

Government of the People's Republic of Bangladesh  
**Prime Minister's Office**  
Bangladesh Economic Zones Authority (BEZA)  
Bangladesh Economic Zones Development Project (Phase-1)  
Monem Business District (level-12), 111, Bir Uttam, C.R Dutta Road, Dhaka-1205

No. 03.07.0000.007.29.229.2020-2663

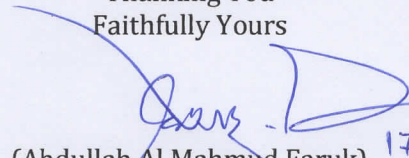
Date : 17.08.2020

**Subject:** Clarification of Pre-bid meeting and Replacement of Pages of bidding document for Interior works and HVAC system installation for BEZA in Administrative Building in BSMSN, BEZA WD-1802B.

A Pre-bid meeting of Bangladesh Economic Zones Development Project (Phase-1) was held on 12 July 2020 at 11:00 hours Dhaka Local Time in the conference room of Bangladesh Economic Zones Authority for Interior works and HVAC system installation for BEZA in Administrative Building in BSMSN (Package No.: BEZA WD-1802B). The queries discussed and clarified, have been consolidated and shown in attachment (Clarifications). Some pages will be replaced which are also attached herewith. These Clarifications and Replaced pages shall be the integral part of the bidding document. Therefore, you are requested to submit bidding document taking considerations of Clarifications and Replaced pages attached herewith.

**Attachment :** Clarification;  
Replaced page (16 pages).

Thanking You  
Faithfully Yours

  
(Abdullah Al Mahmud Faruk) 17.08.2020  
Project Director (Joint Secretary)  
Bangladesh Economic Zones Development  
Project (Phase-1)

**Distribution:**

All bidders who have purchased bidding document yet.  
Attendees in Pre-bid meeting.

**Clarification for Interior works and HVAC system installation for BEZA in Administrative Building in BSMSN, BEZA WD-1802 B**

<b>Queries from Bidder</b>	<b>Reply</b>
Brand name is specified for HVAC system but country of origin is not mentioned. Is it necessary to specify the country of origin?	There is no requirement. Bidders need to declare the country of origin.
How many % of VAT will be deducted from bill?	As per applicable law(s) of Bangladesh.
Quantity miss match between item no. 43.1, 43.2.	Quantity is being Corrected.
Twin screw compressor is specified. Is there any possibility of adding Single screw system compressor?	Yes.

## **Replacement of Pages:**

Page No. 102, 103, 110, 111, 128, 129, 142, 143, 158, 159, 164, 165, 176, 177, 186 & 187 are replaced by same revised attached pages.

### **General Notes for Bidder:**

01. All outdoor metallic installations including Chillers, Split AC must have salt protective coating.

02. For Chiller, Fire Pumps and Fire Alarm Control Panel, the Bidder must have to submit manufacturer's authorization.



Item No.	Description of Item	Unit	Quantity	Unit Rate (BDT)		Amount (BDT)	
				In figures	In words	In figures	In words
1	2	3	4	5	6=5	7=4x5	8=7
	<p>mm Dia. &amp; 1.5 mm wall thickness complete with 18 SWG GP sheet / PVC switch board &amp; pull box with 3mm thick ebonite sheet cover, without switch, fixing materials etc.(without switch) as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards and as per detailed specification mentioned in Annexure-1. The work shall be carried out as per direction &amp; approval of the Engineer.</p> <p>Cables manufactured by govt. of BANGLADESH owned / shared company ltd. (Eastern cables) approved by the Engineer. Light/ exhaust or wall bracket fan point</p>						
28	<p>Surface conduit wiring with the following PVC insulated and sheathed cable (BYM) &amp; Green / White colour PVC insulated ECC wire (BYA) through PVC conduit of reputed manufacturer complete with 18 SWG GP sheet pull box with 3 mm thick ebonite sheet cover, fixing materials, other accessories etc. as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards and as per detailed specification mentioned in Annexure-1. The work shall be carried out as per direction &amp; approval of the Engineer.</p> <p>Cables manufactured by govt. of BANGLADESH owned / shared company ltd. (Eastern cables) approved by the Engineer.</p> <p>1C-2x2.5sqmm (BYM) cable with 2.5 sqmm (BYA) ECC wire through PVC pipe of minimum inner Dia. 25 mm having wall thickness of 1.5 mm</p>	meter	16400				

