

## **SECTION 13 XX XX**

### **FAN FILTER UNITS (FFU) with ECM MOTOR**

#### **PART 1 – GENERAL**

This section specifies the requirements to furnish and install the fan powered filter units in the cleanroom ceiling.

- A. DESCRIPTION – Fan powered filter units (FFU) shall be factory assembled, packaged, prewired cleanroom ceiling filtration units. FFUs shall consist of direct-drive fan and Electronically Commutated Motor (ECM) motor, in a galvanized steel housing, and containing an intake prefilter, and HEPA final filter to provide unidirectional air flow. The ECM model Phantom delivers maximum energy savings due to low power consumption, while also offering the lowest possible operational noise levels.
- B. DESIGN REQUIREMENTS
  - a. The Fan-powered Filter Units shall be UL listed as an appliance , and labeled
  - b. Filters must conform to the following:
    - i. UL 507
    - ii. IEST Recommended Practice for Laminar Flow Clean Air Devices
    - iii. ASHRAE MERV Standard 52.2 for filter performance
  - c. Airborne noise due to operation of the individual units shall not exceed 50 dba, measured 30 inches below the filter face, at 90 fpm air flow velocity. Sound pressure level performance for individual units shall measure below an NC40 contour at 90 fpm.
- C. QUALITY ASSURANCE
  - a. Manufacturer Qualifications
    - i. Manufacturer shall have minimum fifteen years' manufacturing experience of the specified FFU type.
  - b. Installer Qualifications
    - i. The installer shall have minimum five years' experience installing cleanroom filters and ceilings of the specified type of application
- D. SUBMITTALS
  - a. Cross-sectioned drawings depicting the configuration of components, outside dimensions for each size unit, and weight of the complete unit
  - b. UL/CUL Listing certificate
  - c. Installation instructions
  - d. O&M manual
- E. EXTRA UNITS
  - a. Provide (specify quantity) additional FFU's for use by the owner as maintenance stock.

#### **PART 2 – PRODUCTS**

- A. ACCEPTABLE MANUFACTURERS
  - a. Basis of design shall be the ECM PHANTOM fan powered HEPA filter module, manufactured by GORDON, Inc. in Bossier City, Louisiana.
  - b. Optional:
    - i. Other, as approved by the specifying engineer, after evaluation and determination that the product will be equal to the specified FFU

c. **DIMENSIONS:**

- i. 2' X 4' Standard Phantoms shall measure 23-5/8" X 47-5/8" X 12"  
(Alternate: 23" x 47" x 12" for use in rod-suspended ceiling grids on 2'0" x 4'0" centers)
  - ii. 2' X 2' Standard Phantoms shall measure 23-5/8" X 23-5/8" X 12"  
(Alternate: 23" x 23" x 12" for use in rod-suspended ceiling grids on 2'0" x 4'0" centers)
  - iii. 2' X 3' Standard Phantoms shall measure 23-5/8" X 35-5/8" X 12"  
(Alternate: 23" x 35" x 12" for use in rod-suspended ceiling grids on 2'0" x 4'0" centers)
- d. **WEIGHT:** 81 pounds (2' X 4')
- e. **AIR FLOW:** Velocity is variable from 25 FPM up to 110 FPM
- f. **VOLUME:** 638 CFM at 90 FPM (2' X 4')

**B. CONSTRUCTION**

- a. Plenum housing shall be fabricated of powder coated galvanized steel. All seams and penetrations shall be sealed air tight.

**C. FILTERS**

- a. Prefilter: Fan powered filter module shall be provided with a fiberglass prefilter, MERV 4 rated per ASHRAE standard 52.2. Size: 20" X 20" X 1"
- b. Final filter shall be HEPA type; 99.99% minimum efficiency on 0.3 micron size particle challenge. HEPA filter frame shall be fabricated of anodized extruded aluminum.
- c. Integrated face screen shall be clear anodized aluminum, containing a small round-hole perforated pattern with 23% open area.

**D. MOTOR/BLOWER**

- a. Blower shall be direct drive, forward curve, centrifugal type.
- b. Motor shall be 1/3 H.P. ECM-type with integrated motor control. Trivoltage supply power: 120/240/277V vac / 1-Phase / 60 Hertz, rated at 1.6 or 0.08 amps (respective to supply power voltage), operation at 1025 rpm.
- c. Actual power consumption =
- d. The motor bearing life is rated for 100,000 hours operation.

**E. SPEED CONTROL**

- a. Speed control and monitoring is either by digital readout VSC displaying rpm and flow index, or optional MODBUS Protocol card for interface with building monitor/control software.

**F. NOISE**

- a. Fan filter unit shall meet or exceed a sound level of NC-40, tested in accordance With ANSI SI.31 – 1980 and ISO 3741-1975.
- b. Tested sound levels for a single unit are as follows:

Fan Speed	Air Volume (CFM)	Sound Level (dBa)
High	710	53
Medium	620	50
Low	505	45

\*Measured 30" from filter face

**G. SAFETY**

- a. The FFU shall be a UL/CUL listed appliance.

### **PART 3 EXECUTION**

#### **A. DELIVERY, STORAGE, AND HANDLING**

- a. Units shall be shipped fully assembled
- b. Individual units shall be sealed in polyethylene and packaged in heavy cardboard cartons for safe shipping, handling, and storage
- c. The outside of the cartons shall be adequately marked or tagged to indicate its contents by equipment name, size, model number, special handling instructions, if necessary, and any other applicable markings that may be required by the project documents.
- d. Immediately upon receipt, each carton shall be visually inspected for shipping damage, such as crushed corners or sides, punctures, or any other deformation which might indicate possible damage.
  - i. Any visible damage must be noted on the shipper's delivery receipt, and photographs should be taken as documentation for any possible claims.
  - ii. Contact manufacturer immediately to report any damage.
- e. Units must be stored in a clean, dry, indoor storage location.

#### **B. INSTALLATION**

- a. The units shall be installed according to manufacturer's written installation instructions that shall accompany each FFU and in compliance with NEC.
- b. Units shall be supported by the ceiling system, and/or independently suspended as may be required to meet local building codes or special seismic requirements.
- c. Maintain an air tight seal at ceiling grid.
- d. Coordinate installation with other trades, including fire protection, electrical, mechanical, and other trades to assure proper interface with all other work.