

SCHEDULE OF QUANTITIES FOR AIR-COOLED CHILLERS, PUMPS, AHUs WORKS FOR EXISTING AUDITORIUM AT IUCAA, PUNE

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
A	HVAC EQUIPMENTS :				
1.0	SUPPLY OF AIRCOOLED SCROLL CHILLERS				
	Supply of Air-cooled Scroll. The contractor shall furnish and install Rotary Scroll Chillers as per the Technical Specifications and shown and scheduled in the plans.				
	The Compressor(s) shall be Hermetic type Rotary Scroll fixed /Compressor(s) with integral motor suitable for 415V/ 3ph / 50 Hz AC supply. The compressor capacity control shall be as specified.				
	Condensor shall be Air-cooled type and shall be made of integrally finned seamless copper tubes mechanically expanded into aluminum alloy fins with full height collars with integral subcooling arrangement. Design working pressure shall be 450 PSIG (31 bar). Air entering Condenser: max 42 deg.C (to suit Ambient Temp.)				
	The condensor fans shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades / Al. blades molded into low noise, full airfoil cross section, providing vertical air discharge from extended orifices for efficiency and low sound. Each fan in its own compartment to prevent cross flow during fan cycling. Guards of heavy gauge, PVC (polyvinyl chloride) coated or galvanized steel.				
	The fan motors shall be as specified High efficiency, direct drive, single /3-phase, insulation class "F", current protected, totally enclosed air-over (TEAO), rigid mounted, with double sealed, permanently lubricated, ball bearings.				
	Evaporator: Removable heads shall be supplied for cleaning and servicing of cooler tubes with Victaulic type water-side connections-factory supplied. Brazed heat exchanger plate made of AISI 316 stainless steel, externally coated with a anti-condensation mat in a closed cell neoprene / closed cell foam (CFC and HCFC-free) thermal insulation, weather proof and UV resistant. Safeties to be included - Electric resistance thermostat & Differential pressure switch to protect against ice formation inside the unit, Low pressure drops and optimized energy exchange.				
	Evaporator shall be selected for a fouling factor of 0.0001 hr•ft ² °F/BTU (0.018 M ² •°C/kW) The evaporator shall be insulated with a single or double layer of 50 mm thick closed-cell foam insulation with a 0.28 K factor at 75°F mean temperature.				
	The entire chiller package should be mounted on a skid and totally assembled, electrically wired, charged and run-tested before its deilivery to site. The Chiller package should include 1st charge of oil and gas as required to commisssion and handover of the system.				

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	The units shall be installed in accordance with this specification and produce the specified tonnage per the scheduled data in accordance.				
	The Chiller Package should have a factory fabricated and installed Control and Starter Panel with proactive micro computer panel with DDC controller and with open protocol* and suitable for hook up to central BMS. (The working and standby chiller sequencing, programming, scheduling the chillers for equal run, auto stand-by change over, fault take off etc. as specified shall be included)				
1.1	Actual Capacity : 17.55 TR	4	Sets		
	(3 Nos. Working + 1 No. Standby)				
	Number of Scroll Compressors & Circuits / Per Chiller: 2 Min				
	Refrigerant : R410A				
	Chilled water In/Out °C : 12/ 7				
	Chilled water flow rate: To be Specified by Vendor but not less than 11.1 m3/hr				
	Air entering Condenser: max 42°C (Design Ambient Temp.)				
	Chiller (Evaporator) Fouling Factor: 0.0001 hr•ft ² °F/BTU (0.018 m ² •°C/kW)				
	Min Acceptable COP @ 100% 35 Deg C Ambient – 3.35				
	Min EER Btu/h / W - 11.5				
	Noise Level : shall not exceed 66 dBA at 1 mtr.				
	Condenser Coil - Minimum 3 Rows				
	Condenser Fan - Minimum 2 Nos				
	Condenser Fan Motor - Dual Speed shall be vary as per discharge pressure.				
	Expansion valve - Electronic Type				
	Protection Devices - High & Low Pressure / Thermal Protector / Overload Protector / Phase Sequencer				
	External wired controller for all 4 Chillers, Remote Operation Can be possible. Cost shuld include in chiller package				
2.0	SUPPLY, INSTALLATION, TESTING & COMMISSIONING of above Air-cooled Scroll Chillers.The costs shall also include the necessary oil and gas topping up as required till the handover. The commissioning activites and testing shall be carried out to meet the project requirements and readings noted shall also be submitted in accordance with Commisioning requirements and in a required format. The costs shall also include pressure testing & refrigerant gas R410A upto commissioning & handover.				
	The contractor / supplier shall make his own site survey / study of plan for placement of chiller on the Terrace floor. Necessary crane / other specialised equipment / manpower etc. to be included in this scope. A detailed movement plan to be submitted a week before the chiller is being delivered and lifted up.				

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	Installation of chillers shall mean Unloading, lifting-shifting, positioning, levelling & installation in place. These works shall be carried out by qualified & authorised personnel from the suppliers side.				
	Necessary foundation / platform for mounting of chillers shall be made by HVAC vendor as per site requirement. Each chiller shall be mounted on set of cushy foot / spring isolator type vibration isolators provided by Chiller vendor.				
