

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
1.0	<b>EQUIPMENT</b>				
1.1	<b>PUMP SETS</b>				
1.1.1	<b>TERTIARY VARIABLE SPEED PUMPING SYSTEM (BLOCK-3)</b>				
	Supply, Installation, Testing and Commissioning of variable speed pumping system comprising of following accessories and as per the specifications. The system shall be complete in all respects including electrical components suitable for pump motor. Quoted price shall be inclusive of integration with self balancing pressure independent two way modulating control valve for tertiary bridge with necessary wiring, and flow switch etc. as required to make the installation complete. Tertiary control system shall also include a dedicated Tertiary Controller.				
a.	Variable frequency drive (VFD) : 2 Nos.				
b.	Dedicated micro processor based pump controller : 1 No.				
c.	Differential pressure sensors/ transmitters : 2 Nos.				
d.	Software duly down loaded in pump controller : 1 Set				
e.	VSPS shall be BMS compatible and interfacing amongst all components and compatibility of I/O signals shall be provided : 1 Set				
f.	Tertiary valve controller : 1 No.				
g.	Temperature Sensor (providing 4-20mA input to tertiary controller) : 2 Nos.				
	Supply, Installation, Testing and Commissioning of end suction type centrifugal pump sets factory assembled and tested for rated efficiency complete with IE-03, TEFC squirrel cage induction motor with class 'F' insulation, epoxy painted common base frame, flexible coupling, coupling guard, mechanical seals, vibration isolation arrangement etc. for recirculation of chilled water for the central air conditioning system as per the specifications. Quoted price shall be inclusive of <b>inertia base</b> with spring isolators for each pump. The pumps shall be suitable for operation on 415±10% Volts, 50 Hz, 3 Phase AC power supply. <b>Pumps shall be insulated as per the specifications.</b> The pump characteristics shall be as follows:				
	Chilled water flow rate : 840 USGPM				
	(3179 LPM)				
	Head : 26 M				
	Maximum Permissible Speed : 1450 RPM				
	Motor Rating : 30 HP				
	End suction pumps as described above including one standby : <b>2 Nos.</b>				
	Quoted price shall be inclusive of cabling and MS conduiting between pressure sensors and pump controller as per specifications.				
	Variable Speed Pumping System as described above.	1	Set	1111239.00	1111239.00
1.1.2	<b>TERTIARY VARIABLE SPEED PUMPING SYSTEM (BLOCK-4)</b>				
	Supply, Installation, Testing and Commissioning of variable speed pumping system comprising of following accessories and as per the specifications. The system shall be complete in all respects including electrical components suitable for pump motor. Quoted price shall be inclusive of integration with self balancing pressure independent two way modulating control valve for tertiary bridge with necessary wiring, and flow switch etc. as required to make the installation complete. Tertiary control system shall also include a dedicated Tertiary Controller capable of accepting input signals from temperature/ pressure sensors. Each pump shall have variable frequency drive. The entire system alongwith secondary CHW				
a.	Variable frequency drive (VFD) : 2 Nos.				
b.	Dedicated micro processor based pump controller : 1 No.				
c.	Differential pressure sensors/ transmitters : 2 Nos.				
d.	Software duly down loaded in pump controller : 1 Set				
e.	VSPS shall be BMS compatible and interfacing amongst all components and compatibility of I/O signals shall be provided : 1 Set				
f.	Tertiary valve controller : 1 No.				

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g.	Temperature Sensor (providing 4-20mA input to tertiary controller) : 2 Nos.				
	Supply, Installation, Testing and Commissioning of end suction type centrifugal pump sets factory assembled and tested for rated efficiency complete with IE-03, TEFC squirrel cage induction motor with class 'F' insulation, epoxy painted common base frame, flexible coupling, coupling guard, mechanical seals, vibration isolation arrangement etc. for recirculation of chilled water for the central air conditioning system as per the specifications. Quoted price shall be inclusive of <b>inertia base</b> with spring isolators for each pump. The pumps shall be suitable for operation on 415±10% Volts, 50 Hz, 3 Phase AC power supply. <b>Pumps shall be insulated as per the specifications.</b> The pump characteristics shall be as follows:				
	Chilled water flow rate : 840 USGPM				
	(3179 LPM)				
	Head : 26 M				
	Maximum Permissible Speed : 1450 RPM				
	Motor Rating : 30 HP				
	End suction pumps as described above including one standby : <b>2 Nos.</b>				
	Quoted price shall be inclusive of cabling and MS conduiting between pressure sensors and pump controller as per specifications.				
	Variable Speed Pumping System as described above.	1	Set	1111239.00	1111239.00

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1.2	<b>CLOSED EXPANSION TANKS (WITH BUILT-IN DEGASSER)</b>				
	Supply, Installation and Testing of Closed expansion tank complete with twin make-up water pumps including one standby, pressure switch, non-return valve, pressure gauges and necessary isolating valves. Closed Expansion Tanks shall be capable of acting as air separator as well as degassing air in the system. Tank shall be of MS construction duly insulated as per the specifications. The tank shall be integrated to the existing contrller. Expansion tanks shall be of following capacities:				
	i. 300 Litres (BLOCK-3 & 4)	2	Nos.	1166108.00	2332216.00
1.3	<b>DIRT SEPARATORS</b>				
	Supply, Installation, Testing & Commissioning of Dirt Separators as per the specifications on the return water line located at the pump suction or a suitable location as suggested and suitable for water flow mentioned below. The separator should be complete with service valve, non return valve, butterfly valve <del>connection for makeup water inlet flanges drain valve etc</del>				
	i. 840 USGPM (200 mm dia.)	2	Nos.	560562.00	1121124.00
1.4	<b>PLATE TYPE HEAT EXCHANGERS</b>				
	Supplying, Installing, Testing & Commissioning of plate type heat exchangers (water to water type) with SS-304 plates & nozzles. Heat exchanger shall be designed as per TEMA standards and ASME pressure vessel ratings. The plate type heat exchangers shall be cleanable and shall be provided with inlet & outlet connections with flanges, MS frame and all other standard accessories complete as per the specifications. The plate type heat exchanger shall be provided with jacket insulation to prevent condensation, and shall meet the following design parameters:				
a.	<b>FOR BLOCK-3</b>				
	<u>Capacity : 350 TR (1231 kW)</u>				
	Primary Circuit				
	Inlet Temperature : 6.5 degree C				
	Outlet Temperature : 12. degree C				
	Chilled water flow rate : 637 USGPM (2411 LPM)				
	<b>Max. pressure drop : 10 M</b>				
	*Above Details related with PHE Primary Circuit to be reverified with Site as per existing design. HVAC Vendor to get coordinate and quote accordingly.				
	<u>Secondary Circuit</u>				
	inlet Temperature : 13. degree C				
	Outlet Temperature : 7.5 degree C				
	Chilled water flow rate : 840 USGPM (3179 LPM)				
	Max. pressure drop : 10 M				
	Certification : AHRI				
	Plate type heat exchanger as described above.	1	Nos.	932203.00	932203.00
b.	<b>FOR BLOCK-4</b>				
	<u>Capacity : 350 TR (1231 kW)</u>				
	Primary Circuit				
	Inlet Temperature : 6.5 degree C				
	Outlet Temperature : 12. degree C				
	Chilled water flow rate : 637 USGPM (2411 LPM)				
	Max. pressure drop : 10 M				
	*Above Details related with PHE Primary Circuit to be reverified with Site as per existing design. HVAC Vendor to get coordinate and quote accordingly.				
	<b>Secondary Circuit</b>				
	inlet Temperature : 13. degree C				
	Outlet Temperature : 7.5 degree C				

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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	Chilled water flow rate : 840 USGPM (3179 LPM)				
	Max. pressure drop : 10 M				
	Certification : AHRI				
	Plate type heat exchanger as described above.	1	Nos.	932203.00	932203.00
1.5	<b>CHILLED BASED HI-WALL UNITS</b>				
	Supply, Installation, Testing and Commissioning of chilled water based Hi wall type indoor units suitable for two pipe system. These units shall consist of a fan section with dynamically balanced centrifugal fan/s driven by FHP/TEFC squirrel cage induction motor, multirows deep separate cooling coil of copper tubes and aluminium fins etc. Enclosures shall be fabricated as specified for chilled water based hi wall units. These units shall be equipped with synthetic fibre filters, insulated drain pan, safety controls, thermostat, a set of valve station with pair of ball valves (one with strainer and one without strainer) and self balancing pressure independent flow control valves (equivalent to Danfoss make PIBCV) etc. all complete in a unit. The unit shall be provided with BMS compatible Kit. The quoted price shall be inclusive of vibration isolation arrangement for ceiling suspension, associated electrical work, drain pump for condensate removal etc.				
	a. 1.5 TR nominal capacity Hi-wall type unit (chilled water based) with cordless control.	244	Nos.	18220.00	4445680.00
	b. 1 TR nominal capacity Hi-wall type unit (chilled water based) with cordless control.	732	Nos.	15678.00	11476296.00
1.6	<b>VRF SYSTEM FOR BLOCK-1 &amp; 2</b>				
1.6.1	<b>VRF OUTDOOR UNITS</b>				
	Supply Installation, Testing & Commissioning of modular type Variable Refrigerant Flow/Variable Refrigerant Volume air cooled Outdoor units suitable for cooling and heating, having all hermetically sealed inverter type Scroll Compressor(s), minimum two compressors for above 14 HP modules, microprocessor based Controller, top discharge type condensing unit(s), with R 410 A Refrigerant, vibration isolators, with suitable foundation etc. complete as required. The unit shall deliver the rated capacity at AHRI Conditions and work even at 50°C ambient temperature without tripping. The unit shall be suitable to work on 400V +/- 10%, 3 Phase, 50Hz AC power supply. The unit shall be filled with first charge of the refrigerant and ready for use as required. The COP at AHRI conditions shall not be less than 2.1 and ISEER not less than 6.5				
	8 HP (6.4 TR) nominal capacity	8	HP	14393.00	115144.00
	14 HP (11.2 TR) nominal capacity	14	HP	14393.00	201502.00
	16 HP (12.8 TR) nominal capacity - (2 x 16 HP)	32	HP	14393.00	460576.00
	18 HP (14.4 TR) nominal capacity	18	HP	14393.00	259074.00
	20 HP (16 TR) nominal capacity	20	HP	14393.00	287860.00
	40 HP (32 TR) nominal capacity	40	HP	14393.00	575720.00
	44 HP (35.2 TR) nominal capacity	44	HP	14393.00	633292.00
1.7	<b>VRF INDOOR UNITS</b>				
a.	<b>Ceiling Mounted type 4 way cassette Units</b>				
	Supply, installation, testing and commissioning of following minimum capacity 4-way flow VRV/VRF 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, cord less remote control etc., suitable for operation on single phase 230 V ± 10%, 50Hz 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.				

