Guide specifications for Hygienic Certified Air Handling Units

CLCP_ME Euro HYG

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PART 1 - GENERAL

1.0 QUALITY ASSURANCE

1.1 Manufacturers of Air Handling Units shall have ISO 9001: 2015 certification

1.2 The inspection of the units shall be carried out at factory before the shipment by client or consultant representative if required, or Factory Quality Test Reports shall be submitted covering the below items as a minimum,

a) Coil (fin & tube heat exchanger) Leakage Test
b) Fan Motor Assembly Balancing & Fan Motor Run Test

1.3 Applicable Codes and Standard,

a. Air Handling Unit shall be Hygienic Certified by TUV SUD based on following standards,
   - DIN 1946 Part 4 (09/2018)
   - VDI 6022 Part 1 (01/2018)
   - VDI 3803 Part 1 (05/2020)
   - DIN EN 13053 (05/2020)

b. The test laboratory shall be accredited in accordance with ISO/IEC 17025. Display Hygienic certification symbol on units.

c. Valid Certificate for the AHU range conformity to DIN 1946-4:2018, VDI 6022-1:2018 & DIN EN 13053:2020 to be submitted. Certification to only VDI 6022-1:2018 & DIN 1946-4:2018 will not be accepted.

d. All Non-Metallic Materials within Airstream should be certified to ISO 846: Evaluation of the action of microorganisms. Manufacturer should submit test report from 3rd party- accredited lab showing proof of microbiological inertness according to ISO 846 test method A & C. ".
   Intensity of Microbial growth shall have a rating 0
   - Fungal growth Test (Method A)
   - Resistance to bacteria (Method C)

e. **Eurovent Compliance:** Design and Rating of air handling units in accordance with Eurovent Standard EN1886 & EN13053.

   The unit should meet minimum Mechanical Performances, certified and listed in the Eurovent website. Product not complying to **TB1 class Thermal Bridging Factor** will not be accepted.

Eurovent Mechanical Characteristics	Eurovent Class
Construction	Aluminium Profile -Penta Post
PU Panel Thickness	50mm
Casing Strength Class	D1(M)
Casing Air Leakage Class -400 Pa	L1(M)
Casing Air Leakage Class +700 Pa	L1(M)
Filter Bypass Class	F9
Thermal Transmittance Class (U)	T2
Thermal Bridging Factor Class (Kb)	**TB1**

f. All filters shall be tested, rated and classified in accordance to ISO 16890. (This new standard replaces the previous EN779 and ASHRAE 52.2 standard).
HEPA Filters shall be tested, rated and classified in accordance to EN 1822.

g. Coil capacity, pressure drops, and selection procedures shall be rated in accordance to AHRI Standard 410.

h. Fans shall be AMCA Certified and Listed.

i. Fan Motors- Designed & Rated as per IEC 60034.

2.0 SUBMITTALS

2.1 Product Data: Submit manufacturer's technical product data for air handling units showing Dimensions, weights, capacities, ratings fan performance with operating point clearly indicated, Motor electrical characteristics, gauges and finishes of materials, and installation instruction.

2.2 Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, weight loadings, Required clearances, construction details, and field connection details.

2.3 Maintenance Data: Submit maintenance instructions, including instructions for lubrication, filter Replacement, motor and drive replacement, and spare parts lists. Include this data, product data, Shop drawings, and wiring diagrams in maintenance manuals.

2.4 Submit external static pressure calculations based on actual shop drawings for approval by Consultant before final selection of units.

3.0 PRODUCT DELIVERY, STORAGE AND HANDLING

3.1 All of AHU's sections must be fitted with a perimeter base so that they can be handled or lifted Using a crane - if necessary – as well as for their final positioning. The base must be equipped with suitable hoisting holes, drilled into each corner in order to facilitate handling an ensure aeration for bottom Panels.

3.2 Prior to despatch each section will be wrapped, using heavy gauge PVC sheet to provide Protection both during shipment and the erection period.

3.3 Handle air handling units carefully to avoid damage to components, enclosures, and finish. Do not Install damaged components; replace and return damaged components to air handling unit Manufacturer.

3.4 Store air handling units in clean dry place and protect from weather and construction traffic.

3.5 Comply with manufacturer's rigging and installation instructions for unloading air handling units And moving them to final location.

