

# AIR HANDLING UNITS (EUROVENT CERTIFIED FOR MECHANICAL STRENGTH & PERFORMANCE)

## FAISALABAD INSTITUTE OF CARDIOLOGY, FAISALABAD

### General

The characteristics and capacities of air handling units shall be as scheduled. The configuration of component sections shall be as scheduled and as shown on Drawings. All AHUs shall complete with drives, motors, and belts. These shall include mixing box with dampers, filters and humidifiers when scheduled. Filter specifications are given separately in this section.

AHUs shall be of imported origin as mentioned in equipment schedule or list of approved equipment/material or approved by the Engineer.

For purpose of calculation of motor BHP, specified external SP and AHU manufacturer's internal SP should be added. Filter pressure drop shall be part of internal SP, which shall be calculated on average of clean (initial) and filter manufacture-recommended dirty (final) pressure drop. Published recommendation of filter manufacturer shall be furnished along with technical submittal. In case published recommendation is not available, a recommendation on the printed stationery of filter manufacturer shall be acceptable provided the manufacturer certified that no such published data is available. Motor HP shall be at least 120% of calculated BHP.

The EUROVENT certified air handling units shall meet the requirements of ARI 430-86 and ASHRAE 51-85 standards and shall be factory tested according to the requirements of these standards. The minimum mechanical strength standards for AHUs as per Eurovent certification are as follows;

- 1- Casing Mechanical Strength (D1)
- 2- Casing Leakage (L1/L2)
- 3- Thermal Transmittance (T2)
- 4- Thermal Bridge Factor (TB2)
- 5- Bag Filter Leakage Pass (F9)

The (EFF3, TEFC, CLASS F Insulated, VFD Compatible) motors make, country of origin and model no. shall be identified during technical submission and shall be from manufacture's best ranking make, most efficient and shall be included in manufacturer's scope of standard.

The Air Handling Units (AHUs) shall be medical grade type.

Cleaning methodology, general arrangement and dimension of the AHU including location of doors and/or hatches shall be including in the Installation and Operation Manual of the product.

### Construction

These shall be factory assembled draw-through packaged air handling unit of capacities and characteristics as scheduled. Air handling units shall be horizontal or vertical with component and configuration as scheduled and shown on the drawings.

Large AHUs may be shipped in sections e.g. Fan Coil Section, filter section, mixing box section for ease of transportation and rigging.

AHRI Certified (AHRI 410-91) Coils shall be of copper construction with mechanically bonded smooth aluminum fins, suitable for chilled water and hot water applications.

Fan shall be high efficiency (Airfoil/ Backward Curved) mounted on a common shaft. Fan impeller shall be statically and dynamically balanced and shall have permanently lubricated bearings. Fan shall be belt driven with adjustable sheaves. Fan shall have spring isolation from the casing. All fans shall be in accordance with AMCA 210 Standard for performance.

Casing shall be made of sheet steel and finished with baked enamel. (Or approved by the Engineer) The casing shall be double skin with minimum 1-1/2 inch thermal insulation between the skins and removable panel type. AHU shall be equipped with factory fabricated filters and filter boxes with side access door.

The medical grade AHUs shall have inner surfaces of stainless steel. Before coating with the stainless steel, an antibacterial silicon sealant is applied to the unit to prevent water leakage to the bottom part. The unit shall be coated with antimicrobial powder.

All coil bases and sledges shall be made of Cr-Ni stainless steel.

All AHUs shall be supplied with factory built in VFD compatible for the motor.

A condensate drain pan, with double wall construction and insulation in between, shall be provided as per ASHRAE 62.1-2010. Inner pan shall be finished with a factory applied coating of corrosion resistant material. Insulation, adhesive and inner coatings shall comply with NFPA-90A Standard.

Flat filters installed in Air Handling Units, shall be permanent, impingement, dry type, washable, all metal, panel type, at least 2 inch thick unless otherwise scheduled. Media shall be aluminum screen, arranged in alternate layers of flat and herringbone-crimp, 4 layers of each per one inch reinforced and enclosed in a frame of 16 gauge galvanized steel with flush mitered corners. Initial pressure drop at 500 FPS shall not exceed 0.1 inch WG. Holding frame shall be factory-built of 16 gauge steel; with felt air seal. Filters shall have at least 35% efficiency on 0-5 microns range when tested in accordance with ASHRAE Standard 52-76.