Item No.	Description of Item	Unit	Quantity	Unit Rate (BDT)		Amount (BDT)	
				In figures	In words	In figures	In words
1	2	3	4	5	6=5	7=4x5	8=7
29	Concealed conduit wiring with following PVC insulated and sheathed stranded cable (BYM) & PVC insulated Green / White coloured ECC wire (BYA), through PVC conduit of reputed manufacturer complete with 18 SWG GP sheet and pull box with 3mm thick ebonite sheet cover, fixing materials etc. as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards and as per detailed specification mentioned in Annexure-1. The work shall be carried out as per direction & approval of the Engineer. Cables manufactured by govt. of BANGLADESH owned / shared company ltd. (Eastern cables) approved by the Engineer. 1C-2x10sqmm (BYM) cable with 10 sqmm (BYA) ECC wire through PVC pipe of minimum inner Dia. 25 mm having wall thickness of 1.5 mm	meter	2250				
30	Providing & fixing the chandelier light fitting of following manufacturers model & catalogue number suitable for use CFL / LED lamp, brass holder, cylindrical brass carrier suitable for use with earth terminal, necessary wiring with 2 x 0.4 sq.mm stranded PVC insulated flexible FR cable etc. complete (except lamp) as per sample accepted / approved by the Engineer.	each	4.00				
31	Air Cooled Water Chiller (VFD Driven) CH-01 & 02 Air Cooled Water Chiller complete with twin Screw Compressor/Single Screw Compressor with motor, Built-in starter panel with VFD, Air Cooled Condenser, insulated Evaporator, temperature and pressure indicator, microprocessor control panel, Flow switch, Standard safety devices, spring mounted vibration isolators, charged compressor oil and other accessories. The units Control Panel shall be factory wired and tested. The unit	sets	2				

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1	2	3	4	5	6=5	7=4x5	8=7
	the insulation shall be plastered with neat finish over G.I wire-mesh.						
41.0	<b>Pre-insulated Pipe</b> <b>Pipe: Black steel schedule 40(s) ASTM-A-53 Grade B. BS 1387 grade C Heavy duty</b> <b>Insulation:</b> Poly Urethane, density: 45 kg.m3 minimum, Insulation Thermal conductivity: 0.022 w/mK at 20 C mean temp. <b>Jacketing:</b> 0.5mm GP Sheet, spiral wound The works shall be complete with factory fabricated bends, tees, elbows, reducers, socket, union, nipple, flange, etc. as per requirement, drawing and direction. Pipe work shall be complete with pipe hangers, supports, vibration isolator brackets, etc. .						
41.1	Dia 200 mm (thick 50mm)	m	150				
41.2	Dia 150 mm (thick 38mm)	m	50				
41.3	Dia 100 mm (thick 38mm)	m	100				
41.4	Dia 80 mm (thick 38mm)	m	50				
41.5	Dia 65 mm (thick 38mm)	m	100				
41.6	Dia 50 mm (thick 38mm)	m	200				
41.7	Dia 40 mm (thick 38mm)	m	250				
41.8	Dia 32 mm (thick 38mm)	m	150				
41.9	Dia 25 mm (thick 32mm)	m	350				
41.10	Dia 20 mm (thick 32mm)	m	450				
42.0	<b>Chilled Water Pipe Insulation (Joining between Preinsulated pipe or in case of shortage of imported items)</b> Chilled Water Pipe Insulation with Poly Urethane and Jacketing with GP Sheet of 26 SWG.						
42.1	Dia 200 mm (thick 50mm)	m	1				
42.2	Dia 150 mm (thick 38mm)	m	1				
42.3	Dia 100 mm (thick 38mm)	m	1				
42.4	Dia 80 mm (thick 38mm)	m	1				
42.5	Dia 65 mm (thick 38mm)	m	1				
42.6	Dia 50 mm (thick 38mm)	m	1				
42.7	Dia 40 mm (thick 38mm)	m	1				
42.8	Dia 32 mm (thick 38mm)	m	1				
42.9	Dia 25 mm (thick 32mm)	m	1				
42.10	Dia 20 mm (thick 32mm)	m	1				
43.0	<b>Duct Work (Pre-insulated)</b> Supply, fabrication and installation of galvanized sheet steel duct work complete with bends, Tees, reducers, branch takeoffs, air chamber etc. as per direction and drawing, Hangers,						

