

BILL OF QUANTITIES (HVAC)					
NAME OF WORK: CONSTRUCTION OF ADMINISTRATIVE OFFICE BUILDING FOR DEENDAYAL PORT AUTHORITY, KANDALA					
Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
A	AC PLANT ROOM				
1.00	WATER-COOLED SCREW CHILLER				
	Supply, installation, testing and commissioning of factory designed, pre-fabricated and floor-mounted AHRI certified screw type water-cooled chiller machine of actual capacity ≥ 150 TR, complete with semi-hermetic / hermetic screw compressors having single refrigerant circuit and automatic stepless capacity control, water-cooled S/T type condenser, as per ASME / BIS horizontal flooded type evaporator with carbon steel shell and seamless copper tubes with elastomeric insulation, suitable numbers of squirrel cage induction motors of appropriate rating with class 'B' insulation, etc.				
	Unit mounted variable frequency drive (VFD) along with necessary drive arrangement, lubrication system as per manufacturer's design required for smooth and trouble-free operation of the chiller package, common base-frame, interconnected copper refrigerant piping along with elastomeric insulation, fittings, valves, expansion valves and accessories to interconnect compressor, condenser, chiller and expansion valve, microprocessor based control panel comprising of controls including sensors and equipped with a keyboard, LCD touchscreen access input system, protection and monitoring devices to perform control functions, wiring, vibration isolators, gauge panel, automatic safety controls, flow switch at evaporator and condenser connection ends and ozone friendly, CFC-HCFC free refrigerant complete all as specified and directed by the engineer-in-charge.				
	Make: Carrier, Daikin, Trane, York				
	The chiller shall conform to the following requirements / specifications:				
	[i] Chilled water inlet/outlet temperature: 54/44 °F				
	[ii] Evaporator fouling factor: 0.00050 °Fft ² hr/Btu				
	[iii] Evaporator side pressure drop: 6 ft of H ₂ (maximum)				
	[iv] Condenser water inlet/outlet temperature: 90/97.5 °F				
	[v] Condenser fouling factor: 0.001 °Fft ² hr/Btu				
	[vi] Condenser side pressure drop: 10 ft of H ₂ (maximum)				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	[vii] Minimum COP @ 100% load: 6.0 at AHRI condition				
	[viii] Minimum IPLV : 9 at AHRI condition				
	[ix] Minimum NPLV: 0.39 at Site Conditions				
	[x] Maximum Cooling kW/TR @ 100% load: 0.68				
	[xi] Refrigerant (Ozone friendly type): R134a				
	[xii] Test standard: ARI 550 / 590				
	NOTES:				
	[i] The manufacturer of compressor and chiller unit shall be the same OEM.				
	[ii] The quoted rate shall be inclusive of variable frequency drive (VFD) configured in accordance with site parameters, Victaulic coupling and system integrator capable of giving industry standard (Modbus/BACnet) output to BMS for critical parameters.				
	[iii] Mapping shall be required for all critical points displayed on the chiller control panel. The chiller shall be BMS compatible and shall have RS485 / RS232 serial communication protocol.				
	[iv] The unit shall be suitable for 3- Phase, 415 V \pm 10%, 50 Hz AC electric supply, with a built-in microprocessor based control panel.				
	[v] Initial / first charge of refrigerant gas & lubrication oil shall be deemed included in the quoted rate.				
	[vi] Necessary civil work viz. foundation for placement of chillers, etc. shall be deemed included in the scope of work.				
1.01	Supply of AHRI certified screw type water-cooled chiller machine of actual capacity \geq 150 TR.	2	Each		
1.02	Installation, testing and commissioning of AHRI certified screw type water-cooled chiller machine of actual capacity \geq 150 TR.	2	Job		
2.00	CHILLER PLANT MANAGER				
	Supply, installation, testing and commissioning of hand-held module-based chiller plant manager / optimizer to control all equipment and working mechanism as per I/O summary to enable sequential operation and synchronization as per specification to achieve equal operating time and take care of load pattern, optimize plant performance and electric power consumption complete all as specified and directed by the engineer-in-charge.				
	Make: Carrier, Daikin, Trane, York				
	NOTES:				
	[i] All microprocessor should be BTL listed & UL certified.				
	[ii] The chiller plant manager shall work on BACnet/IP protocol.				
2.01	Supply of Chiller Plant Manager (CPM)	1	Each		

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
2.02	Installation, testing and commissioning of Chiller Plant Manager (CPM)	1	Job		
3.00	CHILLED WATER RECIRCULATION PUMP				
	Supply, installation, testing & commissioning of horizontal split-casing single-stage single suction pump having flowrate 24 litre/s @ 25 mWC head for chilled water circulation conforming to IS 6595 (Part 2): 1993 and having horizontal axially split volute type CI delivery casing, suction and discharge nozzles and supporting feet cast integral with lower half casing, enclosed balanced bronze impeller, high tensile steel (CS) shaft supported by antifriction bearing and protected by bronze shaft sleeves in stuffing box area sealed by mechanical seal, deep groove ball / roller bearing, standard drilling flanges etc. suitable for direct coupling with TEFC squirrel cage induction motor suitable for variable frequency drive (VFD) operation on 3-Ph, 415 V±10%, 50 Hz AC supply and conforming to IS 12615: 2018, base plate, mounting channel frame, accessories and fittings, viz. pressure gauge, drain, coupling, coupling guard, vibration isolation arrangement by means of spring / rubber type mounting and foundation as per manufacturer's recommendation duly insulated with elastomeric thermal insulation complete all as specified and directed by the engineer-in-charge.				
	Make: Grundfos, Kirloskar, Xylem, Wilo				
	NOTES:				
	[i] Necessary civil work viz. foundation for placement of pump and pump accessories shall be covered in the scope of work.				
	[ii] Pressure gauges, thermometers and drains shall be measured and paid for saperately.				
	[iii] The contractor shall verify pump head before placing the purchase order of pumps.				
	[iv] VFD shall be measured and paid for saperately.				
3.01	Supply of horizontal split-casing pump having flowrate 24 litre/s @ 25 mWC head for chilled water circulation	3	Each		
3.02	Installation, testing and commissioning of horizontal split-casing pump having flowrate 24 litre/s @ 25 mWC head for chilled water circulation	3	Job		
4.00	INDUCED DRAUGHT COOLING TOWER				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	Supply, installation, testing and commissioning of CTI certified factory assembled / field erected, industrial duty, induced draft, counter-flow type, film fill P-FRP cooling tower suitable for 5000 MBH actual load to cool (1100 USgpm) water from 36 °C to 32 °C (ΔT 4 °C) at entering wet bulb temperature 30.2 °C having uniform water distribution and optimal heat transfer having casing of at least 5 mm thick UV stabilised fiberglass reinforced plastic (FRP) panels, laminated to each other providing a watertight seal, with stainless steel support structure of sufficient structural strength to withstand vibrations and wind velocity up to 60 m/s, mechanical access platform, HDPE shell and sump, FRP basin, low pressured spray system having totally enclosed, non-corroding PVC pipe with large orifice non-clog spray nozzle distribution with single water inlet for hot water distribution, diagonal offset flute, film type thermoformed PVC counterflow fill suitable for entering water temperatures up to 60 °C, thermoformed UV resistant polypropylene cellular drift eliminators having drift losses $\leq 0.0005\%$ of the water flow rate, propeller type direct driven fan incorporating wide-chord geometry and having FRP blades and steel hubs, energy efficient (IE4) TEFC squirrel cage induction motor squirrel cage induction motor(s), conforming to IS 12615: 2018, with class 'F' insulation complete with accessories all as specified and directed by the engineer-in-charge.				
