

Construction of New Air traffic Control Tower (ATCT), Fire Station and Allied Facilities at Skardu International Airport, Skardu

Bill of Quantities

Bill No. 6 - Mechanical / HVAC Works

N0.	DESCRIPTION (& CODE)	Qty.	Unit	Rate (USD)	Rate (Rs)	Amount (Rs)
1	2	3	4	(5)	(6)	(7) = [(5)*280]+(6)*(3)
M.1	Providing, supplying at site, installation, testing, commissioning and performance verification of Floor-Standing, Forced-Draft, Fire-Tube type dual-fuel (LDO/LPG) Hot Water Generator of minimum 450 kW net output each, complete with burner, operating/safety controls and devices, flue/breaching and fuel connections, insulation, vibration isolation, foundation/support interface, power and control wiring terminations, and all incidental and ancillary works necessary for a complete, functional and operational installation, in accordance with the approved shop drawings and Technical Specification Section. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0150	3.00	Each	[Up to 80% Allowed]		
M.2	Providing, supplying, installing, testing, commissioning and performance verification of factory-assembled, high-efficiency, VFD-controlled, water-cooled electric screw chillers (CH-1 & CH-2), minimum 527 kW cooling capacity each, complete with screw compressors, evaporator, condenser, refrigerant circuit, microprocessor controls, starters, vibration isolators, rigging, piping and electrical terminations, control integration, and all accessories and incidental works, complete in all respects in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0550	2.00	Each	[Up to 80% Allowed]		
M33	Providing, supplying, installation, testing and commissioning of Closed-Circuit Cooling Tower (CT) , induced draft cross-flow type, 3-cell assembly (2 Duty + 1 Standby) , with minimum 650 kW heat rejection per cell capacity, complete with heat exchange coils, fans, motors, basins, drift eliminators, VFD controls, spray pumps, all internal piping, supports, isolators, terminations, and all ancillary works for a fully operational system, per Technical Specifications and complete in all respects. Technical Specifications Section - 0720, Section - 0010. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0550, Section - 0880	1.00	Each	[Up to 80% Allowed]		
M.4	Providing, supplying, installing, testing and commissioning of end-suction centrifugal Chilled Water Pump (CHWP), Minimum 567 L/min capacity at 400 kPa head, complete with VFD-compatible motor, common base frame, flexible coupling, coupling guard, vibration isolators, VFD, controls, piping and electrical connections, and all accessories and incidental works, complete in all respects in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0550, Section - 0880	2.00	Each	Not Applicable		

M.5	Providing, supplying, installation, testing and commissioning of end-suction centrifugal, common-base mounted Condenser Water Pump-Motor sets (CWP), VFD-compatible, minimum 1,740 L/min discharge at 320 kPa head, complete with couplings, coupling guards, base frames, vibration isolators, VFDs/controls and accessories; including alignment, piping and electrical terminations, and all incidental and ancillary works for a complete, operational installation, per Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0550, Section - 0880	2.00	Each	Not Applicable		
M.6	Providing, supplying, installing, testing and commissioning of end-suction centrifugal Hot Water Pump (HWP), Minimum 567 L/min capacity at 400 kPa head, complete with VFD-compatible motor, common base frame, flexible coupling, coupling guard, vibration isolators, VFD, controls, piping and electrical connections, and all accessories and incidental works, complete in all respects in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0550, Section - 0880	2.00	Each	Not Applicable		
M.7	Providing, supplying at site, installation, testing and commissioning of complete Closed-Loop Water Treatment and Chemical Feeding System comprising chemical dosing pumps, corrosion/scale inhibitor feeders, pot feeder, water quality monitoring/sampling equipment and accessories; including initial system charging/passivation, chemical dosing schedule, alignment, piping and electrical terminations, and all incidental and ancillary works for a complete, operational installation, per Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Lot	Not Applicable		
M.8	Providing, supplying, installing, testing and commissioning of Cooling Water Treatment and Feeding System for cooling towers, complete with chemical dosing package, dosing pumps, chemical tank, water quality monitoring and bleed control equipment, initial chemical charging, piping, controls, electrical connections, and all accessories required for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Lot	Not Applicable		
M.9	Providing, supplying at site, installation, testing and commissioning of complete packaged Glycol Make-up and Feed System for initial system filling, pressurization and automatic make-up of closed-loop hot water systems operating in low ambient conditions, complete with glycol concentrate, pumps, storage tank, controls, initial fill and all accessories, including all incidental and ancillary works necessary for a complete and operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0850	1.00	Each	Not Applicable		
M.10	Providing, supplying at site, installation, testing and commissioning of the following auxiliary equipment for the Central Plant Room (CPR), in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720			Not Applicable		