	Also Include for above Chillers - Coordination with Chiller supplier, installing piping connections with mating victaulic couplings (supply of victaulic couplings are part of chiller supply), special fittings etc. for chilled water connections, Adaptor box with provision for acceptance of incoming Aluminium armoured cable & connecting copper cable for termination into each chiller mounted Electrical Panel. (Costs for Adaptor box with connecting copper cable to be included)				
2.1	Installation, Testing & Commissioning of 17.55 TR Chillers	4	Sets		
3.0	Pumps				
	Supply, Installation, Testing and Commissioning of electrically driven pumpset having End Suction Pump / Inline type Pump / End suction Back pull out design pump coupled pump. with bronze impeller and mechanical seal. Motor shall be TEFC Sq.cage, 1460/2920 RPM, foot mount, IP55, Class F insulation, high efficiency IE3 rated, suitable for electrical supply of 3 ph-4 wire / 415V/50hz. Pumps shall be of high efficiency (efficiency 75% and above) as specified.				
	The pumpset shall be complete as per technical specifications and complete with coupling, coupling guard, MS Pre-fabricated base frame with slide rail, foundation bolts etc. as required.				
	Installation of Pumps shall mean unloading, lifting-shifting, positioning, levelling, erection & installation in place. The pumps shall be installed free of vibration. Since the pumps are being placed as outdoor duty, a sheet metal fabricated cap shall be placed on the motor top.				
	(Necessary foundation / structural fabrication to be included). Working and Standby pumps can be placed on a common framework skid (heavy duty fabricated) for compact installation. Costs to be included.				
3.1	Chilled Water Primary Pumps should be suitable for Chiller Capacity of 17.55 TR: (3 Nos.working + 1 No. standby)	4	Sets		
	Chilled water flow rate: 11.2 m3/hr)				
	Head: 18 mtrs (Vendor to check and confirm actual head required)				
	Motor KW: - to be confirmed by vendor				
4.0	Air Handling Units				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Supply and Assembly of Sectionalised, Horizontal Double Skin Air Handling Units constructed of extruded aluminum hollow sections framework, preplasticised GS Sheets of 24G (outside) / 22G (inside) with 45mm +/- 2mm thick double skin sandwich panels having rockwool insulation of density 60 kg/cum,, consisting of fan section having direct drive backward curved Radial EC fan (Electronically commutated) with permanent magnet brushless DC motor for stepless variation of speed of fan based on temperature / pressure sensor inputs. vibration isolators as required to be provided. Frame Structure shall consist of 48mm Extruded Aluminium thermal break profile complying to TB2 as per EN1886 wherever specified.				
	Coil Section with 6 row-12 fpi Chilled Water cooling coil with Cu Tubes / Al.fin Coil headers shall be of copper as specified. Drain tray shall be insulated sandwich type drain tray of SS (inside) / GI (outside) with liberal drain connections on either side shall be provided.				
	The Double skin Sections shall include for Coil Section, Fire retardant double canvass connections, DP ports at each section, damper at AHU outlet, access doors with limit switch, maintenance lamp inside the fan section shall be included. The other sections viz: RA plenum, FA plenum , Microvee Filter section shall be provided in modular construction with enough service space and proper access doors as specified (wherever specified / required)				
	The filters shall be confirming to EU / Eurovent standards. The filters shall be with Al. Flange / Frame type with thermally bonded hydrophobic polyolefin fibers [synthetic] washable media. The filters shall be tested for filter efficiency as per EN779 & EN1822				
	AHU's should be suitable for Floor / Loft / Ceiling mounted as Specified. Fan outlet velocity not to exceed 1800 fpm. Coil face velocity not to exceed 500 fpm.				
	The cost shall also include for Starter Panel with dedicated microprocessor based controller (BMS compatible with open protocol and preferably with BACnet / BACnet IP) with software duly downloaded as necessary and as described in the specifications and complete with ON/OFF push buttons with ON/OFF/Trip indications, NO-NC (non polarized) contacts for tripping on signal from fire alarm panel.				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Microprocessor Controller shall provide following outputs minimum. 1. EC fan operation status 2. Chilled water valve operation status 3. AHU Airflow (CFM) 4. AHU power consumption 5. Chilled water in/out Temp 6. Chilled water flowrate 7. Common Alarm 8. Integration with fire alarm to shut AHU incase of fire				
	Installation of AHU's shall mean Unloading, lifting-shifting, positioning, levelling & installation in place. The AHUs shall be installed free of vibration.AHU supplier shall arrange to depute personnel during testing and commissioning and submit a report of the findings and confirm correctness of performance being delivered.				
	Necessary foundation blocks / structural platform to be included under civil scope. For ceiling Suspended AHUs, suitable arrangement to be provided for its ceiling suspension.				
	Horizontal Floor Mounted Side Discharge AHU having Double skin sections, fans with 65 mm TSP, CHW Cooling Coil of 6 R-12 FPI, 90% Efficiency 10 micron (EU4) washable HDPE pre-filters & should be of Low Height & Low Noise for Auditorium application				
4.1	AHU 54 TR / 22000 cfm (for Basement & fresh Air requirement)	1	Set		
5.0	VARIABLE FREQUENCY DRIVE FOR AHUs				
	Incase of AHU fans with EC motor, VFD item will not be required. Vendor to reconfirm.				