	Make: Advance, Marley, Paharpur				
	NOTES:				
	[i] Necessary civil work viz. foundation, supporting structure, etc. for placement of cooling tower shall be deemed included in the scope of work.				
	[ii] The fan motor shall be suitable for 3- Phase, 415 V \pm 10%, 50 Hz AC supply.				
4.01	Supply of induced draft, counter-flow type, film fill P-FRP cooling tower suitable for 5000 MBH actual load to cool (1100 USgpm) water from 36 °C to 32 °C (ΔT 4 °C) at entering wet bulb temperature 30.2 °C	1	Each		
4.02	Installation, testing and commissioning of induced draft, counter-flow type, film fill P-FRP cooling tower suitable for 5000 MBH actual load to cool (1100 USgpm) water from 36 °C to 32 °C (ΔT 4 °C) at entering wet bulb temperature 30.2 °C	1	Job		
5.00	ANTI-FOULING CONDENSER SYSTEM				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	Supply, installation, testing and commissioning of chemical-free intelligent Anti-Fouling Condenser System (AFCS) having continuous descaling mechanism at 10 minutes interval (customizable as per operational requirement), inline ball trap suited for high pressure rating as applicable in hydraulic equipment with leak-proof raised face flange gasket, rust-free fastener and SS-304 mesh, touch panel HMI (human machine interfaces) with high resolution touch display, PLC controller having BMS connectivity and Ethernet, single module with interchangeable relay card and other features viz., motorized valves / solenoid valves, pressure booster pumps as required, high quality sponge balls, energy meter, flowmeter, sensors, common skid piping, etc. suitable for automatic condenser cleaning up to four chiller with a common skid for the required number of chillers in the Plant Room complete all as specified and directed by the engineer-in-charge.				
	Make: Carrier, Daikin, Trane, York				
5.01	Supply of chemical-free intelligent Anti-Fouling Condenser System (AFCS)	1	Each		
5.02	Installation, testing and commissioning of chemical-free intelligent Anti-Fouling Condenser System (AFCS)	1	Job		
	EXPANSION TANK				
6.00	S & F of ASME stamped pre-charged vertical closed bladder expansion tank of 200 litre size, stamped for 125 psi (862 kPa) working pressure having carbon steel shell, conforming to IS 2825: 1969, coated (inside & outside) with anti-corrosion paint with a heavy-duty butyl replaceable bladder, ring base, lifting rings, and 20 mm NPT piping connection protected by strainer at the water inlet, air charging valve connection to facilitate adjusting pre-charge pressure to meet actual system conditions with pressurization unit including pumps and accessories complete all as specified and directed by the engineer-in-charge.				
	Make: Emerald, Precision, Xylem				
6.01	Supply of pre-charged vertical closed bladder expansion tank of 200 litre size	1	Each		
6.02	Installation, testing and commissioning of pre-charged vertical closed bladder expansion tank of 200 litre size	1	Job		
7.00	CONDENSER WATER CIRCULATION PUMP				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	Supply, installation, testing and commissioning of horizontal split-casing single stage single suction pump having flowrate ≥ 36 litre/s @ 13 mWC head for condenser water conforming to IS 6595 (Part 2): 1993 and having horizontal axially split volute type CI delivery casing, suction and discharge nozzles and supporting feet cast integral with lower half casing, enclosed balanced bronze impeller, high tensile steel (CS) shaft supported by antifriction bearing and protected by bronze shaft sleeves in stuffing box area sealed by mechanical seal, deep groove ball / roller bearing, standard drilling flanges etc. suitable for direct coupling with TEFC squirrel cage induction motor suitable for operation on 3-Ph, 415 V \pm 10%, 50 Hz AC supply and conforming to IS 12615: 2018, base plate, mounting channel frame, accessories and fittings, viz. pressure gauge, drain, coupling, coupling guard, vibration isolation arrangement by means of spring / rubber type mounting and foundation as per manufacturer's recommendation and other necessary accessories complete all as specified and directed by the engineer-in-charge.				
	Make: Grundfos, Kirloskar, Xylem, Wilo				
	NOTES:				
	[i] Necessary civil work viz. foundation for placement of pump and pump accessories shall be covered in the scope of work.				
	[ii] Pressure gauges, thermometers and drains shall be measured and paid for saperately.				
	[iii] The contractor shall verify pump head before placing the purchase order of pumps.				
7.01	Supply of horizontal split-casing pump having flowrate 36 litre/s @ 13 mWC head for chilled water circulation	3	Each		
7.02	Installation, testing and commissioning of horizontal split-casing pump having flowrate 36 litre/s @ 13 mWC head for chilled water circulation	3	Job		
8.00	HVAC PANEL				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	Supply, installation, testing and commissioning of factory made, CPRI / ERDA type tested, fully compartmentalized bolted type HVAC Panel (design verified assembly-DVA) of suitable size conforming to IEC 61439-1 & 2 and IEC 61641 and having modular extensible design suitable for indoor mounting, internal arc compliance of minimum 70 kA for 0.5 s, made out of 2.0 mm thick mild steel CRCA sheet, having both sides openable with hinged doors and locking arrangement, IP 43 & IK 10 protection, supported and fixed on structural frame of angle iron of suitable size, including earthing stud, labelling, painting to all internal & external exposed steel surfaces with powder coating paint (7 tank process), duly fixed in ground with PCC foundation (1:2:4) type B1, with danger notice plate of 1.6 mm thick mild steel vitreous enamelled (white) with letters, figures and conventional skull and bones in signal red colour suitable for 3-Phase, 4-Wire system, 500 V grade with necessary wiring, PVC sheathed stranded copper conductor of appropriate length and size, including fixing lugs, bolts, screws, etc. complete all as specified and directed by the engineer-in-charge.				
	Make: ABB, LK E&A, Schneider, Siemens				
	The HVAC Panel shall comprise of the following:				
	[A] BUSBAR CHAMBER				
	[i] 01 Set (3L + N) of copper busbar of rated capacity 630 A, covered with PVC insulated sleeves including insulator, nuts, bolts, etc. with complete connection				
	[B] INCOMING				
	[i] Circuit Breaker				
	(a) 800 A, 415 V, $I_{cs} = 100\% I_{cu} = I_{cw}$ (1 sec for total selectivity) = 50 kA, 50 Hz electrical draw-out type 4P ACB (with LSIG protection), conforming to IS/IEC 60947-2 & 3, having 100% neutral with inbuilt release protection, no derating up to 50 °C, microprocessor based trip & LED based display systems with thermal memory providing overload, short-circuit, instantaneous & earth-fault protection, zone selective interlocking, pre-trip alarm & individual fault indicating LEDs, 20 trip record, % loading, bar graph, max. & min. meter and pre-alarm function for overload, short-circuit & earth fault - 01 Nos.				