PART 2 – PRODUCTS

1. CONSTRUCTION

1.1 FRAME

a) The unit framework is Penta post construction and shall be manufactured from heavy gauge extruded aluminium profiles with built in thermal break system. Aluminium profiles frames are joined by means of nylon fibre glass-stiffened 3Leg corner pieces secured in place by fasteners.

b) The framework shall be "cold bridge free" and both the framework and casing panels shall incorporate a thermal break.

c) Panel to be attached to the frame through a self-locking mechanism represented by a wedge and frame.

d) Proper air sealing shall be achieved by means of PE closed cell gasket with high elastic properties, affixed onto aluminium frame flange(lip).

1.2 CASING

a. The unit casings shall be of double skinned with 50 mm thick, pressure injected polyurethane foam (PUF) sandwiched between Pre-painted/Powder coated Steel-Outer skin and Stainless steel-Inner skin.

b. The PU insulation material specification shall comply to below,
- CFC free with zero ODP and zero GWP
- Thermal conductivity 'K' factor shall be around 0.02 W/m °K
- Overall density shall be around **(48 +/- 2) kg/m³**

c. The Fire Propagation and Surface Spread of flame for the Panels shall confirm to the below as minimum when tested in accordance to BS 476,
- Surface Spread of Flame: Class '1'
- Fire Propagation Index: 1

1.3 BASE FRAME

a. All units shall be provided with Galvanized steel base frame of Minimum height 100 mm.
b. Units shall be provided with base frame made of commercial steel C-channel beams..
c. GI base frame shall be C-Channel Type with a minimum Thickness of 1.9mm -3.0mm depending on unit size.
d. Commercial steel C-channel beams with a minimum thickness of 6mm.

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1.4 HYGEINIC FEATURES ON STANDARD DESIGN

Specific applications such as operating theaters in hospitals, clean rooms or food processes require enhanced features of cleanliness to insure high level of Indoor Air Quality. Some of the following options shall be provided according to each project requirements:

a) Coil and Humidifier sections shall be equipped with a dual pitch slopped SS304, drain pan to collect and drain cleaning water and condensates.

b) Doors shall be provided with external airtight locks, to prevent air leakage,
   - Unit Height 1085mm and below shall be provided with LATCH Door
   - Above 1085mm, shall be provided with Hinged Door
   - Door Seals are replaceable type. Gasket with adhesive nor permitted

1.5 INLET DAMPER AND MIXING SECTION

a) The mixing or intake section shall be provided as a part of AHU.
b) The intake/ mixing section shall be provided with opposed blades type, air volume control damper/s.
c) Dampers shall be manufactured with extruded Aluminum blades and frames or Stainless Steel.
d) Dampers air leakage rate (closed blades air leakage) should meet below,
   - **Minimum Class 4 (DIN EN 1751)** for unit serving operation rooms or other areas where stricter tightness requirements apply, as required by DIN 1946-4.
   - **Minimum Class 3 (DIN EN 1751)** for unit serving to other areas except Operation theaters.
e) Motorized damper with opposes blades and shall close automatically, during any power failure to avoid any entrance of dirt or dust particles inside.
f) Damper Location- Internal for Outdoor and Fresh Air Units.
g) Damper Location- External for Indoor Units.
h) All Dampers shall have an “OPEN/CLOSED” indication sign.

1.6 FILTERS

a. Filter cells shall be of standard sizes and shall be easily obtainable from standard suppliers.
b. Filter materials shall be flame-retardant, incombustible, non-odorous and offer no sustenance to vermin.
c. All filters shall be tested, rated and classified in accordance to ISO 16890. This new standard replaces the previous EN779 and ASHRAE 52.2 standard.
d. In accordance with the new standard, filters shall be classified by,
   i. ISO Coarse - (captures ≤ 50% of ePM10 particle size),
   ii. ISO ePM10 - (particle size from 0.3µm to 10µm),
   iii. ISO ePM2.5 - (particle size from 0.3µm to 2.5µm),
   iv. ISO ePM1 - (particle size from 0.3µm to 1µm).

e. Types of filters offered,
   i. Flat Filter :
      - 2” Washable – G3 / ISO Coarse, 50- 55%,
      - 2” Throwaway- G4 / ISO Coarse >60%.