Bag filter (if schedule) in AHUs shall be extended surface dry type non-supported pocket, cartridge filter. Average efficiency shall not be less than 90% when tested as per ASHRAE standard 52. Initial resistance at 500 FPS shall not exceed 1/2 inch.

Steam humidifiers of capacity as per equipment schedule shall be of self-contained, electronically controlled design suitable for installation in AHUs. Humidifier shall generate steam from ordinary tap water. It shall have full modulating control to provide 0 to 100% capacity. Drain cycle will be self-regulating for automatic control of mineral (conductivity) build-up. Humidifier shall have programmed diagnostics to confirm that input and output circuits are functioning. The humidifier steam generator shall be of cleanable type which can be taken apart for inspection. The electronic circuit shall provide automatic protection from excessive electrode current. The humidifier fill water line shall have an air gap to prevent backflow. Humidifier shall have interface for BMS integration and control. It shall be supplied with stainless steel steam dispersion tube and with condensate connections.

## Spare Parts for Air Handling Units

Following spare parts shall be provided as a minimum along with the spares recommended by the Manufacturer.

a)	Fan Belts	01 set for each AHU type
b)	Mechanical Seal	01 set for each AHU type
c)	Motors	01 for each AHU type
d)	Contactors	01 No. for each AHU type
e)	Contactors Thermal Overload	01 No. for each AHU type

## FILTERS

Flat filters shall be permanent, impingement, dry type, washable, all metal, panel type, at least 2 inch thick unless otherwise scheduled. Media shall be aluminum screen, arranged in alternate layers of flat and herringbone-crimp, 4 layers of each per one inch reinforced and enclosed in a frame of 16 gauge galvanized steel with flush mitered corners. Initial pressure drop at 500 FPS shall not exceed 0.1 inch WG. Holding frame shall be factory-built of 16-gauge steel; with felt air seal. Filters shall have at least 35% efficiency on 0-5 microns range when tested in accordance with ASHRAE Standard 52-76.

## SECTION 3 - FOUNDATIONS AND SUPPORTS

### GENERAL

All equipment, piping and ductwork where used shall be mounted on or suspended from foundations and supports, all as specified, as shown and as required. All concrete foundations where required, including thickened structural slab, housekeeping pads and concrete for inertia pads will be provided by the Contractor.

Shop drawings, other information and templates for all concrete foundations where used, shall be provided by Contractor as per recommendations of the manufacturer of the equipment. Necessary integral steel framings, concrete reinforcing rods welded to frame, required anchor bolts, spring mountings, and neoprene pads, shall be provided by the Contractor. The Contractor shall cooperate with those doing the flooring work to ensure proper installation of all these elements.

Foundations and vibration isolation mountings for various equipment, piping, and ductwork where used shall be as per requirements specified. Vibration isolators where used shall be of approved make.

Springs used for vibration isolation shall be single, open coil type and laterally stable, having a ratio of loaded height to mean coil diameter not greater than 1.25. To preclude possibility of spring coils "shortening" when motor starts or slows down, the springs shall be selected so that there remains when the spring is design loaded, a reserve deflection of between 25 and 30% of maximum deflection of free spring. When fully compressed, maximum stress in steel should not exceed yield stress of spring material. Springs shall be unhoused and held well clear of any part of suspended mass. Isolated system if supported on a flat slab type base shall be held clear of supporting structure or pad by the minimum distance thought necessary for efficient housekeeping or 1 inch. Lower end of each spring shall be supported on a rigid, square steel base plate sufficiently thick to withstand a bearing pressure of 427 kPa. This plate should be complete with 3

thickness of type W neoprene waffle pad between under inside of plate and supporting structure. A 16 gauge steel shim plate bonded to pad surfaces shall separate adjacent thicknesses. Spring base plate shall also be bounded to top layer of pad. Pad area should be chosen to suit hardness of neoprene. For 40 durometer neoprene, bearing pressure on supporting structure shall be 276-352 kPa when spring is design loaded. Waffle pads may have to be cut away in the middle of pads since pads shall have same overall dimensions as spring baseplate.

All pipe hangers must be insulated from the building by cork inserts between the hanger bar fixing and the connection to the structure. Details of the Contractor's method of achieving this shall be submitted to the Engineer for approval. All ceiling hung equipment having fans and motor as integral part of equipment shall have adequate vibration isolators.