	[ii] Instrumentation & Measurement				
	(a) CI 1.0 multi-function meter capable of measuring V, A, F, PF, W/VA, Wh/VAh, Runhrs. Onhrs & interrupts- 01 Nos.				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	(b) 800/5A Cl. 1.0 C.T. with 15 VA burden- 01 Nos.				
	(c) 6A, 10kA, 415V, 50 Hz 4P MCB- 01 Nos.				
	[iii] Indication & Annunciation				
	(a) LED phase indicators (Red, Yellow, Blue)- 01 Set				
	(b) LED status indicators (ON, OFF, TRIP)- 01 Set				
	(c) LED status indicators (SC, SP, TP)- 01 Set				
	[C] OUTGOING				
	[i] Circuit Breaker				
	(a) 320 A, 415 V, $I_{cs} = 100\%$ $I_{cu} = 36$ kA, 50 Hz 4P MCCB, conforming to IEC 60947-2: 2016, having microprocessor based trip unit, adjustable overload setting, adjustable short-circuit setting, adjustable neutral protection, electrical interlocking, front indication LEDs, etc.- 03 Nos.				
	(b) 100 A, 415 V, $I_{cs} = 100\%$ $I_{cu} = 25$ kA, 50 Hz 4P MCCB, conforming to IEC 60947-2: 2016, having thermal magnetic trip unit, adjustable overload setting, adjustable short-circuit setting, front indication LEDs, etc.- 02 Nos.				
	(c) 80 A, 415 V, $I_{cs} = 100\%$ $I_{cu} = 25$ kA, 50 Hz 3P MCCB, conforming to IEC 60947-2: 2016, having thermal magnetic trip unit, adjustable overload setting, adjustable short-circuit setting, front indication LEDs, etc.- 02 Nos.				
	(d) 63 A, 415 V, $I_{cs} = 100\%$ $I_{cu} = 25$ kA, 50 Hz 3P MCCB, conforming to IEC 60947-2: 2016, having thermal magnetic trip unit, adjustable overload setting, adjustable short-circuit setting, front indication LEDs, etc.- 04 Nos.				
	(e) 40 A, 415 V, $I_{cs} = 100\%$ $I_{cu} = 25$ kA, 50 Hz 3P MCCB, conforming to IEC 60947-2: 2016, having thermal magnetic trip unit, adjustable overload setting, adjustable short-circuit setting, front indication LEDs, etc.- 04 Nos.				
	(e) 32 A, 415 V, $I_{cs} = 100\%$ $I_{cu} = 25$ kA, 50 Hz 3P MCCB, conforming to IEC 60947-2: 2016, having thermal magnetic trip unit, adjustable overload setting, adjustable short-circuit setting, front indication LEDs, etc.- 02 Nos.				
	[ii] Motor Starter / Drive				
	(a) Variable Frequency Drive (VFD) of 13 kW rating with IP 55 enclosures and mains disconnect switch and comprising of the following complete with accessories of ABB, Danfoss, L&T E&A or Schneider make- 04 Nos.				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	(1) built-in dual 5% impedance DC link reactor (harmonic filters) on the positive and negative rails of the DC bus of the variable frequency drive (VFD).				
	(2) built-in EMC filters (electro magnetic compatibility filters) for restriction of conducted emissions to comply with IEC61800: 3 (unrestricted distribution): 2004 category C 1 (50 meter)				
	(3) three feedback PID controller having capability to simultaneously accept 3 feedback signals from temperature sensors or pressure sensors for process optimization and accordingly control the speed of pumps.				
	(4) integral graphical keypad.				
	(b) Fully automatic digital soft starter suitable for 15 kW drive having adaptive acceleration control, built-in RTD & thermistor inputs, programmable auto start/stop, emergency run operation, fully programmable overload trip, etc. complete with contactors, push button, LED type indicators, auto/manual selector switch, current sensing type single phase preventer complete with all accessories and wiring etc.- 02 Nos.				
	(c) Fully automatic digital soft starter suitable for 9.3 kW drive having adaptive acceleration control, built-in RTD & thermistor inputs, programmable auto start/stop, emergency run operation, fully programmable overload trip, etc. complete with contactors, push button, LED type indicators, auto/manual selector switch, current sensing type single phase preventer complete with all accessories and wiring etc.- 04 Nos.				
	(c) Fully automatic DOL starter, suitable for 0.75 kW motor, complete with contactors, push button, LED type indicators, auto/manual selector switch, overload protection, current sensing type single phase preventer complete with all accessories and wiring etc.- 02 Nos.				
	[ii] Instrumentation & Measurement				
	(a) 400/5A Cl. 1.0 C.T. with 15 VA burden- 03 Nos.				
	(b) 80/5A Cl. 1.0 C.T. with 10 VA burden- 07 Nos.				
	(c) 50/5A Cl. 1.0 C.T. with 5 VA burden- 04 Nos.				
	(d) 0-400 A ammeter- 03 Nos.				
	(e) 0-80 A ammeter- 07 Nos.				
	(f) 0-50 A ammeter- 04 Nos.				
	(g) 0-40 A ammeter- 02 Nos.				
	[iii] Indication & Annunciation				
	(a) LED status indicators (ON, OFF, TRIP)- 05 Set				
	NOTES:				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	[i] The busbars shall be of double deck arrangement for rating $\geq 1600A$ interleaved /non-interleaved design as per OEM. Separation of busbar shall be as per Form 4b.				
	[ii] ACBs shall have separately powered, individual fault trip indication LEDs (For overload, short circuit, earth fault and trip-unit failure) shall be available on the trip unit which shall function even in the absence of external power supply to the breaker.ACB shall be suitable for ZSI. Trip units shall have thermal memory as standard.				
	[iii] All the MCCBs up to 250 A shall be with thermal magnetic trip unit & above 250A shall be with microprocessor trip units. To ensure failsafe emergency tripping of the breakers (ACBs & MCCBs), it shall be supplied with continuous rated shunt trip coils.				
	[iv] Necessary control and switching devices to execute the switching and control logic shall be deemed inclusive of the scope of supply irrespective of them being specified / not specified above or in the SLD.				
	[v] The Panel / Switchboard shall be tested to withstand vibration caused by an earthquake in accordance with IEC 60068-3-3:2013 or IS 1893 Zone V.				
	[vi] The Panel shall be purchased from the original equipment manufacturer (OEM) or OEM authorized franchises only.				
	[vii] All the necessary noble components (viz., structural, Door noble like hinge, Bush, Door alignment gauge and Bus bar noble - Bus bar support, Close profile structure - horizontal & vertical) of the Panel shall be supplied by the OEM.				
	[viii] The Contractor shall furnish dimensional drawings of the items offered indicating all the fittings, dimensional tolerances, typical GADs, etc. to the engineer-in-charge for approval of the MEP Consultant and thereafter A.O. / representative.				
	[ix] The Contractor shall intimate the Engineer-in-Charge of the routine tests in the OEM factory in presence of a representative nominated by the Engineer-in-Charge before dispatch.				