   ii. Hi-Eff Bag Filter : 15” & 21”
      - F7 / ISO ePM1, 50-65%,
      - F8 / ISO ePM1, 70- 75%,
      - F9 / ISO ePM1 >80%.

   iii. HEPA Filter : (AstroVXL) 12”, Class H13 & H14 (EN 1822).

f. Filters Loading method- Back Loading only (Access from Dirty air side). Side withdrawal is not acceptable
g. Filters shall be mounted on Universal Filter Holding Frames for an easy and quick removal.
h. Filter holding frames shall be made of stainless steel and equipped with seamless PU gasket to support Filter Bypass Air Leakage Class F9.
i. The filter section shall be equipped with an access door at upstream section for service access.
j. The filter section shall be equipped with pressure connection tubes, fitted outside of the casing.
k. The filter section shall be equipped with,
    i. differential pressure gauge to give visual indication of filter pressure drop value and
    ii. differential pressure switch for remote warning of filter dirty condition.

1.7 COOLING COIL & DRAIN PAN

a) Cooling coil should be manufactured by AHU manufacturer only. 3rd party cooling coil will not be accepted
b) The fin and tube coil shall be designed and manufactured in accordance with AHRI 410 Standard. Coils shall be designed to utilise the full available unit cross section area.

c) Coil tubes shall be half inch OD copper and mechanically expanded into aluminium plate fins

d) Coil headers shall be made of hard copper pipe with Brass adaptor with BSPT(ext thd.) pipe connection and protrude through the casing where the openings shall be suitably sealed with grommets.

e) Coil connections shall be fitted with plugged drain and vent tapings to facilitate draining and venting.

f) For Coils used in mild corrosive environments and handling untreated fresh air the Fins shall be Hydrophilic blue fin which can pass 500 hrs Salt spray test with a rating 9 when tested as per JIS-Z-2371
For Coils used in Harsh corrosive environments and handling untreated fresh air shall be with E-KOTE which pass 5000 hrs Salt spray test when tested as per ASTM B-117 as a design special (COD-custom order design)

g) The cooling and heating coil's standard working pressure shall be 250psig (17.2 bar). Coils shall be proof and leak tested at 375 psig(25.9 bar).

h) Coil casing shall be manufactured from 1.5 - 2.0mm, Stainless steel with drain holes in the bottom channel to insure condensate drainage.

i) The Coil Face Velocity shall not exceed 2.54 m/s (500FPM). If the coil Face Velocity exceeds 2.54 m/s moisture eliminators to be provided downstream of the Cooling coil section

j) The standard fin series shall be 120**FPF** (fins per foot), to minimize air pressure drop and easy cleaning.

k) The Primary drain pan shall have dual pitched slope with a side outlet connection for proper condensate removal and easy cleaning, that supports IAQ (Indoor Air Quality).

l) The drain pan shall be fabricated of minimum 1.0mm, thick Stainless Steel. The Drain pan shall be insulated from beneath with 16mm Thick PE insulation.

m) For units with stacked coil, the Intermediate drain pan shall be provided of the same material as the primary drain pan.

1.8 FAN & MOTOR

a) Fans shall be of SWSI, direct driven backward curved Plenum Fan as required to suit the pressure and operating characteristics specified and for stable non surging operation.

b) Fan performance shall be based on tests and procedures performed in accordance with AMCA Publication 211 and 311 and comply with requirements of AMCA Certified Rating Program.

c) Fan Impellers shall be statically and dynamically balanced to ISO1940 and AMCA 204-G2.5 Standard.

d) All fans after assembly shall be trim-balanced to ISO 1940 and AMCA 204-G2.5 standard.

e) The impeller-attached motor, shall be mounted on a sturdy base frame entirely isolated from unit by 1" Restrained-Spring type anti vibration isolators (and rubber in shear isolators on very small units due to space constraint), to limit the vibration transmitted to the AHU casing.

f) Fan intake shall also be isolated from casing by use of a flexible connection.

g) The Fan section shall be provided with a view port and Bulkhead lamp with external switch.

h) The Fan Motor shall be,
- Three-phase, Squirrel Cage Induction Motor
- Designed for Inverter use, comply with IEC 60034-17
- Having minimum efficiency of IE3
- Totally enclosed fan cooled (TEFC), - method of cooling, IEC 60034-6 / IC 411
- Rating and Performance as per IEC 60034-1
- IP55 Protection with, windings Class F insulation and Class B temperature rise
- Designed to work at continuous running duty (S1) at rated voltage and Frequency.