All ceiling hung equipment having fans and motor as integral part of equipment shall have adequate vibration isolators.

Flexible duct connections, as specified elsewhere, shall be fitted wherever ducts cross building expansion joints, at suction and discharge end of each air handling unit and fan wherever ducts are connected to such unit, and/or wherever shown on the drawings. Supply outlet of concealed ceiling-mounted fan coil unit shall also be connected to Fan-coil with flexible connection.

Details of all vibration isolators, flexible connections and bases shall be submitted to the Engineer for approval.

## **SECTION 4 - DUCTING AND SHEET METAL WORK**

### **GENERAL**

#### **Ducting Material**

All duct work shall be of galvanized steel sheet unless otherwise indicated on Drawings. Galvanized steel shall be of lock forming quality (LFQ) and shall have a galvanized coating of 8 oz total for both sides of one square meter of a sheet. The GI sheet shall conform to ASTM A-525 and ASTM-90.

Galvanized steel sheet shall be Cut Lengths coated by the Hot-Dip Method and manufactured per ISO Standard 3575-76 zinc coating designation Z-275.

#### **Structural Steel**

Structural Steel shall be M.S. members rolled from Pakistan Steel billets or equivalent conforming to ASTM designation A-36 standard specifications for structural steel.

#### **Canvas Cloth**

Canvas Cloth shall have specified weight with flame retardant quality.

#### **Painting**

All steel work in connection with supports for ductwork etc. exposed to the elements is to be painted with two coats of an approved rust preventive paint.

All exposed metal surface of hangers, brackets, etc. must be painted with two under-coats and two finishing coats of enamel paint of approved color. G.I. sheet is not to be painted. However, all uninsulated pipe work and valves are to be painted as stated above.

Identification bands shall be painted on uninsulated ducting, or on insulation at frequent intervals. Lettering shall be agreed with the Engineer.

All duct hangers in concealed locations shall be given one coat of black asphalt paint before being concealed.

## DUCT CONSTRUCTION

All sheet metal duct work shall be of a standard construction and erected in a first class workmanlike manner. The duct work shall be constructed as per SMACNA Low Velocity Duct Construction Standards.

Where specified, duct work shall be provided with interior insulation. Ducts shall be straight and smooth on the side, with joints neatly finished. Where ducts are lined with interior insulation, the dimensions required shall be for the net free area after insulation is applied. Ducts shall be anchored securely to the structure in an approved manner and shall be installed so as to be completely free from vibration under all conditions of operation.

Sheet metal ducts shall be properly braced and reinforced with steel angles, or other structural members approved by the Engineer unless otherwise required, the internal ends of all slip joints shall be installed in the direction of flow.

Finished work shall show no flaking or peeling within 1/4" of a cut edge. The construction and gauge of material, size and spacing of stiffeners for duct work shall be as follows:

Larger Dim. of Duct (in.)	Gauge (US)	Traverse Joint Type/Size (Inch)	Interm Bracing, Angle Size (Inch)	Max. Spacing between Traverse Joint &/or Interm Reinforcement
Thru 12	26	Drive slip/-	-	-
13 thru 18	24	Drive slip/-	-	-
19 thru 30	24	Pocket lock/1	1x1x1/8	5
31 thru 42	22	Pocket lock/1	1x1x1/8	5
43 thru 54	22	Pocket lock/1-1/2	1-1/2x1-1/2x1/8	5
55 thru 60	20	Pocket lock/1-1/2	1-1/2x1-1/2x1/8	5
61 thru 84	20	Angled reinforced standing seam	1-1/2x1-1/2x1/8	5
85 thru 96	18	Angled reinforced standing seam	1-1/2x1-1/2x1/4	2.5
Over 96	18	Angled reinforced standing seam	1-1/2x1-1/2x1/4	2.5

Other types of Traverse joints allowed as per ASHRAE/ SMACNA Standards shall

be acceptable, subject to Approval of Engineer, in places where pocket lock is not possible due to tight space.

All angles for bracing shall be painted with one coat of approved rust-inhibitive paint before fixing to duct.

