


SUBWAY (SHOP NO-17) @ L-05, DELHI AIRPORT			
HVAC BOQ			
Sr.No	Description	Unit	Qty
	Note:		
	Prices shall be based on supply, installation, testing & commissioning (SITC) at site including all taxes, duties, transportation & insurance etc.		
1	CHILLED WATER TYPE CEILING SUSPENDED AHU (AIR HANDLING UNIT) :		
1.1	CEILING SUSPENDED AHU :		
	Supply and assembly of Ceiling Suspended Double skin cabinet type AHU Integrated (Air handling units) of following specifications:		
	Frame Structure: It shall consist of 48mm Extruded Aluminium with thermal break profile.		
	Panel: 45mm +/- 2mm thick double skin sandwich panels with rockwool insulation of density 64 kg/m ³ or PUF insulation of 48 kg/m ³ , The sheet thickness shall be minimum 0.6 mm for the outer skin pre-coated and 0.8 mm thickness for the inner skin of plain GI.		
	Mixing Box: shall be provided wherever specified in the drawing.		
	Filtration Section: It shall be provided with single stage washable type of prefilter 'MERV 8' first stage which shall be placed before coil section.		
	Coil Section: Chilled water coil Multi row deep constructed with Aluminium fins of min 0.11mm thick 12 Fins per inch, and copper tubes of min 27 Gauge thickness HYDROPHYLLIC coated fins. Copper tube shall be min 12.5mm diameter. AHRI certified coil. The coil face area velocity shall not exceed 2.5m/sec (500 fpm).		
	Drain Pan: Condensate drain pan shall be fabricated from 18G SS 304 powder coated, insulated with 13 mm thick closed cell elastomeric(nitrile rubber) insulation.		
	Fan Section: SISW / DIDW Direct drive backward curved fan. The fan section shall be provided with limit switch for safety to shut off fan during Opening of access door. Fan outlet velocity not to exceed 1600 FPM. The sound level shall not be exceed more than 60dB @ 1m from the source. Vibration isolators, Door Limit switch, UV Lamp as per Technical Specifications, AHU Summary Sheet and drawings. Total static pressure has to be calculated by Contractor as per the configuration.		
	Other Details : AHU to house control box/ terminal box with Auto-Manual switch and incoming power terminal, with SPP, Over/ Undervoltage protection, shortcircuit protection and with no-nc contacts (potential free contact) to be provided for tripping on signal from Fire Dampers / Fire Alarm Panel. Power cable from Terminal box to motor & control cabling of required size upto the thermostat / sensor etc. to be provided. Internal electrical and control wiring of AHU to be provided as factory fitted from AHU supplier. The cost shall include all necessary supports & accessories required for installation.		
	Contractor shall design the chilled water coil according to the following conditions:		



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	a. Coil air entering temperature - 75.4°F DB		
	b. Coil air leaving temperature - 54 deg. F DB/ 52.99 deg. F WB		
	c. Chilled water temperature entering - 7.0 deg. C/ 44.6 deg. F		
	d. Chilled water temperature leaving - 12 deg. C/ 53.6 deg. F		
	Make : VTS / Zeco / Citizen		
	Type	Capacity	Tonnage
		(Cfm)	TR
			ESP
			(mm WG)
			No. of
			Rows
a	CS AHU	2000	4.2
			25
			4/6
			nos
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	GENERAL NOTES:		
a.	LHS & RHS VALVE station location to be confirmed.		
b.	Fan outlet velocity - 1600 FPM		
c.	Contractor shall submit static pressure calculation for all above units to Client/Consultant.		
d.	Any change in motor HP shall be made at no extra cost to client.		
e.	Fan efficiency shall be minimum 75%		
f.	The cost shall be included lifting & shifting of each equipment / material with all necessary arrangement. Also, it shall be included the cost of scaffolding required for installation of such material / equipment.		
	SUB-TOTAL		
2	CHILLED WATER PIPING WITH INSULATION:		
2.1	CHW PIPE		
	SITC of MS Heavy duty class 'C' ERW Chilled Water pipe conforming to IS 1239 - 2004 primer painted including bends, tees, MS supports, PUFF saddles, anchor fasteners, steel angles and any other material required to complete the work. The piping flange connection bolts, washers and nuts should be hot dipped galvanised. Fluorescent Plastic Sticker/ paint shall be applied to indicate Water flow directions. Only End flanges to be used for capping of pipes. "Table E" of BS code for flange thickness to be adhered.		
	Make: Jindal Hissar / TATA		
a	Φ 32 mm		Rmt
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2.2	CHILLED WATER PIPING INSULATION - INTERNAL USE		
	SITC of insulation for chilled water. piping. For internal pipe - Stick 25mm thick Nitrile rubber class "O" Closed cell nitrile rubber with anti-microbial coating on it. Insulation shall have Thermal conductivity of 0.033 W/(m.K) and water vapor permeance of 0.10. Joints should be sealed with 50 mm wide 3 mm thick self adhesive tape and putting PVC bands at all supports.		
	Make: Armaflex & K-flex		
a	Φ 32 mm		Rmt
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2.3	BALL VALVE		