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1	2	3	4	5	6=5	7=4x5	8=7
	brackets, stiffeners and isolator boxes shall be fabricated with M.S. angle/F.I. bar or rod as per drawing and direction and shall be galvanized. Duct shall be constructed with best-bloomed galvanized sheet steel. Before installation of duct, inside and outside shall be cleaned from any dust. Between flanges, for flanged end duct, approved type of gasket shall be used. Approved type of sealing compound shall be used to make the duct work leak-proof. Duct shall be hanged or supported at an interval of not more than 1.8 meter.						
43.1	Galvanised Steel Sheet metal duct Pre-insulated ducts up to 300 mm width shall be fabricated with steel and drive S-slip joint shall be used and fixing of duct insulation of required thick glass wool with K value of not more than 0.027 Kcal/hr./sqm/OC/mm at 200C. Insulation shall be complete with reinforced aluminum foil vapor barrier, adhesive, aluminum tape, fixing pin @ 250 mm c/c.						
43.1.1	Duct made of 22 SWG sheet	sqm	20				
43.1.2	Duct made of 24 SWG sheet	sqm	600				
43.2	Pre-insulated Duct Duct made of pre-insulated non-metallic duct. It includes Tees, Bends, Elbows, Reducers, Offsets, etc. Approved sealant shall have to be used to make duct leak proof. Foam density: Minimum 48 kg/m <sup>3</sup> Thermal conductivity: 0.035 kg/m. K Aluminum Thickness: 80micro-meter Duct thickness 25mm						
43.2.1	Pre-insulated Duct made of 24 SWG sheet	sqm	600				
43.2.2	Pre-insulated Duct made of 22 SWG sheet	sqm	100				
44.0	Duct Acoustic Lining Duct accoustic lining made of nitrile rubber base with open elastomeric foam, specially prepared for duct accoustic. Lining shall have peelable self adhesive tape for fixing with duct. -Operating temperature: -20 C to 85 C -Thermal Conductivity: Max 0.047 W/mK @ 20 C -Fire: Class 1 -Density: Min 140 kg/m <sup>3</sup> -Tensile Strength: Minimum 100kPa -Thickness: 15mm	sqm	9.5				
45.0	Air Terminals Air terminals shall be constructed						

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				In figures	In words	In figures	In words
1	2	3	4	5	6=5	7=4x5	8=7
	leak. After proper testing, commissioning and balancing the system shall run for seven days up to the satisfaction of the Owner. Submit advance copy of Installation, Operation and maintenance manuals. The work includes training to the Owner's representative at site						
78.0	<b>FIRE ALARM CONTROL PANEL:</b> Addressable type Fire Alarm Control Panel complete with following basic options. Master Controller Assembly / CPU shall be suitable with port to add Voice alarm system / Fire Fighter Telephone system / Printer / Remote Annunciator etc. FACP must be comply with internationally accepted standard. Control units for Fire "Protective Signaling Systems" Addressable Fire Alarm Control Panel shall be complete, non-coded, Addressable, microprocessor based with initiating devices, notification appliances, and monitoring and control devices. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP indicating the location and type of device. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations. Programmable Sensitivity : Photoelectric Smoke Sensors shall have various sensitivity levels ranging from (±) 0.2% up to 3.7%, programmed and monitored from the FACP. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA /internationally accepted standard calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule. The FACP shall automatically indicate when an individual sensor needs cleaning. The	Set	1				

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1	2	3	4	5	6=5	7=4x5	8=7
	<p>system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported [to the Central Monitoring Station]. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition. Options at FACP : The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers. Soft touch keypad, LED indications, LCD Display. Facility for total building paging shall be accomplished by the means of an "All Call" switch. Firefighter's phone (Optional) : Provide a supervised, two-way communication system between the Command Center/main fire alarm control panel and emergency phones. The firefighter's phone system shall be capable of handling single or simultaneous conversations with all phones connected into the system. As many as seven (7) phones shall be able to be connected into the active conversation. The phone system circuits shall be designed to prevent</p>						

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	sizes PVC insulated & sheathed twisted pair telecommunication cables having Dia. of each core is 0.6 mm through pre-laid pipes. Cable manufacturer(s) must have valid test certificate from internationally accredited laboratory (like CPRI, KEMA etc.) approved / accepted by the Engineer.						
	1C-4x0.282 sqmm (2 pair)	Rm	200				
97.0	<b>SHOP DRAWING &amp; DOCUMENTATION :</b> Preparation of detail Shop drawing including, layout drawing, section details, schematic drawing, etc. Get approval of shop drawing before any fabrication or installation works. Shop drawing must be coordinated with other services likely Electrical cabling, Light Fixtures, False Ceiling and Interior design. The work also includes: a) Show actual dimension of Equipment. b) Submit actual Wattage rating of all equipment c) Reconfirm Electrical cable sizing d) Submit Electrical connection diagram of Electric Panels e) Submit General arrangement of Electric Panels f) Submit advance copy of Installation, Operation and maintenance manuals.	Job	1				
98.0	<b>AS-BUILT DRAWING :</b> Preparation and submission of As-built drawing in following forms: One set in tracing paper, size A1 Two sets print out in A1 Paper Soft Copy in CD in AutoCAD Version 2010 Soft Copy in PDF Version	Job	1				
99.0	<b>TESTING, COMMISSIONING &amp; BALANCING :</b> After proper installation and certification the system shall be tested, commissioned and balanced as per direction and recommendation by the Manufacturer as well as Designer.	Job	1				
100.0	<b>TAGGING, IDENTIFICATION &amp; SIGNAGE INDICATION :</b> As per NFPA Code.	Job	1				
101	Engineer's site office of minimum & Labour Shed for labour accommodation	Each	1				
102	Environmental Management Plan as per Bid Document	LS	1				
	Total						
	In Word						