All duct work in the finished areas shall be run parallel to the beams wherever possible. All outlet opening and open ends shall be kept closed with sheet metal caps during construction. Rectangular duct shall be constructed by breaking the corners and grooving the longitudinal seams. Elbows and transformation sections may be formed with Pittsburgh corner seams but complicated fittings shall be constructed with double seams. Angle bracing shall be of steel and shall be carried out on all four sides of the ducts. All bracing is to be in accordance with the current addition of the ASHRAE Hand Book/ SMACNA Standards.

## **ELBOWS**

Ducts shall be built with curves and bends, where required, to affect an easy flow of air. Curved elbows shall have a centre line radius at least equal to 150% of the width of the duct unless otherwise indicated. All duct curves having an inside radius smaller than the width of the curve shall be equipped with approved single thickness vanes.

Vertical ducts shall have full size bends where horizontal branches are taken off unless otherwise indicated, and/or approved.

Where square elbows are used in changing directions, approved and aerodynamically correct vanes as per latest SMACNA Duct Construction Standards shall be used.

These turning vanes must be free from vibration when the system is in operation.

## **HANGERS**

Hangers and supports shall be fastened to the structure in a manner approved by the Engineer All fastening shall be such as to ensure permanent stability and to be capable of supporting at least three times the applied load.

Galvanized sheet metal ducts less than 20" in width (larger dimension) may be suspended by means of galvanized iron straps extended along the bottom of the duct to form a trapeze, only if hanger length above the duct is not more than 12".

All other ducts shall be suspended by means of iron bars securely fastened to the angle iron bracing or angle iron placed under the duct. Bars shall be fastened to bracing only on un-insulated ducts.

Bars shall be screwed to angles attached therein by sleeve/stud anchor screws and heavy iron washers from ceiling. Where horizontal ducting is fixed to walls, columns, supported from floor slabs, etc. angle iron frames are to be fabricated and fitted to support rectangular ductwork and associated equipment.

Vertical ducts are to be supported by steel angles bolted to at least two sides of the duct and on the complete circumference of the ducts where the larger duct dimension is greater than 24 inch.

Angle iron extensions shall be either grouted or bolted to the structure.

Hangers spacing and sizes shall be as follows.

Larger Duct Dim. (Inch)	Strap Size (Inch)	Bar Dia (Inch)	Bottom Angle Size (Inch)	Maximum Spacing (Feet)
Thru 12	1" x 22 ga.	3/8	1x1x1/8	8
14 thru 18	1" x 22 ga.	3/8	1-1/4x1-1/4x1/8	8
19 thru 30	1" x 18 ga.	3/8	1-1/2x1-1/2x1/8	8
31 thru 42	1" x 18 ga.	3/8	1-1/2x1-1/2x1/8	8
43 thru 54	1" x 16 ga	3/8	1-1/2x1-1/2x1/8	7
54 over	1" x 16 ga	1/2	2x2x1/4	6

Hanger rods shall be cross-braced whenever the length of rod above duct work is more than 3 ft. to prevent swing of ducts.

All structural steel including hanger rods and angle iron shall be painted with one coat of approved rust- inhibitive paint before installing.

#### QUADRANTS FOR VOLUME DAMPERS

All dampers other than dampers behind registers and diffusers shall be fitted with substantial locking quadrants, mounted outside the duct in an accessible position. On insulated ducts the quadrants shall be fastened to bearing plates flush with the outside finish of the insulation.

#### DAMPERS

##### Volume Dampers (V.D)

A substantially constructed manual volume damper of the butterfly or multiple blade type as per latest SMACNA Duct Construction Standards shall be fitted where shown on the Drawings and at all branch entries or exits with main ducts for balancing purposes. Dampers shall have galvanized or painted steel interlocking blades of 8" maximum blade width. Blades shall be fabricated from 16 gauge steel with seamed edges and a maximum length of 4 ft. It should be noted that these dampers, shall be separate and independent from the dampers, hereinafter specified. Volume Dampers are not required where splitters Dampers, as specified hereinafter, are installed.

##### Splitter Dampers (S.D)

At each point of division in a supply trunk duct where a branch is taken off a trunk duct, an adjustable splitter or deflecting damper, one gauge heavier than the duct with operating rod and locking quadrant as above, shall be installed. These deflecting dampers shall be permanently set and locked in position after completion of the installation and adjustment with fans running. Operating rods are to be full blade length extending through the duct to externally

mounted bearing plates. Construction shall be as per latest SMACNA Duct Construction Standards.