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	SITC of following sizes of Ball Valve consist of Cap, Brass Body, Rated for 150 psi SWP, 600 psi WOG Pressure: Two-piece construction; with brass body, regular port, B-16 chrome-plated ball and stem, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, vinyl covered steel handle, threaded or soldered ends and extended stem for insulated piping. Same valve shall be used as a Drain valve.		
	Make: Zoloto / Audco / Kitz		
a	Ø 32 mm	Nos.	3 70/
2.4	BALL VALVE WITH Y-STRAINER		
	SITC of following sizes of Brass Ball Valve with Y-Strainer consist of Cap, Brass Body, Rated for 150 psi SWP, 600 psi WOG Pressure: Two-piece construction; with brass body, regular port, B-16 chrome-plated ball and stem, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, vinyl covered steel handle, threaded or soldered ends and extended stem for insulated piping. Filter element shall be of non magnetic SS sheet with perforation.		
	Make: Zoloto / Audco / Kitz		
a	Ø 32 mm	No.	1 ✓
2.4.1	Balancing Valve		
a	Suply and installtion of 32mm dia Balance valve as per airport specification	No.	1 ✓
2.5	PIBCV VALVES		
	SITC of Pressure Independent Balancing cum Control Valves (PIBCV) including integrated motorised control valve and balancing device for combined flow and water balancing requirement. Valve body to be rated for PN 16. The valve design flow rate should be factory calibrated with +/- 5% flow accuracy. Valve shall have necessary measuring ports, drain port, flanges etc., Valve shall also provide temperature sensor with necessary cabling (min 2mtr length to be considered with each valve). The balancing to be done through microprocessor based hand held terminal / POT and the same results shall be furnished in the water balancing report as part of commissioning report and handing over manual.		
	Make: Oventrop / Siemens / Danfoss		
a	Ø 32 mm	No.	1 ✓
2.6	Auto Air Vent Valves		
	Make: Anergy / Flamco		
	Providing and fitting Auto Vent Valves.		
a	SITC of Auto air vent in each risers & common headers & AHU. 3/4" auto vent valves at each coil / riser/ header.	Nos.	2 70/
2.7	SITC of Pressure gauges & Thermometers		
	Make: H Guru / Waree		
	Necessary pressure gauges and thermometers 4" Dial type.		
a	Water Pressure gauges 150mm dial complete with gauge valves, mounting, fittings and copper tubing extension wherever required. Pressure gauges Range 0-10 Kg/CM2	Nos.	2



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b	Thermometers of the mercury in glass stem type and copper separable well complete with guard etc., of industrial grade mounting on water lines. Length 9/12 inches, Thermometer, Range 0-50 deg C	Nos.	2
c	Thermowells	Nos.	4
d	SITC of Brass Test Plug of industrial grade mounting on water	Nos.	1
2.8	INSULATED CONDENSATE DRAIN PIPE		
	SITC of UPVC pipes of following sizes for drain with necessary supports and fittings such as elbows, tees & reducers etc. The insulation line to be insulated with nitrile rubber insulation of thickness 9mm and wrapped by weather proof protection tape. The Pipe wherever concealed should also have a parallel line as a standby arrangement in case of block of primary pipe .		
	Make: Supreme, Prince, Astral		
a	Φ 25 mm	Rmt	10
b	Φ 32 mm	Rmt	2
	NOTES FOR PIPING:		
a	Cover all open pipe ends with muslin cloth during construction		
b	Pipe cleaning & chemical treatment as per specs shall be included in the piping cost.		
c	Unit rates for all indicated sizes of pipes & valves shall be furnished.		
d	Cleaning/Painting of pipe before insulation shall be included in piping cost.		
e	The piping support should be as per tender specification and additional supports are to be provided Contractor as decided by Consultant.		
f	All the valves shall be insulated with the same material as that of Chilled water piping and cost of insulation for valves shall be considered.		
	SUB-TOTAL		
3	VENTILATION SYSTEM		
3.1	KITCHEN EXHAUST AIR FAN WITH WET SCRUBBER		
	SITC of Cabinet type Ventilation fan with Centrifugal Blower, Belt / Direct Drive, Statically & Dynamically Balanced, Backward Curved Impeller, Speed regulator, Dunlop Anti- Vibration Pads, etc. Motor should be TEFC squirrel cage, IP 55 rating with Class F Insulation, suitable for 3phase, 415volts, 50hz power supply. Sound level should be 65dB @ 3mtr distance. MERV 8 / G4 pleated pre-filters should be made of 100% synthetic media to capture common airborne contaminants as per ASHRAE Standard 52.2. Fan shall be BMS compatible. Power will be provided 5 ft away from fan and necessary control wiring with plug will be provided by AC contractor. (Vendor to crosscheck static pressure calculation)		
	Make : Kruger / Nicotra / Systems Air		
a	EXHAUST FAN WITH OUT OF STREAM MOTOR 650mm @ 25mm ESP	No	1
b	FRESH AIR FAN WITH MERV 8 500mm @ 25mm ESP	No	1