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	1.6 TR	6	No	26483.00	158898.00				
	2.4 TR	2	No	27578.00	55156.00				
b.	<b>Wall Mounted type Hi-wall Units</b>								
	Supply, installation, testing and commissioning of following minimum capacity VRV/VRF High wall type Indoor unit equipped with 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 $\pm$ 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.								
	i. 2 TR	14	No	19377.00	271278.00				
1.8	<b>DX TYPE CEILING SUSPENDED TYPE AHUs</b>								
	Supply, Installation, Testing and Commissioning of 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), <b>forward curved</b> DIDW centrifugal fan with MCB/ MCCB of appropriate rating with cable termination box, belt drive package, <b>IE-03</b> 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 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:								
	<b>AHU</b>	<b>Capacity</b>	<b>SP</b>	<b>No. of</b>	<b>Motor</b>	<b>Ref. Calculated</b>			
	<b>No.</b>	<b>(Cfm)</b>	<b>(mm WG)</b>	<b>Rows</b>	<b>Rating (HP)</b>	<b>Load (TR)</b>			
	AH-1	3500	45	6	2	8.8	1	No	142275.00
	AH-2	1500	45	6	1	2.6	1	No	84767.00
	AH-3,4,5	4500	45	6	3	9.6	3	No	172640.00
	AH-6	2500	45	6	1.5	5.2	1	No	120882.00
	AH-7	2500	45	6	1.5	4.3	1	No	120882.00
	AH-8	2500	45	6	1.5	5.1	1	No	120882.00
	AH-9	1500	45	6	1	3.3	1	No	84767.00
	AH-10	1500	45	6	1	2.4	1	No	84767.00
	AH-11	1500	45	6	1	2.8	1	No	84767.00
	AH-12	1500	45	6	1	2.6	1	No	84767.00
1.9	<b>DX TYPE TREATED FRESH AIR UNITS -- TFAUs</b>								
	<b>(WITH FACE &amp; BYPASS ARRANGEMENT)</b>								

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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	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 <b>pre-filter (MERV-8), fine filter (MERV-13)</b> , 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), <b>backward curved DIDW centrifugal fan</b> , belt drive package, insulated SS drain pan, <b>IE-03</b> 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 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:				
	<b>TFA - 1 (Kitchen)</b>				
	Air Quantity Face - 2760 Cfm				
	Air Quantity Bypass - 1840 Cfm				
	Total Air Quantity - 4600 Cfm				
	Static Pressure - 55 mm WG				
	CHW Coils - 6 Rows				
	Motor Rating - 5 HP				
	Ref. Calculated Load (TR) - 12.6				
	Type - Floor Mounted Unit	1	No	228883.00	228883.00
1.10	<b>EXTRACT FAN SECTIONS</b>				
1.10.1	<b>FOR KITCHENS</b>				
	Supply, Installation, Testing and Commissioning of approved make fan section for extract air complete with floor standing <b>backward curved DIDW centrifugal fan</b> , MS base frame, <b>IE-03</b> 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:				
	<b>Fan Capacity S.P Motor Type</b>				
	<b>No. (Cfm) (mmWG) Rating (HP)</b>				
	EFS-1 5000 70 5 CS	1	No	101981.00	101981.00
1.10.2	<b>FOR TOILETS, PANTRIES etc.</b>				
	Supply, Installation, Testing and Commissioning of double skin EFS in sheet metal construction, double skin panels with 25mm thick injected PUF of density not less than 40 kg/CuM. The extract fan sections shall be complete with <b>forward curved DIDW centrifugal fan</b> , belt drive package, <b>IE-03</b> TEFC squirrel cage induction motor with class "F" insulation suitable for operation on 415±10% Volts, 50 Hz, 3 Phase AC power supply, belt drive package, and vibration isolation arrangement all complete as per the specifications. Fan outlet velocity shall not exceed 1800 FPM (9.1 MPS) for Ceiling Suspended EFSs and 2000 FPM (10.2 MPS) for Floor Mounted EFSs. EFSs shall follow the design parameters as mentioned below:				

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	Fan	Capacity	S.P	Motor	Type				
	No.	(Cfm)	(mmWG)	Rating (HP)					
	EFS-1	3500	30	1.5	CS	1	No	68499.00	68499.00
	EFS-2,3	1500	30	1	CS	2	No	50224.00	100448.00
1.11	<b>EXHAUST AIR SCRUBBER</b>								
	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								
	5000 CFM x 1 filter					1	No	214698.00	214698.00
1.12	<b>FAN FILTER UNITS (FFUs)</b>								
	Supply, Installation, Testing and Commissioning of approved make fan section for fresh air complete with floor standing <b>forward curved</b> DIDW centrifugal fan, MS base frame, 50 mm thick viscous metallic filters, <b>IE-03</b> TEFC squirrel cage induction motor with class "F" 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 outlet velocity shall not exceed 2000 FPM. Fan filter unit shall be suitable for ceiling suspension/floor installation as shown in the design drawings. The fan characteristics shall be as follows:								
	Fan	Capacity	S.P	Motor	Type				
	No.	(Cfm)	(mmWG)	Rating					
				(HP)					
	FFU-1	3500	30	1.5	CS	1	No	70160.00	70160.00
1.13	<b>AXIAL FLOW FANS</b>								
1.13.1	<b>Emergency Supply:</b>								

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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	Supply, Installation, Testing & Commissioning of AMCA Certified (For Air and Sound Performance) tube axial flow fans of different capacities in standard GI/M.S. construction as mentioned below. Entire fan model and AMCA Seal shall appear in technical 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 hemispherical 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. Axial Flow Fans shall follow the design parameters as mentioned below:				
	<b>AF Capacity SP Motor Type</b>				
	<b>No. (Cfm) (mm WG) Rating</b>				
	<b>(HP)</b>				
	AF-1,2 5700 20 2 Outdoor	2	No	54799.00	109598.00
	AF-3-6 11600 20 5 Outdoor	4	No	76269.00	305076.00
	AF-7,8 12700 20 5 Outdoor	2	No	83119.00	166238.00
1.14	<b>SPLIT PACKAGES</b>				
	Supply, Installation, Testing and Commissioning of split type airconditioning units, each comprising of an outdoor and a single indoor unit. Condensing unit shall be complete with hermetically sealed rotary/ scroll compressor/s, with aluminium fins, thermostatic expansion valve and air cooled condenser with fan. Evaporating unit shall consist of a fan section with dynamically balanced centrifugal fan/s driven by FHP/TEFC squirrel cage induction motor, multirows deep cooling coil of copper tubes and aluminium fins construction etc. Enclosures shall be fabricated as specified. The evaporating unit shall be equipped with synthetic fibre filters, insulated drain pan, safety controls, thermostat all complete in a unit. The outdoor unit enclosure shall be factory painted to a smooth finish. The quoted price shall be inclusive of full refrigerant charge, vibration isolation pads, associated electrical work and MS base frame duly painted with black enamel paint for mounting of condensing units on floor/ wall. Ductable three phase units shall be complete with phase reversal kit and motor protection device. The units shall have 5 STAR RATING, and shall be R-32/ R-407c/ R-410a refrigerant based.				
1.14.1	<b>Single phase non-ductable split units:</b>				
	a. 1.5 TR nominal capacity split unit with single high wall type non-ductable indoor unit with cordless control.	1	No	38136.00	38136.00
1.14.2	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.	30	RM	890.00	26700.00
1.15	<b>LOW PRESSURE LOW NOISE INLINE FANS</b>				



