



## **CLEANPAK INTERNATIONAL RECIRCULATING AIR HANDLING UNIT SPECIFICATIONS**

### **Part I - General**

#### **1.1 WORK INCLUDED**

CLEANPAK International Recirculating Air Handling Unit (Fan/Coil Unit), hereafter referred to as a "RAH unit".

#### **1.2 REFERENCES**

- A. AMCA Bulletin 300
- B. Federal Standard 209E
- C. IEEE Test Procedure 112A
- D. ASHRAE Test Standard 52-76

#### **1.3 SYSTEM DESCRIPTION**

- A. RAH Units supply Class 1; 10; 100; 1,000; 10,000; or 100,000 areas
- B. Description: RAH units shall be fully factory assembled, packaged, pre-wired cleanroom units. Units can consist of direct driven fan and motor, cooling coil, drain pan, pre-filters, combination starter/disconnect, internal vibration isolation, sound attenuation, enclosed in a finished cabinet. Units shall present a finished, attractive appearance.
- C. The electrical power connection to the RAH will be made by the electrical contractor.
- D. The RAH manufacturer shall provide prototype modules of the RAH as described under Paragraph 1.5, Factory Functional Tests.

#### **1.4 QUALITY ASSURANCE**

- A. Owner's Factory Inspection
  - 1. The owner and contractor shall maintain the right to tour the CLEANPAK International plant any time fabrication is being performed on units intended for a project.
  - 2. The owner and contractor shall maintain the right to require future random testing to ensure specifications during construction.
  - 3. The manufacturer shall notify the contractor when production is finished on the first units constructed. Any time after that date, the owner and contractor may exercise the option, giving 24 hours advance notice, to tour painting, fan balance procedures, noise and vibration testing, cleaning or packaging to ensure that quality control is being maintained.
  - 4. All components shall be recognized by the UL agency.

5. The RAH units shall be manufactured by CLEANPAK International.

#### 1.5 FACTORY FUNCTIONAL TESTS

##### A. Approach

1. Factory functional tests shall be performed on a single unit. The tests will be witnessed by the contractor and owner and must be accepted by same, prior to accepting units. All modifications arriving as a result of the functional testing shall be incorporated into all units.
2. There are three functional tests to be run on each: noise, vibration and leakage.
3. Testing for compliance with these requirements will be carried out by CLEANPAK International. Tests for compliance with the requirements should be carried out in an AMCA-registered laboratory.

##### B. Leakage Test

Each size of fully-assembled RAH units shall be tested to ensure a leakage rate of less than one percent of full volume airflow at a design external static pressure of 1.5 inch w.g. The manufacturer shall submit a test procedure to the contractor for review and approval prior to the witness test.

#### 1.6 SUBMITTALS

A. Submittal sets shall be provided as designated by the engineer. No changes in unit design shall be made without an additional submittal.

1. Complete specifications, descriptive drawings, catalog cuts, maintenance manuals and descriptive literature on all components used in the RAH units shall include make, model, dimensions, capacity and electrical schematics.
2. Fan performance curves showing RPM, brake horsepower and static pressure versus air volume.
3. Inlet and outlet sound power level data for the fans running at design conditions with clean pre-filters and final filters and also at reduced capacity and higher static pressure representing a dirty filter condition. Sound power levels shall be derived from data collected on representative fans in accordance with AMCA Standard No. 300.
4. A cross-sectional drawing showing the configuration of components, access panels, support frame, duct connections, outside dimensions and lifting lugs shall be included.

#### 1.7 DELIVERY, STORAGE AND HANDLING

A. RAH units shall be shipped fully assembled.

B. All units shall be cleaned after final assembly and tested in accordance with these specifications. After the unit is alcohol-cleaned, it must be wrapped in a protective, double-layer plastic bag and seal all joints so that the unit can be transported, stored and installed without concern of contaminating the cleaned unit.

C. Each cleaned and bagged unit shall then be strapped on top of a full-sized wood base to allow shipment and handling without damage to the cabinet. Shipping base and pallet frame shall be suitable for forklift pick-

- up and moving. The contractor will review the method of packaging and shipment prior to the first shipment.
- D. The contractor shall receive, unload, inspect, store, uncrate and install the RAH at the jobsite.
  - E. Any units arriving at the jobsite that have not been adequately protected will be rejected by the contractor/owner and must be returned to the manufacturer for rework or replacement.
  - F. The outside of the package or crate shall be adequately marked or tagged to indicate its contents by equipment number and weight.

## **PART 2: PRODUCTS**

- 2.1 ACCEPTABLE MANUFACTURERS, RAH UNITS  
CLEANPAK International
- 2.2 CABINET AND FRAME
  - A. Cabinet shall be constructed of 16 gauge minimum cold rolled steel with all large panel areas reinforced to prevent flat panel vibrations. Exterior welds shall be ground smooth prior to final finishing. Unit cabinets shall be manufactured to dimensional tolerances of  $\pm .5$  inch to ensure proper field installation and prevent air bypass around individual units.
  - B. Cabinet configuration and dimensions shall be approved prior to construction by the owner/contractor. Cabinets shall be designed to be lifted from the bottom.
  - C. All provisions for chilled water piping connections and electrical connections shall be made on the fan compartment housing sides for side access. Pre-filters shall be face-loaded on the return air wall end of the cabinet. Hinged and handled gasketed access doors shall be provided for motor and fan. Fan/motor assembly shall be completely accessible for service and removal from the side. Larger doors require more latches. A stainless steel drain pan shall be provided under the coil and coil headers. Cap the  $\frac{3}{4}$ " nipples before shipment.
  - D. Support frame shall be steel, as standard of the manufacturer. All interior support members shall provide full rigidity with continuous support as required on the short or long sides. External support mounting angles for the support angles shall be detailed by the unit manufacturer.
  - E. All components used in the fabrication of the fan/coil part of the unit in contact with the airstream shall be of non-shed elements. Of special concern is sound attenuating material used for fan noise control. Any acoustical liner shall be continuous sheets with sealed edges completely sealing the side facing the airstream.
  - F. Each unit includes access into the fan/motor compartment. Access will be through a single or double door that will be hung on lift-off steel hinges and will have three latches as required for securing the door in the shut position against internal pressure. Latches will be adjustable and non-key locking.
- 2.3 DOOR ACCESS  
Each unit includes access into the fan/motor compartment. Access will be through a single or double door that will be hung on nylon hinges and will have three latches as required for securing the door in the shut

position against internal pressure. Latches will be adjustable and non-key locking.