M.10-1	Factory-packaged automatic Pressurization System for closed-loop chilled/hot water hydronic network, comprising duplex pressurization pumps (lead/lag auto alternation), ASME-rated bladder-type Expansion Tank, Air & Dirt Separator, make-up water assembly (PRV, backflow preventer, solenoid valve), safety relief valve, pressure transmitters, and control panel with BAS interface and leak/abnormal make-up alarm; including piping and electrical terminations, testing, commissioning and all incidental and ancillary works, per Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0880	1.00	Lot	Not Applicable		
M.10-2	Complete Light Diesel Oil (LDO) underground storage and distribution system comprising double-wall underground storage tank (min. 100-hour continuous full-load capacity) with interstitial leak monitoring and cathodic protection, duplex transfer pumps, indoor insulated day tank (min. 8-hour capacity) with high/low/high-high alarms, heat-traced fuel piping network (-18°C rated) with insulation, fuel filtration, valves, controls, BMS integration, excavation, backfilling, foundations, testing and commissioning, complying with NFPA 30/31, API 650, UL 58, per Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0150	1.00	Lot	Not Applicable		
M.10-3	Self-regulating parallel-resistance electric heat tracing cable (min. 15–25 W/m) for hot water pipe network freeze protection, maintaining minimum +5°C pipe temperature at -18°C ambient, complete with fluoropolymer jacket, fixing by aluminum adhesive tape, power connection kits, end seals/splice kits, thermostatic controller (energize +4°C/de-energize +10°C), local disconnect, ground fault protection, BMS alarm contacts, weatherproof insulation cladding and all accessories, testing, commissioning and all incidental and ancillary works, per Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Lot	Not Applicable		
M-11	Providing, supplying at site, installation, testing, commissioning and performance verification of chilled/hot water Fan Coil Units, complete with dual-suction multi-blade fan, modulating water control valve, local/centralized controller, drain pan and piping connections, insulation, hangers/supports and all accessories, including all incidental and ancillary works for a complete and operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.11-1	Fan Coil Unit, Code-AA, minimum 4.0 kW cooling capacity. REF: Technical Specifications Section - 0710, Section - 0720	3.00	Each	[Up to 80% Allowed]		
M.11-2	Fan Coil Unit, Code-A, minimum 5.7 kW cooling capacity. REF: Technical Specifications Section - 0710, Section - 0720	25.00	Each	[Up to 80% Allowed]		
M.11-3	Fan Coil Unit, Code-B, minimum 7.0 kW cooling capacity. REF: Technical Specifications Section - 0710, Section - 0720	21.00	Each	[Up to 80% Allowed]		
M.11-4	Fan Coil Unit, Code-C, minimum 10.5 kW cooling capacity. REF: Technical Specifications Section - 0710, Section - 0720	26.00	Each	[Up to 80% Allowed]		
M.11-5	Fan Coil Unit, Code-D, minimum 14.5 kW cooling capacity. REF: Technical Specifications Section - 0710, Section - 0720	26.00	Each	[Up to 80% Allowed]		

