Name of Work: Construction of Visitor's Hostel Extension IIT Kanpur

PART C - HVAC WORKS

Ref	Description	QTY.	Unit	Rate (i/c GST)	Amount (i/c GST)
1.0	**EQUIPMENT**				
1.1	**VRF SYSTEM**				
1.1.1	**VRF OUTDOOR UNITS** Supplying, Installation, Testing & Commissioning of Modular type Variable Refrigerant Flow/Variable Refrigerant Volume air cooled Outdoor units suitable for cooling/heating having 100% hermetically sealed inverter type twin Rotary/Scroll Compressor(s),minimum two compressors (with individual separate PCB) for above 14HP modules, microprocessor based Controller, top discharge type condensing unit(s), with R-410-A Refrigerant or equivalent, vibration Isolators with suitable foundation etc. complete as required. To have better efficiency condensor fan shall be capable to operate at different speed with respect to load.The unit shall deliver the rated capacity and in confirmation as per IS18728:2024 and CPWD Specifications and work even at 50°C ambient temperature without tripping. The system shall be able to deliver 100% of the rated capacity upto 39 °C. The unit shall be suitable to work on 400V +/- 10%, 3 Phase, 50Hz AC power supply and BMS compatible. The unit shall be filled with first charge of the refriger as follows:ations and design drawings. Fans shall be as per specifications and design drawings. Axial Flow Fans shall follow the design parameters as mentioned below: erter Type - Cooling only ective paint as per project specifications. All accessories, supports, and necessary materials for a complete installation shall be included.shall follow the design parameters as mentioned below: (ECSBC) 2024 as below and complete as per CPWD specification, connections, inter connections etc. as required. (For capacity <40 kWr ISEER 6.4, Capacity > 40 and <70 ISEER 6.5, Capacity > 70 ISEER 6.6 for ECSBC+ Building) - For heating or cooling or both				
	46 HP (36.8 TR) nominal capacity (Top Discharge)	46	HP	20385.00	937710.00
	44 HP (35.2 TR) nominal capacity (Top Discharge)	44	HP	20385.00	896940.00
	40 HP (32.0 TR) nominal capacity (Top Discharge)	40	HP	20385.00	815400.00
	40 HP (32.0 TR) nominal capacity (Top Discharge)	40	HP	20385.00	815400.00
	36 HP (28.8 TR) nominal capacity (Top Discharge)	36	HP	20385.00	733860.00
	36 HP (28.8 TR) nominal capacity (Top Discharge)	36	HP	20385.00	733860.00
	34 HP (27.2 TR) nominal capacity (Top Discharge)	34	HP	20385.00	693090.00
	30 HP (24.0 TR) nominal capacity (Top Discharge)	30	HP	20385.00	611550.00
	30 HP (24.0 TR) nominal capacity (Top Discharge)	30	HP	20385.00	611550.00
	22 HP (17.6 TR) nominal capacity (Top Discharge)	22	HP	20385.00	448470.00
	18 HP (14.4 TR) nominal capacity (Top Discharge)	18	HP	20385.00	366930.00
	16 HP (12.8 TR) nominal capacity (Top Discharge)	16	HP	20385.00	326160.00
	Note: The above mentioned outdoor units shall be provided with anti corrosion treatment (preferably from factory). The quoted price shall be inclsuive of same.				
1.1.2	**VRF INDOOR UNITS**				
a.	**Wall Mounted type Hi-wall Units** Supply, installation, testing and commissioning of following minimum capacity VRV/VRF High wall type Indoor unit equipped with and comfort washable synthetic media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX copper coil, electronic expansion valve, outer cabinet, cord less remote control, drain pan, necessary accessories etc., suitable for operation on 230 V ± 10%, 50 Hz, single phase AC supply, complete as required. The unit shall have automatic force shut down provision in case of fire on receiving signal from BMS System. The cooling capacity of indoor unit will be at air inlet conditions of 27 Degree C DB and 19 Degree C WB temperature.(Make will be same as of Outdoor)				
	i. 2.0 TR nominal or higher capacity	31	No	22674.00	702894.00
	ii. 1.6 TR nominal or higher capacity	110	No	22027.00	2422970.00
	iii. 1.3 TR nominal or higher capacity	3	No	21176.00	63528.00
b.	**Ceiling Mounted type Cassette Units**				