	Supply, Installation, Testing and Commissioning of variable speed drives for AHU Fan Motor(s) with 1 No. dedicated microprocessor based controller with software duly downloaded, Adjustable frequency drives, differential pressure sensor/ transmitters as necessary and as described in the specifications and complete with:				
	Integration with bypass mode for Normal starter operation. VFD shall be IP-20/21 suitable to be housed in AHU Starter Panel.				
5.1	VFD (specific for HVAC application) for motors upto 15 KW	RO	Set		
6.0	Supply, installation, testing and commissioning of Double Skin Supply Air Plenum , Sectionalised, constructed of extruded aluminum hollow sections framework, preplasticised GS Sheets of 20G (outside) / 20G (inside) with 50 mm thick Rockwool Insulation / 60 kg/cu.m + 5% density & with thermal break - same specs that of the AHU above.	RO	Set		

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	All internal corners to be with coving sections of extruded aluminium. Internal surface shall be smooth and shall be cleanable without any projection. Plenum must have a inspection window and a access door with interlock. SA Plenum may be additionally acoustically treated to meet NC criteria.				
B	AIR DISTRIBUTION:				
	Airdistribution work is limited to ducting within AHU room that is required for the connectivity with new AHU along with acoustic lining				
1.0	Sheet Metal Ducting - Factory Fabricated				
	Rectangular / Circular Ducting in Galvanised Steel				
	Supply, fabrication, installation and testing of GSS metal ducts as per IS-277 (180 GSM both sides, LFQ & confirming to Class VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including volume control duct dampers, accessories, vanes, 3 mm neoprene rubber gasket etc. complete as per specifications & approved shop drawings.				
	No slip joints shall be allowed. Flanges shall be Rolamate or equivalent and ducts upto 1500 mm width shall be with rigid support (Gripple support to be provided wherever required) as per technical specifications.				
	Ducts to be sent in Fully Factory fabricated and in boxed form. The factory fabricated ducts shall be of pre-approved make only.				
	The quoted costs should include:				
	i) Ducts with reinforcement/ strengthening				
	ii) Air tight joints				
	iii) Accessories such as splitter, damper, guide vane etc.				
	iv) Hangers and supports (Gripple Supporting method to be used wherever required)				
	v) Painting with Black color paint for duct sides behind the grills.				
	vi) The gasket used in case for all ducts shall be fire retardant type				
	vii) Ducts shall be fully sealed with Silicon Sealant for leak tight installation.				
	Ducts shall be leak pressure tested & leakages should be within acceptable limits as specified at Min. 500 Pa				
1.1	0.50 mm (26 SWG) GSS ducting (upto 600mm)	RO	Sq.M.		
1.2	0.63 mm (24 SWG) GSS ducting (601mm-750mm)	RO	Sq.M.		
1.3	0.80 mm (22 SWG) GSS ducting (751mm-1500mm)	20	Sq.M.		
1.4	1.00 mm (20 SWG) GSS ducting (1501mm-2250mm)	60	Sq.M.		
1.5	1.25 mm (18 SWG) GSS ducting (2251mm and above)	RO	Sq.M.		
2.0	Sheet Metal Ducting - Site Fabricated				
	Rectangular Ducting in Galvanised Steel				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Supply, fabrication, installation and testing of GSS metal ducts as per IS-277 (120 GSM both sides, LFQ & confirming to Class VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/ supports, volume control duct dampers, accessories, vanes, 3 mm neoprene rubber gasket etc. complete as per specifications in accordance with the approved shop drawings. No slip joints shall be allowed. Flanges shall be Rolamate or equivalent and ducts upto 1500 mm width shall be with rigid support (Gripple support to be provided wherever required) as per technical specifications.				
	Ducts to be fabricated at the jobsite. Site Fabrication work shall be limited to assembly, installation and suit to site pieces and collars/ droppers.				
	The quoted costs should include:				
	i) Ducts with reinforcement/ strengthening				
	ii) Air tight joints				
	iii) Accessories such as splitter, damper, guide vane etc.				
	iv) Hangers and supports (Gripple Supporting method to be used wherever required)				
	v) Painting with Black color paint for duct sides behind the grills.				
	vi) The gasket used in case for all ducts shall be fire retardant type				
	vii) Ducts shall be fully sealed with Silicon Sealant for leak tight installation.				
2.1	0.63 mm (24 SWG) GSS ducting (upto 750mm)	RO	Sq.M.		
2.2	0.80 mm (22 SWG) GSS ducting (751mm-1500mm)	RO	Sq.M.		
2.3	1.00 mm (20 SWG) GSS ducting (1501mm-2250mm)	10	Sq.M.		
2.4	1.25 mm (18 SWG) GSS ducting (2251mm & above)	20	Sq.M.		