1.9 ELECTRIC HEATER

a) The heater elements shall be SUS304L stainless steel finned tubular type, mounted on heavy gauge bracket.
b) The sheathed stainless steel elements shall be capable of running at "black heat" with an element surface temperature of < 200C.
c) The size and quantity of elements supplied depends on unit size and the required heating capacity.
d) All Heater shall be furnished with a pre-engineered, unit mounted heater control/starter package with the following standard features,
    - Supply air temperature controller, with Human-Machine Interface(operator display)
    - Controller with BMS connectivity.
    - Power Components consist of Solid State Relay (SSR), Contactor and Circuit Breaker(MCB).

e) The electric heater shall be individually fused (MCB) as required by NEC. Heaters drawing more than 48amps shall be subdivided into circuits not to exceed 48amps.

f) In-built Safeties,

- Airflow switch (DPS-Differential Pressure Switch) shall ensure airflow thru the heater for it to be energized
- An automatic reset high temperature limit ensure safe operating temperature of the heater.
- A manual reset overheat protection are final level of protection to ensure safe operating temperature are not exceeded.

1.10 UV LAMPS (if Applicable)

a) Generates ultraviolet germicidal irradiation (UVGI) to control the bio-film, microbial growth and dirt that foul coil surface.
b) UV-C energy can inactivate (kill) micro-organisms when the right dose is applied (intensity and duration).

Package options:

a) High Intensity UVC light system with irradiance level > 1000uW/cm² - to disinfect airstream, coil and drain pan.
b) Standard Intensity UVC light system with irradiance level between 50 to 100uW/cm² – to disinfect coil and drain pan only.
c) The UVC Emitter complete factory package shall include the below including a simple control panel as standard:
   - UVC light system - UVC Lights will only lit on when the Interlocking Safety is fulfilled.
   - Differential pressure switch - Air Flow Proving Device
   - Door switch detector - safety interlock for access door
   - Relay box
   - Hour-meter, to monitor UVC system operating hours.
   - Separate power source installation with On/Off power switch.

PART 3 – HEAT RECOVERY

1.0 CROSS FLOW PLATE HEAT EXCHANGER (If Applicable)

a) Air to Air Plate Heat Exchangers are an extremely effective and low-cost way of reducing the heating or cooling loads on the treatment of process air and air conditioning systems.

b) A reduced heating or cooling load means lower energy bills and carbon emissions.

c) Air Plates use the exhaust air to pre-heat or pre-cool the incoming supply air, without the two air streams ever mixing. The box-like construction of the heat exchanger is suitable to be slid into an enclosure.

d) As a design special option (COD-custom order design), we can supply heat exchangers fitted in our enclosures as complete heat recovery units.

e) Factory Standard Brands of plate heat exchangers are, HOVAL or HEATEX

2.0 HEAT RECOVERY WHEEL (If Applicable)

Heat recovery wheel works similar to energy recovery. In heat recovery applications the incoming cool air in the ventilation system is heated by the warm exhaust air. With high efficient air-to-air heat exchangers, up to 90% of the heat in the exhaust air is transferred to the supply air. The exhaust air is contaminated with humidity and pollutants, but the two airflows never mix, leaving the supply air fresh and clean.
Heat recovery systems give a very small carbon footprint with lower energy consumption and consequently reduced heating costs.

