

DUE DATE: 30-10-2026



HVAC WORK TENDER
Proposed HVAC Works for Construction of
Girls Hostel Building and Ancillary Structures
for Welingkar Institute

for

M/s Shikshan Prasarak Mandal, Pune

At

**Plot No 226(C. S. No. 202B/10),
Matunga (E)-400019, Mumbai, India.**

MEP CONSULTANTS & PMC:	EMPLOYER:
<u>STRUCTWEL DESIGNERS & CONSULTANTS PVT. LTD.</u> Plot No. 15, Sector-24, Turbhe, Navi Mumbai-400705 Tel. : 68541010 (7Lines) e-mail: structwel@vsnl.net web: http://www.structwel.com	<u>SHIKSHAN PRASARAK MANDALI.</u> Sharada Sabhagriha, S P College Campus Tilak Road, Pune 411030 - Maharashtra. e-mail: shikshanapmandali@spm.education web: spmmandali.org.in
ARCHITECT:	STRUCTURAL CONSULTANT:
ASSOCIATED ARCHITECTS "Shreedhar", 1170/31/4, Revenue Colony, Shivajinagar, Pune-411005 e-mail: architects@assoarch.com kailash@assoarch.com	Sunil Mutalik & Associates 1349/50, Arthshilp Complex, Shukrawar Peth, Bajirao Road, Pune, Maharashtra, 411002 e-mail: sunil.mutalik@gmail.com

Section – 1

TENDER NOTICE

Sealed tenders are invited from Contractors of repute for Proposed **HVAC Works** for Construction of **Girls Hostel Building (B+G+20) and Ancillary Structures for Welingkar Institute** for **M/s. Shikshan Prasarak Mandali** at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

The completed sealed tender documents printed hard copies shall be submitted in the office below.

Kind Attn: **Mr. Mahesh Purandare**
Shikshan Prasarak Mandali.
Sharada Sabhagriha,
S P College Campus
Tilak Road,
Pune 411030 - Maharashtra.

On or before 5:00 P.M. on 16 -11- 2026.

Section – 2

LETTER INVITING TENDER

Shikshan Prasarak Mandali.
Sharada Sabhagriha
S P College Campus
Tilak Road,
Pune 411030 - Maharashtra.

Date: 19 Sept 2026

M/s.

Dear Sir (s)

Sub: Proposed HVAC Works for Construction of Girls Hostel Building (B+G+20) and Ancillary Structures for Welingkar Institute, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

We have pleasure in inviting you to quote for the above in line with: -

Sealed tenders in the prescribed tender form in two separate envelopes should be addressed to "Shikshan Prasarak Mandali". And submitted at the office below

Kind Attn: **Mr. Mahesh Purandare**
Shikshan Prasarak Mandali.
Sharada Sabhagriha,
S P College Campus
Tilak Road,
Pune 411030 - Maharashtra.

Envelope - 1 - Technical Bid (Original along with soft copy CD).

Envelope – 2 - Price Bid (Original along with soft copy CD)

A Post-bid negotiation meeting can be arranged as per requirement at the office of Structwel designers & consultants Pvt. Ltd. Details of the same will be informed to you.

Late Tenders are liable to be rejected.

- a. Name of work : Proposed HVAC Works for Construction of Girls Hostel Building (B+G+20) and Ancillary Structures **for Welingkar Institute, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.**
- b. Earnest Money Deposit : **₹ 02,00,000/- Payable by DD/ Pay the order** in favour of the Owner valid for period of 60 days from the date of submission of tender.
- c. Time of completion : Schedule with milestones to be provided as part of technical bid, estimated time is **06 months** including monsoons from date of LOI
- d. Prebid Meeting : On 04-11-2026 @ 11.30 am
- e. Time & date of submission : On 16-11-2026 before 5:00 pm (I.S.T.)
- f. Address : Tenders duly filled and sealed shall be submitted at Shikshan Prasarak Mandali, Pune Office.

BIDDERS QUALIFICATION CRITERIA:

1. The tenderer must be a HVAC contractor/ OEM having experience in multi-storeyed RCC residential or commercial buildings Experience of having successfully completed similar works during last 5 years, ending on 31st March 2026 of previous financial year to the one in which tenders are invited, should be either of the following:

***Similar Work:** Similar work shall mean 'Supply, Installation, Testing & Commissioning of the HVAC Works, all executed under one agreement / contract'.

Similar completed works referred above means each work.

1. Bidder should have completed at least 10 such jobs as mentioned above in last five financial Yrs.
2. The Bidder shall have an average annual turnover of minimum ₹ 05 Crores in any of the last five financial years.
3. The Bidder shall have completed minimum one job of ₹ 02 Crores in the last five financial years.

Bidders should satisfy the qualifying criteria on their own merits and not as a sum total of their sub-agencies. Joint Ventures / Consortium / MOU shall not be entertained. Power of Attorney given to a person other than the bidder's own employee shall not be accepted.

Note: The bidders shall submit supporting documentary evidence in support of the qualification criteria viz. work order with detailed scope of work, work completion certificate copy as applicable issued by the party for whom the work is done. **M/s Shikshan Prasarak Mandali** has a right to verify / cross verification of authenticity of the said documents whenever felt necessary.

SUBMISSION OF BID:

- (A) The Tender shall be submitted in accordance with these instructions and any Tender not conforming thereto is liable to be rejected. These Instructions shall form part of the Tender and the Contract.
- (B) The Tender document which will be issued to each tenderer comprises of these instructions, Form of Tender with Appendix, Form of Agreement, Specifications and Bill of Quantities as detailed in the Specifications.
- (C) The Tender shall be filled in, signed with all particulars complete and submitted by a person who is, duly authorized to do so. The Tenderer shall satisfy the Employer that he is competent and authorized to submit the tender and/or to enter into a legally binding Contract with the Employer by furnishing legal documentary evidence in that behalf.
- (D) Manner of Submission
 - a. Tender document
 - b. Forwarding letter of Bidder
 - c. **Envelope - 1** -
Technical Bid (Original hard copy print along with soft copy CD).
 - d. **Envelope – 2 –**
Price Bid (Original hard copy print along with soft copy CD)
- (E) The Tender shall be completed with all the documents set out in para (B) and (C) above and other documents set out in these instructions and elsewhere in the Tender documents. In particular the Tenderer shall complete and submit the following with his tender to be considered as bonafide:
 - Form of Tender and Appendix
 - Bill of Quantities and its summary, each page duly signed; and other Schedules.
 - Time Schedule for completion including supply.
 - List of Plant/Equipment and personnel (with bio data) to be employed on the works - Important
 - Bidder's Company Profile and Copy of bidder's Shop & Establishment registration certificate.
 - Bio-data of key personnel & technical team who would be associated with the work with their designations, Qualification & Experience as applicable to determine bidder's capability.
 - Audit certified Balance sheet and Profit / Loss A/c for the last 5 years.
 - A Certified copy of PAN Card
 - A Certified copy of GSTIN.
 - Financial status and the Banker/s to whom reference may be made about it.

Submission of offer in Two-Bid System:

Offer must be submitted in Two parts, each offer securely closed (sealed) separately, in Two Envelopes Part – I Technical & Part – II commercial as stated below;

Part-I: Technical bid

This Envelope super scribing the Tender No, Due date & Time should contain the following and it should be submitted along with the tender:

- i) Earnest Money Deposit as per tender terms.
- ii) Technical Bid including tender document, drawings & technical specifications duly filled wherever required, signed & stamped in Original.
- iii) Qualifying documents (Stamped & Signed)
- iv) Self-attested (Stamped & Signed) copy of Tender Document.
- v) Plant capacity and the ongoing and upcoming project list with total tonnages of each project.
- vi) Acceptance on clauses of Tender Enquiry Form (TEF) in the Prescribed Formats duly stamped, signed & filled 'Accepted OR Not Accepted' as applicable for each of the clause - Annexure 'K'
- vii) Acceptance on clauses of Standard terms & Conditions in the Prescribed Format duly stamped, signed & filled 'Accepted OR Not Accepted' as applicable for each of the clause - Annexure 'L'
- viii) Bidder's Undertaking in the prescribed format duly filled, signed & stamped – Annexure 'M'
- ix) Deviation Sheet in case of any deviations from TEF, STACS, GT&C, Special Conditions of Contract and Technical Specifications.
- x) Bio-data of key personnel & technical team who would be associated with the work
- xi) Corrigendum, if any, duly signed & stamped

Part-II:

The **Proposed HVAC Works for Construction of Girls Hostel Building (B+G+20) and Ancillary Structures for Welingkar Institute, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India** is an item rate contract and contractor has to submit the final quote for the Building Solution. The payment would be made in Running Bill basis per month as per the progress of the actual work at site. The format of the quote is attached as Annexure – “P”. The quote shall be including all **duties, transportation, loading/unloading, Octroi, storage, royalties, handling, etc. All other Civil and Finishes Work or any required Work would be in Item Rate. Further to that, contractor has to submit the Schedule of Item Rates in the prescribed format attached in Annexure – “S” duly signed and stamped.**

Priced envelopes contacting any new/fresh conditions (Not mentioned in the un-priced envelop) shall be liable to rejection. Clarifications if any are to be sought by the bidders before submission of bid.

These securely closed (sealed) Envelope super scribing Tender No., Due date & Time should contain only THE COST strictly in the prescribed format provided with the tender. Offer in any other format shall not be considered.

Both these securely closed Envelopes I.e. Part-I & Part-II should be put in a Third Bigger Envelope securely closed (Sealed), Super scribed with Tender No., Due date, time, and should be **Submitted at Shikshan Prasarak Mandali, Pune Office;**

The bids may also be sent by Speed Post / Courier Service well in advance so as to reach the undersigned well before the due date and time. Timely submission of the Bids is

responsibility of the bidders and no reasons / excuses in this regard will be entertained by SHIKSHAN PRASARAK MANDALI.

A list of similar lift works executed by the tenderer and valued as written in tender notice with testimonials of satisfactory completion from respective Employers / builders / Consultants to be furnished.

The tenderer should study all the tender documents carefully and understand the tender contract conditions, drawings, and specifications etc. before quoting. If there are any doubts, they should get clarifications in writing, but this shall not be a justification for submission of late tender or extension of opening date. Tender should be strictly in accordance with project Consultants drawings, specifications and other tender documents and not stipulate any deviation. Submit Section- 6 duly signed & stamped as confirmation.

A common schedule of agreed variations if any comprising of conditions accepted by Employers during pre-bid meeting will be given to all tenderers. The tenderers shall return the same conveying their acceptance and indicating any rebate/increase in their price Bids, before the opening of price Bid. The schedule of agreed variations shall form part of the Contract.

The Tenderer must obtain for himself on his own responsibility and at his own expense, all the information which may be necessary for the purpose of filling this tender and for entering into a contract for execution of the same and must examine the drawings and visit the site and acquaint himself with the site conditions before quoting.

Shikshan Prasarak Mandali reserves the right to accept or reject any or all the tenders in whole or in part without assigning any reason for doing so.

In case if you are not interested in submitting tender for the above work, please state the same in a regret email with reason for the same

Please acknowledge receipt of this letter along with all the enclosures and confirm that you will submit the offer before the due date.

Thanking You,

Yours faithfully,

Mr. Mahesh Purandare
Shikshan Prasarak Mandali.
Sharada Sabhagriha,
S P College Campus
Tilak Road,
Pune 411030 - Maharashtra.

Section – 3

LETTER FOR SUBMISSION OF TENDER.

From:

To,

Mr. Mahesh Purandare
Shikshan Prasarak Mandali.
Sharada Sabhagriha,
S P College Campus
Tilak Road,
Pune 411030 - Maharashtra.

Sub: Proposed HVAC Works for Construction of Girls Hostel Building (B+G+20) and Ancillary Structures for Welingkar Institute, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

Dear Sir,

1. Having visiting the site & examined the Tender document consisting notice Inviting Tender, General Conditions of contract, specifications, Drawings, Time Schedule, Schedule, Schedule of Rates and other documents and papers, all as detailed in the tender documents prepared by your Consultants **M/s. Structwel Designers & Consultants Pvt Ltd.** and having understood the provisions of the said tender documents and having thoroughly studied the requirements of "**Shikshan Prasarak Mandali, Pune** , related to the work tendered in connection with the project and having conducted a thorough study of the job, Site(s) involved, the site conditions, soil condition, the climatic conditions of labour, power, water, material & equipment availability and suitability of borrow area, the availability of land for right of way and temporary office and all other factors and facilities and things whatever necessary to related to the formation of the tender and the performance of work, I/We hereby submit my/our tender for the performance of proposed work in accordance with the terms and conditions and within the time mentioned in the Tender Documents at the rate(s) quoted by me/us in the accompanying Schedule(s) of Rates included within the Tender Documents.
2. It has been explained to me / us that the time stipulated for job(s) and Completion of Works (s) in all respects and in different stages mentioned in the "Time Schedule of Completion of jobs" and signed and accepted by me / us is **ESSENCE OF THE CONTRACT**. I/We agree that in case of my/our failure of strictly observe the time completion of work in all respects according to the schedule set out in the said "Time Schedule of completion of job (s)", I/We shall pay liquidated damages to the Employer as per provisions of tender documents.
3. I/We agree to pay the Earnest Money & Security Deposit / Performance Guarantee and accept the terms & conditions laid down in the memorandum below in this respect.
4. I / We have annexed the following documents to this tender.