	Supplying, Installation, Testing and Commissioning of following minimum capacity 4 way Cassette Type Indoor ceiling mounted unit equipped with synthetic washable media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX Copper coil, electronic expansion valve, outer cabinet, drain pump, grill, necessary supports, vibration Isolation, Corded remote control etc., suitable for operation on single phase 230 V ± 10%, 50Hz AC supply, complete, as required. The Indoor units must shut down upon receiving a singal from the BMS System/Fire Singnals. The system shall be capable to adjust air flow as per room requirement in auto mode. The cooling capacity of indoor unit will be at air inlet conditions of 27 0C DB and 19 0C WB temperature. (Make will be same as of Outdoor)				
	i. 4.0 TR	4	No	33981	135924
1.3	**CENTRALISED CONTROLLER (TOUCH SCREEN TYPE)**				
	Supply, Installation, Testing and Commissioning of main centralised controller as per specifications to hook up indoor units as mentioned above as well "Special Conditions". Controller shall however be suitable for **155** group and more , if required for all indoor units (including customized AHUs & TFAs) of the complete project with all functions such as remote start/stop,temperature setpoint control, status monitoring etc.The controller shall be touch screen new generation type.	1	Lot	185000	185000
1.4	**DX TYPE CEILING SUSPENDED TYPE AHUs** Supply, Installation, Testing and Commissioning of factory built double skin ceiling suspended type air handling units in sheet metal construction, double skin panels with 25mm thick injected PUF of density not less than 40 kg/CuM with thermal break profile. The air handling units shall be complete with pre-filter (MERV-8), multi rows deep DX cooling coil of copper tube and aluminium fin construction (with 100mm gap between two sets of three rows deep cooling coils), **forward curved** DIDW centrifugal fan with MCB/ MCCB of appropriate rating with cable termination box, belt drive package, **IE-03** squirrel cage induction motor, insulated SS auxiliary drain pan all complete as per the specifications. AHUs shall be selected for a maximum face velocity of 500 FPM (2.5MPS). Fan outlet velocity shall not exceed 1800 FPM (9.1MPS). The unit/s shall be be provided with factory fabricated plenum on filter side, with access doors /panels, for duct termination. Suspension arrangement for ceiling suspended AHUs shall also include spring type vibration isolators to make the installation vibration free. The unit shall be supplied with electronic expansion valve/s (Dx), thermostats, control wiring & all accessories as required for completing installation. AHUs shall be of following design parameters:				
	AHU No. / **Capacity (Cfm)** / **SP (mm WG)** / **No. of Rows** / **Motor Rating (HP)** / **Ref. Calculated Load (TR)**				
	AHU-1 / 4500 / 45 / 6 / 3 / 12.6	1	No	138795	138795
1.5	**VERTICAL/HORIZONTAL FLOOR MOUNTED AHUs** Supply, Installation, Testing & Commissioning of double skin sheet metal sectionalised construction floor mounted air handling units , double skin panels with 46mm thick injected PUF of density not less than 40Kg/CuM with thermal break profile. The AHUs shall be complete with **pre-filter (MERV-8),** multi rows deep DX cooling coil of copper tube and aluminium fin construction (with 100mm gap between two sets of three rows deep cooling coils), **forward curved DIDW centrifugal fan**, belt drive package, insulated SS drain pan, **IE-03** squirrel cage induction motor and vibration isolation arrangement all complete as per specifications. AHUs shall be selected for a maximum face velocity of 500 FPM (2.5MPS). Fan outlet velocity shall not exceed 2000 FPM (10.1 MPS). The unit/s shall be be provided with factory fabricated plenum on filter side, with access doors /panels, for duct termination. The unit shall be supplied with electronic expansion valve/s (Dx), thermostats, control wiring & all accessories as required for completing installation. AHUs shall be of following design parameters: AHUs shall be of following design parameters:				
	AHU No. / **Capacity (Cfm)** / **SP (mm WG)** / **No. of Rows** / **Motor Rating (HP)** / **Tonnage (TR)**				
	AH-1 / 8000 / 50 / 6 / 5.0 / 31.5	1	No	403707.00	403707.00
	AH-2 / 6000 / 50 / 6 / 5.0 / 18.4	1	No	322622.00	322622.00
1.6	**AXIAL FLOW FANS FOR EXHAUST (AF)**				
1.6.1	**Emergency Exhaust:**				

Supply, Installation, Testing & Commisioning of AMCA Certified (For Air and Sound Performance) tube axial flow fans of different capacities in standard GI/M.S. contruction as mentioned below. Entire fan model and AMCA Seal shall apear in techncial submittal of fan. All the fans shall be synthetic enamel painted/ hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at fan inlet. The electric motor coupler shall be IE-03 squirrel cage induction type conforming to IS-325, IP-55 rated with class `H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250°C for 2 hours. Fans shall be EN 12101-3 Certified and CE/UL Listed for high temperature. Motor make shall be same as that mentioned on the fire certificate. Fan efficiency should not be less than 65%, and noise level should not be more than 85 db @ 3 m distance when measured under hemisperical reverberant room conditions. Quoted price shall be inclusive of all accessories like bird screens, vibration isolators,mounting brackets/feet/ duly enamel painted M.S structure etc. Fans mentioned as outdoor type shall be good for outdoor installation with proper cowl and mounting arrangement as per approved shop drawings. Fans shall be as per specifications and design drawings. Fans shall be as per specifications and design drawings. Axial Flow Fans shall follow the design parameters as mentioned below:

AF No.	Capacity (Cfm)	SP (mm WG)	Motor Rating (HP)	Type	Area Being Fed				
Ground Floor									
AF-2	8700	25	3	Outdoor	Banquet Hall (GF)	1	No	83344.00	83344.00
2nd Floor									
AF-3	7200	25	3	Outdoor	Dining Hall (2F)	1	No	77945.00	77945.00