M.12	Providing, supplying, installing, testing, commissioning and performance verification of DX ducted split air-conditioning units, complete with inverter-driven compressor, indoor and outdoor units, factory controls, refrigerant piping, condensate drain piping, insulation, supports, electrical and control connections, refrigerant charging, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.12-1	Room Inverter Split Unit (RSU + CU), ducted ceiling-concealed type, nominal cooling capacity 3 TR. REF: Technical Specifications Section - 0710, Section - 0720	6.00	Each	Not Applicable		
M.13	Providing, supplying, installing, testing, commissioning and performance verification of Dedicated Outdoor Air System (DOAS) air handling units, 100% outdoor air, heat recovery type, complete with EC supply and exhaust fans, plate heat exchanger, chilled/hot water coils, filters, dampers, controls, drain pan, casing, piping, electrical connections, vibration isolators, supports, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.13-1	DOAS AHU-1 (TFAU-1) - 400 L/s airflow, minimum cooling capacity 12.0 kW. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	[Up to 80% Allowed]		
M.13-2	DOAS AHU-2 (TFAU-2) - 550 L/s airflow, minimum cooling capacity 15.0 kW. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	[Up to 80% Allowed]		
M.13-3	DOAS AHU-3 (TFAU-3) - 2,200 L/s airflow, minimum cooling capacity 55.0 kW. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	[Up to 80% Allowed]		
M.14	Providing, supplying, installing, testing, commissioning and performance verification of Fans and Ventilation Systems, complete with motors, controls, vibration isolators, supports, electrical connections, backdraft dampers, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.14-1	Exhaust Fan EF-GF-1, 1000 CFM @ 1" w.g. ESP. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.14-2	Exhaust Fan EF-F-1, 1500 CFM @ 1" w.g. ESP. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.14-3	Exhaust Fan EF F-2 (1400 CFM @ 1" ESP) REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.14-4	Exhaust Fan EF F-3, kitchen exhaust fan suitable for grease-laden and hot air service (2000 CFM @ 1.5" w.g. ESP) REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.14-5	Vehicle Exhaust Ventilation System (LEV), complete with ductwork, retractable nozzles, hose-reel with pipe/snorkel and extraction fan, including controls, testing, commissioning and all incidental and ancillary works necessary for a complete and operational installation, in accordance with Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0830	1.00	Lot	Not Applicable		

M.14-6	Staircase Pressurization System, comprising 2 fans (1 duty + 1 standby), complete standalone system with controls and pressure sensors, integrated with BMS, including testing, commissioning and all incidental and ancillary works necessary for a complete and operational installation, in accordance with Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Lot	Not Applicable		
M.14-7	Supply Air Fan for CPR, wall mounted type (SF) REF: Technical Specifications Section - 0710, Section - 0720	4.00	Each	Not Applicable		
M.14-8	Energy Recovery Ventilator, 80% efficiency, 1500 CFM, with supply and exhaust fans and plate type heat exchanger. REF: Technical Specifications Section - 0710, Section - 0720	3.00	Each	Not Applicable		
M.15	CHILLED/HOT WATER PIPING WITH FITTINGS Providing, laying, jointing, testing and commissioning of Polypropylene (PP-R / PP-RP (RCT)) pipes and fittings, manufactured from virgin Fusiofen resin with no recycled content, complying with ASTM F2389, CSA B137.11 and ASTM D2774, in SDR 7.4 / 9 / 11 / 17.6 as per manufacturer's instructions, with hydronic hot water/heating lines incorporating a fiber (faser) layer to limit thermal expansion, complete with fittings, fusion jointing, hangers, supports, sleeves and all accessories, backed by manufacturer's 10-year material warranty with Engineer's approvals, including pressure testing, flushing and all incidental and ancillary works, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.15-1	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	250.00	RFT	Not Applicable		
M.15-2	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	800.00	RFT	Not Applicable		
M.15-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	950.00	RFT	Not Applicable		
M.15-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	800.00	RFT	Not Applicable		
M.15-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	980.00	RFT	Not Applicable		
M.15-6	2-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	50.00	RFT	Not Applicable		
M.15-7	3" dia. REF: Technical Specifications Section - 0710, Section - 0720	1,200.00	RFT	Not Applicable		
M.15-8	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	750.00	RFT	Not Applicable		
M.15-9	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	750.00	RFT	Not Applicable		
M.15-10	6" dia. REF: Technical Specifications Section - 0710, Section - 0720	250.00	RFT	Not Applicable		
M.16	CONDENSATE DRAIN PIPING - uPVC CLASS E (SCHEDULE 40) Providing, laying, jointing, testing and commissioning of uPVC (unplasticized polyvinyl chloride) Class E/Schedule 40 piping of nominal diameters below, including cost of solvent cement and specials, hangers, supports and all accessories, complete as approved and directed by the Engineer, in accordance with Technical Specification. REF: Technical Specifications Section - 0710, Section - 0720					