- i) SECTION 5- MEMORANDUM
- ii) SECTION 6- NO DEVIATION CONFIRMATION
- iii) ANNEXURE A- APPENDIX TO CONDITIONS OF CONTRACT
- iv) ANNEXURE B- FORM OF AGREEMENT
- v) ANNEXURE C- PROFORMA FOR STRUCTURE & ORGANIZATION DETAILS
- vi) ANNEXURE D- PROFORMA FOR DETAILS OF TECHNICAL & ADMINISTRATIVE PERSONNEL OF THE COMPANY.
- vii) ANNEXURE E- PROFORMA FOR ENROLLMENT WITH VARIOUS ORGANISATIONS.
- viii) ANNEXURE F- LIST OF MAJOR WORKS COMPLETED DURING LAST FIVE YEARS.
- ix) ANNEXURE G- LIST OF MAJOR WORKS ON HAND
- x) ANNEXURE H- DETAILS OF PLANT AND EQUIPMENT WITH BIDDER
- xi) ANNEXURE I- OTHER RELEVANT INFORMATION
- xii) ANNEXURE J- SCHEDULE – “F”
- xiii) ANNEXURE K - TEF ACCEPTANCE
- xiv) ANNEXURE L - PAYMENT TERMS ACCEPTANCE
- xv) ANNEXURE M - UNDERTAKING
- xvi) ANNEXURE N - RTGS-NEFT BANK DETAILS
- xvii) ANNEXURE O - PAYMENT TERMS
- xviii) ANNEXURE P - PRICE BID
- xix) ANNEXURE S - CONFIRMATION ON SCHEDULE OF RATES
- xx) ANNEXURE U - LIST OF DISPUTES
- xxi) ANNEXURE V - SUBMISSION OF QUALITY ASSURANCE PLAN
- xxii) ANNEXURE W - CONFIRMATION ON HOUSEKEEPING
- xxiii) ANNEXURE X - MATERIAL PROCUREMENT PLAN

5. I/We hereby undertake that the statements made herein and the information given in the Annexure referred to above are true in all respects, and that in the event of any such statement or information being found to be incorrect will entitle the Employers to resend any resultant Contract.
6. I/We agree to complete the work within **06 months** or mutually accepted schedule from the date of award of the work.
7. I / We agree to pay the Government Tax (State and Central) works contract as required by you.
8. I / We, understand and agree that if I / We am/are awarded the work, on the Retention Money amount / any pending amounts including of running Accounts bills, price differential for agreed materials, final bill amount lying with the Employers from submission of this tender document till the finalization of bills and defects liability period, will not bear any interest under any circumstances and the Employers will not be liable to pay any amount towards interest, compensation, demurrage charges, finance charges, delayed payment charges etc. on such amounts.
9. I / We agree to pay the Government Sales Tax (State and Central), works contract tax, Turnover tax, octroi, duties and any other taxes applicable and prevailing from time to time on such items for which the same are leviable and the rates quoted by me / us are inclusive of the same.”
10. I/We, am/are submitting herewith my/our authority to sign the above tender document and the same shall be binding on my / our company for all the times during the pendency of contract. Dated this day of _____ 2024.

Yours faithfully,

SIGNATURE OF THE TENDERER

Name & Designation of Authorized

Person signing the tender on behalf
of the tenderer (s).

Encl: As Stated.

Section – 5

MEMORANDUM

- a) General description of work : **Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures for Welingkar Institute, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)- 400019, Mumbai, India.**
- b) Earnest Money : **₹ 05, 00,000/-** payable in DD/ Pay Order in favour of the Owner valid for period of 60 days from the date of submission of tender.
- c) Performance Security : 1% of Contract Value in the form of a bank guarantee issued by a Nationalised bank in favour of the Owner shall be submitted at starting of the work & same shall be released along with the Final Bill.
- d) Retention Money : In addition to the performance security, 5% (Five percent) of value of the work done and approved by the Engineer-In-Charge at the time of approving the relevant R. A. Bill will be deducted in cash from each R.A. Bill. Retention Money will be released along with payment of after the Defects Liability Period of 12 months OR against issuance of a PBG issued by a Nationalised Bank (acceptable to the owner) of an amount equal to the Retention Money for the term of the Defects Liability Period.
- e) Time allowed to start the work : 7 days.
1. Should this tender be accepted, I / We hereby agree to abide by and fulfill all terms and conditions referred to above and in default thereof, to forfeit and pay to the OWNER or its successors or its authorized nominees such sums of money as we stipulated in Tender Documents.
2. I/We hereby pay the Earnest Money of Rs. _____ in Bank Demand Draft / Bank Guarantee No. _____ issued by _____ (Name and office of Indian Nationalized Bank) in favor of M/s. Shikshan Prasarak Mandali, Sharada Sabhagriha, S P College Campus, Tilak Road, Pune 411030 - Maharashtra.
3. If I/We fail to commence the work specified in the Memorandum above, or I / We fail to deposit the amount of Security Deposit specified in the Memorandum above, I / We agree that the said OWNER or its successors without prejudice to any other right or remedy be at liberty to forfeit the said Earnest Money shall be retained by OWNER towards the Security Deposit specified in (c) above. The said OWNER shall also be at liberty to cancel the Notice of Acceptance of Tender if I/We fail to deposit the Security Deposit as aforesaid or to execute an Agreement or to start SUPPLY as stipulated in the Tender Documents.

I/We enclose herewith evidence or my / our experience of execution of works of similar nature and magnitude carried out by me/us in the prescribed Proforma and also the Income-tax and Sales-tax Clearance Certificates.

Dated the _____ day of _____ 2024.

Witness:

Name in Block letters:
Address

Yours faithfully,

SIGNATURE OF THE TENDERER

Name & Designation of Authorized
Person signing the tender on behalf
of the tenderer (s).
Encl: As Stated.

Section – 6

Bidders are required to give their No Deviation confirmation and certificate in the prescribed format as below on their letter head.

NO DEVIATION CONFIRMATION

TENDER NUMBER:

Sub: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures for Welingkar Institute, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

We understand that any deviation / exception in any form may result in rejection of bid. We, therefore, certify that we have not taken any exceptions/deviations anywhere in the bid and we agree that if any deviation / exception is mentioned or noticed, our bid may be rejected.

(SEAL AND SIGNATURE OF BIDDER)

TECHNICAL SPECIFICATION
For
HVAC WORK

TABLE OF CONTENTS

1.0 GENERAL DESCRIPTION
2.0 VARIABLE REFRIGERENT FLOW.....
3.0 SHEET METAL WORK:.....
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5.0 VENTILATION AND EXHAUST FANS:.....
6.0 PAINTING:
7.0 ELECTRICAL WORKS:
8.0 PREVENTIVE MAINTENANCE CONTRACT:.....
9.0 MAKE OF EQUIPMENT AND APPROVED MANUFACTURES:.....
10.0 TEST READINGS:

1.0 GENERAL DESCRIPTION

SCOPE:

These specifications together with consultant's plans cover supply, erection, testing and commissioning of Air Conditioning for Girls Hostel Matunga.

1.1 BUILDING:

- 1.1.1 For details of building construction, refer Architects and Structural drawings, a set of which is available at project engineer's Office.

1.2 SCHEDULE OF REQUIREMENTS:

- 1.2.1 Air conditioning, requirements are shown on the drawings.

- i. Outside Condition
 - 108° F Dry Bulb (42.2°C DB)
 - 76° F Wet Bulb (24.4 °C WB)

1.2.2 Office Area: -

- i. Inside Design Condition
 - 73.4°F DB $\pm$ 2° F (23°C Dry Bulb $\pm$ 1.1°C)
- ii. RH around
 - 55% (no control on RH)
- iii. Height
 - 3.9meter
- iv. Lighting
 - 0.6 Watts/Sq.Ft.
- v. Equipment load
 - 120Single or Dual monitor & 75 W/ Laptop
- vi. Ventilation Air
 - Office Area (5 cfm /person + 0.06 cfm /sq.mt.)
 - Cafeteria (7.5 cfm/person + 0.18 cfm/sq.mt.)
 - Exposed Wall: U Wall 0.269
 - Exposed Glass: U Glass 0.57

1.3 PERFORMANCE GUARANTEE:

- 1.3.1 The contractor shall guarantee the air conditioning system to maintain space conditions as per specifications and drawings.
- 1.3.2 The inside design conditions described above shall be guaranteed.
- 1.3.3 The contractor shall guarantee to supply and exhaust the required volume of air indicated in the schedule of requirements and/or as shown on the drawings as well maintaining pressure variances as per space requirements.
- 1.3.4 The contractor shall also guarantee that the performance of the various equipment's individually shall not be less than the specified ratings when working under the operating conditions given for the respective items in the finally accepted: Schedule of Equipment".
- 1.3.5 The contractor shall guarantee the power input to the Air conditioning Units at the specified condition.
- 1.3.6 The contractor shall achieve the desired ambient noise level in the occupied space.

1.4 COUSULTANTS DRAWING:

- 1.4.1 Drawings have been prepared showing the areas to be air-conditioned, ventilated, or exhausted and the space allocated for equipment Rooms.
- 1.4.2 The machine room and duct layout as shown on the drawings represent a feasible scheme. Equipment's may be re-arranged in the space allocated subject to the approval of the Consultant.
- 1.4.3 These drawings are not meant as working drawings. The contractor shall prepare detailed working drawings and get them approved by the consultants.
- 1.4.4 The bidders shall point out all deviations from the drawings and specifications in their enquiry for offer.

1.5 TECHNICAL DATA:

- 1.5.1 Technical data of equipment shall be furnished as required under section: Schedule of Technical Data”.

1.6 TEST DATA:

- 1.6.1 All equipment shall be tested as required by T&C guidelines & “Test Readings” shall be furnished as per T&C documents.
- 1.6.2 Test readings shall be furnished for peak summer and monsoon outside condition.

1.7 WORK AT SITE:

- 1.7.1 The Contractor shall inspect the site and ascertain for himself the nature, character, and extent of work to be executed and shall include all items and services necessary whether specifically mentioned or not in the specifications. Drawings or schedule of equipment to make a complete working plant to meet with the intent and purpose of these specifications.

1.8 ELECTRICAL EQUIPMENT:

- 1.8.1 All electrical equipment shall be suitable for 230V $\pm$ 10%, 1 phase, 50 cycles/415V $\pm$ 10%, 3 phase, 50 cycles, 4 wire AC supply unless otherwise stated.

2.0 VARIABLE REFRIGERANT FLOW SYSTEM

2.1 GENERAL

- 2.1.1 All Variable Refrigerant Volume Air Conditioners shall be fully Factory assembled, charged with refrigerant, wired, piped, filters etc. and tested at the factory.
- 2.1.2 The System shall comprise of Air Cooled Multi Split Type Outdoor units, and a variety of indoor units connected by Common Refrigerant Piping and Power and Control Cabling.
- 2.1.3 All bolts, nuts, screws, washers, plates, etc and all other fittings on all VRF system components shall be plated or passivated to resist corrosion. Any item found corroded during defects liability period shall be replaced by the VRF Contractor with improved

material and the defects liability for that item shall be extended a further 12 months (and if corrosion re-appears the process is repeated with further defect liability extension).

- 2.1.4 When indicated, all outdoor units where the ambient is aggressive, the unit shall have E-coat or equivalent. The complete cupping from the outdoor unit to the indoor unit shall also be coated with Thorogood paint or equivalent.

2.2 VRF SYSTEM

- 2.2.1 The VRF System shall provide stable, trouble free and safe operations, and provide flexibility in operation of Indoor Units with independent control of each Indoor Unit, including stepless partial operation.
- 2.2.2 It shall be possible to switch on only those Indoor Units that require Cooling/Heating in individual Areas.
- 2.2.3 The capacity of Indoor and Outdoor Units shall be matched, sleeplessly, and shall include multi-Compressor cut off / speed control, bypass ssor any other means of capacity Control for stable operations of System.
- 2.2.4 The System shall be capable of automatic operation even with varying Outdoor and Indoor requirements and make up of low Outdoor Temperatures to achieve lower Power Consumption, without any manual adjustments.
- 2.2.5 All Systems shall be modular in nature, and easily upgradeable / inter connectable for larger capacities.
- 2.2.6 Units shall have hermetically sealed Scroll Compressors, to ensure high EER.
- 2.2.7 The refrigerant gas shall be R 410a.
- 2.2.8 All Units shall be Air Cooled type.
- 2.2.9 Modular System shall incorporate all required controls for parallel operation of Compressors, Condensers, Fans, and Indoor Units as well as Refrigerant liquid control.
- 2.2.10 VRF systems use R-410A refrigerant as the heat-transfer fluid and the working fluid, achieving a very high energy efficiency ratio (EER) of 15 to 20 and integrated energy efficiency ratio (IEER) of 17 to 25 - Information mentioned for LEED.
- 2.2.11 (Vendor shall be submitted Actual EER of machine.)

2.3 POWER SUPPLY

- 2.3.1 All the units shall be suitable for operation with 415V+ 10%, 50Hz + 3%, 3 phase, 4 Wire A.C. supply.