1.7 **AXIAL FLOW FANS FOR FRESH AIR SUPPLY (AF)**

1.7.1 **Emergency Supply:**

Supply, Installation, Testing & Commisioning of AMCA Certified (For Air and Sound Performance) tube axial flow fans of different capacities in standard GI/M.S. contruction as mentioned below. Entire fan model and AMCA Seal shall apear in techncial submittal of fan. All the fans shall be synthetic enamel painted/ hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at fan inlet. The electric motor coupler shall be IE-03 squirrel cage induction type conforming to IS-325, IP-55 rated with class `F' insulation. Fan efficiency should not be less than 65%, and noise level should not be more than 85 db @ 3 m distance when measured under hemisperical reverberant room conditions. Quoted price shall be inclusive of all accessories like bird screens, vibration isolators,mounting brackets/feet/ duly enamel painted M.S structure etc. Fans mentioned as outdoor type shall be good for outdoor installation with proper cowl and mounting arrangement as per approved shop drawings. Fans shall be as per specifications and design drawings. Fans shall be as per specifications and design drawings. Axial Flow Fans shall follow the design parameters as mentioned below:

AF No.	Capacity (Cfm)	SP (mm WG)	Motor Rating (HP)	Type	Area Being Fed				
Ground Floor									
AF-1	8700	25	3	Outdoor	Banquet Hall	1	No	79823.00	79823.00
2nd Floor									
AF-2	7200	25	3	Outdoor	Dining Hall	1	No	73954.00	73954.00
PRESSURIZATION									
LIFT WELL									
AF-1	10100	20	3	Outdoor	L-4	1	No	74658.00	74658.00
AF-2,3	9100	20	3	Outdoor	L-1,2	2	No	74658.00	149316.00
AF-4	8100	20	3	Outdoor	L-3	1	No	77006.00	77006.00

1.8 **TREATED FRESH AIR UNITS -- TFAUs**
(WITH FACE & BYPASS ARRANGEMENT)

Supply, Installation, Testing & Commissioning of double skin sheet metal sectionalised construction treated fresh air units , double skin panels with 46mm thick injected PUF of density not less than 40Kg/CuM with thermal break profile. The treated fresh air units shall be complete with **pre-filter (MERV-8), fine filter (MERV-13)**, face & bypass damper, multi rows deep DX cooling coil of copper tube and aluminium fin construction (with 100mm gap between two sets of three rows deep cooling coils), **backward curved DIDW centrifugal fan**, belt drive package, insulated SS drain pan, **IE-03** squirrel cage induction motor and vibration isolation arrangement all complete as per specifications. TFAs shall be selected for a maximum face velocity of 500 FPM (2.5MPS). Fan outlet velocity shall not exceed 1800 FPM (9.1MPS) for ceiling suspended & 2000 FPM (10.1 MPS) for floor mounted TFAUs. The unit/s shall be be provided with factory fabricated plenum on filter side, with access doors /panels, for duct termination. The unit shall be supplied with electronic expansion valve/s (Dx), thermostats, control wiring & all accessories as required for completing installation. TFAUs shall be of following design parameters:

	Ground Floor **TFA - 1 (Kitchen)** Air Quantity Face - 1800 Cfm Air Quantity Bypass - 1200 Cfm Total Air Quantity - 3000 Cfm Static Pressure - 55 mm WG CHW Coils - 6 Rows Motor Rating - 2.0 HP Type - Floor Mounted Tonnage - 6.9 TR	1	No	199146.00	199146.00
	2nd Floor **TFA - 2 (Kitchen/Pantry)** Air Quantity Face - 1600 Cfm Air Quantity Bypass - 1000 Cfm Total Air Quantity - 2600 Cfm Static Pressure - 55 mm WG CHW Coils - 6 Rows Motor Rating - 2.0 HP Type - Floor Mounted Tonnage - 6.0 TR	1	No	195052.00	195052.00
	Note: Above TFA Units should be suitable for outdoor installation and provided with canopy.				
1.9	**COPPER PIPING (REFRIGERANT PIPING)** Supply, Installation, testing and commissioning including vaccumiazation and Nitrogen testing of following nominal sizes of soft/hard drawn copper refrigerant piping for VRV/VRF system, complete with fittings, with suitable adjustable ring type hanger supports, jointing/brazing including accessories, insulated with XPLE Class-O tubular insulation/with Class-O closed cell elastometric nitrile rubber tubular sleeves sections of specified thickness as given below for Suction and Liquid lines, all accessories as per specifications etc. as required :				
a.	6.4 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	280.00	RM	256.00	71680.00
b.	9.5 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	490.00	RM	346.00	169540.00
c.	12.7 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	400.00	RM	487.00	194800.00
d.	15.86 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	623.00	RM	615.00	383145.00
e.	19 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	690.00	RM	739.00	509910.00
f.	22.2 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	55.00	RM	904.00	49720.00
g.	25.4 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19mm thick insulation	15.00	RM	1068.00	16020.00
h.	28.58 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	330.00	RM	1157.00	381810.00
i.	31.8 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19mm thick insulation	15.00	RM	1222.00	18330.00
j	34.9 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	270.00	RM	1286.00	347220.00
k	38.1 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19mm thick insulation	15.00	RM	1322.00	19830.00
l	41.27 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	380.00	RM	1368.00	519840.00
	NOTE:- 1)The Copper Piping & Piping Circuit should be with Minimum Number of joints, which shall be attained by : (i) Using One End Expanded Tubes (ii) Bending the tubes instead of using elbow joints wherever 90 degree bending is required. (2) Piping should be routed at site in such a manner, that brazed joints in the refrigeration piping are kept to a minimum. (3) The makes of tube fittings shall be same as that of tubes. (4) The thickness of fittings used shall be same as that of the pipe.				
1.10	**FITTINGS**				