3.0	Accessories				
	Supply, fabrication, assembling, installation, adjusting & testing of air distribution accessories of assorted size as specified and shown on the drawing:				
3.1	Volume Control Dampers				
	Supply, installation and adjusting of GSS Volume Control Damper within ducts complete as specified and with suitable links, levers. Blades should be opposed blade type. The blades should be mounted in nylon bushes operated by an interior wheel gear system. Manual quadrant control with position indicator to be provided to enable adjust volume of air as required.	3	Sq.M.		
3.2	Fire and Smoke Dampers				
	Fire and Smoke Dampers (FSD) shall be installed in supply air duct when they pass through AHU room walls as shown in the drawings and as per specifications. The Fire Dampers shall be operated with atleast 90 minutes fire rating as per UL-555S-Class I for fire and smoke management rated for 90 min. and UL Stamped.				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Fusible Link should be rated for 72°C. Each FSD shall be of multi leaf type, low leakage and shall be tested in the factory and will be certified by the manufacturer in form of the test certificate.				
	Each FSD shall be supplied with matching extended sleeve (factory supply) and set of retaining angles for installation on wall / slab as indicated on drawings. [up to max size of 1200 mm x 350 mm - This duct size is given as guideline for estimate, actual duct sizes in the approved drawings shall prevail]. Fire Dampers shall be provided with access doors in ducts / false ceiling.				
3.3	Fire and Smoke Dampers - Specifications same as above item B-3.2 but suitable for Motorised Actuator	4	Sq.M.		
3.4	Motorised Actuator for item B-3.3				
	The Actuator shall be direct coupled spring return type and motorised. The Actuator shall be in line with the Technical Specifications and shall be maintenance free direct coupled spring return type suitable to work on 24 V electric supply. The torque rating of the actuator shall exceed at least by 15% over torque required to open / close the damper. Shall have manual over ride facility.	3	Sets		
	The selection of actuator size shall be the responsibility of the manufacturer. Power on indicating lamps with 230 V / 24 V transformer, damper close & open indication, reset push button, push button for manual running of actuator for periodic inspection, auxiliary contacts 24V & 230 V, contact points to receive signal from smoke detector / fire alarm panel etc. should be provided.				
3.5	Double Canvas Connection				
	Supply, fabrication & installation of double canvas (fire retardant) flexible connection as per drawings & specifications.	5	Sq.M.		
3.6	Al. Louvers				
	Supply, installation, testing & commissioning of Fresh Air /Exhaust Air Louvers - constructed in Extruded Aluminium Anodised finish. Blades inclined at 45deg. on 40mm pitch complete with:	RO	Sq.M.		
	a) Sheet steel enclosure cowl				
	b) Opposed Blade Volume Control Damper				
	c) Bird wire guard in galvanised steel with front flanged frame				
4.0	Supply and Installation of Duct Sound Attenuators in SA and RA ducts for 1000mm / 1200mm / 1500mm / 1800 mm lengths as specified complete with multiple baffles, acoustic lining and sound absorbing perforated sheets on the inside as specified & as per approved design. The duct sound attenuators shall be factory fabricated with the sheet metal enclosure casing, not less than 1.0 mm (20 gauge) galvanized sheet steel, or 1.3 mm (18 gauge) as per duct sizing aluminium fitted with suitable flanges to make clean airtight connections to ductwork.				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	The insulating material shall be with 25mm thk / 25 Kg/m3 density acoustic insulation- physically crosslinked open cell polyolefin foam with reinforced aluminium foil facing meeting class 0 as per BS 476 Part 6 & 7 and meeting NRC of 0.4 as per ISO 356.				
	Expected reduction in Noise shall be 10-12 dB. Noise reduction data to be submitted accordingly.				
4.1	1750 x 1150 (SA Duct) - 1800 L	1	No.		
5.0	CO2 Sensor with Modulating type damper for Fresh Air Control	1	Set		
	Supply, Installation, Testing and Commissioning of:				
	CO2 Sensor with monitor (with display) with 230V/ 24V transformer, control cabling, module from sensor to F.A. modulating type damper as per specifications mentioned. The cost should include costs for F.A. modulating dampers of required sizes. The controller shall be of open protocol and compatible with BacNET, Lan Works etc.				
	The Actuator shall be in line with the Technical Specifications and shall be maintenance free direct coupled spring return type suitable to work on 24 V electric supply. The torque rating of the actuator shall exceed at least by 15% over torque required to open / close the damper. Shall have manual over ride facility. The selection of actuator size shall be the responsibility of the manufacturer. Power on indicating lamps with 230 V / 24 V transformer, damper close & open indication, reset push button, push button for manual running of actuator for periodic inspection, auxiliary contacts 24V & 230 V, contact points should be provided.				