8.01	Supply of HVAC Panel	1	Each		
8.02	Installation, testing and commissioning of HVAC Panel	1	Job		
9.00	ELECTRIC POWER CABLE				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	M & L for 1.1 kV grade XLPE insulated armoured cable conforming to IS 7098 (Part 1): 1988, having stranded compact shaped conductors as per Cl. 2 of IS 8130: 1984, PVC inner sheath, single armouring of galvanised steel strip / wire and PVC Type ST-2 outer sheath conforming to IS 5831: 1984, including necessary clamping / dressing with cable ties and termination complete as all specified and directed by engineer- in- charge.				
	Make: Havells, Polycab, RR Kabel				
9.01	Supply of 4 core 95 mm ² , 2XWY cable (for chiller)	50	RM		
9.02	Labour for 4 core 95 mm ² , 2XWY cable (for chiller)	50	RM		
9.03	Supply of 3 core 16 mm ² , 2XWY cable (for AC-DB)	100	RM		
9.04	Labour for 3 core 16 mm ² , 2XWY cable (for AC-DB)	100	RM		
9.05	Supply of 3 core 10 mm ² , 2XWY cable (for CT)	100	RM		
9.06	Labour for 3 core 10 mm ² , 2XWY cable (for CT)	100	RM		
9.07	Supply of 3 core 6 mm ² , 2XWY cable (for CHWP)	60	RM		
9.08	Labour for 3 core 6 mm ² , 2XWY cable (for CHWP)	60	RM		
9.09	Supply of 3 core 6 mm ² , 2XWY cable (for CDWP)	60	RM		
9.10	Labour for 3 core 6 mm ² , 2XWY cable (for CDWP)	60	RM		
10.00	CABLE TRAY				
	S & F of perforated hot dipped galvanized iron cable tray having galvanization thickness not less than 50 microns and perforation not more than 17.5% including fittings viz. joints, bends, tees, etc. in convenient sections of length complete including cable tray supports supports and associated accessories, all as specified and directed by the engineer-in-charge.				
	Make: Aravali Engineers, Elcon, Grent, Indiana				
10.01	Supply of 300 mm X 50 mm X 1.6 mm cable tray	20	RM		
10.02	Labour for 300 mm X 50 mm X 1.6 mm cable tray	20	RM		
10.03	Supply of 150 mm X 50 mm X 1.6 mm cable tray	20	RM		
10.04	Labour for 150 mm X 50 mm X 1.6 mm cable tray	20	RM		
10.05	Supply of 100 mm X 50 mm X 1.6 mm cable tray	20	RM		
10.06	Labour for 100 mm X 50 mm X 1.6 mm cable tray	20	RM		
11.00	GI PLATE EARTHING PIT				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	M & L for earthing complete with GI earth plate electrode of 60 cm x 60 cm x 6 mm size, buried directly in ground (earth pit not less than 2.25 m deep below ground level) with top edge of the plate not less than 1.5 m below normal ground level, connected to copper strip of size 20 mm x 3 mm as earth lead, by means of bolts, buts, check nuts and washers of galvanised iron or steel, galvanized iron pipe of 40 mm diameter, connected to earthing test point, all as shown in electrical plate No. 5 connected to earthing test point all as specified or indicated including testing on completion and including excavation, earthwork, PCC earth pit of dimensions 550 mm X 550 mm (outer) and 300 mm X 300 mm (inner) and 250 mm deep, with a 10 mm thick CI cover, hinged to CI frame on ground level, GI watering pipe, funnel, etc. as all specified and directed by the engineer-in-charge.				
11.01	Supply of GI Plate Earthing Pit	8	Set		
11.02	Labour for GI Plate Earthing Pit	8	Job		
12.00	EARTH CONTUINITY CONDUCTOR				
	M & L for earth contuinity conductor or main earthing lead fixed to wall on batten or recess or chases or buried in ground or drawn in conduit / pipe or fixed to poles or any other indicated situation for loop earthing etc. as required complete as specified and directed by the engineer-in-charge.				
12.01	Supply of 50 mm X 6 mm GI flat / strip	90	RM		
12.02	Labour for 50 mm X 6 mm GI flat / strip	90	RM		
12.03	Supply of 32 mm X 6 mm GI flat / strip	20	RM		
12.04	Labour for 32 mm X 6 mm GI flat / strip	20	RM		
12.05	Supply of 32 mm X 3 mm GI flat / strip	180	RM		
12.06	Labour for 32 mm X 3 mm GI flat / strip	180	RM		
B	CONDENSER WATER PIPING				
13.00	HEAVY GRADE MS PIPING				
	Supply, installation, testing and commissioning of condenser water piping with heavy grade MS pipes, necessary fittings, viz., flexible connections, bends, tees, reducers, flanges, air purge valves, drain valves, structural support, necessary clamps, vibration isolators, etc., including painting and laying in floors or fixing to walls and ceilings, etc., with necessary accessories complete all as specified and directed by the engineer-in-charge.				
	Make: Jindal, MSL, SAIL, Tata				
	NOTES:				
	[i] Pipes of more than 50 mm NB size shall be butt welded with fittings of equal or higher thickness whereas pipes below 50 mm NB size shall be socket welded.				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	[ii] Pipe sizes 150 mm NB & below shall be MS 'C' class as per IS 1239-1: 2004.				
	[iii] Pipe sizes above 150 mm NB shall be welded black steel pipe heavy class as per IS 3589: 2001 from minimum 6.35mm thick M.S. Sheet for pipes up to 350 mm NB and from minimum 7 mm thick MS sheet for pipes of 400 mm NB and above.				
13.01	Supply of 250 mm NB heavy grade MS pipes	60	RM		
13.02	Labour 250 mm NB heavy grade MS pipes	60	RM		
13.03	Supply of 150 mm NB heavy grade MS pipes	30	RM		
13.04	Labour 150 mm NB heavy grade MS pipes	30	RM		
14.00	POT STRAINER				
	Supply, installation, testing and commissioning of PN 1.6 rated POT strainer of 250 mm NB size, conforming to BS 6755-1, suitable for high capacity flow throughout full size inlet / outlet, having CI body & strainer bonnet, stainless steel perforated filter section, black rubber body / bonnet gasket, SS-410 valve and flange drilling standard end connections, etc., with accesories complete all as specified and directed by the engineer-in-charge.				