### **Fire Dampers (F.D)**

Fire dampers are installed as shown on the drawings. Frame shall be 4"x1"x1/8" galvanized steel channel with 16 gauge thick blades. Blades shall have an overlap of 1" and shall be fixed on self-lubricating bronze type bearings.

Dampers shall be complete with linkage rod and fusible link rated at 160 deg F. Damper construction shall meet NFPA 90-A requirements, and shall have the "hour" fire-rating not less than the fire rating of the plane where installed. Fire dampers shall be air tight when in close position.

### **DUCT CONNECTIONS**

Flame proof flexible connections shall be furnished and installed on all suction and discharge connections of fans and air-conditioning units for prevention of transmission of vibration through the ducts to occupied spaces.

Flexible connections also be provided wherever ducts cross building expansion



joints.

Flexible connections shall be factory fabricated of imported origin, made from chemically impregnated canvas or other material approved by the Engineer. Connections shall fit closely and are to be secured in an airtight fashion at connections to ductwork, fans and apparatus. The unclamped section of the flexible connection between apparatus and ductwork shall not be less than 6" in length. Flexible connections shall not be painted or insulated. Samples of the material shall be presented to the Engineer for approval before installation.

## **ACCESS DOORS AND PANELS**

Wherever necessary, suitable access openings, doors and frames to permit inspection, operation and maintenance of all filters, controls, dampers, bearings or other apparatus shall be provided in ducting. Doors shall be of double construction, of not lighter than 20 gauge metal sheet and shall have sponge rubber gaskets around their entire perimeter. On insulated duct work the space between the inner and outer door sheets shall be insulated as specified for the ductwork. All access doors in sheet metal shall have air tight seal, shall be hung on heavy flat hinges and shall be secured in the closed position by means of wing type nuts and screws or coin operated catches.

## **SLEEVES**

Where ducts pass through walls, partitions, or floors, wooden sleeves shall be provided by the Contractor and these sleeves shall remain in place permanently. Sleeves shall be packed with non-combustible glass- fiber insulation, minimum of 1.5 lbs/cu.ft. Density and sealed with sealant.

## **TEST WELLS**

The Contractor shall provide test wells for measurement of air velocity and static pressure for balancing purpose. These wells made up of a brass nipple with screwed caps are to be fixed into the duct or casing on the downstream sides of each fan, filter, AHU, FCU and branch volume damper in each branch supply duct, and on upstream side of branch volume damper in each branch return. The design of test well shall be subject to Engineer's approval.

## **FLEXIBLE ROUND INSULATED DUCT**

This shall be round insulated duct, factory made with 1 1/2" thick fiberglass blanket wound round a coated helix wire coil and fiberglass inner mesh liner. Thermal conductance shall not be more than 0.27 btu/hr-sft-deg F at 75 °F and shall meet the fire safety requirement of UL 181 Class 1 air duct. Flexible round duct shall be as manufactured by certain Teed (USA) or approved equal.

**FAISALABAD INSTITUTE OF CARDIOLOGY, FAISALABAD**  
**AIR HANDLING UNITS (GENERAL)**  
**(EUROVENT CERTIFIED-MATERIAL AND PERFORMANCE)**

**EQUIPMENT SCHEDULE**

SHEET 3 OF 5

CODE	TYPE	SECTION CONFIGURATION	SUPPLY FAN			OUTDOOR AIR (OA) (CFM)	RETURN AIR (RA) (CFM)	DISCH. ARR.	REFER TO SCHEDULE OF CCHC.	REF TO SCH. OF MXB	HUMIDIFIER			AREA SERVED
			CFM	EXTRACT SP (IN)	MAX OV (FPM)						CODE	TYPE	EVAP. RATE (LBS/HR)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AHU-F5	DOUBLE SKIN SINGLE ZONE, HDT, FLOOR MOUNTED	MXB-FF-BF-HUM-CCHC-FAN	21450	2	2000	4349	17101	U B	1 4	1 4	HUM-1	S	101.4	ICU/II CU