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	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:				
	<b>With Centrifugal Fans:</b>				
	<b>Fan Capacity SP Electrical Type</b>				
	<b>No. (Cfm) (mmWG) Characteristics</b>				
	IF- 400 12 220V/1 Ph Circular	3	No	6543.00	19629.00
	IF- 1000 15 220V/1 Ph Rectangula	15	No	24844.00	372660.00
1.16	<b>COPPER PIPING (REFRIGERANT PIPING)</b>				
	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 insulati	120	RM	215.00	25800.00
b.	9.5 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulati	230	RM	290.00	66700.00
c.	12.7 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insula	150	RM	409.00	61350.00
d.	15.86 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insul	190	RM	516.00	98040.00
e.	19 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulati	110	RM	620.00	68200.00
f.	22.2 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insula	80	RM	758.00	60640.00
g.	28.58 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insu	100	RM	972.00	97200.00
h.	41.27 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick ins	20	RM	1148.00	22960.00
	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.				
1.17	<b>FITTINGS</b>				
	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.				
a.	Y- joints for refrigerant piping (pair).	27	No	3814.00	102978.00
1.18	<b>CENTRALISED CONTROLLER (TOUCH SCREEN TYPE)</b>				
	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 20 groups of indoor units including AHUs. The controller shall be touch screen new generation type.	2	Lot	135594.00	271188.00

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Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
1.20	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.	450	Kg	127.00	57150.00
1.21	<b>PROPELLER FANS</b>				
	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.	No	50	1525.00	76250.00
<b>TOTAL CARRIED TO SUMMARY (EQUIPMENT) Rs.</b>					<b>30758538.00</b>
2.0	<b>CHILLED WATER PIPING</b>				
2.1	<b>INSULATED CHILLED WATER PIPING</b>				
	Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing feltstrip(as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required.				
	Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.				
	a. 200mm dia (75 mm thick insulation)	153	RM	6843.00	1046979.00
	b. 150mm dia (50 mm thick insulation)	114	RM	4481.00	510834.00
	c. 125mm dia (50 mm thick insulation)	63	RM	3807.00	239841.00
	d. 100mm dia (50 mm thick insulation)	63	RM	3076.00	193788.00
	e. 80mm dia (50 mm thick insulation)	37	RM	2516.00	93092.00
	f. 65mm dia (50 mm thick insulation)	45	RM	2133.00	95985.00
	g. 50mm dia (50 mm thick insulation)	343	RM	1771.00	607453.00
	h. 40mm dia (50 mm thick insulation)	512	RM	1506.00	771072.00
	i. 32mm dia (50 mm thick insulation)	1060	RM	1322.00	1401320.00
	j. 25mm dia (50 mm thick insulation)	3667	RM	1187.00	4352729.00
2.2	<b>Pre-Insulated MS Pipes (For Burried Piping)</b>				
	Providing and fixing in position the following pre-insulated MS heavy class pipes cut to required lengths and installed with all welded joints. The pipes shall be insulated using PUF insulation, having density not less than 40 kg/ CuM and thickness as per specifications. The outer protective insulation jacket shall be seamless, extruded, black, UV resistant, high-density polyethylene (HDPE) jacket of thickness as mentioned in specifications. The pipes shall be painted with two coats of red oxide primer prior to application of insulation. Providing & fixing in position the necessary fittings like elbows, tees, reducers, hanging arrangement including vibration isolation arrangements with anti-seismic feature etc. as required.				
	a. 200mm dia (6mm thick)	150	RM	7543.00	1131450.00
2.3	Providing & fixing in position the following wafer type Butterfly Valves duly insulated to the same specifications as the connected piping and adequately supported as per specifications, complete with companion flanges, nuts, bolts, gaskets etc. as required. Butterfly valves shall conform to PN -16 rating as per specifications.				
	a. 200mm dia (Gear Operated)	22	No	12412.00	273064.00

HVAC BOQ					
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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
2.4	Supply, Installation, Testing and Commissioning of following sizes electronic, self-balancing, pressure independent type dynamic balancing valve with integrated 2 way modulating control valve in a single body. The actuator shall be capable of accepting upto 10V DC and upto 20 mA electric signal and shall provide similar transduced feedback output to control system. Maximum close off pressure shall not be less than 6 Bar for upto 50 mm valves and 7 Bar for 65 mm & above. Valves should have pressure rating of 25 Bar minimum.				
	a. 200mm dia (Tertiary Bridge)	2	No	152542.00	305084.00
2.5	Providing and fixing in position the following wafer type dual plate check valves. Check valves shall conform to PN-16 rating as per the specifications including insulation as specified.				
	a. 200mm dia	4	No	12707.00	50828.00
2.6	Providing and fixing in position the following 'Y' strainers of Ductile CI Body flanged ends with stainless steel strainer for chilled / hot water circulation including insulation as specified.				
	a. 200mm dia	4	No	43598.00	174392.00
2.7	Providing and fixing in position 20mm dia. automatic purge valves as per the specifications.	8	No	1522.00	12176.00
2.8	Providing and fixing in position industrial type pressure gauges constructed out of SS 304 material. SS siphon shall be factory insulated with closed cell elastomeric insulation in tubing form. Pressure gauges shall be factory fitted with a ball valve at the tube.	16	No	1049.00	16784.00
2.9	Supply and fixing in position V-form industrial type thermometers as per the specifications.	8	No	915.00	7320.00
2.10	Providing and fixing in position the following specified make balancing valves duly insulated to the same specifications as the connected piping and adequately supported as per specifications. Balancing valves shall conform to PN-16 rating as per the specifications. Quoted price shall be inclusive of insulation as per the specifications.				
	a. 50mm dia	26	No	9416.00	244816.00
	b. 40mm dia	20	No	6676.00	133520.00
	c. 32mm dia	2	No	5508.00	11016.00
2.11	Providing and fixing in position the following Ball Valves duly insulated to the same specifications as the connected piping and adequately supported as per specifications. Valves shall conform to PN-16 rating.				
	a. 50mm dia	52	No	2458.00	127816.00
	b. 40mm dia	40	No	1992.00	79680.00
	c. 32mm dia	4	No	1780.00	7120.00
2.12	Providing and fixing in position the following GI medium class pipes for condensate drain cut to required lengths & installed with all screwed joints and providing and fixing position the necessary elbows, tees & reducers.				
	a. 50mm dia	100	RM	1486.00	148600.00
	b. 40mm dia	400	RM	1192.00	476800.00
	c. 32mm dia	500	RM	1099.00	549500.00
	d. 25mm dia	1200	RM	965.00	1158000.00
<b>TOTAL</b>	<b>CARRIED TO SUMMARY (CHW PIPING)</b>				<b>14221059.00</b>
3.0	<b>AIR DISTRIBUTION</b>				
3.1	<b>Ductwork</b>				
a.	<b>Factory Fabricated Ductwork</b>				
	Supply of factory fabricated dutwork, Installation and Testing of galvanised sheet metal ducts including elbows, turning vanes, fire retardant gaskets, slip on flanges, GI fully threaded rods, GI supports/hangers etc. in accordance with the approved shop drawings and specifications of following sheet thickness complete as required.				
	Thickness 0.63 mm sheet	1,000	SqM	947.00	947000.00
	Thickness 0.80 mm sheet	300	SqM	1107.00	332100.00
b.	<b>Conventional site fabricated duct</b>				
	Supply, installation, balancing and commissioning of fabricated at site GSS sheet				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.				
	Thickness 0.63 mm sheet	200	SqM	928.00	185600.00
	Thickness 0.80 mm sheet	100	SqM	1078.00	107800.00
c.	Supply, Fabrication, Installation & Testing of 16 gauge black steel duct work in welded construction. The quoted price shall be inclusive of clean outs as per NFPA at base of verticle riser, change in direction, maximum at every 6.1 M horizontal & every third floor of vertical riser & at sprinkler heads.	60	Sqm	3400.00	204000.00
3.2	Supply, Installation & Testing of 125mm deep Antivibration Flexible Joints made out of fire retardant fabric with extruded aluminium frame/ flange on both sides of approved make.	150	RM	975.00	146250.00
3.3	Supply, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc., as per specifications.	5	SqM	6178.00	30890.00
3.4	Supply, Installation, Testing & Balancing of one way blow linear supply cum return air grilles complete with <b>removable inner core</b> as per approved shop drawing and specifications.				
	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	12	SqM	7983.00	95796.00
	i. Linear Grille without Volume Control Damper for Return	15	SqM	5182.00	77730.00
3.5	Supply, Installation & Testing of extruded aluminium powder coated air transfer grilles to be provided at toilets & kitchen doors.	5	SqM	8051.00	40255.00
<b>TOTAL CARRIED TO SUMMARY (AIR DISTRIBUTION) Rs.</b>					<b>2167421.00</b>
4.0	<b>INSULATION</b>				
4.1	Supply and fixing of acoustic lining of supply air duct and plenum with 25 mm thick resin bonded glass wool having density of 32 kg/m³, with 25 mm X 25 mm GI section of 1.25 mm thick, at 600 mm centre to centre covered with Reinforced Plastic tissue paper and 0.5 mm thick perforated aluminum sheet fixed to inside surface of ducts with cadmium plated nuts, bolts, stick pins, CPRX compound etc. complete as required and as per specifications.				
	a. 25mm thick	1000	SqM	621.00	621000.00
<b>TOTAL CARRIED TO SUMMARY (INSULATION) Rs.</b>					<b>621000.00</b>
5.0	<b>ELECTRICAL INSTALLATION</b>				
5.1	<b>MOTOR CONTROL CENTRE</b>				
	Supply, Installation, Testing and Commissioning of floor mounted cubicle type electrical panel duly powder coated complete with aluminium bus bars, incoming, out going feeders etc. as per specifications, drawings and as described below. The panel shall incorporate an extract fan mounted at the top of the panel complete with thermostat suitable to run the fan at 50 deg C. Fault level 36 kA/1 Sec.				
5.1.1	<b>MCC-1</b>				
	<b>(LOCATION : BLOCK-3 PLANT ROOM)</b>				
	<b>INCOMING :</b>				
a.	100 Amps TP + N MCCB -- 01 Set				
b.	Multifunction meter to read ammeter (0 - 100) Amp, Voltmeter (0-500)V, KW and KWH, A set of CT's, RYB LED type phase indication lights -- 01 Set.				
	<b>BUSBARS :</b>				
	Electrolytic grade (E 91 E), 125 Amps Capacity TPN aluminium bus bar, PVC heat shrunk insulated, supported on DMC/SMC having fault level of 50 KA for 1 second.				
	<b>OUTGOING :</b>				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	a. 63 A TP+N MCCB for 30 HP TERTIARY CHW variable speed pumps, a set of ON & OFF indication lights --- 02 Sets. (1W+1S)				
	b. 16 A 4P MCB (10 kA) for 2/3 HP Pressurizing Unit Pumps, DOL starter with built in single phasing preventer, overload relay & 0-30 seconds adjustable timer, digital type ammeter with CT's & selector switch, a set of ON & OFF indication lights & START-STOP push buttons --- 01 Sets.				
	c. Control wiring & safety circuit as required with Start-Stop PB's stayput or lockable type and LED type 'ON' 'OFF' indication lights.				
	<b>Notes:</b>				
	a. Mechanical /electrical interlocking shall be provided as per system requirement.				
	MCC as described above.				
	b. MCC should have enough space for mounting of VFDs within panel as required for Tertiary pumps and shall have adequate ventilation arrangement for the same.				
	MCC as described above.	No	1	235125.00	235125.00
5.1.2	<b>MCC-1</b>				
	<b>(LOCATION : BLOCK- 4 PLANT ROOM)</b>				
	<b>INCOMING :</b>				
a.	100 Amps TP + N MCCB -- 01 Set				
b.	Multifunction meter to read ammeter (0 - 100) Amp, Voltmeter (0-500)V, KW and KWH, A set of CT's, RYB LED type phase indication lights -- 01 Set.				
	<b>BUSBARS :</b>				
	Electrolytic grade (E 91 E), 125 Amps Capacity TPN aluminium bus bar, PVC heat shrunk insulated, supported on DMC/SMC having fault level of 50 KA for 1 second.				
	<b>OUTGOING :</b>				
	a. 63 A TP+N MCCB for 30 HP TERTIARY CHW variable speed pumps, a set of ON & OFF indication lights --- 02 Sets. (1W+1S)				
	b. 16 A 4P MCB (10 kA) for 2/3 HP Pressurizing Unit Pumps, DOL starter with built in single phasing preventer, overload relay & 0-30 seconds adjustable timer, digital type ammeter with CT's & selector switch, a set of ON & OFF indication lights & START-STOP push buttons --- 01 Sets.				
	c. Control wiring & safety circuit as required with Start-Stop PB's stayput or lockable type and LED type 'ON' 'OFF' indication lights.				
	<b>Notes:</b>				
	a. Mechanical /electrical interlocking shall be provided as per system requirement.				
	MCC as described above.				
	b. MCC should have enough space for mounting of VFDs within panel as required for Tertiary pumps and shall have adequate ventilation arrangement for the same.				
	MCC as described above.	No	1	235125.00	235125.00
5.2	<b>ELECTRICAL PANELS FOR AHUs/ TFAUs/ EFS/FFU/AF etc.</b>				
	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.				
5.2.1	<b>PANEL-'A'</b>				
	<b>Location : Close to Units</b>				
	a. 16A 4P MCB for 1 /1.5/2/3 HP motor - 01 Set.				
	b. RYB LED type indication lights --- 01 Set.				
	c. Fully automatic DOL starter with builtin single phasing preventor, over load relay for 1 /1.5/2/3 HP motor --- 01 Set.				