	Supply, Installation , Testing and Commissioning of following imported fittings to be provided in refrigerant pipe line. Material of construction for fittings shall be similar to refrigerant piping. Joints shall be of same Original Equipment Manufacturer (OEM) make as of ODUs and IDUs				
a.	Y- joints for refrigerant piping (pair).	136.00	No	4500.00	612000.00
1.11	Supply, Fabrication and Installation of MS frame using channels/angle iron sections as required for mounting of air cooled remote condensers of split units. The frame work shall be applied with red oxide primer and thereafter, two coats of enamel paint of approved colour. The general arrangement drawing for frame work shall be got approved from the Architects/Structural Engineers prior to commencement of fabrication.	240.00	Kg	115.00	27600.00
1.12	**CONTROL WIRING** Supply, laying, affecting connections and testing of the following sizes of control cum transmission wiring to be laid in MS conduits between indoor units and outdoor units.				
	a. 2C x 1.5 Sqmm cable (Copper)	2680	RM	95.00	254600.00
1.13	Providing, jointing and fixing of uPVC/ CPVC Condensate drain piping with all fittings conforming to IS: 15778:2007 of SDR 11 Grade. Fittings shall include all standard moulded fittings elbows, tees, couplers, reducers, unions, plugs, adaptors with brass threaded insertions and specials. The Solvent Cement for jointing shall be of make and grade as specified by the manufacturer of uPVC/ CPVC piping system. The installation shall be complete in all respects including cutting chases / holes in walls, slabs and making good, etc The entire uPVC/ CPVC piping system shall be installed, tested and commissioned following the recommendation of the manufacturer including provision of expansion loops. All pipework in shafts, ceiling voids and terrace shall be fixed on MS brackets and hangers with U-clamps made from 10 mm dia galvanised steel rod complete with nuts and washers. Cost for MS structural work for supports shall be included in the rates. All horizontal and vertical crossings of building structure (slabs, walls, beams, column etc), the space between pipe and the structure shall be made good and water tight with concrete. The annular space between the pipe and the sleeves shall be sealed (upto a minimum depth 25 mm) with fire resistant acrylic based sealent of approved make and quality. The pipes shall be painted with two coats of synthetic enamel paint and painting with photoluminescent paint at suitable interval for identification of pipe lines.				
	a. 42mm dia	50.00	mtr	285.00	14250.00
	b. 32mm dia	100.00	mtr	242.00	24200.00
	c. 25mm dia	699.88	mtr	169.00	118279.72
1.14	**EXTRACT FAN SECTIONS**				
1.14.1	**FOR KITCHENS** Supply, Installation, Testing and Commissioning of approved make fan section for extract air complete with floor standing **backward curved DIDW centrifugal fan**, MS base frame, **IE-03** TEFC squirrel cage induction motor with 2 hour fire rating & class "H" insulation, drive package and vibration isolation arrangement including spring isolators, rubber grommets etc. as called for in working drawings & specifications. Fan section casing shall be of double skin sheet metal construction, double skin panels with 25mm thick injected PUF of density not less than 40 kg/CuM. Fan shall be suitable for operation on 415 ± 10% volts, 50 Hz 3 phase AC power supply. Fan motor for kitchen fan, shall be enclosed in GI sheet enclosure enclosure in hot air stream free area. Fan outlet velocity shall not exceed 2000 FPM. Extract fan section shall be suitable for ceiling suspension/floor installation as shown in the design drawings.The kitchen fan motor shall be outside hot air stream. The fan characteristics shall be as follows:				

Fan No.	Capacity (Cfm)	S.P (mmWG)	Motor Rating (HP)	Type				
EFS-1	4200	70	3	FM	1.00	No	126120.00	126120.00
EFS-2	3500	70	2	FM	1.00	No	118720.00	118720.00

	Note: Above TFA Units should be suitable for outdoor installation and provided with canopy.				
1.15	**EXHAUST AIR SCRUBBER**				