## LIST OF RECOMMENDED MANUFACTURERS

Water Chiller	Carrier/Trane/Dunham Bush/Daikin/Rhoss/AERMEC/Equivalent
Fan Coil Unit	Carrier/Trane/Dunham Bush/Daikin/Rhoss/AERMEC/Equivalent
Fans	Nicotra / Fantech / S&P / Chicago / Rhoss/ GEC-Woods / Kruger / Systemair/ Sodeca / Casals/ Blauberg or equivalent.
Pumps	Ajax / Grundfos / Monoflo / Bell & Gosset / Rhoss/ Paco / Paragon / Calpeda / Armstrong / Wilo / Ebit/General or equivalent.
Pump Motor	Siemens / Teco / GEC / ABB / Toshiba / Calpeda / EMM or equivalent.
Valves, Y-Strainer, Flexible Pipe Connection	Crane / Kitz / Nibco / Tozen / Toyo / Maple/ Metraflex / AFA / Birflex / Ekoval / TECOFI / Caleffi or equivalent.
Balancing Valve	Tour and Anderson / Crane / Combi / FlowCon / Oventrop/ TECOFI/ Caleffi or equivalent.
Vibration Isolation / Silencer	Mason Industries / Kinetics or equivalent.
Water Treatment Chemicals	Ecolab / Water Services UOP / Mazer Chemicals/Petaling or equivalent.
Pressure Gauge Pipe Thermometer	Hunter / Weksler / Brannan / Metraflex / Clayton / Singer / Taylor / Maple/Tozen / Caleffi or equivalent.
Water Flow Meter (Digital)	Data Industrial/Asahi/Aichie Tokei/Blue White/Caleffi or equivalent.
Insulation (Rockwool / Glass wool)	Bradford / Polyglass / Foster / Byuksan /Polywool or equivalent.
Insulation (PEF / Nitrile Rubber)	Superlon / Wide / Armaflex / Armacell / Aerocell/ ALP Aeroflex or equivalent.
Duct Insulation (PE insulation)	Jumboo / Polycell or equivalent.
Flexible round duct	Thermaflex / Aeroduct / Civa Flex / Ruskin / Titus or equivalent.
Air Terminals, Variable Air Volume	Titus / Price / Connols-Aire / Trox / System Aire / Halton / Ruskin / Bavcol Air/ Acutherm /Belimo or equivalent.
Automatic Controls system	Johnson Controls/Honeywell / Siemens / Delta/ Regin or equivalent.
Flow Switch	Johnson Controls/Honeywell / Siemens / Delta or equivalent.
Control Valve	Johnson Controls/Honeywell / Siemens/ Belimo/Regin or equivalent.
Expansion Tank (Closed type)	Automatic Heating Appliances / Pneumatex / Monoflo / Emtrol/Reflux or equivalent.
Electrical Components	AEG / Siemens / Telemecanique / GE / ABB / Dorman smith / MEM / Merlin Gerin or equivalent.
Variable Frequency Drive	Siemens / Danfoss / Telemecanique /ABB/Yaskawa or equivalent.
Modulating Control Valve	Siemens, Johnson controls, Belimo, Honeywell or equivalent.
Air Filter / Safe Change Filter (BIBO)	Camfil / Flanders / AAF / Air Guard / Faar / Trox or equivalent.
Electric Cable	Paradise / BRB / BBS or equivalent.
Fire Damper	Trox/Connols Aire/Ruskin or equivalent.
Pre-insulated pipe	SeAH/ Ricwil/ Husteel/ Glensule or equivalent.