Features:

a) The rotor storage matrix of the shall be made of corrosion resistant, an alternating corrugated and flat foils.
The surface of the storage matrix shall be coated with type 3A molecular sieve desiccant especially developed for enhanced moisture transfer. The molecular sieve desiccant shall have an internal pore diameter of maximum 3Å (0.0003 micrometer), coating that offers a high humidity efficiency as well as protection against odours.

b) The rotor storage mass shall be with well height of 2.0mm.
2.0mm well height is a common configuration due to it's good balance between efficiency and pressure drop.

c) The storage matrix shall be cleanable with pressurized air or flushed with water (20 °C to 40 °C) and conventional detergent. The cleaning of the rotor shall not reduce desiccant layer

d) The standard rotor casing and support structure shall be of corrosion resistant material. Operational temperature of the rotor wheel shall be -40 to +65 C.

e) The rotor wheel shall be equipped with sealed for life bearings. The bearing shall be installed protected within the rotor hub and shall be sealed for life.

f) The rotary heat exchanger shall be equipped with a purge sector to prevent carry over from exhaust to supply air, or according to the fan position and pressure relation

g) The rotor wheel outer edge, intermediate beams and purge sector shall be equipped with adjustable brush seals. The brush seals shall consist of double brush type with double foil inside for maximum sealing capability.

h) The rotor wheel shall be driven by a belt around the periphery which is connected to a pulley. The pulley is driven by a gear connected to an electrical AC motor. The AC motor shall have iinsulation class F and shall be equipped with a thermo contact for protection of the windings.

a) The rotary heat exchanger shall be Eurovent/ AHRI certified.

3.0 HEAT PIPE (Wrap Around)

Heat pipe shall be consisting of two coils, pre-cooling and reheating, connected together without any moving part in between them and containing phase change fluid.
For dehumidification function (Wrap Around Heat Pipe), pre-cooling coil is located in the incoming air flow allows the main cooling coil to work much cooler and condense more moisture.
Re-heat coil located after the main cooling coil, reheats the supply air and brings about a more comfortable temperature and relative humidity.
This entire function of humidity reduction is performed while saving energy.

a) Heat pipe shall be externally inserted into the AHU through rectangular openings and wrap around the main cooling coil.

b) The fins shall be of aluminium and continuous plate type. Tubes shall be of refrigeration standard seamless copper heat exchanger use.

c) Casings shall be from heavy gauge galvanized sheet steel. The casing shall incorporate tube sheets and top and bottom channels, around both the precool and reheat heat pipe blocks.

d) The working fluid shall be refrigerant type classified as ASHRAE safety group A1. The refrigerant shall be either R22 or R134A. The heat pipe circuits shall be factory charged and hermetically sealed with the calculated weight of refrigerant.

e) There shall be a multitude of loops in the height of the heat pipe and each loop shall be individually charged. Heat pipes with header assemblies containing a single circuit are not suitable as a single leak will render the entire heat pipe inoperative.

f) Heat pipe performance shall be independently tested and certified in line with the requirements of British Standards BS 5141 pt1 / European Standards EN 305 & 306 / American Standards AHRI 410 for testing and rating of heat exchangers.

PART 4 – EXECUTION

4.1 INSTALLATION

a) Install as shown on the drawings, as detailed, and according to AHU manufacturer's installation instructions.

b) Mount units at appropriate height above floor to insure proper condensate trap depth and condensate drainage.

c) Install air handling unit to provide for adequate service access. Coordinate location to ensure air handling unit does not infringe upon access or service clearances of other equipment.

d) Upon completion of installation of air handling units, start-up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning components, then re-test to demonstrate compliance.

4.2 PRE-OPERATION MAINTENANCE

a) Rotate impeller by hand and check for shifting during shipment and check all bolts, collars, and other parts for tightness.

4.3 START-UP AND INSTRUCTIONS

a) Check vibration and correct as necessary for air balance work.
b) After air balancing is complete and permanent sheaves are in place, perform necessary field mechanical balancing to meet vibration tolerance in Section 15070, Mechanical Sound, Vibration & Seismic Control.

4.4 TESTING, BALANCING AND COMMISSIONING

a) Testing, Balancing and Commissioning shall be as referred to throughout this Section, and in accordance with Section 15950 Testing, Adjusting and Balancing.

b) The test rig and all necessary blanks for the purpose of sealing the ductwork under test shall be provided, blanks shall be removed after the test has been approved for each section of the ductwork.

4.5 IOM

Specific IOM shall be provided for the Hygienic certified AHU with below details as minimum.

a) General information on cleaning procedures and allowed disinfecting agents.

b) Cleaning procedures and maintenance of components

c) Instruction for removal of components.

d) Required Intervals for cleaning and maintenance of components.