	Make: Adavance, Emerald, Honeywell, Sant				
14.01	Supply of 250 mm NB Pot Strainer	1	Each		
14.02	Labour for 250 mm NB Pot Strainer	1	Each		
15.00	Y-STRAINER				
	M & L for PN 1.6 rated 'Y'- type strainer, conforming to BS 6755-1, having cast iron (CI) Gr. FG 200 body & cover, AISI304 plug, AISI304 stainless steel screen trim having 1.2 mm perforation, bolted cover, compressed asbestos fiber gasket, flanges as per BS 10 Table F undrilled, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Emerald, Honeywell, Leader, Sant				
15.01	Supply of 150 mm NB Y-Strainer	3	Each		
15.02	Labour for 150 mm NB Y-Strainer	3	Each		
16.00	MOTORIZED BUTTERFLY VALVE				
	Supply, installation, testing and commissioning of PN 1.6 rated motorized butterfly valve, conforming to IS 13095: 2020, and having CI body, SS disc, 'O' ring, etc., with IP55 rated actuator, capable of accepting up to 10 V DC and up to 20 mA electric signal and providing similar transduced feedback output to control system, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	Make: Belimo, Honeywell, Johnson Controls, Siemens				
16.01	Supply of 250 mm NB Motorized Butterfly Valve	1	Each		
16.02	Labour for 250 mm NB Motorized Butterfly Valve	1	Each		
16.03	Supply of 150 mm NB Motorized Butterfly Valve	2	Each		
16.04	Labour for 150 mm NB Motorized Butterfly Valve	2	Each		
17.00	BUTTERFLY VALVE				
	Supply, installation, testing and commissioning of PN 1.6 rated cast iron (CI) butterfly valve, conforming to IS 13095: 2020, having CI body, CI seat having EPDM / nitrile rubber lining, SG iron / ductile cast iron disc, SS AISI-410 stem, flanged end connection, conforming to BS 10 Table D/E & ANSI B 16.1 CI- 125, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Leader, Sant				
17.01	Supply of 250 mm NB Butterfly Valve	4	Each		
17.02	Labour for 250 mm NB Butterfly Valve	4	Each		
17.03	Supply of 150 mm NB Butterfly Valve	8	Each		
17.04	Labour for 150 mm NB Butterfly Valve	8	Each		
18.00	NON-RETURN VALVE				
	M & L for PN 1.6 rated straight type cast iron (CI) reflux (non-return) valve, conforming to IS 5312-2: 1986, having CI body, bolted cover, integral / renewable seat, renewable disc, gunmetal trim with rubber seat ring, flanged end connection, conforming to IS 1538: 1993, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Honeywell				
18.01	Supply of 150 mm NB Non-Return Valve	3	Each		
18.02	Labour for 150 mm NB Non-Return Valve	3	Each		
19.00	BALANCING VALVE				
	M & L for CL#125 two-piece design cast iron (CI) straight pattern ball valve, conforming to IS 9890: 1981 and having FG 200 cast iron body conforming to IS 210: 2009, AISI 410 stem, stainless steel AISI 304 ball, renewable PTFE seat & gland packing and screwed female BSP parallel threaded ends conforming to BS 21 with necessary accessories all complete as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Honeywell				
19.01	Supply of 150 mm NB Balancing Valve	2	Each		
19.02	Labour for 150 mm NB Balancing Valve	2	Each		
C	CHILLED WATER PIPING				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
20.00	HEAVY GRADE MS PIPING				
	Supply, installation, testing and commissioning of chilled water piping with heavy grade MS pipes, necessary fittings, viz., flexible connections, bends, tees, reducers, flanges, air purge valves, drain valves, structural support, necessary clamps, vibration isolators, etc., including painting and laying in floors or fixing to walls and ceilings, etc., duly insulated with flexible closed-cell elastomeric thermal insulation (in tubular form) made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Jindal, MSL, SAIL, Tata				
	NOTES:				
	[i] Pipes of more than 50 mm NB size shall be butt welded with fittings of equal or higher thickness whereas pipes below 50 mm NB size shall be socket welded.				
	[ii] Pipe sizes 150 mm NB & below shall be MS 'C' class as per IS 1239-1: 2004.				
	[iii] Pipe sizes above 150 mm NB shall be welded black steel pipe heavy class as per IS 3589: 2001 from minimum 6.35mm thick M.S. Sheet for pipes up to 350 mm NB and from minimum 7 mm thick MS sheet for pipes of 400 mm NB and above.				
	[iv] Insulation shall be measured and paid for separately.				
20.01	Supply of 200 mm NB heavy grade MS pipes	80	RM		
20.02	Labour 200 mm NB heavy grade MS pipes	80	RM		
20.03	Supply of 150 mm NB heavy grade MS pipes	40	RM		
20.04	Labour 150 mm NB heavy grade MS pipes	40	RM		
20.05	Supply of 100 mm NB heavy grade MS pipes	60	RM		
20.06	Labour 100 mm NB heavy grade MS pipes	60	RM		
20.07	Supply of 80 mm NB heavy grade MS pipes	124	RM		
20.08	Labour 80 mm NB heavy grade MS pipes	124	RM		
20.09	Supply of 65 mm NB heavy grade MS pipes	250	RM		
20.10	Labour 65 mm NB heavy grade MS pipes	250	RM		
20.11	Supply of 50 mm NB heavy grade MS pipes	310	RM		
20.12	Labour 50 mm NB heavy grade MS pipes	310	RM		
20.13	Supply of 40 mm NB heavy grade MS pipes	210	RM		
20.14	Labour 40 mm NB heavy grade MS pipes	210	RM		
20.15	Supply of 32 mm NB heavy grade MS pipes	300	RM		
20.16	Labour 32 mm NB heavy grade MS pipes	300	RM		
20.17	Supply of 25 mm NB heavy grade MS pipes	160	RM		
20.18	Labour 25 mm NB heavy grade MS pipes	160	RM		
20.19	Supply of 20 mm NB heavy grade MS pipes	220	RM		
20.20	Labour 20 mm NB heavy grade MS pipes	220	RM		
20.21	Supply of 15 mm NB heavy grade MS pipes	2100	RM		
20.22	Labour 15 mm NB heavy grade MS pipes	2100	RM		
21.00	Y-STRAINER				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	M & L for PN 1.6 rated 'Y'- type strainer, conforming to BS 6755-1, having cast iron (CI) Gr. FG 200 body & cover, AISI304 plug, AISI304 stainless steel screen trim having 1.2 mm perforation, bolted cover, compressed asbestos fiber gasket, flanges as per BS 10 Table F undrilled, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Emerald, Honeywell, Leader, Sant				
21.01	Supply of 150 mm NB Y-Strainer	5	Each		
21.02	Labour for 150 mm NB Y-Strainer	5	Each		
21.03	Supply of 100 mm NB Y-Strainer	1	Each		
21.04	Labour for 100 mm NB Y-Strainer	1	Each		
21.05	Supply of 15 mm NB Y-Strainer	355	Each		
21.06	Labour for 15 mm NB Y-Strainer	355	Each		
22.00	MOTORIZED BUTTERFLY VALVE				
	Supply, installation, testing and commissioning of PN 1.6 rated motorized butterfly valve, conforming to IS 13095: 2020, and having CI body, SS disc, 'O' ring, etc., with IP55 rated actuator, capable of accepting up to 10 V DC and up to 20 mA electric signal and providing similar transduced feedback output to control system, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Belimo, Honeywell, Johnson Controls, Siemens				
22.01	Supply of 150 mm NB Motorized Butterfly Valve	2	Each		
22.02	Labour for 150 mm NB Motorized Butterfly Valve	2	Each		
23.00	BUTTERFLY VALVE				
	Supply, installation, testing and commissioning of PN 1.6 rated cast iron (CI) butterfly valve, conforming to IS 13095: 2020, having CI body, CI seat having EPDM / nitrile rubber lining, SG iron / ductile cast iron disc, SS AISI-410 stem, flanged end connection, conforming to BS 10 Table D/E & ANSI B 16.1 CI- 125, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Leader, Sant				
23.01	Supply of 200 mm NB Motorized Butterfly Valve	3	Each		
23.02	Labour for 200 mm NB Motorized Butterfly Valve	3	Each		
23.03	Supply of 150 mm NB Motorized Butterfly Valve	12	Each		
23.04	Labour for 150 mm NB Motorized Butterfly Valve	12	Each		

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
23.05	Supply of 100 mm NB Motorized Butterfly Valve	2	Each		
23.06	Labour for 100 mm NB Motorized Butterfly Valve	2	Each		
24.00	NON-RETURN VALVE				
	M & L for PN 1.6 rated straight type cast iron (CI) reflux (non-return) valve, conforming to IS 5312-2: 1986, having CI body, bolted cover, integral / renewable seat, renewable disc, gunmetal trim with rubber seat ring, flanged end connection, conforming to IS 1538: 1993, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Honeywell				
24.01	Supply of 150 mm NB Non-Return Valve	3	Each		
24.02	Labour for 150 mm NB Non-Return Valve	3	Each		
25.00	BALANCING VALVE				
	M & L for PN 1.6 rated precise balancing double regulation type cast iron (CI) balancing valve having double regulation type cast iron balancing valve having CI body, copper alloy trim, stainless steel stem, flanged end connection, duly insulated with flexible closed-cell elastomeric thermal insulation made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Honeywell				
25.01	Supply of 150 mm NB Balancing Valve	2	Each		
25.02	Labour for 150 mm NB Balancing Valve	2	Job		
26.00	PRESSURE INDEPENDENT CONTROL VALVE				
	Supply, installation, testing and commissioning of PN 16 rated 2-way pressure independent control valve (PICV) with sensor operated flow rate or power control and energy monitoring function, flange end connections, etc. for water-side control (on/off) of chilled water cassette unit / chilled water hi-wall unit along with valve actuator complete all as specified and directed by the engineer-in-charge.				