Item No.	Description of Item
1	2
	which they follow) Four gang switch
26	One gang switch & one 5 amps. 2-pin socket combined.
27	<p>Concealed conduit wiring for following point looping at the switch board with earth terminal with 1C-2x1.5 sqmm PVC insulated and sheathed stranded cable (BYM) &amp; same size PVC insulated ECC (BYA) (Green / White color) including circuit wiring with 1C-2x2.5 sqmm PVC insulated and sheathed stranded cable (BYM) &amp; same size PVC insulated ECC (BYA) Green / White color through PVC conduit (one conduit from switch board to common point on ceiling is considered to draw 3 pair of cable ) of reputed manufacturer of minimum 25 mm Dia. &amp; 1.5 mm wall thickness complete with 18 SWG GP sheet / PVC switch board &amp; pull box with 3mm thick ebonite sheet cover, without switch, fixing materials etc.(without switch) as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards and as per detailed specification mentioned in Annexure-1. The work shall be carried out as per direction &amp; approval of the Engineer.</p> <p>Cables manufactured by govt. of BANGLADESH owned / shared company ltd. (Eastern cables) approved by the Engineer. Light/ exhaust or wall bracket fan point</p>
28	<p>Surface conduit wiring with the following PVC insulated and sheathed cable (BYM) &amp; Green / White colour PVC insulated ECC wire (BYA) through PVC conduit of reputed manufacturer complete with 18 SWG GP sheet pull box with 3 mm thick ebonite sheet cover, fixing materials, other accessories etc. as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards and as per detailed specification mentioned in Annexure-1. The work shall be carried out as per direction &amp; approval of the Engineer.</p> <p>Cables manufactured by govt. of BANGLADESH owned / shared company ltd. (Eastern cables) approved by the Engineer.</p>

Item No.	Description of Item
1	2
	1C-2x2.5sqmm (BYM) cable with 2.5 sqmm (BYA) ECC wire through PVC pipe of minimum inner Dia. 25 mm having wall thickness of 1.5 mm
29	<p>Concealed conduit wiring with following PVC insulated and sheathed stranded cable (BYM) &amp; PVC insulated Green / White coloured ECC wire (BYA) through PVC conduit of reputed manufacturer complete with 18 SWG GP sheet and pull box with 3mm thick ebonite sheet cover, fixing materials etc. as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards and as per detailed specification mentioned in Annexure-1. The work shall be carried out as per direction &amp; approval of the Engineer. Cables manufactured by govt. of BANGLADESH owned / shared company ltd. (Eastern cables) approved by the Engineer. 1C-2x10sqmm (BYM) cable with 10 sqmm (BYA) ECC wire through PVC pipe of minimum inner Dia. 25 mm having wall thickness of 1.5 mm</p>
30	Providing & fixing the chandelier light fitting of following manufacturers model & catalogue number suitable for use CFL / LED lamp, brass holder, cylindrical brass carrier suitable for use with earth terminal, necessary wiring with 2 x 0.4 sq.mm stranded PVC insulated flexible FR cable etc. complete (except lamp) as per sample accepted / approved by the Engineer.
31	<p>Air Cooled Water Chiller (VFD Driven) CH-01 &amp; 02      Air Cooled Water Chiller complete with twin Screw Compressor/Single Screw Compressor with motor, Built-in starter panel with VFD, Air Cooled Condenser, insulated Evaporator, temperature and pressure indicator, microprocessor control panel, Flow switch, Standard safety devices, spring mounted vibration isolators, charged compressor oil and other accessories. The units Control Panel shall be factory wired and tested. The unit shall be complete with Safety and Control devices as specified in</p> <p style="text-align: center;">Technical Specifications:</p> <ul style="list-style-type: none"> <li>-Condenser material: Copper Coil with Aluminum Fins</li> <li>-Cooling capacity: 615 kW (175 Ton of Refrigeration)</li> <li>-Chilled water inlet/outlet Temp : 11.56 C / 6 C</li> <li>-Chilled water flow rate: 1589.7 l/min (420 US GPM)</li> <li>-Condenser air inlet temperature: 35 C</li> <li>-Fouling factor for Evaporator: 1.8x10-5 m2.0C/W</li> <li>-Minimum Number of Compressor: 2</li> <li>-Min Number of Refrigerant Circuit with Gas Locking devices: 2</li> <li>-IPLV rate: Min 4.5</li> <li>-Capacity control: Stepless</li> </ul>