2.4 OUTDOOR UNITS

- 2.4.1 Units shall be able to operate over a range of Outdoor Ambient Temperatures suitable for Indian conditions & give necessary cooling capacities as specified at those other conditions.
- 2.4.2 Units shall have backup Systems built into the Units, to prevent total shut down of System, in case of individual Component failures, even when part of the Units is out of Order.
- 2.4.3 The noise level shall not be more than 55 dB (A) at normal operation measured horizontally 1 M away.
- 2.4.4 All provision in Piping, cabling and Controls shall be available for repair of part of the system when the rest of the System is operational.
- 2.4.5 Units shall have multiple Piping and Cabling connection options, for ease of installation and flexibility.
- 2.4.6 The Units shall be capable of being mounted without structural modifications to Slab.
- 2.4.7 Units shall be suitable for mounting Outdoors, without any covers, etc.
- 2.4.8 Units shall be suitable for connection to multiple Indoor Units of different capacities.
- 2.4.9 All Equipment located Outdoors shall withstand Rain, wind and Solar Radiation as prevalent in Tropical Countries.
- 2.4.10 The Casing etc shall be suitably UV stabilized.
- 2.4.11 The condenser aluminium fins shall be coated with special acrylic pre-treatment for increased durability to salt corrosion.
- 2.4.12 Outdoor units shall employ system of equal run time for all compressors, inverters or ON/OFF type within each outdoor unit single or multi module system.
- 2.4.13 Outdoor units shall conform to technological guidelines for harmonic suppression and shall have in-built harmonic filters to work with inverters.
- 2.4.14 Units shall have standard Antivibration connectors, mounts etc.
- 2.4.15 Air Cooled Condensers shall have sub-Cooling section.
- 2.4.16 All Outdoor Units shall be field serviceable.
- 2.4.17 All Units shall be factory assembled, wired, piped, and tested.
- 2.4.18 The entire system should be able to be diagnosed from one point. The software for the same shall be included in the system.

2.5 COMPRESSOR

- 2.5.1 The unit shall have multiple Scroll Compressors and shall be able to operate even if the inverter compressor is out of order.
- 2.5.2 The inverter shall be IGBT (Insulated Gate Bipolar Transistor) type to be efficient & quiet.
- 2.5.3 Compressor shall have continuous capacity control to meet load fluctuation & indoor unit individual control.
- 2.5.4 Heat Exchanger
- 2.5.5 The Heat Exchanger shall be constructed with copper tubes mechanically bonded to aluminium fins to form a cross fan coil and larger surface area.
- 2.5.6 The fins shall have anti corrosion treatment for Heat Exchanger Coil. The treatment shall be suitable for areas of high pollution and salt laden air.
- 2.5.7 The casings, fans, motors etc. shall also be with anti-corrosion treatment as a standard feature.

2.6 REFRIGERANT CIRCUIT

- 2.6.1 The Refrigerant Circuit shall include an accumulator, liquid & gas shut off valves and a solenoid valve. All necessary safety devices shall be provided to ensure the safety operation of the system.
- 2.6.2 The system shall also include safety devices like HP – LP cutoff switches, fuse, crank case heater, fusible plug, over current protection for inverter, short recycling guard timer, single phase preventor etc.

2.7 PIPING

- 2.7.1 All connections of Refrigerant Piping shall be in high grade Copper of Refrigeration quality of approved make by VRF manufacturer. All connections, Tees, Reducers etc shall be standard make fittings.
- 2.7.2 Insulation of all refrigerant lines shall be carried out with “Class 0 - Armaflex” / equal insulation sheets and tubes with factory laminated glass cloth of appropriate thickness so that condensation does not occur.
- 2.7.3 For individual Piping 50 µ 100mm wide Aluminium Tape shall be used at joints of Piping with Bands for identification.
- 2.7.4 For Outdoor Piping, the finish shall be woven GRP Mat finished with coloured Epoxy paints to withstand outside Ambient conditions and UV Radiation.

2.8 OIL RECOVERY SYSTEM

- 2.8.1 Units shall be equipped with an oil recovery system to ensure stable operation with long refrigerant piping.
- 2.8.2 System shall be designed for proper oil return to compressor along with the distribution of oil to individual compressor.
- 2.8.3 The refrigerant piping shall be extended up to 100 M with 50 M level difference without oil traps.

2.9 INDOOR UNITS

- 2.9.1 Units shall be factory assembled, wired, piped, and tested.
- 2.9.2 Units shall have DX Coils with Copper Tubes and bonded Aluminium Fins for highly efficient Heat transfer.
- 2.9.3 Units shall have Centrifugal Fans for proper amount of Air circulation and low Noise.
- 2.9.4 Units shall have Inlet Filters, which are easily cleanable or replaceable.
- 2.9.5 All component of Units shall be easily accessible for connection, repairs and maintenance.
- 2.9.6 Units shall have very low noise.
- 2.9.7 Units shall have provision for connecting Fresh Air Ducts.
- 2.9.8 Provision of Drain Pump is necessary for all Models with Ceiling or Wall Mounts.
- 2.9.9 All Units with Factory manufactured Unit, Grills shall have auto swing feature for proper Air distribution.
- 2.9.10 All Units shall be controlled by Electronic Expansion Valves only.
- 2.9.11 All Units mounted inside the Ceiling shall have Fans capable of sustaining Duct connections, and special Filters if necessary.
- 2.9.12 Visible Indoor Units shall have wireless remotes.
- 2.9.13 Anticorrosion treatment for avoiding corrosion of coils.
- 2.9.14 All Units shall have adequate Insulation or Lining to avoid condensation.
- 2.9.15 The units include pre-filter, fan section and DX coil section. The housing of units shall be light weight powder coated galvanized steel. Units shall have external casing of ABS Plastic for supply and return air.

2.10 4 WAY CASSETTE TYPE INDOOR UNIT

- 2.10.1 These units shall be installed between the bottom of finished slab & top of false ceiling.
- 2.10.2 Unit shall have provision of connecting fresh air without any special chamber & without increasing the total height of the unit (320 mm maximum).
- 2.10.3 The unit must have in built drain pump, suitable for vertical lift of 750 mm. (d) Unit must be insulated with sound absorbing thermal insulation material, Polyurethane foam. The sound pressure level of unit at the highest operating level shall not exceed 46 dB (A). (e) The unit must have drain pump kit if. The drain pump must be suitable to lift drain up to 1000 mm from the bottom of the unit.

2.11 4 WAY CASSETTE COMPACT TYPE INDOOR UNIT

- 2.11.1 The compact cassette unit should perfectly fit into ceilings and match the standard architectural modules, without the need to cut ceiling tiles.
- 2.11.2 The flaps fold tightly against the ceiling when operation stops so that the ceiling is affected only slightly even if air conditioning is installed.
- 2.11.3 Designed for simple & easy installation and maintenance. It should be slim in design only 268 mm in height even when an electrical box is located inside the unit.
- 2.11.4 The unit must have drain pump kit if. The drain pump must be suitable to lift drain up to 1000 mm from the bottom of the unit.

2.12 CONCEALED DUCT TYPE UNITE

- 2.12.1 These units shall be ceiling suspended with suitable supports to take care of operating weight of the unit, without causing any excessive vibration & noise.
- 2.12.2 The cold air supplied by these units will be supplied to the area to be air conditioned, through duct system specified in the tender.
- 2.12.3 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.
- 2.12.4 The Sound Pressure level of unit at the highest operating level shall not exceed 38 dB (A), at a vertical distance of 1.5 m below the units with duct connected to the unit.
- 2.12.5 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.

2.13 1 WAY CASSETTE TYPE INDOOR UNIT

- 2.13.1 These units shall be installed between the bottom of finished slab & top of false ceiling.
- 2.13.2 Unit shall have provision of connecting fresh air without any special chamber & without increasing the total height of the unit (320 mm maximum).
- 2.13.3 The unit must have in built drain pump, suitable for vertical lift of 750 mm. (d) Unit must be insulated with sound absorbing thermal insulation material, Polyurethane foam. The sound pressure level of unit at the highest operating level shall not exceed 46 dB

(A). (e) The unit must have drain pump kit if. The drain pump must be suitable to lift drain up to 1000 mm from the bottom of the unit.

2.14 WALL MOUNTED UNIT

- 2.14.1 Wall mounted units must be compact & stylish design that does not detract from the décor of the room.
- 2.14.2 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.
- 2.14.3 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.
- 2.14.4 The sound pressure level of unit at the highest operating level shall not exceed 46 dB(A).
- 2.14.5 Refrigerant control in the indoor unit shall be through Electronic Expansion Valve & AHU kit for TFA AHU.

2.15 INSTALLATION:

- 2.15.1 The units shall be mounted on ribbed rubber pads for vibration isolation. The contractor shall supply the required charge of refrigerant, lubricant, and other consumables, for commissioning and testing of the equipment.
- 2.15.2 All the equipment shall be thoroughly tested and checked for leaks. All safety controls shall be suitably set, and a record of all setting shall be furnished to the project supervisor.
- 2.15.3 Providing and fixing M.S. structural support for condensing unit with vibration isolator pad in-between support and structure and vibration isolation suspender and pads for evaporating units shall be in scope of contractor.

2.16 PAINTING:

Shop coats of paint that have become marred during transportation 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.

2.17 CONDENSATE DRAIN PIPING:

All pipes to be used for condensate drain shall be PVC pipe conforming to IS: 4985 - Class I & all joints should be Gluing or solvent cementing as per manufacturer recommendation.

2.18 REFRIGERANT PIPING:

- 2.18.1 All refrigerant pipes and fittings shall be type 'L' hard drawn copper tubes and wrought copper fitting suitable for connection with silver solder. The copper thickness of wall shall be 20G/ 22G (0.7 to 1 mm).
- 2.18.2 All joints in copper piping shall be swaged joints using low temperature brazing and/ or silver solder. Before joining any copper pipe or fittings, its interior shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while construction of the joints. Subsequently, it shall be thoroughly blown out using nitrogen. Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg per Sq.cm.
- 2.18.3 After the refrigerant piping installation has been completed the refrigerant piping system shall be pressure tested using, Freon mixed with nitrogen at a pressure of 20 Kg per Sq. cm.

(High side) and 10 Kg per Sq. cm (Low side). Pressure shall be maintained on the system for 24 hours.

- 2.18.4 The system shall then be evacuated to a minimum vacuum of 70 cm. of mercury and held for 24 hours, during which time; change in vacuum shall not exceed 12 cm of mercury.
- 2.18.5 All refrigerant piping shall be installed strictly as per the instructions and recommendations of air conditioning equipment manufacturers.

2.19 POWER SUPPLY

Power supply near the indoor unit will be provided by Electrical Vendor with suitable 6A plug point socket & switch.

However, where the power requirement is of central control from ODU's, as per the design of the system, the entire power supply then shall be done by the HVAC contractor.

CONTROLS

- 2.19.1 All Units shall have Microprocessor Controls.
- 2.19.2 Setting of addresses for each Unit should be automatic and need not be programmed.
- 2.19.3 Microprocessor should have 'Auto Check Function' to indicate Piping and Cabling errors to avoid malfunction.
- 2.19.4 Control wiring shall be in FRLS grade, and simple with control and transmission wiring being common.
- 2.19.5 Control Units shall be central, suitable for ON/OFF and Temperature control of zones, including scheduling.
- 2.19.6 Malfunction and status display shall be available.
- 2.19.7 Control Units shall be compatible with BMS of standard makes.
- 2.19.8 Individual Controllers with wired or wireless remote for operation, status etc shall be used.
- 2.19.9 Precision Temperature Control shall be mandatory with Electronic Expansion Valves adjusting to Load fluctuation and operating load fluctuation to maintain ± 0.5 deg C, of set point with PID control Algorithm.
- 2.19.10 Microprocessor to control speed or switching or by pass of Compressors, Condensers, Fans and Liquid management functions along with the System for proper oil Return and Stable and safe operation of System, shall be part of standard control System.
- 2.19.11 Units shall have automatic Restart in case of Mains failures.
- 2.19.12 Microprocessor shall have pre set memory, which shall not be erased on power failures.
- 2.19.13 All Units shall have "Self-Diagnostic Function" to pre warn of failures or problems, with function codes.
- 2.19.14 All Controllers shall have digital indication.
- 2.19.15 Power to the Control System shall be generated inside the Units from common Power source only.
- 2.19.16 Control / communication wiring shall run in 25mm PVC conduits with markers.

2.20 CONDENSATE DRAIN PIPING

- 2.20.1 1" dia hard PVC insulated Drainpipe shall be used to remove condensate from Evaporator Unit to Drain point. The joints shall be properly sealed so that there is no water leakage. U-trap shall be provided at the end. Additional insulated Drain tray shall be provided below the Evaporator Unit, if required.

2.21 AIR-CONDITIONONG MANAGEMENT SYSTEM

- 2.21.1 The VRF system must be provided with PC based air-conditioning management system. The required hardware must be selected, suitable for minimum 128 indoor units.
- 2.21.2 The complete operation, monitoring and diagnosis of VRF system shall have to be possible through this PC system.
- 2.21.3 The system shall be capable to take external signals from security, fire, DG & Building Management System.

2.22 BUILDING MANAGEMENT SYSTEM

- 2.22.1 The VRF system shall have to be suitable for communication between VRF and intelligent Building Management System through BAC Net gateway.

2.23 MOUNTING

- 2.23.1 All Indoor Units shall be mounted with Brackets, Hangers etc with proper size anchor Fasteners.