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	Note:		
a.	Fan outlet velocity - 1600 FPM		
b.	All cabinet fans should have plenum section.		
c.	Fresh air fan should to have 6mm thick synthetic media washable filter with framework.		
d.	Contractor shall submit static pressure calculation for all above units to Client/Consultant for their approval. Also, the total static drops across the systems shall cover the overall length from suction / discharge to grille (inside the outlet).		
e.	Any change in motor HP or coil selection shall be made at no extra cost to client.		
f.	Fan efficiency shall be minimum 75%		
g.	The cost shall be included lifting & shifting of each equipment / material with all necessary arrangement. Also, it shall be included the cost of scaffolding required for installation of such material / equipment.		
SUB-TOTAL			
4	SHEET METAL WORKS:		
4.1	GI SHEET METAL DUCTING		
	Supply, Fabrication, Testing, and Commissioning of Factory Fabricated GI Sheet Metal 120GSM Rectangular boxed ducting, Plenums, Cowls, Elbows with turning vanes, Splitters, Reducers, Flanges, Collars etc as per IS:655 and installation as per SMACNA standards, The complete ducting shall be provided with MS Supports, Rods, Angles, Flanges, Bracing, Rubber Gaskets, Wooden frames, Canvas Connections, etc. as per drawings and specifications.		
	GI Sheet Makes : Tata, Jindal, SAIL, Ispat		
	Make: Rola Star, Zeco & Ductofab		
a	22 Gauge GI Sheet Metal Duct (751-1500mm)	Sq.mtr	10
b	24 Gauge GI Sheet Metal Duct (0-750mm)	Sq.mtr	75
4.2	EXTRUDED ALUMINIUM CEILING GRILLES		
	Supply, Installation, Testing and Balancing of Powder coated aluminium grilles complete with removable inner core as per approved shop drawing and specifications. The area of grille can be of any geometrical shape (Square/rectangular/Linear). The grilles shall be with 15/30/45° deflections as per requirement. The Colour shall be decided and approved by client and architect.		
	Make: Cosmos, Air Master & System Air		
b	Square / Rectangular / Linear	Sq.mtr	4
4.3	OPPOSED BLADE DAMPER		
	SITC of Aluminium Opposed blade dampers black powder coated vertical blades type for supply air collar. The damper should be gear operated type.	Sq.mtr	12
	Make: Cosmos, Air Master & System Air		
4.6	MULTI LEAF VOLUME CONTROL DAMPER		



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	SITC of multiblade box type galvanised steel sheet volume control dampers for ducts to be provided with suitable links, levers and quadrants for manual control of volume of air flow and for proper balancing of the air distribution system as per the approved shop drawings and specifications.	Sq.mtr	5
	Make: Carryaire / System Air / Dynacraft / Air Master		
4.7	EXTRUDED ALUMINIUM SQUARE AIR DIFFUSER		
	Supply, Installation, Testing and Balancing of Powder coated aluminium supply air square diffuser complete with removable inner core as per approved shop drawing and specifications. The diffuser shall also be provided with Black painted GI opposed blade damper (OBD) of required sizes. Each diffuser shall have double inlet rings to connect flexible ducts. The diffuser shall be suitable for gypsum/grid ceiling. The Colour shall be decided and approved by client and architect.		
	Make: Cosmos / Ruskin Titus / Air Master		
a	SQUARE DIFFUSER FOR GRID CEILING		
	Supply Air Diffuser with OBD - Neck Size 250x250mm	Nos.	4
	Return Air Diffuser without OBD	Nos.	4
b	SQUARE DIFFUSER FOR GYPSUM CEILING		
	Supply Air Diffuser with OBD - Neck Size 250x250mm	Nos.	4
	Return Air Diffuser without OBD	Nos.	4
4.8	CANVAS CONNECTION		
	Supply & fixing of flexible Canvas connections between mouth piece and initial piece of ducting. Flexible connections shall be fire resistant made of closely woven, double layer canvass / neoprene coated fibre glass.		
a	CHW AHU	No.	1
b	Cabinet Exhaust Fan	No.	1
c	Cabinet Fresh Air Fan	No.	1
	NOTES:		
a	The ducting support should be as per tender specification and additional supports are to be provided by Contractor as decided by Consultant.		
b	Muslin cloth cover for all air outlets during construction.		
c	Pressure testing of complete duct work as per DW/ SMACNA standard.		
d	Silicon sealant for longitudinal & transverse joints as per specification.		
e	Diffusers & grilles shall be powder coated as per color approved by Architect.		
	SUB-TOTAL		
5	THERMAL INSULATION		
5.1	THERMAL INSULATION		