Item No.	Description of Item
1	2
	-Non-return flap to prevent back flow -Balanced turbine fan with curved blade -Capacitor operated motor with Class E insulation -Spring clip on front cover for easily removable -ESP: 50 pa -Power supply: 220V, 1 ph, 50 Hz, -Sound rating: Max 40 dBA at 3 m -Air flow rate: 50 CFM
40.0	<b>Closed Type Expansion Tank with Auto Refil Pump</b> The closed type Expansion Tank shall be complete with Automatic Refil Unit based on system pressure requirement (2 to 3 Bar, adjustable). It is constructed of mild steel. The tank shall be painted. Accessories: -Auto Refil pump (pressure actuated with Pr. Sensor) -Isolating valve -Check valve -Pressure relief Valve -Air Purger -Starter Panel -Capacity: 1500 Liter The outside surface of the tank shall be insulated with 38mm. Thick of fire retardant type closed cell insulation. The tank shall be installed on R.C.C colum after proper clipping of the roof. All the accessories of the tank shall be properly cleaned, painted over the primer. The outer surface of the insulation shall be plastered with neat finish over G.I wire-mesh.
41.0	<b>Pipe-insulated Pipe</b> <b>Black steel schedule 40(s) ASTM-A-53 Grade B. BS 1387 grade C Heavy duty</b> <b>Insulation:</b> Poly Urethene, density: 45 kg.m3 minimum, Insulation Thermal conductivity: 0.022 w/mK at 20 C mean temp. <b>Jacketing:</b> 0.5mm GP Sheet, spiral wound The works shall be complete with factory fabricated bends, tees, elbows, reducers, socket, union, nipple, flange, etc. as per requirement, drawing and direction. Pipe work shall be complete with pipe hangers, supports, vibration isolator brackets, etc. .
41.1	Dia 200 mm (thick 50mm)
41.2	Dia 150 mm (thick 38mm)
41.3	Dia 100 mm (thick 38mm)
41.4	Dia 80 mm (thick 38mm)
41.5	Dia 65 mm (thick 38mm)
41.6	Dia 50 mm (thick 38mm)
41.7	Dia 40 mm (thick 38mm)
41.8	Dia 32 mm (thick 38mm)
41.9	Dia 25 mm (thick 32mm)
41.10	Dia 20 mm (thick 32mm)
42.0	<b>Chilled Water Pipe Insulation (Joining between Preinsulated pipe</b>

Item No.	Description of Item
1	2
	<b>or in case of shortage of imported items)</b> Chilled Water Pipe Insulation with Poly Urethane and Jacketing with GP Sheet of 26 SWG.
42.1	Dia 200 mm (thick 50mm)
42.2	Dia 150 mm (thick 38mm)
42.3	Dia 100 mm (thick 38mm)
42.4	Dia 80 mm (thick 38mm)
42.5	Dia 65 mm (thick 38mm)
42.6	Dia 50 mm (thick 38mm)
42.7	Dia 40 mm (thick 38mm)
42.8	Dia 32 mm (thick 38mm)
42.9	Dia 25 mm (thick 32mm)
42.10	Dia 20 mm (thick 32mm)
43.0	<b>Duct Work (Pre-insulated)</b> Supply, fabrication and installation of galvanized sheet steel duct work complete with bends, Tees, reducers, branch takeoffs, air chamber etc. as per direction and drawing. Hangers, brackets, stiffeners and isolator boxes shall be fabricated with M.S. angle/F.I. bar or rod as per drawing and direction and shall be galvanized. Duct shall be constructed with best-bloomed galvanized sheet steel. Before installation of duct, inside and outside shall be cleaned from any dust. Between flanges, for flanged end duct, approved type of gasket shall be used. Approved type of sealing compound shall be used to make the duct work leak-proof. Duct shall be hanged or supported at an interval of not more than 1.8 meter.
43.1	Galvanised Steel Sheet metal duct Pre-insulated ducts up to 300 mm width shall be fabricated with steel and drive S-slip joint shall be used and fixing of duct insulation of required thick glass wool with K value of not more than 0.027 Kcal/hr./sqm/OC/mm at 200C. Insulation shall be complete with reinforced aluminum foil vapor barrier, adhesive, aluminum tape, fixing pin @ 250 mm c/c.
43.1.1	Duct made of 22 SWG sheet
43.1.2	Duct made of 24 SWG sheet
43.2	Pre-insulated Duct Duct made of pre-insulated non-metallic duct, It includes Tees, Bends, Elbows, Reducers, Offsets, etc. Approved sealant shall have to be used to make duct leak proof. Foam density: Minimum 48 kg/m <sup>3</sup> Thermal conductivity: 0.035 kg/m. K Aluminum Thickness: 80micro-meter Duct thickness 25mm
43.2.1	Pre-insulated Duct made of 24 SWG sheet
43.2.2	Pre-insulated Duct made of 22 SWG sheet
44.0	<b>Duct Acoustic Lining</b> Duct accoustic lining made of nitrile rubber base with open elastomeric foam, specially prepared for duct accoustic. Lining shall have peelable self adhesive tape for fixing with duct. -Operating temperature: -20 C to 85 C -Thermal Conductivity: Max 0.047 W/mK @ 20 C -Fire: Class 1