3.0 SHEET METAL WORK:

3.1 SCOPE:

- 3.1.1 Supply, installation, testing and commissioning of all sheet metal ducts as shown in the drawings. All sheet metal air ducts shall conform to IS 655-1963.

3.2 MATERIALS:

- 3.2.1 Ducts shall be made of either galvanized steel sheets or aluminum sheets. The galvanized steel sheet shall conform IS: 277 – 1975. Aluminum shall be of grade SIC of B-3 as specified in IS: 177 – 1974.

3.2.2 Thickness of sheet shall be as given below:

Maximum Side (mm)	Thickness (mm)	
	G.S.S.	Aluminum
Upto 750	0.63	0.80
751-1500	0.80	1.00
1501-2250	1.00	1.50
2250-2500	1.20	
Plenums & Ducts above 2500	1.60	

3.3 SUPPORTS:

- 3.3.1 The bracing shall be as per ISS 655-1963. Supports for ducts shall be MS sections at 2.4mdistance apart up to 2250/1.2m distance apart for longer ducts.

3.3.2 Duct supports shall be as follows.

Duct parameter (mm)	support	Location
up to1800	40 x40x3mm (11/2"x11/2")x (1/8" MS angle with 9mm(3/8") tie rod	at Transverse Joint

Over 1800 to 2500	40 x40x6mm (1 1/2x1 1/2x1/4") MS angle with 12.5mm (1/2") tie rod	at Transverse Joint
over 2500	50 X 50 X 6mm (2 X 2 X 1/4")	at Transverse Joint

- Duct supports shall be of mild steel, adjustable for height and prime coated with rust preventive paint and finish coated black. Where duct and clamp are of dissimilar material, a gasket shall be provided in between.
- Contractor shall ensure that all ducts with insulation are not in direct contact with the hangers (duct supports). Additional supports wherever considered necessary, by the Engineer-in-charge shall be provided.
- Supports shall be made with anchor fasteners in the RCC work and fixing of steel members shall involve minimum damage. The entire supporting system shall have the approval of the Engineering-charge.
- All duct supports, flanges; hanger shall be given one coat of red-oxide before installation and two coat of aluminum paint after complete erection. Heavy ducts should not be rested on walls.
- Where ducts are connected to the wall, such connections shall be made through mild steel frame fixed to the wall through suitable shear fasteners.
- Ducts connecting to air moving apparatus shall be through 15 OZ mildew resistant double canvass as directed by the Engineer. For rectangular ducts the material is to be flanged and bolted with a backing flat or bolted to mating flange with backing flat. The flexible connection shall not be less than 75mm and not more than 200mm.
- All ducts passing through a wall (which will be sealed) should be treated with two coats of Bitumen (cold or hot) before plastering.

3.4 FABRICATION:

3.4.1 Ducts shall be rectangular in cross section and fabricated in accordance with the following:

Max. Size	Min. Thick	Transverse joints	Reinforcement	Hanger Rod dia
Up to 400	0.63 (24 SWG)	38 x 38 x 4.2 Companion flanges	Cross break	8
401 to 750	0.63 (24 SWG)	38 x 38 x 4.2 Companion flanges	25 x 25 x 4.2 Girth angle @ 1000	8

751 to 900	0.80 (22 SWG)	38 x 38 x 4.2 Companion flanges	25 x 25 x 4.2 Girth angle @ 1000	8
901 to 1500	0.80 (22 SWG)	38 x 38 x 4.2 Companion flanges	38 x 38 x 4.2 Girth angle @ 760	10
1501 to 2250	1.00 (20 SWG)	38 x 38 x 4.2 Companion flanges	38 x 38 x 4.2 Girth angle @ 760	10
2250 to over	1.25 (18 SWG)	50 x 50 x 4.2 Companion flanges	50 x 50 x 4.2 Girth angle @ 610	12
Plenums	1.25 (18 SWG)	50 x 50 x 7.4 Companion flanges	50 x 50 x 7.4 Girth angle @ 300	12

- Girth angles and companion flanges shall be mired and welded at corners and riveted to duct sheets at 75mm centers. Flanged joints shall be made with 9.5mm G.I bolts spaced at 100mm centers and provided with 3.2mm foamed rubber gasket. All joints and seams shall be rendered air shall be of sliding type.
- Standard elbows with a R/D ratio of not less than 1.25 shall be used as far as possible. Where space restriction do not permit use of standard radius elbow with lesser R/D ratio, square elbows with equally spaced double thickness vanes may be used.
- All duct fabrication and installation shall conform to the extent modified herein, to the SMACNA Standard for Low Pressure Duct Construction. Length of taper ducts shall be at least four times the maximum size difference between the ends.
- All duct lining for acoustic insulation shall be carried out as specified under Section “NOISE & VIBRATION” before the duct is installed in position.

3.4.2 VOLUME CONTROL DAMPER

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

- Description:
 - Frame is constructed from galvanized steel sheet. Joints are welded and protected by aluminum spray coating.
 - Blades are coupled by external concealed linkage, which can provide either parallel or opposed blade operation.
 - Linkage rods are coupled with hand locking quadrant with open and close marking. Hand locking quadrant frame is marked to show exact position of damper.
 - Structure is available with flanged edges and are supplied undrilled as standard.
 - Dampers without flanges available as option for duct insertion purpose. Flanged edges with drilled holes are also available.
 - Available in square and rectangular sizes. Designed for use in heating, ventilating and air conditioning systems.
- Motorized dampers: Volume control dampers will be supplied with actuators of client's choice. The dampers can also be provided with an extended linkage to fix the motor at the site.

Standard sizes:

- Available in square and rectangular sizes. □
 - Sizes available from 100 x 100 mm with an increment of 25mm.
 - Nonstandard sizes available as option.
- CIRCULAR VOLUME CONTROL DAMPER
 - Construction:
 - Frame: 1.2 mm thick galvanized steel sheet.
 - Frame size: 12.5 mm depth and standard flange height of 25mm
 - Blades: Double skinned high quality extruded aluminum aero foil profiles.
 - Bearing pins: Electro plated square steel rod of size 12.7 mm x 12.7 mm.
 - Bushings: Self-oiling nylon bushings of internal square size.
 - Bearing pin connecting quadrant: Electro plated square steel rod of size 12.7 x 12.7 mm. □
 - Blade linkage: Steel / aluminum linkage.
 - Blade stopper: 20 mm x 20 mm aluminum angle.
 - Description:
 - Frame is constructed from galvanized steel sheet. Joints are welded and protected by aluminum spray coating.
 - Damper blade, which is fixed to the bearing pin, can be rotated in vertical plane from full open to full close.
 - Bearing pin is coupled with hand locking quadrant with open and close marking. Hand locking quadrant frame is marked to show exact position of damper.
 - Designed for use in heating, ventilating and air conditioning systems.
 - NON-RETURN DAMPER DUCT MOUNTED
 - Construction:
 - Frame: High quality extruded aluminum profile with 30 mm flange width as standard. 12, 16,

24 mm flange widths are optional.

- Blades: Aluminum sheet as standard. GI sheet as option.
- Blade supports: Self oiling nylon bushings with 8 mm diameter aluminum rods.
- Blade seals: Foam gasket for air tightness.
- Blade stopper: 20mm x 20mm aluminum angle.

○ Description:

- Frame is of high-quality extruded aluminum profiled construction with the advantages of corrosion resistance and rigidity.
- Air operated damper blades are fixed to the frame by self-oiling nylon bushes with 8mm dia aluminum pipes.
- Blades are sealed with foam gasket at the bottom to avoid rattling noise and to provide airtight operation.
- Blades open fully or to any angle depending on the air velocity. Blades stay in position of opening without fluctuating when there is constant airflow. Blades close quietly when the airflow stops.
- Designed to maintain a constant pressure level inside pressurized rooms by relieving excess air when it exceeds the desired limit.
- Generally installed on diesel generator, plant rooms ventilation system and exhaust ducting.
- Available in square and rectangular sizes.

○ Standard finishes:

- Natural anodized aluminum finish.
- Powder coated color finish as per RAL color codes.
- Flexibility of finishing is available as option.

○ Standard sizes:

- Sizes available from 100 x 100mm with an increment of 50mm.
- Available in square and rectangular sizes.
- Nonstandard sizes available as option.

3.4.3 GRILLS & DIFFUSERS

● SUPPLY AIR CURVED LINEAR BAR GRILLE

○ Construction:

- Frame: High quality extruded aluminum profile with 30mm flange width as standard. 12, 16, 24mm flange widths are optional.
- Face bars: High quality aluminum profiles of 00, 150 – 1 way throw and 150 – 2-way throw
- Bar spacing: 12mm as standard. 6mm as option □ Grille width: 50mm to 300mm with increments of 50mm.
- Length: 1 meter as standard.

○ Description:

- Frame and face bars are of high-quality extruded aluminum profiled construction with the advantages of corrosion resistance and rigidity.

- Horizontal face bars with 00, 150 – 1 way throw and 150 – 2 way throw are fixed rigidly to the frame with 8-mm pipes.
- Vertical aluminum aero foil blades are fixed at the rear side of the frame by nylon bushings.
- These blades can be adjusted manually and individually in the vertical plane to obtain optimum air distribution.
- For perfect unbroken appearance of continuous runs, alignment strips are provided with no additional cost.
- Supply and return air curved linear bar grilles are available up to a length of 3 mts with a minimum radius of curvature of 1 meter.
- Available without damper. Dampers can be provided to use in plenum boxes as option.
- Foam gasket is sealed around the back of the frame as option to avoid air leakage.
- Supplied with C clamps for concealed fixing.
- Standard Finishes:
 - Natural anodized aluminum finish. ☐
 - Powder coated color finish as per RAL color code. ☐
 - Flexibility of finish available.
- **SUPPLY AIR LINEAR SLOT DIFFUSER:**
 - Construction:
 - Frame & Blades: High quality extruded aluminum profiles.
 - Damper: Hit and miss damper.
 - Slot width: 20mm as standard. 16 mm, 25 mm and non-standard sizes available as option.
 - Number of slots available: 1,2,3,4,5,6,7,8 ☐ Length: Up to 5.8 mt available in a single piece.
 - Optional Accessories: Plenum box unlined, internally insulated or externally insulated.
 - Description:
 - Frame and deflection blades are made of high quality extruded aluminum profiled construction with the advantages of corrosion resistance and rigidity.
 - Air distribution can be changed vertically or horizontally by means of deflection blades without changing the air flow rate. These blades can be fully adjusted from face opening.
 - Air flow rate can be adjusted by fixing hit and miss damper at the rear side of the diffuser. Damper blades are adjusted from the face opening.
 - Dampers are designed in a unique way that it can be used as an equalizing grid.
 - Positive alignment of adjacent sections can be made by using alignment strips.
 - Foam gasket is sealed around the back of the frame as option to avoid air leakage.
 - Suitable for installation for ceiling and stills.
 - Standard Finishes:
 - Natural anodized aluminum finish.
 - Powder coated color finish as per RAL color code.
 - Flexibility of finish available.
- **DOOR GRILLE WITH SINGLE FRAME:**
 - Construction:
 - Frame: High quality extruded aluminum profiles with 30mm flange width as standard. 12, 16, 24mm flange widths are optional.

- Blades: High quality extruded aluminum profiles.
- Blade pitch: 15mm
- Description:
 - Frame and blades are of high-quality extruded aluminum profiled construction with the advantages of corrosion resistance and rigidity.
 - Inverted “V” type horizontal blades are fixed rigidly to the frame.
 - Blades are spaced at a distance of 15mm.
 - Grilles are made to withstand heavy use to which door grilles are subjected.
 - Frame is fabricated to suit door thickness of 30mm to 60mm.
 - Structure provides around 55% free area for air transmission.
 - Used in facilities such as offices, hospitals, schools and toilets for transfer of air from one room to another room.
 - Fire rated door grilles are available with ½ and 1 hour fire rating with additional cost.
- Standard finishes:
 - Natural aluminum anodized finish. □
 - Powder coated color finish as per RAL color codes.
 - Flexibility of finishing is available.
- FILTERS:
 - Ceiling diffusers available with removable type washable aluminum filters with aluminum mesh as the filter media.
 - Fabricated from 1 mm thick aluminum sheet with aluminum mesh as the filter media.
 - Filter frame is screw fixed to the diffuser.
 - Generally available in 12, 25, 40 & 50 mm thickness as standard.
 - Structure will have high dust holding capacity and low resistance to air flow.
 - Other insulating materials as option.
- RETURN AIR LINEAR BAR GRILLE
 - Construction:
 - Frame: High quality extruded aluminum profile with 30mm flange width as standard. 12, 16, 24mm flange widths are optional.
 - Face bars: High quality aluminum profiles of 00, 150 – 1 way throw and 150 – 2 way throw
 - Bar spacing: 12mm as standard. 6mm as option □ Grille width: 50mm to 300mm with increments of 50mm.
 - Length: 1 meter as standard. Available from 0.2 mt to 5.8 mt in a single piece.
 - Description:
 - Frame and face bars are of high-quality extruded aluminum profiled construction with the advantages of corrosion resistance and rigidity.
 - Horizontal face bars with 00, 150 – 1 way throw and 150 – 2 way throw are fixed rigidly to the frame with 8-mm pipes.
 - For perfect unbroken appearance of continuous runs, alignment strips are provided with no additional cost.
 - Total structure is manufactured by mechanical assembly, assuring rigidity and to maintain straight-line appearance.