	Make: Anergy, Belimo, Danfoss, Midea, Schneider				
26.01	Supply of 150 mm NB PICV	2	Each		
26.02	Labour for 150 mm NB PICV	2	Each		
26.03	Supply of 100 mm NB PICV	1	Each		
26.04	Labour for 100 mm NB PICV	1	Each		
26.05	Supply of 15 mm NB PICV	355	Each		
26.06	Labour for 15 mm NB PICV	355	Each		
	BALL VALVE				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
27.00	M & L for CL#125 two-piece design cast iron (CI) straight pattern ball valve, conforming to IS 9890: 1981 and having FG 200 cast iron body conforming to IS 210: 2009, AISI 410 stem, stainless steel AISI 304 ball, renewable PTFE seat & gland packing and screwed female BSP parallel threaded ends conforming to BS 21, duly insulated complete all as specified and directed by the engineer-in-charge.				
	Make: Advance, Audco, Honeywell, Leader, Sant				
27.01	Supply of 15 mm NB Ball Valve	710	Each		
27.02	Labour for 15 mm NB Ball Valve	710	Each		
28.00	AIR & DIRT SEPARATOR				
	Supply, Installation, testing and commissioning of a combined Air and Dirt Separators having chilled water flow rate of 750 US gpm, shall be confirm to Section VIII, Division I of the ASME Boiler and Pressure Vessel Code designed, constructed, inspected and stamped per ASME Section VIII, Division 1. As per Specifications on the return water line located at the pump suction or a suitable location in AC Plant Room as suggested. Separator should be capable of removing all micro bubbles and should have a steel tube & copper wire media to carry out its operation. It should be able to remove upto 10 microns of dirt particles. The separator should be complete with high capacity air vent, service valve, non return valve, butterfly valve connection for makeup water inlet, flanges, drain valve etc. complete all as specified and directed by the engineer-in-charge.				
	Make: Anergy, Emerald, Xylem				
28.01	Supply of Air & Dirt Separator	1	Each		
28.02	Labour for Air & Dirt Separator	1	Job		
29.00	CHILLED WATER PIPING INSULATION (NBR)				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	S & F of flexible closed-cell elastomeric thermal insulation (in tubular form) made of elastomeric foam based on synthetic rubber (NBR / PVC) with UV resistant metal finishing on one side, having thermal conductivity $\lambda \leq 0.035$ W/mK at mean temperature $\theta_m = 0$ °C as per EN 12667, moisture diffusion resistance factor $\mu \geq 7000$ as per EN 12086 for the base foam, water absorption by volume $\leq 0.2\%$ as per ASTM C 209 / C1763 for the base foam, flame spread index (FSI) Class 1 as per BS476 Part 7 for surface spread of flame and Fire Propagation requirement as per BS476 Part 6 to meet the Class 'O' Fire category as per 1991 Building Regulations (England & Wales) and the Building Standards (Scotland) Regulations 1990, density of base foam between 40- 55 kg/m ³ , density of laminated insulation material between 50 to 70 kg/m ³ , tensile strength of the base foam with covering > 1.5 MPa (32 mm) in MD & > 0.4 MPa (32 mm) in CD, elongation of the base foam with covering $> 40\%$ (32 mm) in MD & $> 38\%$ (32 mm) in CD, tear strength of the base foam with covering > 35 KN/m (32mm) in MD & 25 kN/m (32 mm) in CD with covering material of multiple layered laminate of polymeric material reinforced with scrim with a special UV protection with necessary accessories complete all as specified and directed by the engineer-in-charge.				
	Make: Armacell, Kaimann Flex, Vidoflex				
	The insulation shall conform to the following technical specifications.				
	[i] The insulation material shall be dust and fibre free.				
	[ii] The insulation material shall be formaldehyde free.				
	[iii] The insulation material shall be CFC & HCFC free.				
	[iv] The insulation material shall withstand maximum surface temperature of +85°C and minimum surface temperature of 0°C as per EN 14706.				
	[v] The base insulation material shall have ODP (Ozone Depletion Potential) and GWP (Global Warming Potential) of Zero.				
	[vi] Covering material shall be non-metallic, mat finish and provide mechanical resistance with an excellent aesthetic look.				
	[vii] Covering material shall be of 380 ± 20 GSM as per ASTM D 646.				
	[viii] Covering material shall be of 380 – 400 microns as per ASTM E 252.				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	[ix] Covering material shall have the tensile strength of > 5 MPa in MD & CD as per ASTM D 638.				
	[x] Covering material shall have good puncture and tear resistance.				
	[xi] Covering material shall have good UV resistance as per ISO 4892-2 Method A tested for 1000 hrs.				
	[xii] Covering material shall withstand maximum surface temperature of +75 °C and minimum surface temperature of -25 °C as per EN 14706.				
	[xiii] Covering material shall be installed with 30mm – 50mm overlaps on all horizontal and longitudinal joints. Joints along the material length shall be installed facing downward. The joints shall be secured with 50 mm – 75 mm tapes. Manufacturer recommended adhesive can be used for flat sheets, or where restricted access prevents use of rivets. All joints and overlaps must be finished with manufacturer recommended PSA Tape.				
	[ixv] For fittings of an unusual shape, or large size, the covering material should be cut and installed as per traditional metal cladding.				