	Supply, Installation, Testing and Commissioning of Scrubber each comprising of extract air intake section, electrostatic precipitation technology, dry type air cleaner to remove odour, smoke and fumes from exhaust air. Electrostatic section shall be made of 16 gauge galvanised sheet, high bake epoxy powder coated, washable type aluminium mesh filters, stainless steel spiked ionizers to create high voltage DC field, aluminum collector plates which should be alternatively charged positive and negative with large collecting area with 14" deep cell, to work as magnet for charged smoke and oil particles. Average efficiency of 90-95% in single pass as per DOP test method. Electrostatic Precipitator should be able to charge particles from 0.01 micron to 10 microns through solid state power supply. Collector cell should be of permanent type and incorporate slide out facility for easy removal for cleaning. The system should be fitted with interlock switch for safety . The system should allow connection to a fan section to achieve 500 FPM velocity across the air cleaner. Operating Voltage : 220V, 50 Hz Ionizing Voltage : 12.5 to 13 KVDC Collector Cell Voltage : 6 to 6.5 KVDC Power Consumption : 50 Watts				
	4200 CFM x 1 filter	1.00	No	259188.00	259188.00
	3600 CFM x 1 filter	1.00	No	259188.00	259188.00
1.16	**PROPELLER FANS** Supply, Installation , Testing and Commissioning of propeller fans for supply of fresh air and for exhaust air as shown on drawings. Each fan shall be complete with permanent split capacitor, mounting plate and accessories like wire guard, bird screen and gravity louvers for weather protection as required. Fan selection, arrangement and electrical characteristics shall be as follows:				
	a. 300 mm dia 900/1400 RPM fan suitable for 220+6%Volts, 50 Hz, single phase AC supply.	13.00	No	7043.00	91559.00
1.17	**LOW PRESSURE LOW NOISE INLINE FANS** Supply, Installation, Testing and Commissioning of inline fans for air transfer as shown in the design drawings, complete with GSS casing, direct driven centrifugal fan OR Backward curved plug fan, motor with proper protection and inspection door etc. as per the specifications. Fan should be suitable for operation on 220±10 %, 50 Hz, single phase AC power supply as required. Low pressure Low noise inline fans shall be provided with speed regulators with Anti-humming feature. Quoted price shall be inclusive of necessary contactors, relays, wiring and MS conduiting. Fan shall be suitable for installation as shown in design drawings and shall be of following capacities: Sound level shall not be more than 45 dBA at 1 meter.				
	With Forward Curved Centrifugal Fan				
	Fan Capacity S.P. Electrical Type				
	No. (Cfm) (mmWG) Characteristics				
	IF- 600 12 220V/1 Ph Circular	No	5	10000	50000
	IF- 550 12 220V/1 Ph Circular	No	2	8000	16000
	IF- 400 12 220V/1 Ph Circular	No	2	7000	14000
	IF- 350 10 220V/1 Ph Circular	No	2	6300	12600
	IF- 300 10 220V/1 Ph Circular	No	3	6150	18450
	IF- 200 10 220V/1 Ph Circular	No	2	6000	12000
1.18	Supplying , Installation, Testing and Commissioning of Air Cooled Hi Wall split type Air conditioners complete with Indoor unit(IDU), Out door unit (ODU), surface / concealed copper Refrigerant piping with insulation (closed cell elastomeric nitrile rubber tubular pipe section) upto 3 Mtr (IDU to ODU), copper power cable upto 3.5 Mtr (IDU to ODU) i/c drain pipe R-32/R-410/ R-407 Green Refrigerant, wireless Remote control, suitable for working between 180- 260V with low & high voltage cutoff and 50 hz ,1 phase AC supply capable of performing cooling, dehumidification, air circulation of following capacity with Scroll / rotary compressor. The system shall be able to deliver 100% of the rated capacity upto 42 0C. Min 5 year Original Equipment Manufacturer (OEM) warranty both compressor and Printed Circuit Board (PCB). Must comply : Electrical cable IS 694 or IS 9968 temperature sensing control IS /International ctrotechnical Commission (IEC) 60730, hermetic compressor IS 10617, heat exchanger IS 11329 capacitor IS 2993 and motor IS 12615. Complete as per CPWD specification and IS : 1391 Part II 2023. The system shall be able to operate up to 50 0C (out door ambient temperature). Inverter Type - Cooling only				
	2.0 TR nominal or higher capacity (with 5 Star BEE Rating)	No	2	57396	114792

1.18.1	Supply, Installation, Testing & Commissioning of copper refrigerant piping complete with closed cell elastomeric insulation material with Class "O" fire rating in tubing form and Electrical work including power wiring associated with the above split packages as required. **a. Pair of soft refrigerant piping duly insulated.(duly insulated.)**	RM	10	1150	11500
1.18.2	Supply, Installation, Testing and Commissioning of PLC for Auto Sequencing of Split units with micrprocessor based controller along with enclosure/ accessories having facility for configuration of the same as per requirement for sequenced Start/Stop for split units as follows:				
	b. For Two number split packages including one standby.	Set	1	10500	10500
1.19.1	**Normal Supply:** Supply, Installation, Testing & Commisioning of AMCA Certified (For Air and Sound Performance) tube axial flow fans of different capacities in standard GI/M.S. contruction as mentioned below. Entire fan model and AMCA Seal shall apear in techncial submittal of fan. All the fans shall be synthetic enamel painted/ hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at fan inlet. The electric motor coupler shall be IE-02 squirrel cage induction type conforming to IS-325, IP-55 rated with class `F' insulation. Fan efficiency should not be less than 65%, and noise level should not be more than 70 db @ 3 m distance when measured under hemisperical reverberant room conditions. Quoted price shall be inclusive of All accessories like bird screens, vibration isolators,mounting brackets/feet/ duly enamel painted M.S structure etc. Fans mentioned as outdoor type shall be good for outdoor installation with proper cowl and mounting arrangement as per approved shop drawings. Fans shall be as per specifications and design drawings. Fans shall be as per specifications and design drawings. Axial Flow Fans shall follow the design parameters as mentioned below:				
	AF No. / Capacity (Cfm) / SP (mm WG) / Appox. Motor Rating (HP) / Type				
	AF- 1700 25 1.0 Indoor	No	1	25000	25000
1.19.2	**Normal Exhaust:** Supply, Installation, Testing & Commisioning of AMCA Certified (For Air and Sound Performance) tube axial flow fans of different capacities in standard GI/M.S. contruction as mentioned below. Entire fan model and AMCA Seal shall apear in techncial submittal of fan. All the fans shall be synthetic enamel painted/ hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at fan inlet. The electric motor coupler shall be IE-03 squirrel cage induction type conforming to IS-325, IP-55 rated with class `H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250°C for 2 hours. Fans shall be EN 12101-3 Certified and CE/UL Listed for high temperature. Motor make shall be same as that mentioned on the fire certificate. Fan efficiency should not be less than 65%, and noise level should not be more than 70 db @ 3 m distance when measured under hemisperical reverberant room conditions. Quoted price shall be inclusive of All accessories like bird screens, vibration isolators,mounting brackets/feet/ duly enamel painted M.S structure etc. Fans mentioned as outdoor type shall be good for outdoor installation with proper cowl and mounting arrangement as per approved shop drawings. Fans shall be as per specifications and design drawings. Fans shall be as per specifications and design drawings. Axial Flow Fans shall follow the design parameters as mentioned below:				
	AF No. / Capacity (Cfm) / SP (mm WG) / Appox. Motor Rating (HP) / Type				
	AF- 1700 25 1.0 Indoor	No	1	25000	25000
SUMMARY (EQUIPMENT) Rs.					**18273995.72**
2.0	**AIR DISTRIBUTION**				
2.1	**Ductwork**				
a.	**Factory Fabricated Ductwork :** Supply, Installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular/ round ducting complete with neoprene rubber gaskets, elbow, splitter dampers, vanes, hangers, supports etc. as required complete in all respect in confirmation to IS : 655 and approved drawings and specifications of following sheet thickness complete as required.				