4.0 INSULATION:

4.1 SCOPE:

- 4.1.1 Scope of this Article comprises supply and installation of insulation as herein specified.

4.2 GENERAL:

- 4.2.1 All tests like pressure testing should be complete and recorded and all systems approved by the Consultants before insulation is applied to the equipment and piping.
- 4.2.2 Insulation material shall be supplied by approved manufacturers and shall be of the type specifically intended for the services specified.
- 4.2.3 Insulation material as well as adhesive shall not release toxic gases.
- 4.2.4 Thermal conductivity for closed cell nitrile rubber- 0.035 w/m.k at 0 deg.C
- 4.2.5 Thermal conductivity for open cell nitrile rubber- 0.046 w/m.k at 0 deg.C

4.3 REFRIGERANT PIPING:

4.3.1 Insulation Material:

- Thermal Insulation should be Nitrile Rubber Class 'O' and of closed cell tubing type.
- Acoustical insulation should be Nitrile Rubber Class 'I'.
- Thickness shall be as indicated in the BOQ.

4.3.2 Application:

Piping and accessory insulation application shall be as follows:

- Pipes shall be thoroughly cleaned with wire brush and rendered free from all rust and grease.
- Use closed cell type insulation of density 45 to 55 Kgs/ m³ of suitable diameter.
- The insulation of straight pipe use slips on method. Use snaps off method for elbows and bends.
- Insulation shall be fixed tightly on the surface taking care to seal all joints.
- Provide Nitrile Rubber 6mm thick x 50mm tape to seal all longitudinal & transverse joints fixed with Armaflex adhesive 520.

4.4 DRAINPIPE INSULATION:

4.4.1 Insulation Material:

- Insulation should be nitrile rubber.
- Thickness of pipe insulation shall be 13mm thick.

4.4.2 Application:

Piping and accessory insulation application shall be as follows:

- Pipes shall be thoroughly cleaned with wire brush and rendered free from all rust and grease.

- Apply Nitrile Rubber adhesive 520 on the cleaned pipe surface.
- Use closed cell type insulation of density 45 to 55 Kg / m³ of suitable diameter.
- The insulation of straight pipe use slips on method. Use snaps off method for elbows and bends.
- Insulation shall be fixed tightly on the surface taking care to seal all joints.
- Provide Nitrile Rubber 6mm thick x 50mm tape to seal all longitudinal & transverse joints fixed with Nitrile Rubber adhesive SH 998.

4.4.3 Drain piping shall be insulated with 13mm Armaflex. The insulation shall be applied as recommended by manufacturers. All joints shall be taped and sealed to ensure that there is no sweating of pipes. Insulation shall be fixed with approved adhesive.

4.5 DUCTS INSULATION

4.5.1 SCOPE

The scope of this section comprises the supply and application of insulation conforming to these specifications.

4.5.2 MATERIAL

- Thermal insulation material for Duct insulation shall be closed cell Elastomeric Nitrile Rubber or cross-linked polyethylene of Thermal conductivity of the insulation material shall not exceed 0.038 W/moK or 0.212 BTU / (Hr-ft²-oF/inch) at an average temperature of 30oC.
- Density of the nitrile rubber shall be 40-60 Kg/m³. The product shall have temperature range of -40 oC to 105oC. The insulation material shall be fire rated for Class 0 as per BS 476 Part 6 : 1989 for fire propagation test and for Class 1 as per BS 476 Part 7, 1987 for surface spread of flame test.
- Water vapor permeability shall be not less than 0.024 per inch (2.48 x 10⁻¹⁴ Kg/m.s.Pa i.e. $\mu > 7000$: Water vapor diffusion resistance).
- Thickness of the insulation shall be as specified for the individual application. Each lot of insulation material delivered at site shall be accompanied with manufacturer's test certificate for thermal conductivity values, density, water vapor permeability and fire properties.
- Samples of insulation material from each lot delivered at site may be selected by Owner's site representative and gotten tested for thermal conductivity and density at Contractor's cost.
- Adhesive used for sealing the insulation shall be non-flammable, vapor proof adhesive strictly as per manufacturer's recommendations.

Ducting insulation thickness shall be as per table below.

During Position	Thickness of Insulation
SA duct in RA path	9mm

Ducted return air system	SA duct: 25mm RA duct: 19mm
both SA& RA exposed	Both 25mm

4.5.3 DUCT ACOUSTIC LINING

- Duct acoustic lining material shall be Nitrile Rubber open cell foam. Thermal conductivity of the insulation material shall not exceed 0.047 W/moK at an average temperature of 20oC. Density of the nitrile rubber shall be 140 – 180 Kg/m3.
- The material should withstand maximum surface temperature of +85oC and minimum surface temperature of -20oC.
- The material should conform to Class 1 rating for surface spread of Flame in accordance to BS 476 Part 7 & UL 94 (HBF, HF 1 & HF 2) in accordance to UL 94, 1996.
- It should have Microban, antimicrobial product protection, and should pass Fungi Resistance as per ASTM G 21 and Bacterial Resistance as per ASTM E 2180. The insulation should pass Air Erosion Resistance Test in accordance to ASTM Standard C 1071-05 (section 12.7).
- Thickness of the material shall be 15 mm thick specified for the individual application. The insulation should be installed as per manufacturer's recommendation.
- Microban is a registered trademark of the Microban Products Company, USA.
- The Random Incidence Sound Absorption Coefficient (RISAC); tested as per ISO 354, should be minimum as per following chart.

Freq (Hz)	125	250	500	1000	2000	4000	NCR
10mm	0.03	0.04	0.14	0.04	0.88	1	0.35
15mm	0.01	0.09	0.29	0.74	1.08	0.83	0.55
20mm	0.04	0.13	0.40	0.9	1.04	0.9	0.60
25mm	0.02	0.25	0.86	1.14	0.88	0.99	0.80
30mm	0.07	0.32	0.99	1.16	0.93	1.08	0.85
50mm	0.23	0.73	1.29	0.99	1.09	1.11	1.05

- Ducts so identified and marked on Drawings and included in Schedule of Quantities shall be provided with 15 mm thick acoustic lining of thermal insulation material for a distance of minimum 5 meters (or 30% of the duct length whichever is more).
- Installation Procedure
 - The inside surface for the ducts shall be covered with adhesive recommended by

the manufacturer. Cut Foamed sheets into required sizes apply adhesive on the foam and stick it to the duct surface.

4.5.4 External thermal insulation shall be provided as follows:

- The thickness of nitrile rubber shall be as shown on drawing or identified in the schedule of quantity.
- Following procedure shall be adhered to:
 - Duct surfaces shall be cleaned to remove all grease, oil, dirt, etc. prior to carrying out insulation work. Measurement of surface dimensions shall be taken properly to cut closed cell elastomeric rubber sheets to size with sufficient allowance in dimension.
 - Cutting of nitrile rubber sheets shall be done with adjustable blade to make 90° cut in thickness of nitrile rubber sheet. Hackshaw or blades are not acceptable tools for cutting the insulation.
 - Material shall be fitted under compression and no stretching of material shall be permitted. A film of adhesive shall be applied on the back of the insulating material sheet and then on to the metal surface.
 - When adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. All longitudinal and transverse joints shall be sealed by providing 6 mm thick 50 mm wide nitrile rubber tape. The adhesive shall be strictly as recommended by the manufacturer.

4.6 UNDER DECK INSULATION:

4.6.1 All air-conditioned areas with exposed roof shall be provided with under deck insulation of 13mm Armaflex class “O” or as indicated in the BOQ / dwg.

4.6.2 Under deck duct insulation shall be applied as follows:

- Clean the surface and make it free from dust and loose particles.
- Apply a coat of approved Armaflex adhesive 520 for duct insulation.
- Seal the longitudinal joints and intra slab joints with adhesive and Provide Armaflex 6mm thick x 50mm tape to seal all longitudinal & transverse joints fixed with Armaflex adhesive 520.

4.7 MODE OF MEASUREMENT FOR INSULATION:

- 4.7.1 All duct insulation shall be measured on the basis of the finished insulation surface area and excluding all openings for grilles, diffusers but including all flanges, dampers etc.
- 4.7.2 In case of bends, tapers etc. the duct prime surface shall be determined on the basis of the average dimension.
- 4.7.3 In general, IS code shall be followed for insulation measurement.
- 4.7.4 All pipe insulation shall be linear measure along the length of the pipe, over all fittings. In case of bends the length of insulation shall be determined on the basis of the longer area

5.0 VENTILATION AND EXHAUST FANS:

5.1 PROPELLER TYPE EXHAUST FANS:

- 5.1.1 Propeller type fans shall be G.E.C or Crompton. Fan shall be of blade type, ring or diaphragm mounted and of the capacity shown in the schedule of equipment. Fans shall be provided with gravity type louvers unless otherwise stated.
- 5.1.2 Fan drive shall be single phase or three phase motors as indicated in the schedule of equipment and shall be complete with starter unless otherwise stated. All motors shall be of class 'F' insulation.
- 5.1.3 Fan shall be provided with speed regulators. Provide rain protection louver and bird screen for each fan.

5.2 INSTALLATION:

- 5.2.1 The wooden frame required for the fans will be prepared by the owner to the drawings supplied by the contractor. All necessary hardware shall be by GI. Base frame shall be given 2 coats of epoxy paint.
- 5.2.2 After completion of installation the Vendor shall give final paint to the fans as per the color shade approved by consultant. Two coats of epoxy paint to be given.

5.3 INLINE FANS:

- 5.3.1 Inline fan shall incorporate SISW direct driven centrifugal fan with TEFC (IP-44) motor. The fan assembly shall be encased in sheet metal housing of 22G GSS and with necessary inspection cover with proper gasket assembly. The fan material shall be of galvanized sheet. Flanges shall be provided on both side of the inline fan to facilitate easy connection. Flexible anti-vibration joints shall be provided to arrest vibration being transformed to other equipment connected to inline fan. Motor shall be single phase/3 phase shall be mentioned in technical specification attached in tender.
- 5.3.2 All single phase shall be provided with speed regulator while all three phase fans shall be provided with opposed blade dampers in GSS construction at fan outlet for air balancing.

6.0 PAINTING:

6.1 SCOPE:

- 6.1.1 Scope of this section comprises painting of various equipment, piping etc. as specified herein.

6.2 GENERAL:

- 6.2.1 Prime and finish paints used for mechanical work shall be of standard brands, ready mixed, products of qualified manufacturers, of approved make and shade.
- 6.2.2 Deliver paints in their original containers with seals unbroken bearing manufacturer's label specifying trade name, brand and quality.
- 6.2.3 When requested, submit manufacturer's written statement that a particular brand of paint is recommended and guaranteed by him for surfaces on which it will be applied. Also, when requested, submit analysis of pigment and vehicle used for a particular brand of paint.

6.3 APPLICATION:

- 6.3.1 All equipment which do not have factory finish shall be given two coats of paint approved by the Architects. Where paints are damaged in transit in case of factory finished products, two coats of the original color shall be applied.
- 6.3.2 Equipment which are insulated shall be given two coats of approved color paint over the surface.
- 6.3.3 All exposed ducts shall be given two coats of paint as directed by the Architect.
- 6.3.4 All grilles and diffusers shall be powder coated to match with the interior of the rooms as directed by the Architect.

6.4 PIPING:

- 6.4.1 All pipes running inside the building shall be given color codes as specified herein below:

Description		
<u>Refrigerant Piping:</u>		
a)	Liquid line	Red
b)	Hot gas	Yellow

All pipes shall have arrow marks to indicate the direction of flow. Arrow shall be painted in white.

7.0 ELECTRICAL WORKS:

- 7.1.1 The scope of work will cover supply and installation of all cabling and earthing required for the air-conditioning and ventilation System. Power will be supplied by others near each AC unit and all other electrical work connected with AC Plant will be provided by AC Contractor.

LT CABLES:

- 7.1.2 Cable shall conform to IS 1554 (part I) amended up to date.
- 7.1.3 Voltage grade 1.1 K V
- 7.1.4 PVC insulated overall FRLS PVC sheathed steel armored cables of electrical grade aluminum conductor except control cabling and cables of 2.5 sq. mm size and smaller switch shall be electrical grade copper conductor.
- 7.1.5 The cables shall be in trenches trays or GI conduits or buried in ground as specified in cable schedule or drawing, cable routing given on the drawings shall be checked in the field to

avoid interference with structures, piping, ducting and minor adjustment shall be made to suit the field conditions.

- 7.1.6 All cables shall be carefully measured and cables cut to the required length leaving sufficient length for final connections to the equipment.
- 7.1.7 The quantity indicated in the cable schedule is only approximate. The contractor shall ascertain the exact requirement of cable for a particular feeder by measuring at site along the actually finalized route. He shall prepare, cut length schedule of cables before taking up cable laying.
- 7.1.8 Cable shall be neatly arranged in the trenches/trays in such a manner, that criss crossing is avoided and final take off to the equipment is facilitated.
- 7.1.9 All cables shall be identified close to their termination point by cable mark as per the cable schedule.
- 7.1.10 Cables shall be handled carefully during installation prevent mechanical injury to the cables.
- 7.1.11 Cable installed above ground level shall be run in GI perforated cable trays.
- 7.1.12 Individual cables or shall group of cables shall be clamped by means of 2mm thick aluminum saddles of 25 x 6mm aluminum strips. The cost of such saddle shall be included in the cost of installation of cables.