Item No.	Description of Item
1	2
	<p>tested in accordance with relevant IEC/VDE/NEMA/BS/JIS standard having following breaking capacity with thermal over current and instantaneous electromagnetic short ckt. release, necessary arrangement for fixing of above CBs including stove enamel/gray hammer painting of board etc <b>Incoming</b> 250 Amps TP MCCB (36 kA) with following accessories:</p> <p><b>Busbars</b> 300 amps TPN +E, copper busbars with color coded heat shrinkable insulation sleeve.</p> <p><b>Outgoings</b> 1 No. 250A, TP MCCB (36 kA)</p> <p>1 No.16A, TP MCB (6 kA) 1 No. 20A, SP MCB (6 kA)</p> <p>1 No. 16A, SP MCB (6 kA) 1 No.16A, TP MCB (6 kA) Spare</p>
73.2	<p><b>Electrical Cabling (through PVC conduit), Fire Rated</b> Surface conduit wiring with the following PVC insulated and sheathed stranded cable (NYY) / XLPE insulated and PVC sheathed stranded cable (2XY) &amp; PVC insulated Green / White colour ECC wire (BYA) through PVC conduit of reputed manufacturer complete with fixing materials, other accessories etc. as required including mending the damages good. All electrical contacts shall be of brass / copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC / BDS / BS / VDE standards.</p>
73.2.1	<p><b>FSDB to Pumps Controller (Electric Pump)</b> 1C-4x95sqmm (NYY) with 50 sqmm (BYA) ECC wire through PVC pipe of minimum inner Dia. 75 mm having wall thickness of 3 mm</p>
73.2.2	<p><b>FSDB to Pumps Controller (Jockey Pump)</b> 1C-4x4 sqmm (NYY) (FR) with 4 sqmm (BYA) (FR) ECC wire through PVC pipe of minimum inner dia. 30 mm having wall thickness of 1.5 mm</p>
73.2.3	<p><b>FSDB to Pumps Controller (For Diesel Pump)</b> 1C-2x4 sqmm (FR) cable with 4 sqmm (FR) ECC wire through PVC pipe of minimum inner dia. 25 mm having wall thickness of 1.5 mm</p>
74.0	<p><b>SHOP DRAWING:</b> Preparation of detail Shop drawing including, layout drawing, section details, schematic drawing, etc coordinating with different installations of existing factory. Get approval of shop drawing before any fabrication or installation works. The work also includes:</p> <p>a) Show actual dimension of Equipment</p> <p>b) Submit actual kW rating of all equipment</p> <p>c) Reconfirm Electrical cable sizing</p> <p>d) Reconfirm Ampere ratings of electric components</p> <p>e) Submit Electrical conn diagram of Electric Panels</p> <p>f) Submit General arrangement of Electric Panels</p> <p>g) Submit Plinth drawing for equipment and Pipe supports</p>
75.0	<p><b>AS-BUILT DRAWING</b> Preparation and submission of As-built drawing in following forms:</p> <p>One set in tracing paper, size A1 Two sets print out in A1 Paper Soft Copy in CD in AutoCAD Version 2010 Soft Copy in PDF Version</p>
76.0	<p><b>TAGGING, IDENTIFICATION &amp; SIGNAGED INDICATION:</b></p>

Item No.	Description of Item
1	2
	As per NFPA Code
77.0	<p><b>TESTING, COMMISSIONING AND BALANCING</b></p> <p>The system shall be tested, commissioned and balanced as per direction and recommendation. Pipe work shall be tested at a test pressure of 15 kg/cm<sup>2</sup> for 24 hours without any leak. After proper testing, commissioning and balancing the system shall run for seven days up to the satisfaction of the Owner. Submit advance copy of Installation, Operation and maintenance manuals. The work includes training to the Owner's representative at site</p>
78.0	<p><b>FIRE ALARM CONTROL PANEL:</b> Addressable type Fire Alarm Control Panel complete with following basic options. Master Controller Assembly / CPU shall be suitable with port to add Voice alarm system / Fire Fighter Telephone system / Printer / Remote Annunciator etc. FACP must be comply with internationally accepted standard. Control units for Fire -Protective Signaling Systems" Addressable Fire Alarm Control Panel shall be complete, non-coded, Addressable, microprocessor based with initiating devices, notification appliances, and monitoring and control devices. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP indicating the location and type of device. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations. Programmable Sensitivity : Photoelectric Smoke Sensors shall have various sensitivity levels ranging from (±) 0.2% up to 3.7%, programmed and monitored from the FACP. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA /internationally accepted standard calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported [to the Central Monitoring Station]. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a</p>

Item No.	Description of Item
1	2
	manufacturer(s) must have valid test certificate from internationally accredited laboratory (like CPRI, KEMA etc.) approved / accepted by the Engineer.
	1C-4x0.282 sqmm (2 pair)
97.0	<b>SHOP DRAWING &amp; DOCUMENTATION :</b> Preparation of detail Shop drawing including, layout drawing, section details, schematic drawing, etc. Get approval of shop drawing before any fabrication or installation works. Shop drawing must be coordinated with other services likely Electrical cabling, Light Fixtures, False Ceiling and Interior design. The work also includes: a) Show actual dimension of Equipment. b) Submit actual Wattage rating of all equipment c) Reconfirm Electrical cable sizing d) Submit Electrical connection diagram of Electric Panels e) Submit General arrangement of Electric Panels f) Submit advance copy of Installation, Operation and maintenance manuals.
98.0	<b>AS-BUILT DRAWING :</b> Preparation and submission of As-built drawing in following forms: One set in tracing paper, size A1 Two sets print out in A1 Paper Soft Copy in CD in AutoCAD Version 2010 Soft Copy in PDF Version
99.0	<b>TESTING, COMMISSIONING &amp; BALANCING :</b> After proper installation and certification the system shall be tested, commissioned and balanced as per direction and recommendation by the Manufacturer as well as Designer.
100.0	<b>TAGGING, IDENTIFICATION &amp; SIGNAGE INDICATION :</b> As per NFPA Code.