	i. Thickness 0.63 mm sheet	975.00	SqM	1191.00	1161225.00
	ii. Thickness 0.80 mm sheet	285.00	SqM	1382.00	393870.00
	iii. Thickness 1.0 mm sheet	210.00	SqM	1488.00	312480.00
	iv. Thickness 1.25 mm sheet	55.00	SqM	2013.00	110715.00
b.	**Conventional site fabricated duct** Supply, Installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/ round ducting complete with neoprene rubber gaskets, elbow, splitter dampers, vanes, hangers, supports etc. as required complete in all respect in confirmation to IS : 655 and approved drawings and specifications of following sheet thickness complete as required.				
	i. Thickness 0.63 mm sheet	140.00	SqM	1213.00	169820.00
	ii. Thickness 0.80 mm sheet	105.00	SqM	1415.00	148575.00
	iii. Thickness 1.0 mm sheet	10.00	SqM	1851.00	18510.00
	iv. Thickness 1.25 mm sheet	10.00	SqM	2063.00	20630.00
c.	Supply, fabrication, installation, testing, and insulation of MS kitchen exhaust ducting constructed from 1.6mm thick MS sheet with fully welded joints and MS angle iron flanges, as per good engineering practices. Ductwork shall include oil traps as required, and fire-retardant gasket-sealed access panels for cleaning provided at every 3 meters, bends, and transitions. All duct joints, flanges, and seams shall be sealed using CISCRYL DS 50 acrylic water-based fire-retardant sealant. Ducting shall receive a minimum of two coats of zinc phosphate epoxy primer, followed by the application of cisbond fr 802 fire-retardant coating (internal and external) at 600–700 microns DFT to achieve a 120-minute fire rating. The fire-retardant coating shall comply with BS 476 Part 6 & 7, ASTM E84, ASTM D4541, ASTM D2794, ASTM D5184-01, and IS 101 (P-2/Sec-3) 2015. All works shall strictly follow the project specifications. HVAC contractor shall provide necessary openings for sprinkler installation and ensure proper sealing after installation. The entire duct shall be thermally insulated with 50mm thick mineral wool, wrapped with 0.1 mm thick aluminium foil, covered with glass cloth, and finished with cisbond vb 30 UV-protective paint as per project specifications. All accessories, supports, and necessary materials for a complete installation shall be included.	200.0	SqM	3,750.0	750,000.0
2.2	Supply, Installation & Testing of 125mm deep Antivibration Flexible Joints made out of imported fire retardant fabric with extruded aluminium frame/ flange on both sides of approved make.	20.00	RM	1150.00	23000.00
2.3	Supplying, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc in confirmation to SMACNA/IS and as per specifications complete etc. as required.	4.00	SqM	7580.00	30320.00
2.4	Supply, Installation, Testing & Balancing of one way blow linear supply cum return air grilles complete with removable inner core as per approved shop drawing and specifications - in confirmation to SMACNA/IS and as perspecifications complete etc. as required. The grilles shall be powder coated, extruded aluminum sections type, with integral flanges on both sides & ends. The grilles shall be rectangular/ square in shape. The grilles shall be of approved colour & shade.				
	i. Linear Grille with Volume Control Damper for Supply	8.00	SqM	9623.00	76984.00
	ii. Linear Grille without Volume Control Damper for Return	12.00	SqM	6285.00	75420.00
2.5	Supply, Installation & Testing of extruded aluminium powder coated air transfer grilles to be provided at toilets & kitchen doors.	2.00	SqM	10500.00	21000.00