29.01	Supply of 200 mm NB (32 mm thk) insulation	80	RM		
29.02	Labour 200 mm NB (32 mm thk) insulation	80	RM		
29.03	Supply of 150 mm NB (32 mm thk) insulation	40	RM		
29.04	Labour 150 mm NB (32 mm thk) insulation	40	RM		
29.05	Supply of 100 mm NB (32 mm thk) insulation	60	RM		
29.06	Labour 100 mm NB (32 mm thk) insulation	60	RM		
29.07	Supply of 80 mm NB (25 mm thk) insulation	124	RM		
29.08	Labour 80 mm NB (25 mm thk) insulation	124	RM		
29.09	Supply of 65 mm NB (25 mm thk) insulation	250	RM		
29.10	Labour 65 mm NB (25 mm thk) insulation	250	RM		
29.11	Supply of 50 mm NB (25 mm thk) insulation	310	RM		
29.12	Labour 50 mm NB (25 mm thk) insulation	310	RM		
29.13	Supply of 40 mm NB (25 mm thk) insulation	210	RM		
29.14	Labour 40 mm NB (25 mm thk) insulation	210	RM		
29.15	Supply of 32 mm NB (19 mm thk) insulation	300	RM		
29.16	Labour 32 mm NB (19 mm thk) insulation	300	RM		
29.17	Supply of 25 mm NB (19 mm thk) insulation	160	RM		
29.18	Labour 25 mm NB (19 mm thk) insulation	160	RM		
29.19	Supply of 20 mm NB (19 mm thk) insulation	220	RM		
29.20	Labour 20 mm NB (19 mm thk) insulation	220	RM		
29.21	Supply of 15 mm NB (19 mm thk) insulation	2100	RM		
29.22	Labour 15 mm NB (19 mm thk) insulation	2100	RM		
30.00	CHILLED WATER PIPING INSULATION (EPS)				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	S & F of fire-retardant quality expanded polystyrene moulded pipe section (EPS) insulation of density 20 kg/m ³ , with a thick coat of cold setting adhesive (CPRX compound) wrapping with 500g polythene faced hessian and finally sand cement plaster and tar felt cladding complete with type, grade-1 roofing felt strip, conforming to IS 1322: 1993, at joints repairing of damage to building etc. for the following diameters as required complete all as specified and directed by the engineer-in-charge.				
30.01	Supply of 200 mm NB (75 mm thk) insulation	80	RM		
30.02	Labour 200 mm NB (75 mm thk) insulation	80	RM		
D	INSTRUMENTATION				
31.00	AUTO AIR VENT				
	Supply, installation, testing and commissioning of automatic air-vent valve with 20 mm end connections, brass body and cover, plastic float, brass cap etc. suitable for maximum operating pressure of 16 bar and maximum operating temperature 100 °C respectively, installed on all high points in the water piping system to automatically remove the trapped air complete all as specified and directed.				
	Make: Advance, Anergy, Sant, Hindustan				
31.01	Supply of auto air vent	4	Each		
31.02	Installation, testing and commissioning of auto air vent	4	Each		
32.00	TEMPERATURE GAUGE				
	S & F of 6" dual scale (°F/°C), lower mount (radial), bimetal thermometer having 0.5 NPT process connection, Grade A accuracy class as per ASME B40.200, stem diameter 6.35 mm, laminated safety glass window, stainless steel 304 case, steam, process connection & joint, aluminium dial & pointer, IP67 protection, scale range 0- 60 °C complete with accessories, etc. as specified and directed by engineer-in-charge.				
	Make: General, WIKA, TSI				
32.01	Supply of temperature gauge	14	Each		
32.02	Fixing of temperature gauge	14	Each		
33.00	PRESSURE GAUGE				
	S & F of 4" bourdon tube pressure gauge conforming to EN 837-1, having copper alloy process connection & pressure element, plastic black pointer & case, plastic crystal-clear window, snap-fitted in case, accuracy class 2.5, scale range 0- 25 bar complete with accessories, etc. as specified and directed by engineer-in-charge.				
	Make: General, WIKA, TSI				
33.01	Supply of pressure gauge	20	Each		

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
33.02	Fixing of pressure gauge	20	Each		
34.00	FLOW METER				
	Supply, installation, testing and commissioning of insertion type flow sensor with a non-magnetic, spinning impeller (paddle wheel) as the only moving part) with sensor sleeve of brass (or SS316) with PPS housing, glassfilled nylon or Tefzel impeller with a UHMPWE or Tefzel sleeve bearing, tungsten carbide shaft, 2" NPT adapter having two ethylene-propylene O-Rings for installation into any commercially available weld-on fitting or pipe saddle, all electronics epoxy-sealed with a 2-conductor shielded cable extending out through a ½" conduit connection on top of the sensor, etc. operating in line pressures up to 400 psi and liquid temperature up to 220 °F and flows of 1 fps to 30 fps in pipes of 3" diameter up to 40" diameter with linearity of +1% and repeatability of +1% complete all as specified and directed by the engineer-in-charge.				
	Make: Anergy, Belimo, Danfoss				
34.01	Supply of flow meter	1	Each		
34.02	Fixing of flow meter	1	Each		
E	DRAIN PIPING				
35.00	MEDIUM GRADE GI PIPING				
	Supply, installation, testing and commissioning of drain piping with medium grade GI pipes, necessary fittings, viz., flexible connections, bends, tees, reducers, structural support, necessary clamps, etc., including painting and laying in floors or fixing to walls and ceilings, etc., duly insulated with flexible closed-cell elastomeric thermal insulation (in tubular form) made of elastomeric foam based on synthetic rubber (NBR / PVC) complete with necessary accessories all as specified and directed by the engineer-in-charge.				
	Make: Jindal, MSL, SAIL, Tata				
	NOTES:				
	[i] Insulation shall be measured and paid for separately.				
35.01	Supply of 32 mm NB medium grade GI pipes	10	RM		
35.02	Labour 32 mm NB medium grade GI pipes	10	RM		
35.03	Supply of 25 mm NB medium grade GI pipes	10	RM		
35.04	Labour 25 mm NB medium grade GI pipes	10	RM		
35.05	Supply of 20 mm NB medium grade GI pipes	150	RM		
35.06	Labour 20 mm NB medium grade GI pipes	150	RM		
35.07	Supply of 15 mm NB medium grade GI pipes	550	RM		
35.08	Labour 15 mm NB medium grade GI pipes	550	RM		
36.00	BALL VALVE				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	S & F of PN 1.6 rated forged brass ball valve, having lever operated two piece design, renewable P.T.F.E. seat, brass ball, machined brass nickle plated stem, P.T.F.E. packings, full bore port opening, screwed female BSP parallel thread end connections, duly insulated with elastomeric thermal insulation with adhesives and other necessary accessories complete all as specified and directed by engineer-in-charge.				
	Make: Advance, Sant, Hindustan				
36.01	Supply of 15 mm NB Ball Valve	15	Each		
36.02	Labour for 15 mm NB Ball Valve	15	Each		
36.03	Supply of 25 mm NB Ball Valve	1	Each		
36.04	Labour for 25 mm NB Ball Valve	1	Each		
F	HYDRONIC FAN COIL UNIT				
37.00	CHILLED WATER CASSETTE UNIT				
	Supply, installation, testing and commissioning of Eurovent certified BLDC chilled water cassette unit having lower height design (≤ 300 mm), lower noise levels, 360° round flow panel, 3 air swing pattern control, draft prevention & soil prevention, turbo fan with BLDC motor, 2-pipe coils, individual louver control, 5-speed DC fan for perfect comfort, 20% fresh air intake hole, built-in high head drain sump and water flow switch, etc., complete all as specified and directed by the engineer-in-charge.				