#### LIST OF RECOMMENDED MANUFACTURERS

Water Chiller	Carrier/Trane/Dunham Bush/Daikin/Rhoss/AERMEC/Equivalent
Fan Coil Unit	Carrier/Trane/Dunham Bush/Daikin/Rhoss/AERMEC/Equivalent
Fans	Nicotra / Fantech / S&P / Chicago / Rhoss/ GEC-Woods / Kruger / Systemair/ Sodeca / Casals/ Blauberg or equivalent.
Pumps	Ajax / Grundfos / Monoflo / Bell & Gosset / Rhoss/ Paco / Paragon / Calpeda /Armstrong / Wilo / Ebbitt/General or equivalent.
Pump Motor	Siemens / Teco / GEC / ABB / Toshiba / Calpeda / EMM or equivalent.
Valves, Y-Strainer, Flexible Pipe Connection	Crane / Kitz / Nibco / Tozen / Toyo / Maple/ Metraflex / AFA / Birflex / Ekoval / TECOFI / Caleffi or equivalent.
Balancing Valve	Tour and Anderson / Crane / Combi / FlowCon / Oventrop/ TECOFI/ Caleffi or equivalent.
Vibration Isolation / Silencer	Mason Industries / Kinetics or equivalent.
Water Treatment Chemicals	Ecolab / Water Services UOP / Mazer Chemicals/Petaling or equivalent.

Pressure Gauge Pipe Thermometer	Hunter / Weksler / Brannan / Metraflex / Clayton / Singer / Taylor / Maple/Tozen / Caleffi or equivalent.
Water Flow Meter (Digital)	Data Industrial/Asahi/Aichie Tokei/Blue White/Calfi or equivalent.
Insulation (Rockwool / Glass wool)	Bradford / Polyglass / Foster / Byuksan /Polywool or equivalent.
Insulation (PEF / Nitrile Rubber)	Superlon / Wide / Armaflex / Armacell / Aerocell/ ALP Aeroflex or equivalent.
Duct Insulation (PE insulation)	Jumboo / Polycell or equivalent.
Flexible round duct	Thermaflex / Aeroduct / Civa Flex / Ruskin / Titus or equivalent.
Air Terminals, Variable Air Volume	Titus / Price / Connols-Aire / Trox / System Aire / Halton / Ruskin / Bavcol Air/ Acutherm /Belimo or equivalent.
Automatic Controls system	Johnson Controls/Honeywell / Siemens / Delta/ Regin or equivalent.
Flow Switch	Johnson Controls/Honeywell / Siemens / Delta or equivalent.
Control Valve	Johnson Controls/Honeywell / Siemens/ Belimo/Regin or equivalent.
Expansion Tank (Closed type)	Automatic Heating Appliances / Pneumatex / Monoflo / Emtrol/Reflux or equivalent.
Electrical Components	AEG / Siemens / Telemecanique / GE / ABB / Dorman smith / MEM / Merlin Gerin or equivalent.
Variable Frequency Drive	Siemens / Danfoss / Telemecanique /ABB/Yaskawa or equivalent.
Modulating Control Valve	Siemens, Johnson controls, Belimo, Honeywell or equivalent.
Air Filter / Safe Change Filter (BIBO)	Camfil / Flanders / AAF / Air Guard / Faar / Trox or equivalent.
Electric Cable	Paradise / BRB / BBS or equivalent.
Fire Damper	Trox/Connols Aire/Ruskin or equivalent.
Pre-insulated pipe	SeAH/ Ricwil/ Husteel/ Glensule or equivalent.

## RECOMMENDED LIST OF MATERIALS AND MANUFACTURERS

Equipment	Manufacturer
<b>Fire Pumps and Accessories</b>	
<b>Fire Pump and Jockey Pump</b>	Patterson USA/ KSB, Germany/ Grundfos, Denmark/ NAAFCO, UAE/ Xylem, USA/ SFFECO, UAE/ Lifeco, UAE/ Ebit, Turkey/ Wilo, Germany/ NM Fire, France/ Lifeco, UAE/ <b>Or equivalent</b>