2.6	Supplying, fixing, testing and commissioning of fire dampers in supply air duct/ main branch and return air path as and where required of required sizes i/c control wiring, the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally munted. The damper shall also be closed in the event of fire signal complete as required and as er specifications in confirmation to SMACNA/IS and as perspecifications complete etc. as required.				
	a. Bare fire dampers	4.00	SqM	18377.00	73508.00
	b. Actuator with control panel, temperature sensor & spring return action and suitable for 10 NM Torque.	8.00	No	9793.00	78344.00
2.7	Supplying, fixing, testing commissioning of supply air diffuser of powder coated aluminium with aluminium volume control dampers with anti smudge ring & removable core - in confirmation to SMACNA/IS and as perspecifications complete etc. as required.	3.00	SqM	12841.00	38523.00
2.8	Supplying, fixing, testing commissioning of return air diffuser of powder coated aluminium without aluminium volume control dampers with anti smudge ring & removable core.	3.00	SqM	6285.00	18855.00
2.9	Supply, Installation, Testing and Commissioning of thermal insulated factory fabricated flexible ducts of following sizes duly supported at regular interval as per site requirement etc. complete as required as per specifications.				
	i. 200mm dia.	20.00	RM	633.00	12660.00
2.10	Supply of spigots of different sizes to facilitate flexible duct connection.				
	a. 200mm dia	16.00	No	400.00	6,400.00
2.11	Supply, Installation, Testing and Balancing of multi-slot type linear slot diffusers as per the approved shop drawings and specifications. a. Powder coated extruded aluminium diffusers of approved colour & shade.				
	i. 2/3/4 slot diffusers having width of slots as 25mm.	5.00	SqM	9728.00	48,640.00
IMARY (AIR DISTRIBUTION) Rs.					**3589479.00**
3.0	**INSULATION**				
3.1	Supply & Installation of acoustic lining within supply air ducting using open cell XLPE insulation with 140-160 Kg/cum. density. All ducts shown cross hatched on the approved shop drawings shall be provided with acoustic lining as per the specifications. The cost shall be inclusive of low VOC adhesive.				
	a. 15 mm thick	85.00	SqM	781.00	66,385.00
3.2	Supply & installation of external thermal insulation on ducts with approved sample of Aluminium foil faced XLPE duct insulation with density 25-30 Kg/Cum, class 'O' complete as per specifications. All longitudinal and transverse joints shall be sealed with XLPE tape. The cost shall be inclusive of Low VOC adhesive.				
	i. 25 mm thick insulation for treated fresh air ducts in shafts and AHU rooms.	160.00	SqM	560.00	89,600.00
	ii.19 mm thick insulation for supply air duct in AC area and return air duct in non AC area.	630.00	SqM	466.00	293,580.00
	iii. 13 mm thick insulation for return air duct in AC area.	160.00	SqM	370.00	59,200.00
3.3	Supplying and fixing Installation, Testing and commissioning of 50mm thick aluminium foil faced resin bonded fibre glass insulation (on duct) of density 24 kg/cu.m or mineral wool insulation(non combustible) of density 44 kg/cu m after applying two coats of cold setting adhesive (CPRX compound) sealing all joints with self adhesive aluminium tape & covering with 0.63mmx19mm GI wire mesh netting & butting all joints and laced with GI wire complete and finally covered with one layer of tar felt stuck with hot bitumen as per specifications and as required. (for outdoor applications)	160.00	SqM	629.00	100,640.00

3.4	Supplying and fixing of following thickness duly laminated aluminium foil of mat finish closed cell Nitrile rubber (Class "O") insulation on existing duct/drain pipes after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.				
	a. 32mm	5.00	SqM	1120.00	5,600.00
	b. 25mm	20.00	SqM	1033.00	20,660.00
	c. 19mm	120.00	SqM	810.00	97,200.00
UMMARY (INSULATION) Rs.					**732865.00**
4.0	**ELECTRICAL INSTALLATION**				
4.1	**ELECTRICAL PANELS FOR HVAC SYSTEM** Supply, Installation, Testing & Commissioning of wall/floor mounted cubicle type electrical panels including system control wiring with incoming, outgoing feeders as described below and as per specifications.				
4.1.1	**PANEL-'A'**				
	Location : Close to Units a. 10A/16A 4P MCCB for 0.5/1/1.5/2/3 HP motor - 01 Set. b. RYB LED type indication lights --- 01 Set. c. Fully automatic DOL Star starter with builtin single phasing preventor, over load relay for 0.5/1/1.5/2/3 HP motor --- 01 Set. d. Auto-Manual type selector switch to facilitate auto start of fans after restoration of power -- 01 Set. e. Control wiring & safety circuit as required with Start-Stop PB's and LED type 'ON' 'OFF' indication lights. Electrical panels as described above.	5.00	No	42874.00	214,370.00
4.1.2	**PANEL-'B' IP-65**				
	Location : Close to Units a. 32A 4P MCCB for 5.0 HP motor - 01 Set. b. RYB LED type indication lights --- 01 Set. c. Fully automatic DOL Star starter with builtin single phasing preventor, over load relay for 5.0 HP motor --- 01 Set. d. Auto-Manual type selector switch to facilitate auto start of fans after restoration of power -- 01 Set. e. Control wiring & safety circuit as required with Start-Stop PB's and LED type 'ON' 'OFF' indication lights. Electrical panels as described above.	2.00	No	46362.00	92,724.00
4.1.3	**PANEL-'C' IP-65** **Location : Close to Units** **INCOMING :** a. 32A 4P MCB --- 01 Set. b. RYB LED type indication lights --- 01 Set. c. Digital Type Voltmeter (0-500)V --- 01 Set.				