	Make: Carrier, Daikin, Kubic, Midea, Sinco, Trane, York				
37.01	Supply of Chilled Water Cassette Unit 0.9 TR @ 330 CFM min.	116	Each		
37.02	Installation, testing and commissioning of Chilled Water Cassette Unit 0.9 TR @ 330 CFM min.	116	Job		
37.03	Supply of Chilled Water Cassette Unit 1.1 TR @ 422 CFM min.	104	Each		
37.04	Installation, testing and commissioning of Chilled Water Cassette Unit 1.1 TR @ 422 CFM min.	104	Job		
37.05	Supply of Chilled Water Cassette Unit 1.2 TR @ 462 CFM min.	86	Each		
37.06	Installation, testing and commissioning of Chilled Water Cassette Unit 1.2 TR @ 462 CFM min.	86	Job		
37.07	Supply of Chilled Water Cassette Unit 1.6 TR @ 667 CFM min.	31	Each		
37.08	Installation, testing and commissioning of Chilled Water Cassette Unit 1.6 TR @ 667 CFM min.	31	Job		
38.00	CHILLED WATER HI-WALL UNIT				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
	Supply, installation, testing and commissioning of Eurovent certified BLDC chilled water hi-wall unit having built-in 2-way control valve, turbo fan with BLDC motor, 2-pipe coils, 5-speed DC fan for perfect comfort, condensate drain sump along with LHS / RHS drain outlet optional at site etc., complete all as specified and directed by the engineer-in-charge.				
	Make: Carrier, Daikin, Kubic, Midea, Sinco, Trane, York				
38.01	Supply of Chilled Water Hi-wall Unit 0.8 TR @ 300 CFM min.	1	Each		
38.02	Installation, testing and commissioning of Chilled Water Hi-wall Unit 0.8 TR @ 300 CFM min.	1	Job		
38.03	Supply of Chilled Water Hi-wall Unit 1.4 TR @ 600 CFM min.	17	Each		
38.04	Installation, testing and commissioning of Chilled Water Hi-wall Unit 1.4 TR @ 600 CFM min.	17	Job		
H	MISC.				

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
39.00	UNDERDECK INSULATION				
	S & F of FM approved highly- flexible, closed-cell, 25 mm thick underdeck insulation of elastomeric foam based on synthetic rubber (NBR) tested for service temperature range -50-105 °C as per EN 14706, EN 14707 & EN 14304, thermal conductivity $\lambda \leq 0.037$ W/mK at mean temperature $\theta_m = 20$ °C as per EN 12667 & EN ISO 8497, water vapour diffusion resistance factor $\mu \geq 7000$ as per EN 12086 & EN 13469, water absorption by volume 0.2% as per ASTM C 1763 & ASTM C 209, Class 0 fire performance as per BS 476 Part 6: 1989, Class 1 surface spread of flame as per BS 476 7: 1997, flammability HB, V-0 as per UL- 94, having good resistance to mechanical impact, excellent resistance to ozone, oil and chemicals, zero ozone depletion potential along with adhesives and other necessary accessories complete all as specified and directed by engineer-in-charge.				
	Make: Armaflex, Vidoflex, Kaimenflex				
	NOTES:				
	[i] The following installation procedure shall be followed:				
	(a) The ceiling surface needs to be thoroughly cleaned.				
	(b) Fix soffit / clamp to ceiling by means of rawl plug / dash fasteners.				
	(c) Fix Z or C shaped GI channel runners or aluminium ones along the length of the space 600 mm spacing in one direction to the ceiling by rawl plugs / dash fasteners.				
	(d) Apply any suitable adhesive to the ceiling and place slabs of underdeck insulation in-between by spot sticking method.				
	(e) Hold the insulation slab in position by 22 SWG GI lacing wire placed diagonally.				
	[ii] Ensure the specified sheet thickness is maintained throughout installation.				
	[iii] All seams and joint shall be sealed with manufacturer recommended adhesive.				
	[iv] The quoted rate shall be inclusive of adhesive, etc. and fixing of the underdeck insulation in place.				
39.01	Supply of 25 mm thick underdeck insulation	2172	SM		
39.02	Labour for 25 mm thick underdeck insulation	2172	SM		

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
40.00	G.S.S. DUCTING				
	Supply, installation, testing & balancing and commissioning of factory fabricated galvanized steel sheet metal (G.S.S.) round / rectangular low pressure ducting of following sheet thickness having zinc coating of 120 g/m ² total on both sides and complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, volume control dampers, hangers, supports, etc. as per approved drawings and conforming to IS 655: 2006 & the latest edition of HVAC Duct Construction Standards - Metal and Flexible of SMACNA along with required scaffolding work to install the ducts at site complete all as specified and directed by engineer-in-charge.				
	Make: Ruskin Titus, SystemAir, Trox, Rola Star				
40.01	Supply of 24 G (MS angle flanges)	100	SM		
40.02	Installation, testing & commissioning for 24 G (MS angle flanges)	100	SM		
	NOTES:				
	[i] The connection of ducts shall be carried out by angle flange technique.				
	[ii] The quoted shall be inclusive of hangers & supports, etc.				
	[iii] Volume Control Damper shall be measured and paid for separately.				
41.00	INLINE FAN				
	Supply, installation, testing and commissioning of inline fan for exhaust complete with motor suitable for 220 volts 50 Hz, single phase AC supply with supporting arrangement etc. as required at site complete all as specified and directed by the engineer-in-charge.				
	Make: Greencheck, Kruger, Systemair, Nicorta				
41.01	Supply of 1300 CFM inline fan	6	Each		
41.02	Installation, Testing & commissioning of 1300 CFM inline fan	6	Each		
41.03	Supply of 450 CFM inline fan	6	Each		
41.04	Installation, Testing & commissioning of 450 CFM inline fan	6	Each		
41.05	Supply of 300 CFM inline fan	6	Each		
41.06	Installation, Testing & commissioning of 300 CFM inline fan	6	Each		
41.07	Supply of 150 CFM inline fan	3	Each		
41.08	Installation, Testing & commissioning of 150 CFM inline fan	3	Each		
41.09	Supply of 100 CFM inline fan	4	Each		
41.10	Installation, Testing & commissioning of 100 CFM inline fan	4	Each		

Sl. No.	Description	Qty.	Unit	Rate	Amount
				(₹)	
42.00	AIR TERMINAL				
	M & L for square / rectangular / round neck ceiling diffuser for fixed, consisting of an outer frame assembly with a square / rectangular inlet being an integral part thereof, from the face of the diffuser by removing the spring-loaded inner core assembly, throw reducing vanes, anodic acrylic paint finish, etc. and tested as per ANSI / ASHRAE standard 170-1991 complete all as specified and directed by the engineer-in-charge.				
	Make: Air Master, Caryire, Ruskin-Titus, Systemair				
42.01	Supply of 150 mm X 150 mm Neck size	205	Each		
42.02	Labour for 150 mm X 150 mm Neck size	205	Each		
TOTAL					