine the flow of air to and through the filters, fans, etc., shall be constructed of 18 G GI Sheets, thoroughly stiffened with 25 mm x 25 mm angle iron braces and fitted with all necessary doors as required to give access to all parts or apparatus. Doors shall not be less than 450 mm x 600 mm in size.

Where sheet metal ducts sleeves terminate in woodwork, brick or masonry openings, Tight joints shall be made by means of closely fitted heavy flanged collars.

Connection of ducts to fans shall be of suitable flexible synthetic material.

On completing the erection, the system shall be pressure tested with dry nitrogen or carbon Dioxide. The test pressures shall be as under for R-22

High pressure side

- kg/sqcm(psi) - 28./5 (420)

Low pressure side

- kg/sqcm(psi) - 10.0 (150)

The systems shall hold the pressure for a minimum period of 24 hours without revealing any leaks. After the leak test has been completed successfully, the pressure due to the nitrogen gas/carbon-dioxide in the system shall be used to blow-out the system.

The system shall then be dehydrated by drawing a vacuum. The vacuum achieved shall be atleast as deep as 500 microns and shall be maintained for a period of atleast 24 hours after the vacuum pump has been shut off.

INSULATION & ACOUSTIC LINING

THERMAL INSULATION

The scope of this Section comprises the supply and application of insulation to condensate drain piping, refrigerant piping, sheet metal ducting,

The materials used shall be rigid poly urethane foam, suction lines, condensate drain pipes and equipments, while for sheet metal ducting, resin bonded fibre glass in mat form shall be used.

The RPUF used shall conform to the following requirements:

- A) Density : Not less than 24 kg/ cum
- b) Compressive strength: Not less than 1.73
- c) 'K' value : Not greater than 0.019
w/m deg C at 10 Deg. C
- d) Water vapour : Not more than 13 mg/Nh.

The fiber glass used for insulation of sheet metal ducts & for acoustic lining shall have a density of not less than 24 kg/cum & 'K' value of not less than 0.033 w/m² Deg C at a mean temperature of 10 deg C

The owners / consultants also reserve the right to require that the weights dimensions, etc., of the materials supplied be measured and shown to conform to values specified.

The insulation material used for insulating equipment shall be in the form of panels while for piping the RPUF shall be in the form of pre-formed cylindrical sections

Notwithstanding the above specifications, however, the final choice of the material rests on the owners whose approval shall be obtained before the AC contractor place his order or brings material to site.

Samples of all insulation material specified in various forms i.e. panels, pipe sections, mats, etc., shall be submitted by the successful contractor and approval obtained therefore. The owners/ consultants shall have the right to reject all supplies, which do not conform to the samples so approved.

All insulation on equipment, piping etc. shall be applied only after they have been pressure tested satisfactorily.

Where stipulated, supply and return air ducts running in unconditioned spaces shall be insulated with 50 mm thick fiber glass mats. The fiber glass mats shall conform to the specifications contained in clause 2.2.2 It shall be in the form of blankets incorporating factory laminated 0.009 mm thick aluminium foil. The material shall be as manufactured by KIMMCO - Kuwait / UP TWIGA, the contractor shall submit a sample of the material before placing his order for total requirements.

The blanket shall be so applied that the face incorporating the aluminium foil is in contact with ambient air while the fiber glass material shall be applied directly on to the external surface of the sheet metal ducting.

The insulation shall be applied as under:

Wire brush the surfaces of the ducts to remove dirt and rust.

Apply a thick coat of bituminous primer.

When the primer is still tacky, apply the slabs of insulation material, so that, it hugs the duct/equipment casing snugly. Seal all joints using 75 mm wide self adhesive PVC tape, taking care a minimum overlap of 50mm for all joints.

ACOUSTIC LINING

1. Where stipulated the supply air ducts – whether of masonry or sheet metal – shall be lined acoustically using 25 mm thick rigid fiber glass boards with 28 gauge aluminum perforated facing on one side. The density of the material used shall be 48 kg/ cum
The rigid fiber glass boards shall be fixed to the inner surface of the ducts so that the plain fiber glass finish facing will be in contact with sheet metal ducting while the face with RP tissue facing will be in contact with air. The boards shall be fixed using GI bolts, nuts, & washers.

The joints between the boards be sealed using PVC adhesive tapes.

The joints between the boards be sealed using PVC adhesive tapes.

REFRIGERANT PIPING INSULATION

Insulation of refrigerant piping shall be carried out with Nitrile Rubber material. The Nitrile Rubber shall be closed cell structure of minimum 13mm thickness.

Application

- Clean the surface of the pipe which is to be insulated.
- Select the size of the section and cut the section longitudinally along with length. The cut shall be straight throughout the length.
- Apply a thin layer of Adhesive on the surface of the Pipe and leave it to dry for 2-3 minutes.
- Fix the insulation material after drying and both the surfaces shall be matched properly.
- Apply self adhesive black cotton tape on both the longitudinal and circumferential joints.