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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	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.	No	13	23087.00	300131.00
5.2.2	<b>PANEL-'A1' (IP-65)</b>				
	<b>Location : Close to Units</b>				
	a. 16A 4P MCB for 1 /1.5/2/3 HP motor - 01 Set.				
	b. RYB LED type indication lights --- 01 Set.				
	c. Fully automatic DOL starter with builtin single phasing preventor, over load relay for 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.	No	2	25694.00	51388.00
5.2.3	<b>PANEL-'B'</b>				
	<b>Location : Close to Units</b>				
	<b>INCOMING :</b>				
	a. 40 A 4P MCB --- 01 Set.				
	b. RYB LED type indication lights --- 01 Set.				
	c. Digital Type Voltmeter (0-500)V --- 01 Set.				
	<b>BUSBARS :</b>				
	Electrolytic grade (E 91 E), 63 A capacity TPN aluminium busbar, PVC heat shrunk insulated, supported on DMC/SMC having fault level of 10 kA for 1 second.				
	<b>OUTGOING :</b>				
	a. 16A 4P MCB for 3 HP motor, a fully automatic DOL starter with built in single phasing preventer and overload relay, selector switch, a set of LED type ON & OFF indication lights & START-STOP push buttons - 03 sets.				
	b. Auto-Manual type selector switch to facilitate auto start of fans after restoration of power - 03 sets.				
	c. Control wiring & safety circuit as required with Start-Stop PB's and LED type 'ON' 'OFF' indication lights.				
	Electrical panels as described above.	No.	1	73632.00	73632.00
5.2.4	<b>PANEL-'C' (IP-65)</b>				
	<b>Location : Close to Units</b>				
	<b>INCOMING :</b>				
	a. 40 A 4P MCB --- 01 Set.				
	b. RYB LED type indication lights --- 01 Set.				
	c. Digital Type Voltmeter (0-500)V --- 01 Set.				
	<b>BUSBARS :</b>				
	Electrolytic grade (E 91 E), 63 A capacity TPN aluminium busbar, PVC heat shrunk insulated, supported on DMC/SMC having fault level of 10 kA for 1 second.				
	<b>OUTGOING :</b>				
	a. 32A 4P MCB for 5 HP motor, a fully automatic DOL starter with built in single phasing preventer and overload relay, selector switch, 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 and LED type 'ON' 'OFF' indication lights.				

HVAC BOQ					
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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	Electrical panels as described above.	No.	1	65359.00	65359.00
5.2.5	<b>PANEL-D' (IP-65)</b>				
	<b>Location : Close to Units</b>				
	<b>INCOMING :</b>				
	a. 63 A TP+N MCCB --- 01 Set.				
	b. RYB LED type indication lights --- 01 Set.				
	c. Digital Type Voltmeter (0-500)V --- 01 Set.				
	<b>BUSBARS :</b>				
	Electrolytic grade (E 91 E), 100 A capacity TPN aluminium busbar, PVC heat shrunk insulated, supported on DMC/SMC having fault level of 10 kA for 1 second.				
	<b>OUTGOING :</b>				
	a. 32A 4P MCB for 5 HP motor, a fully automatic DOL starter with built in single phasing preventer and overload relay, selector switch, a set of LED type ON & OFF indication lights & START-STOP push buttons - 03 sets.				
	b. Auto-Manual type selector switch to facilitate auto start of fans after restoration of power - 03 sets.				
	c. Control wiring & safety circuit as required with Start-Stop PB's and LED type 'ON' 'OFF' indication lights.				
	Electrical panels as described above.	No.	2	77485.00	154970.00
	<b>IMPORTANT NOTES (PANELS):</b>				
	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.				
	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 be compatible with BMS and necessary provisions to be made in each panel.				
	7. All Electrical Panels shall have necessary provisions for fire integration.				
	8. Fault Levels - ACB - 50 kA, MCCB - 36 kA, MCB - 10 kA				
	9. All VFD Panels and Enclosures shall have adequate ventilation provisions, and panel should be large enough to accommodate the VFD.				
	10. Vendor shall submit SLDs, GADs and wiring drawings for Consultant's Approval prior to procurement.				
5.3	<b>POWER CABLING</b>				
	Supply, laying, affecting connections & Testing of the following sizes of 1.1 KV armoured PVC insulated aluminium/ copper 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.				
	<b>Normal Cables</b>				
	b. 3C x 25 Sqmm cable (Aluminium)	RM	120	237.00	28440.00
	c. 3C x 16 Sqmm cable (Copper)	RM	25	898.00	22450.00
	d. 3C x 10 Sqmm cable (Copper)	RM	35	591.00	20685.00
	e. 3C x 6 Sqmm cable (Copper)	RM	60	366.00	21960.00
	f. 3C x 4 Sqmm cable (Copper)	RM	80	195.00	15600.00
	g. 3C x 2.5 Sqmm cable (Copper)	RM	370	153.00	56610.00
	<b>FRLS Cables - For Fire &amp; Life Safety Equipments</b>				
	a. 3C x 4 Sqmm cable (Copper)	RM	70	297.00	20790.00