8.0 CABLE TERMINATION:

All PVC cables shall be terminated at switch gear/equipment by means of single compression type brass glands and copper/aluminum lugs.

- 8.1.1 In case of control cables, all cores shall be identified at both ends by their terminal numbers by means of PVC ferrules.
- 8.1.2 Contractor shall drill holes for fixing glands wherever necessary at no extra cost. All holes required shall be made by circular saw cutter only.
- 8.1.3 Cable leads shall be terminated at the equipment terminals by means of crimped type solder - less lugs.

8.2 EARTHING:

- 8.2.1 Entire installation of earthing shall be conforming to the Indian Standard specification IS: 3043-1966 code of practice for earthing.

- 8.2.2 Size of copper earthing wire/strip shall be as follows:

- Up to 15 HP --12 SWG
- Up to 20 to 30 H -- 8 SWG
- Up to 35 to 50 HP -- 4 SWG
- Above 50 HP -- 25 X 3 mm Strip
- Main Grid -- 25 x 6 mm Strip

8.3 CABLES TRAYS:

- 8.3.1 Cable tray shall conform to relevant IS specification.
- 8.3.2 The cable trays shall be Hot dipped, galvanized GI perforated trays made out of 2mm thick sheet steel 2.5 meters long and 100/50 in height as per IS standards.
- 8.3.3 Cable trays installed outdoor shall be covered with GI sheet steel covers after cables are laid.

9.0 PREVENTIVE MAINTENANCE CONTRACT:

- 9.1.1 The equipment supplied and installed will be maintained by contractor as follows:

9.1.2 REGULAR SERVICE:

All equipment will be checked and serviced 12 times in a year for 2 years. Each such preventive maintenance service shall mainly consist of:

- Checking general functioning of all the equipment like split units, condensing units, controls, Fans, fresh air unit with heat recovery wheel etc.
- Checking and adjusting belt tension/alignment of all drives, tightening of bolts, etc.
- Lubricating bearings of motors and fans and checking oil levels in various equipment like compressor, motor starter and gear boxes, wherever required.
- Checking refrigerant leaks.
- Inspecting/adjusting refrigeration controls at site/service station as and when necessary.
- Chemical cleaning of evaporator coils, cleaning of air-cooled condenser coil and fins whenever required during the contracted period or at least once every year.
- Free replacement of consumables like V belts, filters.
- Replenishment of refrigerant gas and compressor oil in the system required as a result of leak in the system.
- Painting of equipment installed on terrace/ outdoors every 2 years and indoor units every year.

9.1.3 The following are to be included in Contractor's scope:

- Day to day/routine maintenance of plant.
- Cleaning of drain piping external to the equipment.
- Repairs to or replacement of electrical installation like cabling, dressing of lugs, switch boards isolators, panels, fuses, strip heaters with associated ammeters/voltmeters.

10.0 MAKE OF EQUIPMENT AND APPROVED MANUFACTURES:

HVAC MAKE LIST		
1	VRV/VRF	O GENERAL/ TRANE /MITSUBISHI
2	INDOOR UNIT	O GENERAL/ TRANE /MITSUBISHI
3	TFA UNITS	O GENERAL/ TRANE /MITSUBISHI
4	COPPER PIPE	MAX FLOW / MANDEV
5	UPVC/ CPVC PIPES	FINOLEX/SUPREM/PRECISION
6	DIFFUSERS/GRILLS	RUSKIN TITUS / SYSTEM AIR / COSMOS
7	DUCTING SHEETS	SAIL / JINDAL/TATA

8	GI DUCT	ZECO/DUCTOFAB/DUSTECH/TECHNOFAB RI
9	FIRE DAMPERS/DAMPERS	ROLASTAR / CAM DUCT/ ZECO
10	VCD (G.I.)	AIR MASTER/ COSMOS/SYSTEMAIR
11	ANCHOR FASTNERS	DANFOSS / ABB /SCHNEIDER
12	ANTI- VIBRATION MOUNTING	DUNLOP / POLYBOND
13	NITRILE RUBBER INSULATION	ARMAFLEX / SUPERLON
14	ACOUSTIC INSULATION	ARMAFLEX / SUPERLON
15	ELECTRICAL CABLE (FRLS)	POLYCAB / HAVELLS / KENTER
16	CABLE TRAY	PROFAB /INDIANA /RECO STEEL/SLATTCO
17	CONDUITS FRLS	DUNLOP / POLYBOND
18	EXHAUST FANS	CARYAIRE/KRUGER/SYSTEMAIRE/NICOT RA
19	CONTROL CABLES	POLYCAB / HAVELLS / KENTER
20	OCCUPANCY/WINDOW SENSORS for HVAC	HONEYWELL/DWYER/SCHNEIDER

11.0 TEST READINGS:

11.1.1 Test readings shall be submitted as per T&C documentation.

DRAWINGS FOR APPROVAL & COMPLETION DRAWINGS:

Drawing for approval on award of the work –

The contractor shall prepare & submit three sets of following drawings and get them approved by the Engineer-in-Charge before start of the work. The approval drawings, however, do not absolve the contractor not to supply the equipment's/materials as per agreement, if there is any contradiction between the approved drawings and agreement.

- Shop drawings for HVAC layouts, support details, etc.
- General arrangement drawings of the Outdoor Units, Indoor units, Fans, Ducts etc. with complete dimensions.
- Any other drawings relevant to the work.

Drawings/ Documents to be furnished on completion of installation:

Five sets of the As -built drawings in hard & also in Soft shall be submitted by the contractor while handing over the system to the Client/Consultant/Department. HVAC installation drawings giving complete details of all the equipment including their foundations.

- i) ii) Manufacturer's technical catalogues of all equipment and accessories.
- ii) iii) Operation and maintenance manual of all major equipment, detailing all adjustments, operation and maintenance procedure.

ANNEXURE A - APPENDIX TO CONDITONS OF CONTRACT

Details	Clause
Earnest Money Deposit	₹ 02,00,000/- payable in DD/Pay Order
Performance Guarantee/ Security Deposit	Within 7 days of finalization contractor to submit Performance guarantee of amount 1% of the contract value in the form of Bank Guarantee shall be from a Nationalized Bank, validity till the contractual completion date plus 4 months. If the

Details	Clause
	work gets delayed or extended the bank guarantee will be extended at no extra cost to client.
Time for project completion	04 months for date of issue of LOI including Monsoon season including complete handing over including snag list clearance
Mobilization Advance	The contractor shall not be paid any Mobilization Advance.
Mobilization Time	The Contractor shall start work within a period of 7 Days from the date of LOI or notice to Proceed.
Insurance	The Insurance Policies / Contractor all risk policy to be taken and kept in force by the contractor throughout the construction. An amount of Rs. 0,00,00,000/- to be insured at all times
Licenses and local approvals	The contractor shall obtain at his own cost Govt/ Municipal licenses/permits required for labour, site facilities and all other government licenses required before start of work in the area.
Site office	Contractor to provide furnished office to his site staff, Employer & representative with computer, printer & internet connection and other basic facilities.
Supply of Material and reconciliation.	All materials shall be supplied by Contractor. No wastage allowance shall be considered. The Contractor shall also provide a proper reconciliation of the material consumed, duly verified by the Consultants / Employer, and along with the RA bills submitted from time to time and also Final reconciliation Statement with final Bill.
Contract Rates.	The Contract rates shall remain firm throughout the period of the contract. No escalation or price adjustment shall be done due to any reason.
Local Issues	All local issue will be handled by the contractor
RA (Running account) Bill	It will take 7 working days to check and certify the bill by consultant after receiving soft and hard copy of bill along with all necessary documents and R.A. Bills will be paid within 15 working days from the date of certification of bills by Consultants. This payment will be made after making necessary

Details	Clause
	deductions as stipulated elsewhere in the CONTRACT DOCUMENT.
Final Bill	Only on obtaining completion certification from the Consultants & Employer, the Contractor shall submit the FINAL BILL which will be settled within a period of 1.5 months (45 days) provided the contractor completed work as per conditions of contract. Final Bill shall be complete in all respects including duly signed final measurements, material reconciliation statements, authentication of non-tender items by quantity and by rates agreed upon. Payment against final bill will be made as set, after deducting of any advance, other dues/income tax and recoveries.
Liquidated Damage/ Bonus	In the event of delay in completion of work, the contractor shall pay liquidated damages at the rate of 0.5% of contract price per week of delay subject to a maximum of 5% of contract price. Contractor shall be entitled for a bonus of 1% for each 30 days early completion of work. The period of less than 30 days shall be ignored while working out bonus. The maximum bonus shall be limited to 2.5% of original contract value.
Defects Liability Period	12 months from date of issue of virtual completion Certificate.
Retention money	5% retention amount will be deducted from every running account bill. Maximum of 5 % of contract value. 100% after completion of one year / after defects liability period after certification of consultant. 100% amount can be released on receipt of bank guarantee from nationalized bank of the amount up to end of defects liability period
Water	Water for construction shall not be made available to the contractor. Contractor has to arrange the construction water without any extra cost. The contractor at his own cost shall arrange distribution of pipe networks, storage and such distribution network arrangement shall have the prior approval of the Engineer-in-Charge.

Details	Clause
Electricity	Supply of electric power for the work shall be arranged by the contractor without any extra cost. The contractor shall make further distribution arrangements from this point. Contractor will be responsible for overall lighting of the site. Power Supply required for testing of lifts shall be arranged by the contractor.
Labour Hutments	Contractor to make his own arrangement for labour hutments outside the plot. Labour camp will not be allowed to stay inside the plot. He will not be allowed to make hutments just outside the plot or adjoining to the existing compound wall.
Penalty	Rs. 1,000/- per incident of unsafe act / non-compliance of Legal / Statutory requirements as may be pointed out by the Consultants / Employer. Such fault shall also include acts that are specifically prohibited under various provisions / clauses provided as part of this tender document.

I/WE AGREE TO ABOVE

Witness :

Signature of Contractors
(With Rubber Stamp)

ANNEXURE B

FORM OF AGREEMENT

THIS AGREEMENT made the _____ day of _____ 2026
BETWEEN Shikshan Prasarak Mandali. (Hereinafter called "the Employer") of the first
part and _____ (hereinafter called
the "the Contractor") of the other part.

WHEREAS the Employer is desirous that certain work should be carried out viz " Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India." and has accepted a tender by the Contractor for execution and maintenance of such works.

NOW THIS AGREEMENT as follows:

In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

The following documents shall be deemed to form and be read and construed as part of this agreement, viz.

The said Tender and Appendix thereto.

Instructions to Tenderers

The Drawings

The Conditions of Contract

Special Conditions and Specifications

General Specifications

Standard Descriptions of Items

Bill of Quantities

Letter of Acceptance dated _____

Any correction or addition thereof.

Final negotiation meeting records

In consideration of the payments to be made by the Employer to the contractor as herein after mentioned the contractor hereby covenants with the Employer to construct complete and maintain the works in conformity in all respects with the provisions of the contract.

The Employer hereby covenants to pay to the Contractor in consideration of the construction, completion and maintenance of the work the contract price at the times and in the manner prescribed by the contract.

IN WITNESS whereof the parties hereto have caused their respective common seals to be hereunto affixed (or have hereunto set their respective hands and seals) the day and your first above written.

SIGNED BY THE SAID IN THE PRESENCE OF

OWNER

WITNESS

NAME :

ADDRESS:

SIGNED BY THE SAID IN THE PRESENCE OF
WITNESS

CONTRACTOR

NAME :
ADDRESS:

Note this format may be changed as per requirement of client

ANNEXURE C

Proforma for Structure & Organization Details

Sr. no	Description	Detail
1.	Name of the firm	
2.	Address.	
3.	Telephone no. – Office	
	Residence.	
4.	Telegraphic Address, if any.	
5.	Month and year in which the present firm was established in present name	
6.	Particulars of old firm(if present firm is new) if main partners of the present firm were working as construction contractors in some other name in the past(the partnership deed of the old firm be enclosed)	
7	Particulars of sister concern if any	
8(i)	What is the constitution of the firm viz. sole proprietor, partnership, Pvt Ltd. Public ltd. Etc.	
(ii)	Enclose copy of partnership deed or Articles of Association etc.	
9.	Give details of enrolment with Govt./Semi Govt/PSU & with other organizations.	
10 (i)	Annual turnover for last five years(enclose documentary evidence or proof to support figures)	Year Lacs Rs. In i) ii) iii) iv) v)
iii)	Enclose latest Income-tax clearance certificate. Certificate enclosed for Assessment year.	
11 (i)	Name and complete address of bankers	

Sr. no	Description	Detail
(ii)	Enclose solvency certificate indicating the amount	Rs.
iii)	Bank Guarantee Limits with various Banks.	i) Rs. Lacs with ii) Rs. Lacs with
12 (i)	Enclose list of immovable properties with complete postal addresses, full description.	Rs.
18(i)	How do you normally carry out work of water supply, sanitary and plumbing installations ?	
ii)	Who is the license holder and what is his experience of this work ?	
19(i)	How do you normally get the work of electrical installations carried out ?	
(ii)	Who is the license holder and what is his experience ?	
20.	Any other information, the applicant might like to give .	