**LEGEND:**

CFM = CUBIC FEET/MINUTE

HDT = HORIZONTAL DRAW THRU

TH = TOP HORIZONTAL

UB = UP BLAST

VDT = VERTICAL DRAW THRU

**NOTES :**

CCHC = COMBINATION COOLING-HEATING COIL

HUM = HUMIDIFIER

MXB = MIXING BOX

F.F = FLAT FILTER BOX WITH HIGH VELOCITY FILTER

B.F = BAG FILTER BOX WITH HIGH VELOCITY FILTER

FPM = FEET PER MINUTE

S = STEAM HUMIDIFIER

SAF = SUPPLY AIR FAN

RAF = RETURN AIR FAN

1. FAN SHOULD BE SELECTED FOR TOTAL SP= ESP+AHU SP + FILTER PRESSURE LOSS (AVG. OF MFR RECOMMENDED DIRTY & CLEAN FILTER)

2. MOTOR HP SHALL BE ATLEAST 120 % OF REQUIRED BHP.

3. 'FOR "MAKE" AND "COUNTRY" OF MANUFACTURE SEE SCHEDULE H TO BID OF VOLUME-I "LIST OF APPRO

"MANUFACTURERS FOR ITEMS/MATERIALS/EQUIPMENT OF HVAC WORKS".

4. AHUs INSTALLED OUTSIDE SHALL BE WEATHER PROOF TYPE WITH WEATHER RESISTANT CANOPY

SUITABLE FOR EXPOSED TO VISION INSTALLATION.

5. ALL MOTORS SHALL BE DESIGNED FOR CONTINUOUS OPERATION IN THE TEMPERATURE OF 104 °F (40 °C).

**FAISALABAD INSTITUTE OF CARDIOLOGY, FAISALABAD**  
**AIR HANDLING UNITS (HEAT RECOVERY TYPE)**  
**(EUROVENT CERTIFIED-MATERIAL AND PERFORMANCE)**

CODE	TYPE	QTY.	SECTIONAL CONFIGURATION	SUPPLY AIR FAN DATA			EXHAUST AIR FAN DATA			HEAT RECOVERY WHEEL DATA						DISCH ARR.	REFER TO SCHEDULE OF CCHC	REFER TO SCHEDULE OF MXB	HUMIDIFIER			AREA SERVED	
				SUPPLY AIR (CFM)	EXT SP (IN)	MAX OV (FPM)	FRESH AIR (CFM)	CFM	EXT SP (IN)	MAX OV (FPM)	TYPE	MINIMUM EFFICIENCY (%)	AIR TEMPERATURE						CODE	TYPE	EVAP. RATE (LBS/HR)		
													EDB (°F)	LWB (°F)	LDB (°F)								
1	2	3	RF	5	6	7		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
AHU-F4	HORIZONTAL DRAW THRU DOUBLE SKIN 100% FRESH AIR HEAT RECOVERY TYPE AIR HANDLER	1	EW FF B CC SF HC	10,884	5	2000		6,722	5	2000	ENTHALPY WHEEL	75	115.04	85.64	84.02	74.30	UB	13	-	-	-	-	OT 3, 4 & 5

**LEGEND:**

CFM = CUBIC FEET/MINUTE  
 HDT = HORIZONTAL DRAW THRU  
 TH = TOP HORIZONTAL  
 UB = UP BLAST  
 VDT = VERTICAL DRAW THRU  
 EDB = ENTERING DRY BULB TEMPERATURE  
 EWB=ENTERING WET BULB TEMPERATURE  
 LDB=LEAVING DRY BULB TEMPERATURE  
 LWB=LEAVING WET BULB TEMPERATURE  
 CCHC = COMBINATION COOLING-HEATING COIL  
 HUM = HUMIDIFIER  
 MXB = MIXING BOX  
 FF = FLAT FILTER BOX WITH HIGH VELOCITY FILTER  
 BF = BAG FILTER BOX WITH HIGH VELOCITY FILTER  
 FPM = FEET PER MINUTE  
 S= STEAM HUMIDIFIER  
 SF = SUPPLY AIR FAN  
 RF = RETURN AIR FAN  
 EW=ENTHALPY WHEEL