	BUSBARS : Electrolytic grade (E 91 E), 40 A capacity TPN aluminium busbar, PVC heat shrunk insulated, supported on DMC/SMC having fault level of 25 KA for 1 second. **OUTGOING :** a. 16A 4P MCB for 3 HP motor, a fully automatic DOL starter with built in single phasing preventer and overload relay, a set of LED type ON & OFF indication lights & START- STOP push buttons -02 sets. b. Auto-Manual type selector switch to facilitate auto start of fans after restoration of power -- 02 Sets. c. Control wiring & safety circuit as required with Start-Stop PB's stayput or lockable type and LED type 'ON' 'OFF' indication lights.	4.00	No	58571.00	234,284.00
	Electrical panels as described above.				
4.1.4	**PANEL-'D' IP-65**				
	Location : Close to Units a. 16A 4P MCCB for 3.0 HP motor - 01 Set. b. RYB LED type indication lights --- 01 Set. c. Fully automatic DOL Star starter with builtin single phasing preventor, over load relay for 3.0 HP motor --- 01 Set. d. Auto-Manual type selector switch to facilitate auto start of fans after restoration of power -- 01 Set. e. Control wiring & safety circuit as required with Start-Stop PB's and LED type 'ON' 'OFF' indication lights.				
	Electrical panels as described above.	2.00	No	42874.00	85,748.00
	<u>Important Notes</u>: 1. The fabricator shall have the busbar chamber tested & approved at CPRI for 50 KA/1 Sec. 2. Proper isolation switches to be provided near air supply and extract fans (MCB/MCCB of appropriate rating). 3. Bimetal overload relay for all the starters shall have built-in single phasing prevention feature. 4. Electrical interlocking wiring shall be provided as per system requirement. 5. Power cabling/wiring with necessary earthing from source to each panel shall be provided by other agencies. 6. All Electrical Panels shall have necessary provisions for fire integration. 7. Fault Levels - ACB - 50 kA, MCCB - 25 kA, MCB - 10 kA. 8. All starter MPCB shall have Type-2 cooordination for selection of contactor and overload relays. 9. All Panels suitable for both top/bottom cable entry. 10. VFD based Panel's casing shall be large enough to accommodate variable frequency drives and have adequate ventilation provisions.				
4.2	**POWER CABLING** Supply, laying, affecting connections & Testing of the following sizes of 1.1 KV armoured PVC insulated aluminium/ copper conductor cables. Cables shall be inclusive conductor cables. Cables shall be inclusive of all clamps, saddles, screws, cable identification tags, cable terminal joints including terminal lugs, insulating tapes, affecting terminal connections to the equipment as per the specifications and as required.				
	Normal Cables				

	a. 4C x 10 Sqmm cable (Copper)	360.00	RM	1057.00	380,520.00
	b. 4C x 6 Sqmm cable (Copper)	120.00	RM	647.00	77,640.00
	c. 3C x 4 Sqmm cable (Copper)	40.00	RM	372.00	14,880.00
	d. 3C x 2.5 Sqmm cable (Copper)	140.00	RM	277.00	38,780.00
	FRLS Cables				
	a. 3C x 4 Sqmm cable (Copper)	50.00	RM	664.00	33,200.00
	b. 3C x 2.5 Sqmm cable (Copper)	30.00	RM	561.00	16,830.00
4.3	**CABLE TRAYS** Supplying & Fixing of following sizes of GI cable tray duly painted perforated type along with necessary elbows, bends, reducers etc. anchored along the wall / suspended from the ceiling with necessary MS supports. Supports shall be in the form of 40mmx40mmx5mm angles and provided at a distance of 1200mm including grouting in the wall and making good as well.				
	a. 50 x 100 x 50 x 1.6mm	550.00	RM	623.00	342,650.00
	b. 50 x 150 x 50 x 1.6mm	150.00	RM	686.00	102,900.00
4.4	**CABLE TERMINATIONS** Supply & making terminal joints for the following sizes of 1.1 KV armoured XLPE insulated aluminium/ copper conductor cables including terminal lugs, insulating tapes, effecting terminal connections to the equipment as required.				
	a. 3C x 4 Sqmm cable (Copper)	4.00	No	550.00	2,200.00
	b. 3C x 2.5 Sqmm cable (Copper)	28.00	No	450.00	12,600.00
4.5	**EARTHING** Providing & fixing in position the following bare GI tape/ Cu wire including providing all fixing accessories & effecting proper connections.				
	a. 6 SWG GI Wire	10000	RM	84.00	840,000.00
TOTAL CARRIED TO SUMMARY (ELECTRICAL)	**Rs.**				**2489326.00**
Note: **i. The Defect liablity period for the above entire VRF work shall be for 3 years from the date of compeletion, covering all the equipments installed as per the contract shall include all spares, consumables such as gas charging,etc., & replacement of defective/damaged parts such as PCB replacement ,etc., as required to run the complete existing VRF system.** **ii. Certificate from OEM is required during 3 years of defect liablity period to support the backend maintenance.**					
	GRAND TOTAL (i/c GST)				**25085665.72**
	Say Rs.				**25085666.00**