M.16-1	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	290.00	RFT	Not Applicable		
M.16-2	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	394.00	RFT	Not Applicable		
M.16-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	1,250.00	RFT	Not Applicable		
M.16-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	280.00	RFT	Not Applicable		
M.17	GALVANIZED STEEL PIPE (BS 1387), Providing, supplying, laying, jointing, testing and commissioning of galvanized steel piping, complete with fittings, unions, supports, sleeves, testing and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.17-1	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	10.00	RFT	Not Applicable		
M.17-2	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	20.00	RFT	Not Applicable		
M.17-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	30.00	RFT	Not Applicable		
M.17-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	25.00	RFT	Not Applicable		
M.17-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	20.00	RFT	Not Applicable		
M.18	Providing, laying, jointing, testing and commissioning of 1/4" dia. hard-drawn copper pipe, ASTM B88 Type L, internally chemically cleaned, with brazed fittings (inert gas purged), hangers, supports and all accessories. REF: Technical Specifications Section - 0710, Section - 0720	20.00	RFT	Not Applicable		
M.19	VALVES AND SPECIALTIES Providing, supplying, installing, testing and commissioning of valves and piping specialties of the types and sizes specified below, complete with companion flanges, unions, gaskets, bolts, supports, identification tags, testing and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-1	Gate Valves. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-1-1	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	120.00	Each	Not Applicable		
M.19-1-2	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	80.00	Each	Not Applicable		
M.19-1-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	5.00	Each	Not Applicable		
M.19-1-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-1-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-1-6	2-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		

M.19-1-7	3" dia. REF: Technical Specifications Section - 0710, Section - 0720	4.00	Each	Not Applicable		
M.19-1-8	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	9.00	Each	Not Applicable		
M.19-1-9	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	18.00	Each	Not Applicable		
M.19-2	Balancing Valves. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-2-1	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	60.00	Each	Not Applicable		
M.19-2-2	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	35.00	Each	Not Applicable		
M.19-2-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-2-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-2-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-2-6	2-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.19-2-7	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-2-8	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	4.00	Each	Not Applicable		
M.19-3	Y-Strainers. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-3-1	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	60.00	Each	Not Applicable		
M.19-3-2	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	30.00	Each	Not Applicable		
M.19-3-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-3-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-3-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	3.00	Each	Not Applicable		
M.19-3-6	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-3-7	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	4.00	Each	Not Applicable		
M.19-4	Flexible Joints. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-4-1	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	4.00	Each	Not Applicable		
M.19-4-2	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	16.00	Each	Not Applicable		
M.19-5	Check Valves. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-5-1	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	45.00	Each	Not Applicable		

M.19-5-2	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	65.00	Each	Not Applicable		
M.19-5-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	5.00	Each	Not Applicable		
M.19-5-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.19-5-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Each	Not Applicable		
M.19-5-6	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.19-5-7	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	4.00	Each	Not Applicable		
M.19-6	Ball Valves / Drain Cocks. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-6-1	1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	20.00	Each	Not Applicable		
M.19-6-2	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	15.00	Each	Not Applicable		
M.19-6-3	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	10.00	Each	Not Applicable		
M.19-7	Automatic Air Vents. REF: Technical Specifications Section - 0710, Section - 0720					
M.19-7-1	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	8.00	Each	Not Applicable		
M.20	Providing, supplying, fabricating, installing, testing and commissioning of galvanized steel ductwork, complete with fittings, flanges, flexible connections, volume control dampers, access doors, hangers, supports, sealants, stiffeners, acoustic lining (where specified), leakage testing, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	18,000.00	Sqft	Not Applicable		
M.21	Providing, supplying at site, fabrication and installation of welded steel Breaching/Flue Stack for Hot Water Generator, minimum 6mm thick plate conforming to ASTM A36 or A283, complete with structural angle flanges at breaching and HWG connections, flue collar interface, supports, joints, stack termination, sealing, access provisions, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	800.00	SFT	Not Applicable		
M.22	FLEXIBLE ROUND DUCT Providing, supplying and installing insulated flexible round duct, complete with factory-applied vapour barrier, clamps, take-offs, connectors, hangers, supports, sealants and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.22-1	6" dia. REF: Technical Specifications Section - 0710, Section - 0720	100.00	RFT	Not Applicable		
M.22-2	8" dia. REF: Technical Specifications Section - 0710, Section - 0720	150.00	RFT	Not Applicable		