**NOTES:**

- FAN SHOULD BE SELECTED FOR TOTAL SP= ESP+AHU SP + FILTER PRESSURE LOSS (AVG. OF MFR RECOMMENDED DIRTY & CLEAN FILTER)
- MOTOR HP SHALL BE AT LEAST 120% OF REQUIRED BHP.
- FOR "MAKE" AND "COUNTRY" OF MANUFACTURE SEE SCHEDULE H TO BID OF VOLUME-I LIST OF APPROVED MANUFACTURERS FOR ITEMS/MATERIALS/EQUIPMENT OF HVAC WORKS.
- AHUs INSTALLED OUTSIDE SHALL BE WEATHER PROOF TYPE WITH WEATHER RESISTANT CANOPY SUITABLE FOR EXPOSED TO VISION INSTALLATION.
- ALL MOTORS SHALL BE DESIGNED FOR CONTINUOUS OPERATION IN THE TEMPERATURE OF 104 °F (40 °C).

**FAISALABAD INSTITUTE OF CARDIOLOGY, FAISALABAD**  
**AIR HANDLING UNITS (COIL)**  
**(EUROVENT CERTIFIED-MATERIAL AND PERFORMANCE)**

EQUIPMENT SCHEDULE

SHEET 4 OF 5

CODE	INSTALLED IN	AIR THRU COIL (CFM)	MAX. COIL FV	COOLING (AIR SIDE)				COOLING (WATER SIDE)				HEATING (AIR SIDE)				HEATING (WATER SIDE)				
				TH (MBH)	EDB deg F	EWB deg F	SH (MBH)	EWT deg F	LWT deg F	MAX. FLOW RATE USGPM	MAX. PD FT.WG	TH (MBH)	EWT deg F	LWT deg F	MAX. FLOW RATE USGPM	MAX. PD FT.WG	TH (MBH)	EWT deg F	LWT deg F	MAX. FLOW RATE USGPM
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17				
CCHC-F4	AHU-F4	10884	500	834.0	103.40	81.00	416.505	44.00	-	167	20	245.776	140	-	49	20				
CCHC-F5	AHU-F5	21450	500	869.0	79.40	64.60	164.800	44.00	-	174	20	319.627	140	-	64	20				

**LEGEND:**

CCHC COMBINATION COOLING-HEATING COIL  
 CFM CUBIC FEET PER MINUTE  
 FPM FEET PER MINUTE  
 SH COIL SENSIBLE HEAT

EAT ENTERING AIR TEMPERATURE  
 EDB ENTERING DRY BULB TEMPERATURE  
 EWB ENTERING WET BULB TEMPERATURE  
 EWT ENTERING WATER TEMPERATURE

TH COIL TOTAL HEAT  
 USGPM UNITED STATES GALLON PER MINUT  
 LAT LEAVING AIR TEMPERATURE  
 LWT LEAVING WATER TEMPERATURE

**FAISALABAD INSTITUTE OF CARDIOLOGY, FAISALABAD**

**AIR HANDLING UNITS (MIXING BOX)  
(EUROVENT CERTIFIED-MATERIAL AND PERFORMANCE)**

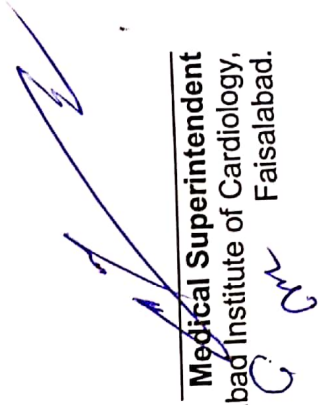
**EQUIPMENT SCHEDULE  
SHEET 5 OF 5**

CODE	INSTALL D WITH	AIR ENTERS FROM		RETURN AIR (RA) (CFM)	FRESH AIR (OA) (CFM)	BY PASS AIR (CFM)	ACCESSORIES	REMARKS
		RA	OA					
1	2	3	4	6	7	8	9	10
14	AHU-F5	TOP	REAR	17101	4349		AS SPECIFIED	

**NOTE: RATINGS ARE FOR SELECTION PURPOSE ONLY. SCHEDULE WILL BE UPDATED FOR OPERATING VALUES AT INSTALLATION STAGE**

**Special Note:**

The contractor will submit an undertaking along with bid that he will be responsible to dismantle already installed AHUs with no extra payments and All accessories / materials / civil works which will be required for installation of Air Handling Units will be the responsibility of successful bidder on FOC basis.

  
**Medical Superintendent**  
 Faisalabad Institute of Cardiology,  
 Faisalabad.