6.0	Testing, Adjustment, Balancing & Commissioning of complete Air side and Water side for the HVAC System installed which would involve : Involvement of 1 Engineer, 4 Technicians, 4 helpers shall be treated as 1 team-day. # total 15 team days. (The air balancing activity with digital flow measuring hoods of appropriate size, pitot tube, anemometers, digital thermometers, sling psychrometers, pitot tubes etc. is part of scope of low side vendor deliverables and not to be included as part of this item) The scope would also include demonstration of the test readings in random in presence of the HVAC Consultant & Client for final review and sign-off.	1	Lot		
C	WATER DISTRIBUTION:				
1.0	Chilled Water Piping				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Supply, fabrication, assembling, laying, testing and balancing of chilled water piping using Mild Steel Heavy Duty "C" Class Pipes as per IS 1239 Part A & B & IS 3589 with all heavy duty fittings such as bends, elbows, tees etc. and complete with vibration isolators, hangers, full round PU supports as per specifications. The chilled water piping on terrace and outside of the HVAC Plant room shall be suitably supported for proper head room clearance. This supporting arrangement shall be included in the respective pipe sizes and no additional measurements / costs shall be considered.				
1.1	125 NB[thk. as per IS 1239 - heavy duty]	RO	RMT		
1.2	100 NB[thk. as per IS 1239 - heavy duty]	120	RMT		
1.3	80 NB[thk. as per IS 1239 - heavy duty]	RO	RMT		
1.4	65 NB[thk. as per IS 1239 - heavy duty]	RO	RMT		
1.5	50 NB[thk. as per IS 1239 - heavy duty]	96	RMT		
1.6	40 NB[thk. as per IS 1239 - heavy duty]	RO	RMT		
2.0	Valves				
	Supply, installation, testing & commissioning of heavy duty valves PN-16 rated for all valves, as specified and shown on the drawing complete with:				
	a) Flanges for valves above 50 mm dia and screwed ends with flanges for valves below 50-mm dia.				
	b) Additional supports				
	c) Nuts, bolts, gaskets etc.				
	d) with ports for balancing valves only				
2.1	Butterfly Valves				
2.1.1	125 mm butterfly valves	RO	No.		
2.1.2	100 mm butterfly valves	2	Nos.		
2.1.3	80 mm butterfly valves	RO	No.		
2.1.4	65 mm butterfly valves	RO	Nos.		
2.1.5	50 mm butterfly valves	16	No.		
2.2	Ball Valves				
2.2.1	40 mm ball valves	RO	No.		
2.2.2	32 mm ball valves	1	No.		
2.2.3	25 mm ball valves	1	No.		
2.3	Non Return Valves [NRV] / Check Valve				
2.3.1	80 mm NRV	RO	No.		
2.3.2	65 mm NRV	RO	Nos.		
2.3.3	50 mm NRV	4	No.		
2.4	Y Strainer				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
2.4.1	80 mm NRV	RO	No.		
2.4.2	65 mm NRV	RO	Nos.		
2.4.3	50 mm NRV	4	No.		
2.5	Manual Balancing Valves				
2.5.1	100 mm Balancing Valve	1	No.		
2.5.2	80 mm Balancing Valve	RO	No.		
2.5.3	65 mm Balancing Valve	RO	No.		
3.0	2 way Motorised Valve - ON/OFF type (at Chiller outlet)				
	Supply, installation, testing & commissioning of heavy duty valves as specified and shown on the drawing complete with:				
	a) Flanges for valves above 50 mm dia and screwed ends with flanges for valves below 50-mm dia				
	b) Additional supports				
	c) Thermostat, 100VA -transformer, mounting plate etc.				
	d) Union, nut bolts, gaskets or any other special fittings as required.				
	e) With Controller, Sensor, Thermostat, Mounting Brackets etc.				
3.1	100 mm 2 way motorised valves	RO	No.		
3.2	80 mm 2 way motorised valves	RO	No.		
3.3	65mm 2 way motorised valves	RO	Nos.		
3.4	50 mm 2 way motorised valves	4	Nos.		
4.0	Miscellaneous Control				
4.1	25 mm Air release valve	1	No.		
4.2	25 mm Auto Purge valve	1	No.		
5.0	AHU Valve Station				
	Supply, installation, testing & commissioning of heavy duty valve station complete with Butterfly Valves PN 16 (3) with flanges, Ystrainer (1) with flanges, bypass arrangement & Butterfly valve (2), 3 way motorised modulating valve PN 16 (appropriate size an suitable cv value) to be placed in return chilled water line with control cabling from actuator to digital thermostat (with buiilt in sensor), Binder Points for 4" Dial type Thermometer & 4" dial 0-10 kg/cm2g Pressure Gauges, Bypass line ball /globe valve, Drain Plug for AHU coil, mounting bracket for valve station & interconnecting heavy duty piping for the valve station as specified and shown on the drawing for following sizes:				
5.1	100 mm dia	1	Set		
5.2	80mm dia	RO	Set		
6.0	Instruments and Indicators				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Supply and installation of instruments and Indicators as specified				
	a) Pressure gauges with gauge cocks-1/2"				
	b) Thermometers with thermowells				
6.1	Pressure gauge 6" dial (range 0-10kg/cm ² g)	16			
6.2	Thermometers Dial type - 6" dial (range 0-50deg.C)	8			
6.4	Immersion type temperature sensors (range 0-20deg.C)	RO			
7.0	Expansion Bellow / Flexible Connectors				
	Supply and installation of rubber flexible connection at the Chiller & pump inlet and outlet complete with flanged joints, nuts, bolts and gasket. The flexible connectors shall be with AISI 321 SS corrugated tubing with AISI 304 SS single overbraid & SS fittings.				