I/We certify that the above particulars are correct and that it should be found that I/We fails to notify the fact of my/our subsequent amalgamation with another contractor or firm, The Shikshan Prasarak Mandal, Pune may remove my/our name from the list of contractors and any contract that I/We may be holding at the time may be rescinded.

(SIGN & STAMP OF BIDDER)

Date:

ANNEXURE D

Proforma for Details of Technical & Administrative Personnel of the company.

Sr. No.	Name	Designation	Age	Academic Qualification	Period of Service with the firm	Total Experience	Details of experience

SIGN & STAMP OF BIDDER

ANNEXURE E

Proforma for ENROLLMENT WITH VARIOUS ORGANISATIONS:

Sr. no.	Name and address of Authority with whom You are Enrolled	Year to year	Is copy of letter enclosed	Class or category	Limit works enrolled for . (Rs. In Lacs)

SIGN & STAMP OF BIDDER

ANNEXURE F

LIST OF MAJOR WORKS COMPLETED DURING LAST FIVE YEARS.

Sr. no.	Name and Complete Postal Address of			Order			Date of commencement	Scheduled date of completion	Progress made and expected date of completion and reasons for delay if any.
	Site of work & nature of work	Owner	Authority under whom work is carried out	Ref. No. & Date	Amount (Rs. In lacs)	Is copy enclosed			

SIGN & STAMP OF BIDDER

ANNEXURE G

LIST OF MAJOR WORKS ON HAND

Sr. no.	Name and Complete Postal Address of			Order			Date of commencement	Scheduled date of completion	Progress made and expected date of completion and reasons for delay if any.
	Site of work & nature of work	Owner	Authority under whom work is carried out	Ref. No. & Date	Amount (Rs. In lacs)	Is copy enclosed			

SIGN & STAMP OF BIDDER

ANNEXURE H

DETAILS OF PLANT AND EQUIPMENT WITH BIDDER

[illegible]

We declare that the information provided by us is correct and when required we shall provide the required documentation for the same.

Contractor

ANNEXURE I

OTHER RELEVANT INFORMATION

[illegible]

ANNEXURE J

TEF ACCEPTANCE FORMAT

To,
M/s Shikshan Prasarak Mandal, Pune

TENDER ENQUIRY No – _____

Date: - _____

I/We hereby accept all the tender enquiry terms.

COMPANY'S NAME & ADDRESS: SIGNATURE:

DATE:

NAME:

DESIGNATION:

BIDDER'S COMPANY

SEAL:

NOTES:

Bidders should carefully read the Terms & Conditions of the Tender Enquiry Form (TEF) prior to filling up this acceptance format.

This format should be properly filled, signed and returned by the bidder(s) along with their technical offer for considering their Bid.

Bidder(s) to attach Separate Sheet for any deviations taken by them.

ANNEXURE K

Payment Terms Acceptance Format

To,
M/s Shikshan Prasarak Mandal, Pune

TENDER ENQUIRY No – _____ Date: - _____

I/We hereby accept all the payment terms mentioned in tender.

COMPANY'S NAME & ADDRESS: SIGNATURE:

DATE:

NAME:

DESIGNATION:

BIDDER'S COMPANY SEAL:

NOTES:

1. Bidder(s) should carefully read payment terms included in the tender prior to filling up this acceptance format.
2. This format should be properly filled, signed and returned by the bidder(s) along with their technical offer for considering their Bid.
3. Bidder(s) to attach Separate Sheet indicating all relevant details such as Number & description of the Clause, Reasons for Deviation and Alternative suggested for any deviations taken by them.

ANNEXURE L

FORM OF UNDERTAKING TO BE FURNISHED BY THE BIDDER

To,
Shikshan Prasarak Mandali.
Sharada Sabhagrah,
S P College Campus
Tilak Road,
Pune 411030 – Maharashtra

Sir,
Sub: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

REF: M/s. Shikshan Prasarak Mandali TENDER ENQUIRY No – _____ Date: _____

Having visited the site and examined the Drawing(s), Conditions of Contract, Special Conditions of Contract, General Specification and Detailed Specifications, building specifications of the above named work(s), we offer to design and construct, the whole of the said works as listed in the scope in conformity with the said Drawings, General Conditions of Contract, Specification, building specification included in this Tender Document for such other sum as may be ascertained in accordance with the said conditions of Contract.

We undertake to complete and deliver the works as per the time period mentioned in the tender

We have independently considered the amount of Liquidated damages shown in the tender and agree that it represents a fair estimate of the loss likely to be suffered by you in the event of the work(s) not being completed in time.

The Contractor's All Risk Policy for the full value of the Contract valid till the completion period will be obtained by us in the joint names of M/s. Shikshan Prasarak Mandali and us. We shall also undertake workmen compensation policy as per the tender terms.

We agree to abide by this Tender for the period of 30 days from tender closure date from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiry of this period.

Unless and until a formal Agreement or Order is prepared and executed, this tender together with your written acceptance thereof, shall constitute a binding Contract between us.

We understand that if our Tender-Bid is accepted, we are to be jointly and severally responsible for the due performance of the Contract.

We understand that you are not bound to accept the lowest or any Tender you may receive.

Dated this _____ day of _____
(year)

Signature _____ in the capacity of _____
Duly authorized to sign Tenders for and on behalf of _____

(IN BLOCK CAPITALS)

Witness:

Signature _____

Address of Witness _____

Name _____

Occupation _____

ANNEXURE M

RTGS/NEFT – MANDATE AUTHORISATION FORM

1. Supplier's / Vendor's Name:

[illegible]

2. Supplier's / Vendor's Name as per Bank Records:

[illegible]

3A. Supplier's Code

3B. Supplier's PAN Number: #

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[illegible]

Quoting PAN No. in all the e-returns has become 100% mandatory w.e.f. 14-02-2008 hence, ensure to fill- up this and also send a photocopy of PAN duly self-attested. If there is any difference between the name given in the supplier's name and name given in the PAN card, then a note to explain the reason for the difference and the correlation between both.

4. Supplier's / Vendor's Complete Postal Address:

Door No.								Street:											
Location:								District :											
City:								State					PIN						

5. Supplier's / Vendor's E-mail ID:

[illegible]

6. Supplier's / Vendor's Telephone Number & Mobile Phone Number:

[illegible]

7. Name of the Bank:

[illegible]

8. Bank (Branch) Postal Address:	
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[illegible]

9. RTGS*/NEFT** - Code of the Branch:

[illegible]

RTGS* - “Real Time Gross Settlement”, NEFT** - “National Electronic Fund Transfer”.

These “IFSC” Codes are unique numbers of each Branch – “Indian Financial Services Code”. For some Branches both the codes are the same and some Banks, may maintain one Code No. for RTGS and another Code No. for NEFT. Hence, please fill-up both the rows, even if it is the same.

10. Nature of the Account: (Tick whichever is applicable & put 'x' mark for the balance two accounts)

Saving Bank Account:		Cash Credit Account:		Current Account:	
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11. Bank Account Number of the Supplier: ©

[illegible]

© Fill up from the 1st column. For the balance left out blank columns, please mention 'x' mark.

We hereby declare that the particulars given above are correct and complete. If the transaction is delayed for reasons of incomplete or incorrect information, we would not hold M/s. Shikshan Prasarak Mandali responsible.

Date:

Supplier's Seal:

ANNEXURE N

PAYMENT TERMS:

Sr. No.	Description	Percentage
1	Mobilization advance	NA
2	Running Bills- Maximum one each month	95% Via Running Bills
3	Retention Money: After defect liability period i.e. 1 year or against bank guarantee from nationalized bank valid till defects liability period	5 %
4	RA Bill Checking Time	
	The Consultant shall then check the verified/corrected R.A. bill within 5 (five) days from its receipt	
	The Owner will make payment against certificate of payment through Demand Draft drawn of any bank within 15 days from the receipt of bill & Certificate of Payment in their office unless such amounts are being disputed or not approved by the Engineer.	
5	Frequency of Interim Valuations (R A Bills)	Maximum 1 (one) R A bills per month.
6	Value of Interim Valuations (R A Bills)	Each Interim Valuation (R A Bill) to have a minimum value Rs. 25,00,000/- (Rupees Twenty Lakhs only).

ANNEXURE O

NAME OF WORK: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

NAME OF TENDERER :

PRICE BID

I have gone through the entire tender documents and the building specifications
Our price as per the Annexed Bill of Quantities will be Rs. _____. (In words
Rupees _____ Only).

The above quoted rate is inclusive of all taxes/ duties as mentioned below:

	quote in INR	Taxes applicable	Tax %	Total including taxes
Final Amount as per BOQ				

SIGNATURE OF TENDERER

ANNEXURE P

Name of Work: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

NAME OF TENDERER :

SCHEDULE OF RATES (FORM – A)

The Schedule of rates should be read in conjunction with all the other sections of the tender. The tenderer shall be deemed to have studied the specifications, drawing and the details of work to be done within the time schedule attached and to have assessed the extent of work to be done and also to have acquainted himself of the conditions prevailing at the site.

The quantities shown against the items of work are only approximate and may vary to any extent subject to relevant clause of General Conditions of Contract.

The work shall be measured on completion and paid for at the accepted rates.

The item of work mentioned in the Schedule of Rates and covered by this contract shall be carried out as per the specifications, drawing and directions of the Consultants and shall be include all labor, materials, tools etc., required to complete the job, in all respects.

The rates inserted in the bills of quantities are to be for the full inclusive value of the work described under the several items, including all costs and expenses which may be required in and for the construction and full protection on the work described, together with all general risks, liabilities and obligations set forth or implied in the documents and on which are tender is based. The quoted rates will be for all heights, lifts and leads unless otherwise mentioned specifically in the description of item.

General directions and descriptions of work and materials given elsewhere in the contract documents are not necessarily repeated in the Bills. Reference is to be made to the other documents for the full information.

The Contractor will be deemed to have visited the site before quoting for the tender and to have examined for himself the conditions under which the work will be carried out including local conditions effecting labour and to have studied the items of the Bills of Quantities, the drawings and specifications clauses relating to them and to have satisfied himself that the rates quoted by him provide for all minor accessories and contingent works or services necessary for the works described even though they are not precisely defined.

Part of this contract, then the Contractor being called upon Tenderer is advised to read items of works carefully and quote the rates accordingly, however, if he quotes different rates for the same items of work under different schedules of items, the lowest rates quoted shall be made applicable to all the Bills of Quantities and the contract sum corrected accordingly.

Where an item of work not mentioned in a particular Bill of Quantities, is required to be executed and where the rate for such an item of work is quoted under a different Bill of Quantities forming shall execute the work and shall be paid at the rate so quoted Nothing extra over shall be payable on this account.

The drawing (s) attached with these tender documents are for the purpose of tender only, giving the tenderer a general idea of the nature and the extent of works to be executed. The rates quoted by the tenderer shall be deemed to be for the execution of works in accordance with the “Construction drawings” (to be supplied to the Contractor at the time of execution of the works) taking into the account the “Design Aspect” of these drawings.

I agree to above

SIGNATURE OF TENDERER

ANNEXURE Q

Name of Work: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

NAME OF TENDERER:

LIST OF ARBITRATION / DISPUTES.

LIST OF DISPUTES/LITIGATIONS/ARBITRATIONS

The tenderer shall give herein below the details of disputes/litigations/Arbitrations in the works executed in last 5 years in the following Proforma:

Sr.. No.	Year of Work	Name of Client	Nature of dispute/	Name of Arbitrator In brief	Money Amount	Status & details involved Thereof
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SIGNATURE OF TENDERER

In case if space is insufficient the tenderer may attach additional sheets with clear indication.

ANNEXURE R

Name of Work: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

NAME OF TENDERER:

QUALITY ASSURANCE PLAN

(The tenderer shall describe in details a various measures for each item of work to insure desire Quality.)

SIGNATURE OF TENDERER

In case if space is insufficient the tenderer may attach additional sheets with clear indication.

ANNEXURE S

Name of Work: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

NAME OF TENDERER :

HOUSEKEEPING

(The tenderer shall describe in details a various measures for maintaining Housekeeping in a manner suiting best standards in terms of Daily schedule, by alternate daily, weekly schedule, fortnightly schedule and monthly schedule)

SIGNATURE OF TENDERER

In case if space is insufficient the tenderer may attach additional sheets with clear indication.

ANNEXURE T

Name of Work: Proposed HVAC Works for Construction of Girls Hostel Building and Ancillary Structures, for M/s. Shikshan Prasarak Mandali at Plot No 226 (C. S. No. 202B/10), Matunga (E)-400019, Mumbai, India.

NAME OF TENDERER :

MATERIAL PROCUREMENT PLAN

(The tenderer shall describe in details of procurement of material for major items of works.)

SIGNATURE OF TENDERER

In case if space is insufficient the tenderer may attach additional sheets with clear indication.

ANNEXURE U

PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

(To be stamped in accordance with the Stamp Act)

Ref No. _____ Bank Guarantee No. _____ Date _____

To,

Shikshan Prasarak Mandali.

Sharada Sabhagriha,

S P College Campus

Tilak Road,

Pune 411030 - Maharashtra

Dear Sir(s),

In accordance with Letter inviting Tender under your reference No _____

M/S _____ having their Registered/ Head
Office at _____ (hereinafter called the Tenderer) wise to participate
in the said tender for _____.