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	Supply & fixing of Thermal insulation for supply air duct using 19mm thick class " O " Closed cell nitrile rubber with anti-microbial coating on it. Insulation shall have Thermal conductivity of 0.033 W/(m.K) and water vapor permeance of 0.10. Joints should be sealed with 50 mm wide 3 mm thick self adhesive tape. The duct shall be stick with recommended adhesive.	Sq.mtr	10
	Make: Armaflex & K-flex		
5.2	ACOUSTIC INSULATION		
	Supply & fixing acoustic insulation for ducting using Class "1" closed cell elastomeric insulation of 10mm thick Nitrile rubber insulation adhesive, longitudinal & transverse joints sealed with adhesive in neat & clean manner. Material shall be processed Nitrile Rubber foam with anti-microbial protection. Insulation shall have thermal conductivity of 0.047 W/(m.K) and density of 140 - 180 kg/m ³ .	Sq.mtr	40
	Make: Armaflex & K-flex		
5.3	THERMAL INSULATION FOR KITCHEN DUCTS		
	SITC of Glass Fibre Blanket Insulation material bonded with Thrmosetting Resin, with factory applied laminated aluminium foil of 22 micrns with fibre glass backing. Further, wire mesh along with 7 mil cloth shall be applied on above the insulation with proper adhesive. Nominal density : 48 Kg/CuM. Thermal conductivity, < 0.033 W/m.K at 24 degC. All Insuation material and adhesives shall be as per Class I for surface spread and in accordance with BS 476, & Class O for non-combustible grade.		
	Makes : UP Twiga, Owens Corning, Supreme		
	25 mm Thick	Sq.mtr	30
	SUB-TOTAL		
6	ELECTRICAL WORKS		
6.1	Power Cable:		
	Supply, handling, laying effecting proper connections testing and commissioning of following sizes of 1.1 KV grade XLPE insulated FRLS Aluminium / Copper conductor cables laid over MS supports cable racks or fixing on walls including clamping the cable to supports in an approved manner as required complete with Copper earthing as specified for continuous earthing along with cable. All complete as required and as per final instruction as given by Owners/ Consultants and as per Technical specifications. Earthing shall be measured separately and shall be connected in two runs. Power to ELCB to be provided near each ODU by electrical contractor.		
a	CU Armoured Cable for Suitable 2000 CFM AHU Fan, 3PH Fan	Rmt	5
b	CU XLPE Cable for EX Fan, 1PH Fan with Industrial Top Plug	Rmt	5
c	CU XLPE Cable for FA Fan, 1PH Fan with Industrial Top Plug	Rmt	5
d	8 SWG GI Earthing	Rmt	10
6.2	CABLE TERMINATION :		

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	Supply & Making of Cable termination of armoured / unarmoured cables 1.1 KV grade including installation of cable glands, cable lugs (Aluminium for A2XFY & copper for 2XFY & YY Double compression type), heat shrinkable sleeves on long ends, crimping paste etc. The work includes testing & commissioning of cables, meggering values & submitting reports of tests. (One set includes termination of all cores of one end only). All crimping tools & dies shall be arranged by contractor.		
a	CU Armoured Cable for Suitable 2000 CFM AHU Fan, 3PH Fan	Nos.	2
6.3	CABLE TRAYS		
	Supplying & Fixing of following sizes of GI cable tray duly painted perforated type of height 50mm along with necessary bends, reducers etc. anchored along the wall / suspended from the ceiling with necessary MS supports.		
a	50mm x 50mm x 1.6mm Thick	Rmt	15
b	100mm wide x 50mm x 1.6mm Thick	Rmt	5
	Starter panel		
1	Suply and instalaltion of starter panel as per machine specification	nos	3
SUB-TOTAL			
GRAND TOTAL			

70%

70% work completed *And*
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