7.1	100 mm connection	RO	Set		
7.2	80 mm connection	RO	Set		
7.3	65 mm connection	RO	Sets		
7.3	50 mm connection	8	Sets		
8.0	Test Points for Chilled Water Line				
	Supply & Installation of Test points with needle valves & plug at various locations in chilled water line for taking pressures and temperature measurements using portable instruments complete with thermowell etc.	4	Nos.		
9.0	Open Type Make up cum Expansion Tank				
	Supply and installation of Make up tank as specified and shown on the drawing complete with:				
	a) Inlet, Make up, overflow & drain nozzle				
	b) Level indicator				
	c) Manhole with cover				
	d) 20 mm ball float valve				
	e) Air release valve				
9.1	200 litres water tank	1	Set		
10.0	Combination Suction Deareator & Dirt Sperator				
	Comprising of Fabricated Vessel consisting of unique tubes for dirt seperation, auto air vent, air chamber, collection chamber, drain valve etc. & suitable for pipe size upto 1 x 100 mm (OR 3 x 65mm / 2 x 80mm dia) with flanged connections & mating flanges. The unit shall have integral magnetic particle collector and air seperator.	1	Set		
11.0	Make up Piping				
	Supply, installation & testing of Mild Steel Medium Duty "B" Class drain piping with elbows, bends, tees, cleanouts etc. without insulation complete as per Technical Specifications.				
11.1	Upto 50 mm dia	70	RMT		

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12.0	Insulated Drain Piping				
	GI 'B' class make up / drain piping with U traps, elbows, bends, tees, cleanouts etc. from pipe sizes 19mm upto 40mm dia (without insulation) complete as per Technical Specifications. The piping shall be suitably insulated with 19 mm thick physically crosslinked polyolefin foam with factory laminated heavy duty and ultra tough multi-layered composite aluminium foil facing with puncture resistance of >400N as per ASTM D4833 and Class 0 fire properties as per BS 476 Part 6 & 7 and as per the specification.				
12.1	50 mm dia	12	RMT		
12.2	40 mm dia	RO	RMT		
12.3	32 mm dia	RO	RMT		
13.0	Hard PVC Piping (AHU Drain)				
	Supply, installation & testing of Hard PVC drain piping with U traps, elbows, bends, tees, cleanouts etc. The piping shall be suitably insulated with 19mm thk, Physically crosslinked polyolefin foam with factory laminated heavy duty and ultra tough multi-layered composite aluminium foil facing with puncture resistance of >400N as per ASTM D4833 and Class 0 fire properties as per BS 476 Part 6 & 7 and as per the specification.				
13.1	50 mm dia	12	RMT		
13.2	40/32 mm dia	RO	RMT		
D	INSULATION WORKS				
1.0	Thermal Insulation of Piping, Valves etc.				
	Supply, installation and testing of insulation for chilled water piping insulation, complete with bends, elbows, tees, duly insulated with RESIN BONDED PIPE SECTION - Duly insulated with 80 kg/cum density resin bonded fiber glass pipe section insulation covered with a layer of 120 gm/sqm polythene sheet (vapour barrier) and finally applying 0.56 mm 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.				
1.1	125 NB with 40 mm thk	RO	RMT		
1.2	100 NB with 40 mm thk	120	RMT		
1.3	80 NB with 40 mm thk	RO	RMT		
1.4	65 NB with 40 mm thk	RO	RMT		
1.5	50 NB with 32 mm thk	96	RMT		
2.0	Thermal Insulation of Ducts				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	Supply, fabrication & Installation of thermal insulation on GI ducts complete with Physically crosslinked polyolefin foam with factory laminated reinforced aluminium foil facing with Class 0 fire properties as per BS 476 Part 6 & 7 as per the specification. The insulation joints shall be sealed with 3" wide Black Tape.				
2.1	25 mm thick Insulation	60	Sq.M.		
2.2	19 mm thick Insulation	50	Sq.M.		
2.3	13 mm thick Insulation	RO	Sq.M.		
3.0	Acoustic Insulation of Walls / AHU RM				
	Supply, fabrication and installation of Acoustic insulation on walls and Trap doors as specified and shown on the drawing complete with: 24 mm thk, Physically crosslinked Open cell polyolefin foam with factory applied reinforced aluminium foil having density of 25kg/m ³ and meeting the Class 0 requirements of Fire safety as per BS 476 Part 6 & 7. The material shall be antifungal in nature and tested to ASTM G21 standard.	100	Sq.M.		
4.0	Acoustic Lining of Ducts				
	15 mm thick acoustic insulation physically crosslinked open cell polyolefin foam with reinforced aluminium foil facing meeting class 0 as per BS 476 Part 6 & 7 and meeting NRC of 0.4 as per ISO 356. w, Stuck to inside of duct walls with manufacturer recommended adhesive / 520 bonding. Insulation material shall be antifungal.	80	Sq.M.		