#### 2.4 FANS

- A. Fans shall be direct drive aluminum plug fans.
- B. The fan and motor assembly shall be mounted on a structural frame inside the RAH unit that is isolated from the main cabinet.
- C. Fan Balance: CLEANPAK International Standard Balance Specification: Factory fan assembly balancing tests shall be furnished to certify that the fan meets the balance requirements set forth in this specification. Measurements shall be taken in a direction parallel to the motor shaft in a horizontal plane, and in a direction perpendicular to the shaft in both the horizontal and vertical planes. These measurements shall be taken at the drive and idle motor/shaft bearing locations. Measurement center band frequency shall be the fundamental frequency of the fan speed and have a bandwidth no greater than the smallest available bandwidth on the measurement instrumentation. Instrumentation shall have a certified calibration traceable to NIST, no older than one year. All measurements as described above must be at or below .023 in/sec velocity.
- D. **Option: Econo-Disk®:** The fan shall be supplied complete with a CLEANPAK International variable volume Econo-Disk® damper. The Econo-Disk® is capable of reducing the air volume to 10% of design flow. This shall be accomplished by a movable non-ferrous disk which telescopes inside the fan wheel, creating an effect similar to a narrow-width wheel. All moving parts shall be accessible for routine inspection. The Econo-Disk® and fan assembly shall be vibration-free through the entire operating range. The Econo-Disk® shall be provided with a manual operator.

#### 2.5 ELECTRICAL SYSTEM

The RAH units shall be factory pre-wired from the electrical starter/disconnect or VFD to the motor, as required.

#### 2.6 MOTORS

- A. Motors shall be single-speed, squirrel-cage induction type, open-drip proof construction unless otherwise specified with sealed, isolated or re-greaseable ball-type bearings. Motors shall be rated 480V, 3 Phase, 60 Hz, 900 RPM (or as required). Insulation shall be Class B, 80 degrees C rise over a 40 degree C ambient temperature. Temperature shall be based on motor having a service factor of 1.15 and operated a service factor load. Motors shall meet NEMA Standard MGI. Motors shall be manufacturer's energy-efficient model.
- B. Motors shall be manufactured by Magnetek or Siemens.
- C. Provide certified copy of test reports on an essentially identical motor tested in accordance with NEMA B speed-torque curve.
- D. Provide liquid-tight aluminum flexible conduit (steel not approved) and copper conductors based on National Electric Code between the motor terminal junction box and externally-mounted starter/disconnect.

#### 2.7 PRE-FILTERS

- A. Pre-filters shall be 2-inch thick pleated media, rated at 30 percent by ASHRAE Test Standard 52-76.

- B. Filter-holding frames shall be arranged vertically at the return air wall end of the cabinet only, and replacement shall be from the face.

#### 2.8 COOLING COIL

- A. Provide a two-row, eight to ten fins/inch chilled water coil, fabricated with seamless copper headers, seamless copper tubes with mechanically bonded aluminum fins and stainless steel or galvanized casings. Coil headers shall have drain and vent tapings. Coils shall be circuited as required to produce the indicated capacities. Coils shall be ARI-rated and approved. Tubes shall be 5/8", .025" wall thickness. Coils shall have connections on one side.
- B. Drain pans. Provide under cooling coils as required to catch condensate from cool surfaces. Drain pan shall have one drain connection, 3/4" minimum. Drain pans shall be fabricated of stainless steel.
- C. Coils shall be sized for full flow of return air and shall be arranged in a draw-through configuration. Pipe counter flow air to water.

#### 2.9 PAINTING

All interior and exterior surfaces are to be cleaned, primed and coated with a TGIC baked-on powder coating.

#### 2.10 AIRFLOW MONITORING

Each fan shall be supplied with a factory mounted air flow measurement device and shall consist of 2 rings of total static pressure pick-ups at various positions around the fan inlet cone throat and the fan inlet cone surface perpendicular to the axis of the fan. There shall be a minimum of 4 taps in each ring. These pressure tap(s) for air flow measurement shall not be placed on any location not on the inlet cone itself. The flow measuring device shall not obstruct the inlet to the fan and shall not have any effect on fan performance (flow or static pressure) or fan sound power levels. The flow measuring station shall be CLEANPAK P-Cone. Provide a CFM gage on the external side of the fan section that indicates flow (CFM) through the fan and is calibrated for correct elevation. [Provide a factory installed velocity transmitter for air flow measuring station connection to the BMS system. Transmitter shall have a 4-20mA output signal.]

### **PART 3: EXECUTION**

#### INSPECTION

- A. The contractor and the owner shall inspect all RAH units upon receipt of shipment at the jobsite. Any defects and damage shall be noted and the manufacturer shall recommend corrective action.
- B. The manufacturer shall inspect all damaged units, determining whether repairs can be accomplished on-site or if the unit(s) need to be returned to the factory.
- C. The owner/contractor must approve of any corrective action to be made.