M.22-3	10" dia. REF: Technical Specifications Section - 0710, Section - 0720	80.00	RFT	Not Applicable		
M.22-4	12" dia. REF: Technical Specifications Section - 0710, Section - 0720	20.00	RFT	Not Applicable		
M.23	Providing, supplying and installing closed-cell elastomeric thermal insulation for piping, ductwork and equipment, complete with adhesive, vapour barrier sealing, insulation inserts, jackets/protection (where specified), finishing, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	12,000.00	Sqft	Not Applicable		
M.24	INSULATION Providing, supplying and installing thermal and acoustic insulation for ductwork, piping and equipment, complete with adhesives, vapour barriers, protective jacketing/cladding, finishing, supports and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.24-1	1" Glass Fibre Blanket (0.75 lbs/ft³) + 4-Oz Aluminum Canvas Insulation for indoor supply/return air ducts concealed from vision and outdoor air ducts passing through conditioned space. REF: Technical Specifications Section - 0710, Section - 0720	13,500.00	SFT	Not Applicable		
M.24-2	1" Glass Fibre Blanket (0.75 lbs/ft³) + 8-Oz Aluminum Canvas Insulation for indoor supply/return air ducts exposed to vision and in plant rooms, including protection. REF: Technical Specifications Section - 0710, Section - 0720	500.00	SFT	Not Applicable		
M.24-3	1.5 lbs/ft³ Fibre-Glass with Neoprene Scrim Acoustic liner on supply air ducts and sheet metal air plenums. REF: Technical Specifications Section - 0710, Section - 0720	800.00	SFT	Not Applicable		
M.24-4	2" Mineral wool (rock wool) blanket, minimum density 6 lb/ft³ with 24-gauge aluminum jacket Insulation for flue stack. REF: Technical Specifications Section - 0710, Section - 0720	800.00	SFT	Not Applicable		
M.24-5	1" Closed-Cell Elastomeric Foam Insulation for indoor chilled/hot water piping, fittings, accessories and valves. REF: Technical Specifications Section - 0710, Section - 0720					
M.24-5-1	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	250.00	RFT	Not Applicable		
M.24-5-2	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	800.00	RFT	Not Applicable		
M.24-5-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	950.00	RFT	Not Applicable		
M.24-5-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	800.00	RFT	Not Applicable		
M.24-5-5	2" dia. REF: Technical Specifications Section - 0710, Section - 0720	980.00	RFT	Not Applicable		
M.24-5-6	2-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	50.00	RFT	Not Applicable		
M.24-5-7	3" dia. REF: Technical Specifications Section - 0710, Section - 0720	1,200.00	RFT	Not Applicable		