5.0	Underdeck Insulation				
	Supply, fabrication and laying of under deck thermal insulation of approved make as specified and shown on the drawing complete with 25mm thick physically cross linked polyolefin foam insulation, with reinforced aluminium foil facing, meeting class O as per BS 476 Part 6 &7, permability resistance u of 80,000 & above or equivalent stuck to the underside of the exposed slab with recommended /proprietary synthetic adhesive bonding and held in place with GI wire 16 SWG lacing and GI washers at approved distance.	RO	Sq.M.		
E	ELECTRICAL WORKS FOR HVAC:				
1.0	Electrical Panel for Chillers & Pumps at Terrace				
	Supply, Installation, Testing & Commissioning of Power Distribution Panel (outdoor type) for HVAC comprising of fully compartmentalised cubicle type panel, as per specifications and complete with :				
	i) Tinned Al. Busbars				
	ii) 7 tank pre-treatment, Panel with IP 65 construction				
	iii) Oven baked epoxy paint finish or powder coated				
	iv) Incoming and outgoing feeders				
	v) Indicating and measuring instruments				
	vi) Interconnections, interlocking, earthing etc.				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	vii) Starters & control panel				
	viii) Incomer to this panel shall have a 250 A, 4 pole, changeover switch before the main MCCB for accepting two separate incoming power supply.				
	Panel Cost should include also OLP, SPP, On/ Off push buttons with On / Off / Trip indications, 3 Nos. non polarised NO-NC contacts tripping on signal from fire dampers / fire alarm panel & BMS.				
	HVAC Main MCC Panel with IP 65 construction (suitable for locating exposed on Terrace)				
1.1	(Incoming Power with earthing as required to be provided from AHU room below. Incomer suitable for 200A MCCB TPN / 25 KA x 1 No.)	1	Set		
	(ii) Outgoing				
	a) Feeders for Air cooled chillers (4 Nos.) 23 kW each, 100 A TPN MCCB, 25 KA X 4 Nos. (3 working + 1 Stand by).				
	b) Feeders with Starter & Control Panel for Chilled Water Pumps upto 7.5 kW, 63 A TPN MCB 10 KA X 4 Nos.(3 working + 1 Stand by).				
	c) Spare feeder with 100 A TPN MCCB 25 KA X 1 No.				
	d) Spare feeder with 63 A TPN MCB 10KA X 1 No.				
2.0	Electrical Cabling Earthing, Terminations & Lugging for Chillers and Pumps				
2.1	Cabling				
	Cables shall be as per Technical Specifications and XLPE insulated type armoured with overall PVC sheath unless otherwise stated.				
	Power cabling of copper armoured cable from control panel to motor with double compression gland & Copper armoured Control cabling with hookup to its controller. (i.e.. Control cabling for 3 way valve operation between sensor, controller, transformer and actuator to be included)				
	Cabling rate to include end terminations, termination, lugging etc. as per specifications.				
	(All structural / supporting work, cable trays to be included in vendors scope of work.)				
	Control Cabling & Termination for each Chiller upto the control panel.				
	Control Cabling & Termination for each Pump upto the control panel.				
	Power cabling from panel upto respective Chiller.				
	Power cabling from panel upto respective pump.				
	Cabling & looping for fire damper and tripping of AHU / Fan motors based on fire signal from FAS panel.				
2.1	Power Cabling (XLPE)				
2.1.1	3.5C x 185 sq.mm Al. armoured conductor cable, as per specs.	50	RMT		

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
2.1.2	4C x 16 sq.mm Cu. armoured conductor cable, as per specs.	RO	RMT		
2.1.3	4C x 10 sq.mm Cu. armoured conductor cable, as per specs.	80	RMT		
2.1.4	4C x 6 sq.mm Cu. armoured conductor cable, as per specs.	80	RMT		
2.1.5	4C x 4 sq.mm Cu. armoured conductor cable, as per specs.	RO	RMT		
2.2	Control cabling				
	All Cabling rates to include End terminations as per specifications. Cables shall be as per Technical Specifications and XLPE insulated type unless otherwise stated.				
2.2.1	2C x 1.5 sq.mm Cu. Armoured conductor cable, as per specs.	100	RMT		
2.2.2	5C x 1.5 sq.mm Cu. Armoured conductor cable, as per specs.	100	RMT		
2.2.3	2C x 2.5 sq.mm Cu. Armoured conductor cable, as per specs.	RO	RMT		
2.2.4	5C X 2.5 sq.mm Cu. Armoured conductor cable, as per specs	RO	RMT		
2.3	Earthing				
	Supply, Installation, Testing and Commissioning of:				
2.3.1	6 / 8 SWG GI double earthing	100	RMT		
2.3.2	25 x 3 mm GI double earth strip	60	RMT		
2.3.3	50 x 6 mm GI double earth strip	RO	RMT		
3.0	Cable Trays				
	Supply and installation of GI perforated type cable trays of the following sizes fabricated out of perforated hot dip galvanised MS sheets of minimum 2 mm thick with 75 mm flange to be installed horizontally or vertically.				
	The cable tray shall be complete including cost of bends, elbows, cross, tees, reducers etc as per drawings/ site condition and rate shall include cost of anchor fasteners, screws, nuts, bolts and misc. other fixing hardware painting of support structure etc as required.				
	i) Structural steel such as ISMC, ISA, flats, rods etc to be used for support shall be included in this item.				
	ii) The cable tray shall be factory built. Bidder shall include in his price, required numbers of Tees, Crosses, Bends, Elbows etc as required as per actual site conditions.				