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Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	b. 3C x 2.5 Sqmm cable (Copper)	RM	30	212.00	6360.00
5.4	<b>CABLE TRAYS</b>				
	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	RM	400	476.00	190400.00
	b. 50 x 150 x 50 x 1.6mm	RM	100	530.00	53000.00
	c. 50 x 200 x 50 x 2mm	RM	10	604.00	6040.00
	d. 50 x 300 x 50 x 2mm	RM	100	682.00	68200.00
5.5	<b>EARTHING</b>				
	Providing & fixing in position the following bare GI tape/ Cu wire including providing all fixing accessories & effecting proper connections.				
	a. 2x 25mm x 3mm tape	RM	120	214.00	25680.00
	b. 6 SWG GI Wire	RM	450	61.00	27450.00
5.6	Supply and fixing of 1.1 KV grade rubber mat 914.4 mm wide 6mm thick to withstand 1.1 KV dielectric strength in front of each panel.	RM	10	2967.00	29670.00
<b>TOTAL CARRIED TO SUMMARY (ELECTRICAL)</b>		<b>Rs.</b>			<b>1709065.00</b>
15.6	<b>RO DRINKING WATER &amp; CHILLER SYSTEM</b>				
15.6.1	<b>R.O. Plant For Block-4</b>				
1	Supply, installation, testing and commissioning of R.O. Plant capacity of <b>150LPH</b> (Complete system to be compact type, skid-mounted / cabinet enclosed, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components:-				
	(i) Inlet Quantity : As per Detailing				
	(ii) Output Quantity : 150 LPH				
	(iii) Inlet TDS : 2000 PPM				
	(iv) Outlet TDS : 75 PPM				
	(v) Inlet Hardness : 350 PPM )				
	(vi) Outlet Hardness : 50 PPM )				
<b>A)</b>	Raw Water pumps of horizontal, centrifugal type suitable for a flow rate of <b>300LPH</b> at 25m head. The Pump construction shall be of <b>SS-304 &amp; impeller shall be also SS-304</b> . The motor shall be TEFC suitable for a supply of 415V/3-phase/50Hz supply. The pump shall be supplied complete with base channel coupling foundations, bolts, pressure gauge at inlet and outlet of each pump. -- 2 Nos.				
<b>B)</b>	Special Antiscalant Dosing System consisting of one HDPE tank of 100 litre capacity with a positive displacement diaphragm dosing pump having variable flowrate of 0-6 LPH. The motor shall be suitable for operation at 240V/single phase/50Hz supply. the pump shall be supplied complete with necessary polypropylene piping, valves, strainers & injection fittings. -- 1 Set.				
<b>C)</b>	Micron cartridge filter suitable for a flowrate of <b>300LPH</b> to achieve particle filtration of less than 5 microns. The unit shall be supplied complete with inlet and outlet branches removal cap for replacement of element, inlet and outlet pressure indicators. (One for the pressure treatment & other for CIP system) MOC:				
<b>D)</b>	R.O High Pressure feed pumps of vertical, multistage centrifugal type suitable for a flowrate of <b>300 LPH</b> at 14 Kg/sq.cm. The pump construction shall be of SS-316-L & impeller shall be also SS-316-L. The motor shall be of TEFC suitable for a supply of 415V/3 phase/50 Hz supply. the pump shall be supplied complete with base channel coupling foundation, bolt, pressure gauge at inlet and outlet of each pump. - 2 Nos.				
<b>E)</b>	R.O. modules made out of Spiral Wound Thin Film composite suitable to withstand pressure of 20kg/sq.cm. Suitable BSPT/NPT connections shall be used for connecting feed & reject ends. the modules shall be supplied complete with all necessary instrumentation, valves for sampling, drain, reject & permeate, epoxy-coated structural steel bases and supports, as per following system capacity requirements.				
	(i) Total net treated water output of system = <b>150LPH</b>				
	(ii) System recovery = <b>60 %</b>				