M.24-5-8	4" dia. REF: Technical Specifications Section - 0710, Section - 0720	750.00	RFT	Not Applicable		
M.24-5-9	5" dia. REF: Technical Specifications Section - 0710, Section - 0720	750.00	RFT	Not Applicable		
M.24-5-10	6" dia. REF: Technical Specifications Section - 0710, Section - 0720	250.00	RFT	Not Applicable		
M.24-6	1/8" Self-Adhesive Vinyl Aluminum Foam Tape Insulation for cooling coil condensate drain piping, including fittings and accessories. REF: Technical Specifications Section - 0710, Section - 0720					
M.24-6-1	3/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	380.00	RFT	Not Applicable		
M.24-6-2	1" dia. REF: Technical Specifications Section - 0710, Section - 0720	231.00	RFT	Not Applicable		
M.24-6-3	1-1/4" dia. REF: Technical Specifications Section - 0710, Section - 0720	650.00	RFT	Not Applicable		
M.24-6-4	1-1/2" dia. REF: Technical Specifications Section - 0710, Section - 0720	20.00	RFT	Not Applicable		
M.24-7	1" Closed-Cell Elastomeric Foam Insulation for Expansion Tank. REF: Technical Specifications Section - 0710, Section - 0720	1.00	LOT	Not Applicable		
M.24-8	1" Closed-Cell Elastomeric Foam Insulation for Air Separator. REF: Technical Specifications Section - 0710, Section - 0720	1.00	LOT	Not Applicable		
M.24-9	1" Removable Closed-Cell Elastomeric Jackets Insulation for Pumps. REF: Technical Specifications Section - 0710, Section - 0720	6.00	Each	Not Applicable		
M.24-10	1" Polyethylene (PE) Foam (0.040 W/m-K) Insulation for Chiller-Heaters. REF: Technical Specifications Section - 0710, Section - 0720	2.00	Each	Not Applicable		
M.25	Providing, supplying and installing Manual Volume Control Dampers (VCD), complete with galvanized steel frame, opposed-blade damper assembly, locking quadrant with engraved graduated position indicator (0-100% open), operating linkage, bearings, sleeves, fixing hardware, testing, commissioning, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	150.00	SFT	Not Applicable		
M.26	Providing, supplying and installing Fire Dampers (FD), complete with galvanized steel sleeve, retaining angles, fusible link, access door, breakaway duct connection, fixing hardware, testing, commissioning, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	50.00	SFT	Not Applicable		
M.27	Providing, supplying and installing flexible duct connections for vibration isolation, complete with fire-retardant flexible fabric, galvanized steel fixing frames, clamps, fasteners, sealants, and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	76.00	RFT	Not Applicable		

M.28	AIR TERMINAL DEVICES (measurement on SFT of neck area) Providing, supplying, installing, testing, adjusting and balancing of aluminium air terminal devices, complete with powder-coated finish, fixing frames, gaskets, opposed-blade dampers (where applicable), fixing hardware and all accessories necessary for a complete operational installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.28-1	Supply Air Grille (CODE-I), double deflection type, extruded aluminum construction, complete with opposed blade damper. REF: Technical Specifications Section - 0710, Section - 0720	680.00	SFT	Not Applicable		
M.28-2	Filter Back Return Grille (CODE-I), extruded aluminum construction, complete with hinged filter access door, 1" washable filter, opposed blade damper. REF: Technical Specifications Section - 0710, Section - 0720	700.00	SFT	Not Applicable		
M.28-3	Fresh Air Louvers, extruded aluminium weatherproof drainable type with bird/insect screen and washable filter. REF: Technical Specifications Section - 0710, Section - 0720	50.00	SFT	Not Applicable		
M.29	ELECTRICAL EQUIPMENT AND CONTROLS Providing, supplying, installing, testing, commissioning and performance verification of electrical equipment and controls for the HVAC system, complete in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720					
M.29-1	Motor Control Centres (MCCs) and Auxiliary Control Panels (ACPs), floor/wall-mounted, complete with Form-2 or higher compartmentalized enclosures, ACBs/MCCBs/MCBs, VFDs/soft starters (where specified), contactors, relays, meters, surge protection, control transformer, internal wiring, terminals, earthing, labels, BMS interface and all accessories. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0550	1.00	Lot	Not Applicable		
M.29-2	Complete HVAC electrical installation, excluding MCCs and ACPs, comprising power and control cabling, conduits, cable trays, trunking, junction boxes, isolators, earthing, equipment terminations, control wiring, BMS field wiring, testing, commissioning and all accessories for a complete operational installation. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Lot	Not Applicable		
M.30	AUTOMATION AND CONTROLS Providing, supplying, installing, programming, testing, commissioning and performance verification of the HVAC Building Automation System (BAS), complete in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0880					
M.30-1	HVAC Building Automation System (BAS) with BACnet/IP protocol-compatible DDC controls, complete with controllers, operator workstation, software, graphics, licences, sensors, actuators, control valves, control dampers, BMS interfaces, networking, point-to-point testing, system integration and all accessories necessary for a complete operational installation. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0880	1.00	Lot	Not Applicable		