	Ladder Type G.I. Cable Tray with GI Supports :				
3.1	300 mm wide	RO	RMT		
3.2	200 mm wide	100	RMT		
3.3	150 mm wide	50	RMT		
3.4	100 mm wide	RO	RMT		
F	EVAPORATIVE COOLING SYSTEM FOR COMMON AREAS				
1.0	Evaporative Cooling Unit				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	<p>Design, fabricate, supply, delivery, unloading at site (as per approved equipment layout), site assembly, installation, testing and commissioning of floor mounted horizontal type two stage air washer unit with draw through arrangement. Air washer unit shall be of double skin construction type. The inner skin 22G (0.8 mm) plain G.I. panel and 22 G (0.8mm) G.I. preplasticized outer skin with 25 mm thick & 40±2 kg/m³ density PUF insulation sandwiched between panel, with internal coving, with necessary extruded Hollow Aluminium profile structure with nylon connectors, frame work for supporting channels, foundation bolts with canvas connections & required accessories for final assembly. Blower door provided with mechanical guard and limit switches for additional safety. Primary blower shall be plug type fan consisting of TEFC 4/6P, IP55 & IE3 type motor. Unit shall be provided with Marine light # 3 no's, 1 no limit switch, internal electrical wiring & cabling for limit switch & marine light, control cabling for limit switch up to main HVAC MCC panel. Unit shall consists of following section viewing from fresh air entry side.</p>				
	<p>Pre filter section</p> <ul style="list-style-type: none"> - Extruded Al low leakage manual fresh air damper with calibration knob. - G4 type 50 mm thick flange type washable Prefilter in aluminium frame construction designed with not more than 500 fpm velocity. (10 micron filtration with 90% efficiency) & - Bag type Fine filter in aluminium frame construction designed with not more than 500 fpm velocity. (5 micron filtration with 80% efficiency) 				
	<p>Sensible (Indirect) heat exchanger section:</p> <ul style="list-style-type: none"> -Cross flow type air to air plate (indirect) type heat exchanger made up of engineered polymer cartridges with thermally fused Non-woven-cartridges. The Indirect type heatexchanger shall be UL type tested & certified. 				
	<p>Adiabatic heat exchanger section</p> <ul style="list-style-type: none"> - Munters make minimum 200 mm thick treated and impregnated special cellulose material with saturation efficiency upto 95%. - Required piping with main header and necessary nozzles as part spray system. - Common water sump in SS-304 construction for heat exchanger sections with submersible pumps in SS construction duly complete with isolation valves, y strainer, check valve connected with the spray piping. Tank shall have required makeup, overflow and drain connections. 18SWG (1.2mm) thick SS 304 plain sheet - Necessary Temperature & relative humidity sensors and water level sensors. 				

Sr. No.	Description of Works	Qty.	Unit	Rate (Rs)	Amount (Rs)
	The unit shall have independent water recirculation pumps with necessary valves & fittings for each heat exchanger. The pump shall be with SS-304 MOC and shall be of submersible type.				
	<p>Supply fan section</p> <ul style="list-style-type: none"> - SISW plug type fan - Primary blower. - Fan drive consisting of TEFC, IP55 IE3 motor with common extruded channel base frame by using anti-vibration isolators and self-extinguishing fabric flexible connection. - Fan outlet velocity shall not exceed 2000 fpm. Fan shall be selected with not less than 75%. - Marine light shall be provided. Switch for on / off of marine lights shall be located outside the unit. - Limit switch shall be interlock with fan section. - Opening hole for cable entry along with blank off cap. 				
	Extruded Al low leakage manual supply air damper with calibration knob. There should be access door across every section of AHU's.				
	<p>Unit shall be supplied with non-compartmentalised power cum control panel. Panel shall be complete with the required set of incomer and necessary feeders. PLC shall integrate with all the field devices and shall control the fan speed based on the T/Rh sensor inputs mounted on the supply air duct. Based on the T/Rh sensor inputs, PLC shall control the adiabatic water circulation system. Panel shall be compatible with BMS with the help of RS485 port. (RYB indication - Indication lamps, Incomer-SFU Blower/Pump controls- Thru' - MPCB, Contactor with OLR, Digital display- VAF meter, ATE-PLC - for logic control, Sensor-Temp./Rh for logic control Non - Compartmentalised panel)</p> <p>Make - SFU/MPCB/Contactor with OLR - Siemens/Legrand Digital display-VAF meter-Seleco or Elmeasure PLC - ATE Temp. & Rh Sensor - E+E/Rotronic - (4-20mA) VFD DRIVE-Siemens/Danfoss/ABB</p>				
1.1	6000 CFM	2	Sets		
	TOTAL				
	GST				
	NET TOTAL				
<p>Note : Rates quoted for all the items should be included all taxes, duties, surcharge, freight, insurance, transport, loading and unloading, installation & commissioning charges, overheads and profit etc. Only GST Should be mentioned separately as applicable.</p>					