4 FUSIBLE LINK FIRE DAMPERS

All supply / return air ducts of air handling units and return air openings shall be provided with approved fire dampers of at-least 1/2 hour fire rating. These shall be of approved make. The damper shall be fabricated of 16 gauge GSS housing with blades formed out of 1.6 mm sheets. The damper shall be pivoted on both ends using chrome plated spindles in bronze bushes. The stop seals shall be provided on top and bottom of the damper housing. The damper blades shall be held in horizontal position using spring actuator bimetallic fusible link. the damper blades shall close in the event of fire by motor actuation capable of taking signal from the controller.

5 SUPPLY AND RETURN AIR GRILLS

Supply and return air grilles shall be of anodized extruded Aluminium construction with adjustable bars. Supply air grills shall be generally double deflection type backed with GI damper. The supply/return air grills being provided with removable key operated volume control dampers. Aluminium supply and return grills shall be powder coated and should have the color of client's choice as per bill of quantities.

6 SUPPLY AND RETURN AIR DIFFUSERS

The supply air diffuser shall be provided with removable key operative volume control dampers. Aluminium supply and return air diffusers shall be powder coated and should have the colour of client's choice or shall be extruded Aluminium. Supply/return air linear diffuser shall be Extruded Aluminium construction, square, rectangular, or round diffusers with flush fixed pattern or adjustable flow pattern. Diffusers for different spaces shall be selected in consultation with the Client/Consultants. Supply air diffusers may be equipped with fixed air-distribution grids, removable key-operated volume control dampers, and anti-smudge rings as per requirements of schedule of quantities.

7 FRESH AIR INTAKE AND EXTRACT LOUVERS

All the louvers shall be rain protection type and shall be fabricated from extruded aluminum section. The louvers shall additionally be provided with heavy duty expanded metal bird screen and Cowl. They shall be factory made with powder coating finish. The louvers shall be provided with control damper with lever for operation and control of fresh air.

LIST OF APPROVED MANUFACTURERS / NATURAL SOURCES OF
MATERIALS TO BE USED IN THE HVAC (AIR CONDITIONING) WORKS SUBJECT
TO THE APPROVAL OF SAMPLES BY SBIIM / CONSULTANT.

<u>S.No.</u>	<u>Material Name.</u>	<u>Brand / Manufacturer / Recommended Make.</u>
1.	Inverter split AC	AS specified in the NIT
2.	GI Sheets	TATA / HSL / SAIL / NIPPON DENRO or approved equivalent.
3.	Fire Damper	Caryaire / AirMaster / Air Breeze / Ravistar or approved equivalent.
4.	Vibration Isolators / Flexible Connectors	Resistoflex / Dunlop or approved equivalent.
5.	INSULATION / Fibre glass.	UP Twiga / Kimmco / Owens corning or approved equivalent.
6.	Power Cables	CCI / ICC / Gloster / UCL or approved equivalent.
7.	Control Cables	Finolex / Delton or approved equivalent.
8.	Aluminum Grilles Diffusers / Linear Grilles	Caryaire / Air Master / Air Breeze / SRIFABS or approved equivalent.
9.	Filters	Klenzoids / Airtech / Aerosol / Anfilco or approved equivalent.
10.	Cooling Coils / Heating Coils	Bluestar / Rohini / Ethos / Carrier / Jaypee / Coil Company / ZECO or approved equivalent.
11.	Nitrile rubber	Armaflex / vedoflex / AERO FLEX / ARMACELL or approved equivalent.

NOTE : The contractor shall use only above mentioned material or equivalent make to be approved by SBIIM / Consultant. All other materials shall conform to the specifications laid down. The tenderer shall take this into account while tendering rates / prices.

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PRICE BID

SI No		Unit	Qty	Unit Rate	Total amount
1	SITC OF CASSETTE AC Design, Supply, Installation, testing and commissioning of Cassette AC				
a	2.0TR	No	5		
b	COPPER PIPING WORKS: Supply, installation, testing & commissioning of SUITABLE SWG copper Refrigerant Piping for suction & return of suitable dia. The rate shall include Copper pipe and insulation with 19 mm Thick Nitrile rubber tube (i.e. As per Unit Manufacturer recommendation) and necessary Installation accessories such as supports and clamps. The sizes given shall be verified by Supplier for adequacy and size based on manufacturer standards. The scope of work includes supply of & laying of suitable power & communication cable from indoor to out door	Rmt	105		
c	CABLE: Supply and laying of suitable electrical flexible cable from out door to indoor	Rmt	107		
d	DRAIN PIPE Supply & Erection of CPVC pipe Insulated condensate drain pipe of the following size etc., complete as per the specification	Rmt	101		
e	MS STAND: Supply & Fixing of suitable MS Stand for above high-wall Split Acs	No	5		
TOTAL COST					

*Amount quoted is exclusive of GST, The GST will be paid as per Govt norms.