As an irrevocable Bank Guarantee against Earnest Money Deposit for as amount of
_____ is required to be submitted by the Tenderer as a condition precedent
for participation in the said Tender which amount is liable to be forfeited on the happening of
any contingencies mentioned in the Tender Document.

We, the _____ Bank at _____ having our
Head Office _____ (Local address) guarantee
and undertake to pay immediately on demand by M/s. Shikshan Prasarak Mandali the
amount _____ without any reservation. protest. demur
and recourse. Any such demand made by Shikshan Prasarak Mandali, shall be conclusive
and binding on us irrespective of any dispute or difference raised by the Tenderer.

This guarantee shall be irrevocable and shall remain valid up to _____ (this date
should be 180 days (One Hundred and Eighty days) after the date finally set out for closing of
tender) If any further extension of this guarantee is required, the same shall be extended to
such required period on receiving instructions from

M/S _____ whose behalf this guarantee is
issued.

In witness whereof the Bank, through its authorized officer, has set its hand and stamp on this
_____ day of _____ at
_____.

WITNESS :

(SIGNATURE)

(NAME)

(SIGNATURE)

(NAME)

(SIGNATURE)

(NAME)

Designator with Bank stamp

(OFFICIAL ADDRESS)

Attorney No _____

Date : _____

Attorney as per power of

Sr. No.	Description	Unit	Qty.	Rate	Total Amount
1	VRV OUTDOOR UNIT				
1.1	Supplying, erecting, testing and commissioning of 7HP , VRF/VRV air conditioning system outdoor unit (ODU) complies type-IV OEM standards working on HFC refrigerant R410A or other required/suitable green equivalent refrigerant, for minimum cooling capacity as delivering 100% capacity at 39° C , non stop cooling even at 56° C and coefficient of performance (COP) 3.00 to 4.00, modular type horizontal hot air discharge suitable for longer piping range upto 1000m operation in cooling mode with inverter/digital VRF/VRV technology microprocessor based control compressor starter/control panel with scroll compressor, air cooled copper condenser coil of suitable shape for increasing maximum heat transfer area, rain protection cover, built in oil separator, accumulator and oil receiver, copper tube aluminium fin air cooled condenser, condenser fan with motor suitable for 415V±10%, 50 Hz, 3 phase power supply (all suitable for high ambient conditions), internal copper refrigerant piping, internal wiring and refrigerant, etc. all housed in powder coated weather proof cabinet complete.	Nos	2		
1.2	Supplying, erecting, testing and commissioning of 8HP , VRF/VRV air conditioning system outdoor unit (ODU) complies type-IV OEM standards working on HFC refrigerant R410A or other required/suitable green equivalent refrigerant, for minimum cooling capacity as delivering 100% capacity at 39° C , non stop cooling even at 56° C and coefficient of performance (COP) 3.00 to 4.00, modular type horizontal hot air discharge suitable for longer piping range upto 1000m operation in cooling mode with inverter/digital VRF/VRV technology microprocessor based control compressor starter/control panel with scroll compressor, air cooled copper condenser coil of suitable shape for increasing maximum heat transfer area, rain protection cover, built in oil separator, accumulator and oil receiver, copper tube aluminium fin air cooled condenser, condenser fan with motor suitable for 415V±10%, 50 Hz, 3 phase power supply (all suitable for high ambient conditions), internal	Nos	17		

	copper refrigerant piping, internal wiring and refrigerant, etc. all housed in powder coated weather proof cabinet complete.				
1.3	Supplying, erecting, testing and commissioning of 9HP, VRF/VRV air conditioning system outdoor unit (ODU) complies type-IV OEM standards working on HFC refrigerant R410A or other required/suitable green equivalent refrigerant, for minimum cooling capacity as delivering 100% capacity at 39° C, non stop cooling even at 56° C and coefficient of performance (COP) 3.00 to 4.00, modular type vertical hot air discharge suitable for longer piping range upto 1000m operation in cooling mode with inverter/digital VRF/VRV technology microprocessor based control compressor starter/control panel with scroll compressor, air cooled copper condenser coil of suitable shape for increasing maximum heat transfer area, rain protection cover, built in oil separator, accumulator and oil receiver, copper tube aluminium fin air cooled condenser, condenser fan with motor suitable for 415V±10%, 50 Hz, 3 phase power supply (all suitable for high ambient conditions), internal copper refrigerant piping, internal wiring and refrigerant, etc. all housed in powder coated weather proof cabinet complete.	Nos	1		
2	VRV INDOOR UNIT				
	VRV HI-WALL UNITS				

2.1	Supply, installation, testing and commissioning of VRF/VRV based Hi-wall type room/indoor unit (IDU) of nominal cooling capacity 1.02TR (328 cfm) to 1.25TR (417 cfm) having EER as per BEE standards and specifications with multiple speed evaporator fan with motor, copper tube aluminium fin evaporator coil, washable air filter, insulated drain tray, in built drain pump, expansion device, cordless remote control with necessary controls and electrical terminal to receive power supply, etc. IDU shall have anti-corrosive coating suitable for costal area. Unit shall be of decorative slim dimension suitable indoor wall mounting. The indoor unit shall also have an electronic control console. The unit shall be suitable for wall mounting and provided with suitable mounting brackets with any additional refrigerant and oil charge as per requirement during installation complete.	Nos	9		
	VRV 1 WAY CASSETTE UNITS				
2.2	Supply, installation, testing and commissioning of VRF/VRV based ceiling suspended 1 way cassette room/indoor unit (IDU-compact / standard size) of nominal cooling capacity 1.28TR (378 cfm) to 1.3TR (512 cfm to 530 cfm) having EER as per BEE standards and specifications, suitable as per site requirement with swing louvers and adjustable blades from sides. IDU with drainage arrangements, fan, refrigerant liquid and refrigerant piping, cordless remote control, and fresh air port etc. IDU shall have anticorrosive coating suitable for costal area in all respects suitable to operate on 1-phase, 230V, 50Hz, AC supply complete. The unit consisting with any additional refrigerant and oil charge as per requirement during installation.	Nos	92		
3	REFRIGERANT PIPE				
3.1	Supplying, laying/fixing, testing and commissioning of appropriate nominal refrigerant copper pipe of 22.2mm dia (OD) for liquid line/suction line supply and return piping of suitable gauge (hard copper pipe for liquid main line and soft copper pipe for refrigerant) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19mm thick elastomeric nitrile	Rmt	25		

	rubber along with application of multicoating of VRV/VRF piping for protection against mechanical damages, fungal growth, flame spread, water permeance and ultra violet radiation with OEM standards of VRV/VRF air conditioning system complete.				
3.2	Supplying, laying/fixing, testing and commissioning of appropriate nominal refrigerant copper pipe of 19.1mm dia (OD) for liquid line/suction line supply and return piping of suitable gauge (hard copper pipe for liquid main line and soft copper pipe for refrigerant) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19 mm thick elastomeric nitrile rubber along with application of multicoating of VRV/VRF piping for protection against mechanical damages, fungal growth, flame spread, water permeance and ultraviolet radiations with OEM standards of VRV/VRF air conditioning system complete.	Rmt	50		
3.3	Supplying, laying/fixing, testing and commissioning of appropriate nominal refrigerant copper pipe of 15.9 mm dia (OD) for liquid line/suction line supply and return piping of suitable gauge (hard copper pipe for liquid main line and soft copper pipe for refrigerant) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19mm thick elastomeric nitrile rubber along with application of multicoating of VRV/VRF piping for protection against mechanical damages, fungal growth, flame spread, water permeance and ultraviolet radiations with OEM standards of VRV/VRF air conditioning system complete.	Rmt	250		

3.4	Supplying, laying/fixing, testing and commissioning of appropriate nominal refrigerant copper pipe of 12.7mm dia (OD) for liquid line/suction line supply and return piping of suitable gauge (hard copper pipe for liquid main line and soft copper pipe for refrigerant) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19mm thick elastomeric nitrile rubber along with application of multicoating of VRV/VRF piping for protection against mechanical damages, fungal growth, flame spread, water permeance and ultra violet radiations with OEM standards of VRV/VRF air conditioning system complete.	Rmt	484		
3.5	Supplying, laying/fixing, testing and commissioning of appropriate nominal refrigerant copper pipe of 9.5 mm dia (OD) for liquid line/suction line supply and return piping of suitable gauge (hard copper pipe for liquid main line and soft copper pipe for refrigerant) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19mm thick elastomeric nitrile rubber along with application of multicoating of VRV/VRF piping for protection against mechanical damages, fungal growth, flame spread, water permeance and ultra violet radiations with OEM standards of VRV/VRF air conditioning system complete.	Rmt	782		
4	REFNET				
4.1	Supplying and installation of high pressure grade required size copper connection Y or T- Joints/refnet complete erected on wall/ceiling with supports/raceways, Nitrile rubber insulation, painting etc. with brazing and testing for leakages confirming the normal operation of the VRV/VRF air conditioning system.	Nos	80		
5	POWER CABLE				
5.1	Supplying and erecting PVC insulated PVC round flexible FR 1.5 sq.mm (30 no. x 0.25mm dia.) 3 core flexible multi stranded copper industrial cable for voltage grade up to 1.1 Kv	Rmt	360		
6	CONTROL CABLE				

6.1	Supplying, installing, testing and commissioning FR, XLPE sheilded cable 2 core 1.5 sq.mm. copper conductor complete erected on wall/ ceiling complete as per specification no. CB-LT/CU	Rmt	1250		
7	CABLE TRAY				
7.1	Providing & erecting hot dipped galvanised ladder type cable tray manufactured from 16 SWG GI sheet of 150 mm width & 100 mm height with required standard accessories.	Rmt	750		
7.2	Providing & erecting hot dipped galvanised ladder type cable tray manufactured from 16 SWG GI sheet of 200 mm width & 100 mm height with required standard accessories.	Rmt	450		
8	3 PIN PLUG TOP				
8.1	Supplying 6A 3 pin plug top bakelite type of 230V A.C. supply.	Each	101		
9	DRAIN PIPE				
9.1	Supplying and erecting 20/25 mm (ID/OD) Chlorinated polyvinyl chloride pipe (CPVC), thickness 2.6 mm conforming to IS 15778 (CTS Series) with necessary CPVC fittings and solvent cement for Solar Water Heater System as per specification No. ESD-HWP/CPVC	m	370		
10	MS STAND FOR OUTDOOR UNIT				
10.1	Supplying and erecting iron work, sheet metal work consisting of CRCA sheets, various sections of iron, plates, chequered plates, rods, bars, MS pipes, etc. for panel board or any other purpose with bending, cutting, drilling and welding complete erected at the position with necessary materials duly painted with one coat of red oxide and two coats of enamel paint to match the switchgears or as per directions by the authority.	Kg	5000		
11	CEILING MOUNT VENTILATION FAN				
	Supplying & erecting ceiling mounted ventilation fan of 80 CFM	Each	75		
12	Ventilation Duct				

12.1	Supplying, erecting, testing & commissioning GI sheet 0.6 mm (24 SWG) having zinc coating of 275 microns with galvanization process compliance to IS 2629:1985 to be used for fabrication of boxes panel boards etc. including cutting, bending, drilling, welding, riveting etc. and painting with one coat of red lead paint and 2 coats of enamel paint as per specification no. CP/SH/CR	Sq mtr	160		
13	EXHAUST FAN				
13.1	Supplying, erecting, testing & commissioning fresh air intake system, ductable circular inline fresh air fan inlet unit having 1400cfm capacity with maintaining the external static pressure minimum 20mm suitable to operate on 1ph, 230 V, 50Hz, A.C. supply complete.	Each	1		
14	SHEET METAL				
14.1	Supplying, erecting, testing & commissioning GI sheet 0.6 mm (24 SWG) having zinc coating of 275 microns with galvanization process compliance to IS 2629:1985 to be used for fabrication of boxes panel boards etc. including cutting, bending, drilling, welding, riveting etc. and painting with one coat of red lead paint and 2 coats of enamel paint as per specification no. CP/SH/CR	Sq mtr	30		
15	LINEAR GRILL				
15.1	Supplying and erecting aluminium powder coated linear grill of suitable size for width length without collar dampers having matching colour with the existing false ceiling and suitable for deflection of 15/30/45°.	Sq. mtr	2		
16	CANVAS CONNECTION				
16.1	Supply, fabrication, installation an testing of flexible canvass connections constructed between ductable unit/dampers/ducting of suitable size with fire resist flexible double canvas sleeve complete.	Each	2		
17	VOLUME CONTROL DAMPER				
17.1	Supply, installation, testing and commissioning of manually operated, opposed blade, duct mounted, flanged volume control dampers of required sizes in GI construction with operating mechanism, mounting arrangement, rubber refrigerant kits etc. complete.	Sq. mtr	1		

18	POWER CABLE				
18.1	Supplying, erecting & terminating FR XLPE insulated, galvanised steel formed wire armoured (strip) cable 1100 V, 3 core 4 sq. mm. copper conductor complete erected with glands & lugs, on wall/ trusses/ pole or laid in provided trench/ pipe as per specification no. CB-LT/CU	m	20		
19	Supply, Installation, Testing & Commissioning of wall /ceiling mounted wireless / thermostat controlled Occupancy /Window Sensors integrated with the indoor unit which turns off with an integrated window/door open including control cables, sensors, required accessories, etc.	Each	101		
	TOTAL AMOUNT WITHOUT GST				