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Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	(iii) Filtration area per membrane = <b>85 sq.ft.</b>				
	(iv) Number of membranes = The total number of membranes required shall be as per requirements, supported by calculations from the vendor.				
<b>F)</b>	Clean in place pump of horizontal end suction suitable for a flow rate of <b>300 LPH</b> at required head. The pump construction shall be of stainless steel SS-304. The motor shall be TEFC suitable for a supply of 415V/3 phase/50Hz supply. The pump shall be supplied complete with base channel, coupling, foundation bolts, pressure gauge at inlet & outlet of <b>the pump</b> . -- 1 Set				
<b>G)</b>	Centralised PLC control panel along with touch-screen digital display board along with all digital sensors for TDS & Flow, made out of CRCA sheet min. 2mm thick having main contactors for all pumps (listed above) including SPP, 3 phase thermal overload relay. The control panel for monitoring and control of P.O. system shall include all required signal lamps, HRC fuses, Annunciation box with Hooter. All control and power cabling along with double earthing between the panel shall be included in the scope of supply of the contractor. An emergency stop push button shall be provided in the panel. The MCC panel shall have the following interlocks:-				
	i) High Pressure Pump unit trip in case of Low suction pressure.				
	ii) High Pressure Pump unit trip in case of High discharge pressure.				
	iii) Special anti-scalant dosing pump trips in case high pressure pump trips and vice versa.				
	iv) High Pressure pump trip in case of high conductivity in permeate.				
	v) SHC dosing pump trips incase high pressure pump trips and vice versa.				
	vi) In all above cases Annuciator box indicates nature of malfunctioning.				
	vii) The System should display the TDS of Raw Water & R.O. Water, Flow Rate of Inlet, Outlet & Reject Water simultaneously.				
<b>H)</b>	Instrumentation mounted in R.O. system/panel as follows:-				
	i) Digital Flow meters to measure and control the flow of feed/product/reject stream. -- 3 Nos.				
	ii) Pressure Gauges made out of SS316 (glycerine filled) of pricol/equivalent make. -- 5 Nos.				
	iii) Digital Conductivity probes for conductivity display -- 2 Nos.				
	iv) Pressure Switches to control pressure and given High/Low pressure trip. (Danfoss/Switzer/Square D make) -- 4 Nos.				
	v) Level switches to control water level in the output storage tank and soft Water Tank. -- 2 Nos. 1 Nos.				
	vi) ORP with dump valve. -- 1 Set				
<b>I)</b>	First fill of all chemicals and lubricants to commission and operate the plants. --1 Lot				
<b>J)</b>	All interconnecting piping work with valves:-				
	i) Low Pressure Side till R.O. feed water pump. Piping shall be of extra strong PVC and all valves shall be of extra strong PVC and all valves shall be PVC ball valves. --				
	ii) High Pressure side piping from the R.O. high pressure pumps to the reject stream control valves shall be of SS - 304 using all SS fittings ball valves of suitable pressure rating shall be used till 25 mm size, above 25 mm, flanged globe/ wafer butterfly valves in SS construction shall be used. Rejects pressure control valves shall be globe valve and feed flow control valve shall be of SS-304. -- Lot				
	(All for above from "A" to "J" complete)	Set	2	211864.00	423728.00
15.6.2	Complete Stainless Steel treated water storage tank (double Wall ) of capacity <b>300 Litres</b> including all inlet/outlet connections, accessories, valves, double seal manhole covers, insulation etc. The Stainless steel tank must be ozone resistant and to be used as ozone contact tank. Fabrication to be done as per approved shop	Set	2	46610.00	93220.00
15.6.3	<b><u>R.O. Plant For Block-3 (Cluster-1)</u></b>				
1	Supply, installation, testing and commissioning of R.O. Plant capacity of <b>150LPH</b> (Complete system to be compact type, skid-mounted / cabinet enclosed, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components:-				
	(i) Inlet Quantity : As per Detailing				
	(ii) Output Quantity : 150 LPH				
	(iii) Inlet TDS : 2000 PPM				
	(iv) Outlet TDS : 75 PPM				
	(v) Inlet Hardness : 350 PPM )				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	(vi) Outlet Hardness : 50 PPM )				
A)	Raw Water pumps of horizontal, centrifugal type suitable for a flow rate of <b>300LPH</b> at 25m head. The Pump construction shall be of <b>SS-304 &amp; impeller shall be also SS-304</b> . The motor shall be TEFC suitable for a supply of 415V/3-phase/50Hz supply. The pump shall be supplied complete with base channel coupling foundations, bolts, pressure gauge at inlet and outlet of each pump. -- 2 Nos.				
B)	Special Antiscalant Dosing System consisting of one HDPE tank of 100 litre capacity with a positive displacement diaphragm dosing pump having variable flowrate of 0-6 LPH. The motor shall be suitable for operation at 240V/single phase/50Hz supply. the pump shall be supplied complete with necessary polypropylene piping, valves, strainers & injection fittings. -- 1 Set.				
C)	Micron cartridge filter suitable for a flowrate of <b>300LPH</b> to achieve particle filtration of less than 5 microns. The unit shall be supplied complete with inlet and outlet branches removal cap for replacement of element, inlet and outlet pressure indicators. (One for the pressure treatment & other for CIP system) MOC:				
D)	R.O High Pressure feed pumps of vertical, multistage centrifugal type suitable for a flowrate of <b>300 LPH</b> at 14 Kg/sq.cm. The pump construction shall be of SS-316-L & impeller shall be also SS-316-L. The motor shall be of TEFC suitable for a supply of 415V/3 phase/50 Hz supply. the pump shall be supplied complete with base channel coupling foundation, bolt, pressure gauge at inlet and outlet of each pump. - 2 Nos.				
E)	R.O. modules made out of Spiral Wound Thin Film composite suitable to withstand pressure of 20kg/sq.cm. Suitable BSPT/NPT connections shall be used for connecting feed & reject ends. the modules shall be supplied complete with all necessary instrumentation, valves for sampling, drain, reject & permeate, epoxy-coated structural steel bases and supports, as per following system capacity requirements:-				
	(i) Total net treated water output of system = <b>150LPH</b>				
	(ii) System recovery = <b>60 %</b>				
	(iii) Filtration area per membrane = <b>85 sq.ft.</b>				
	(iv) Number of membranes = The total number of membranes required shall be as per requirements, supported by calculations from the vendor.				
F)	Clean in place pump of horizontal end suction suitable for a flow rate of <b>300 LPH</b> at required head. The pump construction shall be of stainless steel SS-304. The motor shall be TEFC suitable for a supply of 415V/3 phase/50Hz supply. The pump shall be supplied complete with base channel, coupling, foundation bolts, pressure gauge at inlet & outlet of <b>the pump</b> . -- 1 Set				
G)	Centralised PLC control panel along with touch-screen digital display board along with all digital sensors for TDS & Flow, made out of CRCA sheet min. 2mm thick having main contactors for all pumps (listed above) including SPP, 3 phase thermal overload relay. The control panel for monitoring and control of P.O. system shall include all required signal lamps, HRC fuses, Annunciation box with Hooter. All control and power cabling along with double earthing between the panel shall be included in the scope of supply of the contractor. An emergency stop push button shall be provided in the panel. The MCC panel shall have the following interlocks:-				
	i) High Pressure Pump unit trip in case of Low suction pressure.				
	ii) High Pressure Pump unit trip in case of High discharge pressure.				
	iii) Special anti-scalant dosing pump trips in case high pressure pump trips and vice versa.				
	iv) High Pressure pump trip in case of high conductivity in permeate.				
	v) SHC dosing pump trips incase high pressure pump trips and vice versa.				
	vi) In all above cases Annuciator box indicates nature of malfunctioning.				
	vii) The System should display the TDS of Raw Water & R.O. Water, Flow Rate of Inlet, Outlet & Reject Water simultaneously.				
H)	Instrumentation mounted in R.O. system/panel as follows:-				
	i) Digital Flow meters to measure and control the flow of feed/product/reject stream. -- 3 Nos.				
	ii) Pressure Gauges made out of SS316 (glycerine filled) of pricol/equivalent make. -- 5 Nos.				
	iii) Digital Conductivity probes for conductivity display -- 2 Nos.				
	iv) Pressure Switches to control pressure and given High/Low pressure trip. (Danfoss/Switzer/Square D make) -- 4 Nos.				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
v)	Level switches to control water level in the output storage tank and soft Water Tank. -- 2 Nos. 1 Nos.				
vi)	ORP with dump valve. -- 1 Set				
I)	First fill of all chemicals and lubricants to commission and operate the plants. --1 Lot				
J)	All interconnecting piping work with valves:-				
i)	Low Pressure Side till R.O. feed water pump. Piping shall be of extra strong PVC and all valves shall be of extra strong PVC and all valves shall be PVC ball valves. --				
ii)	High Pressure side piping from the R.O. high pressure pumps to the reject stream control valves shall be of SS - 304 using all SS fittings ball valves of suitable pressure rating shall be used till 25 mm size, above 25 mm, flanged globe/ wafer butterfly valves in SS construction shall be used. Rejects pressure control valves shall be globe valve and feed flow control valve shall be of SS-304. -- Lot				
	(All for above from "A" to "J" complete)	Set	1	220339.00	220339.00
15.6.4	Complete Stainless Steel treated water storage tank (double Wall ) of capacity <b>300 Litres</b> including all inlet/outlet connections, accessories, valves, double seal manhole covers, insulation etc. The Stainless steel tank must be ozone resistant and to be used as ozone contact tank. Fabrication to be done as per approved shop	Set	1	50847.00	50847.00
15.6.5	<b><u>R.O. Plant For Block-3 (Cluster -2 including Multipurpose Hall)</u></b>				
1	Supply, installation, testing and commissioning of R.O. Plant capacity of <b>200LPH</b> (Complete system to be compact type, skid-mounted / cabinet enclosed, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components:-				
	(i) Inlet Quantity : As per Detailing				
	(ii) Output Quantity : 200 LPH				
	(iii) Inlet TDS : 2000 PPM				
	(iv) Outlet TDS : 75 PPM				
	(v) Inlet Hardness : 350 PPM )				
	(vi) Outlet Hardness : 50 PPM )				
A)	Raw Water pumps of horizontal, centrifugal type suitable for a flow rate of <b>400LPH</b> at 25m head. The Pump construction shall be of <b>SS-304 &amp; impeller shall be also SS-304</b> . The motor shall be TEFC suitable for a supply of 415V/3-phase/50Hz supply. The pump shall be supplied complete with base channel coupling foundations, bolts, pressure gauge at inlet and outlet of each pump. -- 2 Nos.				
B)	Special Antiscalant Dosing System consisting of one HDPE tank of 100 litre capacity with a positive displacement diaphragm dosing pump having variable flowrate of 0-6 LPH. The motor shall be suitable for operation at 240V/single phase/50Hz supply. the pump shall be supplied complete with necessary polypropylene piping, valves, strainers & injection fittings. -- 1 Set.				
C)	Micron cartridge filter suitable for a flowrate of <b>400LPH</b> to achieve particle filtration of less than 5 microns. The unit shall be supplied complete with inlet and outlet branches removal cap for replacement of element, inlet and outlet pressure indicators. (One for the pressure treatment & other for CIP system) MOC:				
D)	R.O High Pressure feed pumps of vertical, multistage centrifugal type suitable for a flowrate of <b>400 LPH</b> at 14 Kg/sq.cm. The pump construction shall be of SS-316-L & impeller shall be also SS-316-L. The motor shall be of TEFC suitable for a supply of 415V/3 phase/50 Hz supply. the pump shall be supplied complete with base channel coupling foundation, bolt, pressure gauge at inlet and outlet of each pump. - 2 Nos.				
E)	R.O. modules made out of Spiral Wound Thin Film composite suitable to withstand pressure of 20kg/sq.cm. Suitable BSPT/NPT connections shall be used for connecting feed & reject ends. the modules shall be supplied complete with all necessary instrumentation, valves for sampling, drain, reject & permeate, epoxy-coated structural steel bases and supports, as per following system capacity requirements:-				
	(i) Total net treated water output of system = <b>200LPH</b>				
	(ii) System recovery = <b>60 %</b>				
	(iii) Filtration area per membrane = <b>85 sq.ft.</b>				
	(iv) Number of membranes = The total number of membranes required shall be as per requirements, supported by calculations from the vendor.				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
F)	Clean in place pump of horizontal end suction suitable for a flow rate of 400 LPH at required head. The pump construction shall be of stainless steel SS-304. The motor shall be TEFC suitable for a supply of 415V/3 phase/50Hz supply. The pump shall be supplied complete with base channel, coupling, foundation bolts, pressure gauge at inlet & outlet of the pump. -- 1 Set				
G)	Centralised PLC control panel along with touch-screen digital display board along with all digital sensors for TDS & Flow, made out of CRCA sheet min. 2mm thick having main contactors for all pumps (listed above) including SPP, 3 phase thermal overload relay. The control panel for monitoring and control of P.O. system shall include all required signal lamps, HRC fuses, Annunciation box with Hooter. All control and power cabling along with double earthing between the panel shall be included in the scope of supply of the contractor. An emergency stop push button shall be provided in the panel. The MCC panel shall have the following interlocks:-				
	i) High Pressure Pump unit trip in case of Low suction pressure.				
	ii) High Pressure Pump unit trip in case of High discharge pressure.				
	iii) Special anti-scalant dosing pump trips in case high pressure pump trips and vice versa.				
	iv) High Pressure pump trip in case of high conductivity in permeate.				
	v) SHC dosing pump trips incase high pressure pump trips and vice versa.				
	vi) In all above cases Annuciator box indicates nature of malfunctioning.				
	vii) The System should display the TDS of Raw Water & R.O. Water, Flow Rate of Inlet, Outlet & Reject Water simultaneously.				
H)	Instrumentation mounted in R.O. system/panel as follows:-				
	i) Digital Flow meters to measure and control the flow of feed/product/reject stream. -- 3 Nos.				
	ii) Pressure Gauges made out of SS316 (glycerine filled) of pricol/equivalent make. -- 5 Nos.				
	iii) Digital Conductivity probes for conductivity display -- 2 Nos.				
	iv) Pressure Switches to control pressure and given High/Low pressure trip. (Danfoss/Switzer/Square D make) -- 4 Nos.				
	v) Level switches to control water level in the output storage tank and soft Water Tank. -- 2 Nos. 1 Nos.				
	vi) ORP with dump valve. -- 1 Set				
I)	First fill of all chemicals and lubricants to commission and operate the plants. --1 Lot				
J)	All interconnecting piping work with valves:-				
	i) Low Pressure Side till R.O. feed water pump. Piping shall be of extra strong PVC and all valves shall be of extra strong PVC and all valves shall be PVC ball valves. --				
	ii) High Pressure side piping from the R.O. high pressure pumps to the reject stream control valves shall be of SS - 304 using all SS fittings ball valves of suitable pressure rating shall be used till 25 mm size, above 25 mm, flanged globe/ wafer butterfly valves in SS construction shall be used. Rejects pressure control valves shall be globe valve and feed flow control valve shall be of SS-304. -- Lot				
	(All for above from "A" to "J" complete)	Set	1	220339.00	220339.00
15.6.6	Complete Stainless Steel treated water storage tank (double Wall ) of capacity 400 Litres including all inlet/outlet connections, accessories, valves, double seal manhole covers, insulation etc. The Stainless steel tank must be ozone resistant and to be used as ozone contact tank. Fabrication to be done as per approved shop	Set	1	46610.00	46610.00
15.6.7	<b><u>R.O. Plant For Block-1 (Admin/Guest)</u></b>				
1	Supply, installation, testing and commissioning of R.O. Plant capacity of 50LPH (Complete system to be compact type, skid-mounted / cabinet enclosed, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components:-				
	(i) Inlet Quantity : As per Detailing				
	(ii) Output Quantity : 50 LPH				
	(iii) Inlet TDS : 2000 PPM				
	(iv) Outlet TDS : 75 PPM				
	(v) Inlet Hardness : 350 PPM )				
	(vi) Outlet Hardness : 50 PPM )				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
A)	Raw Water pumps of horizontal, centrifugal type suitable for a flow rate of 100LPH at 25m head. The Pump construction shall be of SS-304 & impeller shall be also SS-304. The motor shall be TEFC suitable for a supply of 415V/3-phase/50Hz supply. The pump shall be supplied complete with base channel coupling foundations, bolts, pressure gauge at inlet and outlet of each pump. -- 2 Nos.				
B)	Special Antiscalant Dosing System consisting of one HDPE tank of 100 litre capacity with a positive displacement diaphragm dosing pump having variable flowrate of 0-6 LPH. The motor shall be suitable for operation at 240V/single phase/50Hz supply. the pump shall be supplied complete with necessary polypropylene piping, valves, strainers & injection fittings. -- 1 Set.				
C)	Micron cartridge filter suitable for a flowrate of 100LPH to achieve particle filtration of less than 5 microns. The unit shall be supplied complete with inlet and outlet branches removal cap for replacement of element, inlet and outlet pressure indicators. (One for the pressure treatment & other for CIP system) MOC:				
D)	R.O High Pressure feed pumps of vertical, multistage centrifugal type suitable for a flowrate of 100 LPH at 14 Kg/sq.cm. The pump construction shall be of SS-316-L & impeller shall be also SS-316-L. The motor shall be of TEFC suitable for a supply of 415V/3 phase/50 Hz supply. the pump shall be supplied complete with base channel coupling foundation, bolt, pressure gauge at inlet and outlet of each pump. - 2 Nos.				
E)	R.O. modules made out of Spiral Wound Thin Film composite suitable to withstand pressure of 20kg/sq.cm. Suitable BSPT/NPT connections shall be used for connecting feed & reject ends. the modules shall be supplied complete with all necessary instrumentation, valves for sampling, drain, reject & permeate, epoxy-coated structural steel bases and supports, as per following system capacity requirements:-				
	(i) Total net treated water output of system =50LPH				
	(ii) System recovery = 60 %				
	(iii) Filtration area per membrane = 85 sq.ft.				
	(iv) Number of membranes = The total number of membranes required shall be as per requirements, supported by calculations from the vendor.				
F)	Clean in place pump of horizontal end suction suitable for a flow rate of 100 LPH at required head. The pump construction shall be of stainless steel SS-304. The motor shall be TEFC suitable for a supply of 415V/3 phase/50Hz supply. The pump shall be supplied complete with base channel, coupling, foundation bolts, pressure gauge at inlet & outlet of the pump. -- 1 Set				
G)	Centralised PLC control panel along with touch-screen digital display board along with all digital sensors for TDS & Flow, made out of CRCA sheet min. 2mm thick having main contactors for all pumps (listed above) including SPP, 3 phase thermal overload relay. The control panel for monitoring and control of P.O. system shall include all required signal lamps, HRC fuses, Annunciation box with Hooter. All control and power cabling along with double earthing between the panel shall be included in the scope of supply of the contractor. An emergency stop push button shall be provided in the panel. The MCC panel shall have the following interlocks:-				
	i) High Pressure Pump unit trip in case of Low suction pressure.				
	ii) High Pressure Pump unit trip in case of High discharge pressure.				
	iii) Special anti-scalant dosing pump trips in case high pressure pump trips and vice versa.				
	iv) High Pressure pump trip in case of high conductivity in permeate.				
	v) SHC dosing pump trips incase high pressure pump trips and vice versa.				
	vi) In all above cases Annuciator box indicates nature of malfunctioning.				
	vii) The System should display the TDS of Raw Water & R.O. Water, Flow Rate of Inlet, Outlet & Reject Water simultaneously.				
H)	Instrumentation mounted in R.O. system/panel as follows:-				
	i) Digital Flow meters to measure and control the flow of feed/product/reject stream. -- 3 Nos.				
	ii) Pressure Gauges made out of SS316 (glycerine filled) of pricol/equivalent make. -- 5 Nos.				
	iii) Digital Conductivity probes for conductivity display -- 2 Nos.				
	iv) Pressure Switches to control pressure and given High/Low pressure trip. (Danfoss/Switzer/Square D make) -- 4 Nos.				
	v) Level switches to control water level in the output storage tank and soft Water Tank. -- 2 Nos. 1 Nos.				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
vi)	ORP with dump valve. -- 1 Set				
I)	First fill of all chemicals and lubricants to commission and operate the plants. --1 Lot				
J)	All interconnecting piping work with valves:-				
i)	Low Pressure Side till R.O. feed water pump. Piping shall be of extra strong PVC and all valves shall be of extra strong PVC and all valves shall be PVC ball valves. --				
ii)	High Pressure side piping from the R.O. high pressure pumps to the reject stream control valves shall be of SS - 304 using all SS fittings ball valves of suitable pressure rating shall be used till 25 mm size, above 25 mm, flanged globe/ wafer butterfly valves in SS construction shall be used. Rejects pressure control valves shall be globe valve and feed flow control valve shall be of SS-304. -- Lot				
	(All for above from "A" to "J" complete)	Set	1	50847.00	50847.00
15.6.8	Complete Stainless Steel treated water storage tank (double Wall ) of capacity <b>100 Litres</b> including all inlet/outlet connections, accessories, valves, double seal manhole covers, insulation etc. The Stainless steel tank must be ozone resistant and to be used as ozone contact tank. Fabrication to be done as per approved shop	Set	1	12712.00	12712.00
15.6.9	<b>ONLINE CHILLER SYSTEM (FOR BLOCK 4)</b>				
15.6.9.1	Supply, installation, testing and commissioning of MS powder coated online Chiller system capacity of <b>75 LPH</b> with chilled SS water storage tank of 150 Ltr and Compressor capacity 1-1.5 TR, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components complete in all respects as per the direction of the Engineer-In-Charge:-				
	(i) Cooling capacity : 75 LPH				
	(ii) Compressor Capacity : 1-1.5 TR				
	(iii) Refrigerant : R 22				
	(iv) Power Supply : 1/3 Ph, 220/440 V, 50 Hz				
	(v) Material of construction of body : MS Powder Coated				
	(vii) Inlet water Temperature :35 ± 5° C				
	(vii) Outlet water Temperature : 20 ± 3° C	Set	2	211864.00	423728.00
15.6.9.2	Chilled Water Storage Tank : Capacity 150 Litre, Chiller storage tank shall be made out of 0.8 mm thick SS steel of grade SS 316L, covered with 60 mm thick puf insulation of density not less than 48 kg/m³, having suitable water level sensors, with copper pipe of 12.7 mm dia dipped inside it etc. complete as reqd.	Each	2	46610.00	93220.00
15.6.10	<b>ONLINE CHILLER SYSTEM (FOR BLOCK-3 (Cluster-1))</b>				
15.6.10.	Supply, installation, testing and commissioning of MS powder coated online Chiller system capacity of <b>75 LPH</b> with chilled SS water storage tank of 150 Ltr and Compressor capacity 1-1.5 TR, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components complete in all respects as per the direction of the Engineer-In-Charge:-				
	(i) Cooling capacity : 75 LPH				
	(ii) Compressor Capacity : 1-1.5 TR				
	(iii) Refrigerant : R 22				
	(iv) Power Supply : 1/3 Ph, 220/440 V, 50 Hz				
	(v) Material of construction of body : MS Powder Coated				
	(vii) Inlet water Temperature :35 ± 5° C				
	(vii) Outlet water Temperature : 20 ± 3° C	Set	1	211864.00	211864.00
15.6.10.	Chilled Water Storage Tank : Capacity 150 Litre, Chiller storage tank shall be made out of 0.8 mm thick SS steel of grade SS 316L, covered with 60 mm thick puf insulation of density not less than 48 kg/m³, having suitable water level sensors, with copper pipe of 12.7 mm dia dipped inside it etc. complete as reqd.	Each	1	46610.00	46610.00
15.6.11	<b>ONLINE CHILLER SYSTEM FOR BLOCK-3 (CLUSTER -2 INCLUDING MULTIPURPOSE HALL)</b>				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
15.6.11.	Supply, installation, testing and commissioning of MS powder coated online Chiller system capacity of <b>100 LPH</b> with chilled SS water storage tank of 200 Ltr and Compressor capacity 1-1.5 TR, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components complete in all respects as per the direction of the Engineer-In-Charge:-				
	(i) Cooling capacity : 100 LPH				
	(ii) Compressor Capacity : 1-1.5 TR				
	(iii) Refrigerant : R 22				
	(iv) Power Supply : 1/3 Ph, 220/440 V, 50 Hz				
	(v) Material of construction of body : MS Powder Coated				
	(vii) Inlet water Temperature :35 ± 5° C				
	(vii) Outlet water Temperature : 20 ± 3° C	Set	1	296610.00	296610.00
15.6.11.	Chilled Water Storage Tank : Capacity 200 Litre, Chiller storage tank shall be made out of 0.8 mm thick SS steel of grade SS 316L, covered with 60 mm thick puf insulation of density not less than 48 kg/m³, having suitable water level sensors, with copper pipe of 12.7 mm dia dipped inside it etc. complete as reqd.	Each	1	46610.00	46610.00
15.6.12	<b>ONLINE CHILLER SYSTEM (FOR GUEST AND ADMIN)</b>				
15.6.12.	Supply, installation, testing and commissioning of MS powder coated online Chiller system capacity of <b>50 LPH</b> with chilled SS water storage tank of 100 Ltr and Compressor capacity 1-1.5 TR, as per detailed shop drawings to be approved) for the following parameters and consisting of (but not limited to) the following main components complete in all respects as per the direction of the Engineer-In-Charge:-				
	(i) Cooling capacity : 50 LPH				
	(ii) Compressor Capacity : 1-1.5 TR				
	(iii) Refrigerant : R 22				
	(iv) Power Supply : 1/3 Ph, 220/440 V, 50 Hz				
	(v) Material of construction of body : MS Powder Coated				
	(vii) Inlet water Temperature :35 ± 5° C				
	(vii) Outlet water Temperature : 20 ± 3° C	Set	1	169492.00	169492.00
15.6.12.	Chilled Water Storage Tank : Capacity 100 Litre, Chiller storage tank shall be made out of 0.8 mm thick SS steel of grade SS 316L, covered with 60 mm thick puf insulation of density not less than 48 kg/m³, having suitable water level sensors, with copper pipe of 12.7 mm dia dipped inside it etc. complete as reqd.	Each	1	42373.00	42373.00
15.7	<b>AIR COOLED HEAT PUMP</b>				
15.7.1	<b>AIR COOLED HEAT PUMP FOR GENERATING HOT WATER (FOR BLOCK-4)</b>				
15.7.1.1	<b>Hot Water Recirculation Pumps in Heat pump and tank.</b>				
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement				
	Flow - 700 LPH Per Pump				
	Head - 15 M				
	Capacity - 2 No. 38 KW (1 W + 1 S)	Each	2	677966.00	1355932.00
15.7.1.2	<b>HOT WATER RETURN PUMP</b>				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement	Each	2	72034.00	144068.00
15.7.1.3	<b>Hot Water Storage Tank Capacity 3000 Ltrs</b>				
	Supply, installation, testing & commissioning of Stainless Steel Gr-304(horizontal / Vertical) hot water				
	storage tank suitable for minimum 6 Kg /Sq.cm operating pressure. Tank shall be fabricated with minimum 6mm sheet & 8 mm Dish thickness. Tank shall be provided inlet from hydropneumatic system, inlet / outlet, overflow / drain connection with 12 mm thick MH cover (550 mm OD) pressure relief valve, pressure gauge & Hot watwer outlet. All the valves & accessories shall be suitable for an operating pressure as mentioned above. Tank shall be mounted on 450 mm high steel structural supports with access ladder painted with 2 coats of red oxide paint. (Inlet temperature to hot water storage tank 60-70 deg C)- Tank shall be insulated with 50 mm LRB/ Rock wool of density of 85Kg/m3, including 24 gauge aluminium cladding. Tanks shall comprise of 36 KW (6 KW x 6 Nos) heating 3 Phase elements fabricated with SS 316L as back up to maintain the 60 Deg tempretature in supply.	Each	1	169492.00	169492.00
15.7.2	<b><u>AIR COOLED HEAT PUMP FOR GENERATING HOT WATER (FOR BLOCK-3 (CLUSTER-1))</u></b>				
15.7.2.1	<b>Hot Water Recirculation Pumps in Heat pump and tank.</b>				
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement				
	Flow - 700 LPH Per Pump				
	Head - 15 M				
	Capacity - 2 No. 38 KW (1 W + 1 S)	Each	1	677966.00	677966.00
15.7.2.2	<b><u>HOT WATER RETURN PUMP</u></b>				



HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement	Each	1	72034.00	72034.00
15.7.2.3	<b>Hot Water Storage Tank Capacity 3000 Ltrs</b>				
	Supply, installation, testing & commissioning of Stainless Steel Gr-304(horizontal / Vertical) hot water				
	storage tank suitable for minimum 6 Kg /Sq.cm operating pressure. Tank shall be fabricated with minimum 6mm sheet & 8 mm Dish thickness. Tank shall be provided inlet from hydropneumatic system, inlet / outlet, overflow / drain connection with 12 mm thick MH cover (550 mm OD) pressure relief valve, pressure gauge & Hot watwer outlet. All the valves & accessories shall be suitable for an operating pressure as mentioned above. Tank shall be mounted on 450 mm high steel structural supports with access ladder painted with 2 coats of red oxide paint. (Inlet temperature to hot water storage tank 60-70 deg C)- Tank shall be insulated with 50 mm LRB/ Rock wool of density of 85Kg/m3, including 24 gauge aluminium cladding. Tanks shall comprise of 36 KW (6 KW x 6 Nos) heating 3 Phase elements fabricated with SS 316L as back up to maintain the 60 Deg tempretature in supply.	Each	1	169492.00	169492.00
15.7.2.4	<b><u>AIR COOLED HEAT PUMP FOR GENERATING HOT WATER (FOR BLOCK-3 (CLUSTER -2 INCLUDING MULTIPURPOSE HALL))</u></b>				
5.7.2.4.	<b>Hot Water Recirculation Pumps in Heat pump and tank.</b>				
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement				
	Flow - 800 LPH Per Pump				
	Head - 15 M				
	Capacity - 2 No. 42 KW (1 W + 1 S)	Each	1	677966.00	677966.00
15.7.3.2	<b><u>HOT WATER RETURN PUMP</u></b>				