M.30-2	Field installation works for the HVAC BAS, including control cabling, conduits, cable trays, junction boxes, field control panels, power supplies, mounting supports, equipment terminations, testing, commissioning and all accessories necessary for a complete operational installation. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0880	1.00	Lot	Not Applicable		
M.30-3	Temperature and pressure instrumentation, comprising thermometers, pressure gauges, thermometer wells, gauge cocks, siphons, isolation valves, fittings, supports, calibration, testing and all accessories necessary for a complete operational installation. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Lot	Not Applicable		
M.31	Providing and constructing reinforced concrete foundations, housekeeping pads, equipment supports, inertia bases, vibration isolators, anchor bolts, non-shrink grout, embedded steelwork, making good and all accessories necessary for complete installation of HVAC equipment, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0880, Section - 0150	1.00	Job	Not Applicable		
M.32	Preparation, submission and revision of coordinated shop drawings, coordinated services drawings, and as-built drawings for the complete HVAC installation, Engineer's approvals and record documentation, in accordance with the Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Job	Not Applicable		
M.33	Providing surface preparation, painting, colour coding, tagging and identification of all HVAC equipment, piping and ductwork, complete with direction-of-flow arrows, valve tags, equipment labels, pipe markers and all accessories, in accordance with the approved shop drawings and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Job	Not Applicable		
M.34	Providing Testing, Adjusting and Balancing (TAB), commissioning and performance verification of the complete HVAC system, including complete system cleaning and flushing, pre-commissioning inspections, functional performance testing, air and water balancing using calibrated instruments, adjustment of control settings, submission of TAB and commissioning reports, demonstration of system performance, attendance during Engineer's inspections, and all incidental works necessary for successful acceptance of the installation, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720	1.00	Job	Not Applicable		
M.35	Providing comprehensive Operation and Maintenance (O&M) services for the complete HVAC installation for a period of 365 days from the date of Taking-Over by the Employer, measured on a monthly basis, including provision of qualified operating personnel for continuous daytime operation, preventive and corrective maintenance in accordance with OEM recommendations, lubrication, filter replacement, water treatment and chemical dosing, consumables, minor repairs, fault diagnosis and troubleshooting, tools and test instruments, training of the Employer's personnel, maintenance records, daily/weekly/monthly inspection reports, and all incidental works necessary to maintain the system in a safe, efficient and reliable operating condition, in accordance with the approved shop drawings, project design and Technical Specifications. REF: Technical Specifications Section - 0710, Section - 0720, Section - 0880	12.00	Months	Not Applicable		

Total Amount in Words=			TOTAL Rs.	0.00
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1) This BOQ shall be read in conjunction with the Special Provisions, Technical Specifications, Equipment Schedules, Tender Drawings, Conditions of Contract, Employer Requirements , Approved Materials and Manufacturers Lists and all issued addenda.

2) BOQ descriptions are abbreviated and shall not limit the Contractor's obligation to provide complete and fully functional HVAC systems.

3) Rates shall include supply, delivery, storage, installation, testing, adjusting, balancing, commissioning, warranties, O&M manuals, training, as-built drawings and all accessories required for complete operation.

4) Contractor remains responsible for completeness of scope whether or not minor components are expressly identified in individual BOQ descriptions. All these items are on the bases of Supply, installation, testing, commissioning and performance verification complete , including, controls, connections, insulation and accessories in accordance with specifications and schedules. complete in all respect

5) Technical specification references within the item descriptions cite ONLY the documents attached to this tender: "Technical Provisions (ATCT-PAA/HVAC/TP)" - Sections 1 to 13 with Section 2 clauses numbered 2-01 to 2-32; "Special Provisions (ATCT-PAA/HVAC/SP)"; and the "HVAC Equipment Schedule (ATCT-PAA/HVAC/EQUIPMENT SCHEDULE)" - Schedules 1 to 6 plus the water coil schedules. References are for tendering assistance only; the full referenced documents, approved drawings and schedules shall govern. The REMARKS column identifies resolved items (green), pending decisions (yellow) and specification defects requiring addendum (red).

6) R5 note: all references to "Volume-II", four-digit section numbers (0010/0550/0680/0710/0720/0830/0840/0850/0880) and "Annex 2 (A2.x)" that appeared in the R3 draft have been removed - those designations do not exist in any document attached to this tender. Should the Employer issue a Volume-II master document set, citations may be re-indexed accordingly by addendum.