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement	Each	1	72034.00	72034.00
15.7.1	<b>Hot Water Storage Tank Capacity 3000 Ltrs</b>				
	Supply, installation, testing & commissioning of Stainless Steel Gr-304(horizontal / Vertical) hot water				
	storage tank suitable for minimum 6 Kg /Sq.cm operating pressure. Tank shall be fabricated with minimum 6mm sheet & 8 mm Dish thickness. Tank shall be provided inlet from hydropneumatic system, inlet / outlet, overflow / drain connection with 12 mm thick MH cover (550 mm OD) pressure relief valve, pressure gauge & Hot watwer outlet. All the valves & accessories shall be suitable for an operating pressure as mentioned above. Tank shall be mounted on 450 mm high steel structural supports with access ladder painted with 2 coats of red oxide paint. (Inlet temperature to hot water storage tank 60-70 deg C)- Tank shall be insulated with 50 mm LRB/ Rock wool of density of 85Kg/m3, including 24 gauge aluminium cladding. Tanks shall comprise of 36 KW (6 KW x 6 Nos) heating 3 Phase elements fabricated with SS 316L as back up to maintain the 60 Deg temprature in supply.	Each	1	169492.00	169492.00
15.7.4	<b><u>AIR COOLED HEAT PUMP FOR GENERATING HOT WATER (FOR BLOCK-1 (ADMIN/GUEST))</u></b>				
15.7.4.1	<b>Hot Water Recirculation Pumps in Heat pump and tank.</b>				
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement				
	Flow - 150 LPH Per Pump				
	Head - 15 M				
	Capacity - 2 No. 10 KW (1 W + 1 S)	Each	1	677966.00	677966.00
15.7.4.2	<b><u>HOT WATER RETURN PUMP</u></b>				
	Providing, fixing ,testing and commissioning suitable complete horizontal/ vertical multistage centrifugal pumping set having stainless steel (SS 304) impellers & shaft and single mechanical seal with pumps suitable for 415 Volts, Single Phase 50 cycles A.C Supply complete with all standard accessories including , M.S.channel, base plate complete with vibration isolators, isolating valve on suction and discharge, non return valve on discharge, pressure gauges with stop cock and dial type thermometer on suction or discharge.(suitable for hot water temperature up to 85 deg C.) The pump 2 No (1 working+1standby) complete with Control Unit Panel for automatic Cold & Hot water circulation, manifolds , as per the approval of Project-in-charge complete with base frame, necessary foundation as per requirement	Each	1	72034.00	72034.00

HVAC BOQ					
Construction of Hall of Residence No. 15 for Girls (G + 12) at IIT Kanpur (SH: HVAC work)					
Ref	Description	QTY.	Unit	Rate without GST	Amount without GST
15.7.1	<b>Hot Water Storage Tank Capacity 3000 Ltrs</b>				
	Supply, installation, testing & commissioning of Stainless Steel Gr-304(horizontal / Vertical) hot water				
	storage tank suitable for minimum 6 Kg /Sq.cm operating pressure. Tank shall be fabricated with minimum 6mm sheet & 8 mm Dish thickness. Tank shall be provided inlet from hydropneumatic system, inlet / outlet, overflow / drain connection with 12 mm thick MH cover (550 mm OD) pressure relief valve, pressure gauge & Hot watwer outlet. All the valves & accessories shall be suitable for an operating pressure as mentioned above. Tank shall be mounted on 450 mm high steel structural supports with access ladder painted with 2 coats of red oxide paint. (Inlet temperature to hot water storage tank 60-70 deg C)- Tank shall be insulated with 50 mm LRB/ Rock wool of density of 85Kg/m3, including 24 gauge aluminium cladding. Tanks shall comprise of 36 KW (6 KW x 6 Nos) heating 3 Phase elements fabricated with SS 316L as back up to maintain the 60 Deg tempretature in supply.	Each	1	169493.00	169493.00
	<b>Total RO Plant &amp; Heat pump system</b>				<b>6877118.00</b>
	<b>Grand Total (In Rs.) without GST</b>				<b>56354201.00</b>