

## SECTION 23 34 23

### HVAC POWER VENTILATORS

#### PART 1 GENERAL

##### 1.01 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material gauges and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
- B. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
- C. Maintenance Data: For centrifugal fans to include in maintenance manuals specified in Division 1.
- D. Quality Assurance Data:
  - 1. Electrical Components, Devices, and Accessories: listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 2. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
  - 3. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
    - a) Fan ratings shall be based upon test performance in strict accordance with AMCA Standard 210-67 Test Code for Air Moving Devices.
  - 4. Manufacturer's Qualifications: Firms regularly engaged in manufacture of specified fans with characteristics, sizes, and capacities required, whose specified fan has been in satisfactory use in similar service for not less than 3 years.
  - 5. Codes and Standards: Comply with the following:
    - a) AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.
    - b) NEMA Compliance: Provide motors and electrical accessories complying with NEMA standards.
    - c) UL Compliance: Provide power ventilators which are designed, manufactured, and tested in accordance with UL 705 "Power Ventilators".
- E. General
  - 1. All fans shall be statically and dynamically machine balanced and shall have solid shafts.
- F. All fan motors shall operate within nameplate values and shall be in accordance with "Motors" paragraph in Section 15070 Motors and Drives. Project Record Documents:
  - 1. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - a) Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
    - b) Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

- c) Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
  - d) Wiring and termination drawings.
- G. Operation and Maintenance Data:
- 1. Operating and maintenance procedures.
  - 2. Complete set of manufacturer's drawings.
  - 3. Complete documentation of inspections and tests performed, including any logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
  - 4. Spare parts lists.
  - 5. Data sheets updated to reflect field installation conditions.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Utility-Set Fans And Alternatives:
- 1. Acme
  - 2. Barry Blower
  - 3. Cook
  - 4. Greenheck
  - 5. Twin City
  - 6. Trane
- B. In-Line Tubular Centrifugal Fans:
- 1. Acme
  - 2. Cook
  - 3. Greenheck
  - 4. Twin City
- C. Propeller-Type Ventilation Fan:
- 1. Acme
  - 2. Aerovent
  - 3. Cook
  - 4. Greenheck
  - 5. Twin City Fans
- D. Power Roof Ventilators:
- 1. Acme
  - 2. Cook
  - 3. Greenheck
  - 4. Jenn-Air
  - 5. Twin City Fans
- E. Ceiling Type Exhaust Fans:
- 1. Acme
  - 2. Cook
  - 3. Greenheck

4. Jenn-Air
5. Pace
6. Twin City Fans

## **2.02 UTILITY SET FANS**

- A. Description: Belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.
- B. Housing: Fabricated of steel with side sheets fully welded to scroll sheets.
  1. Housing Discharge Arrangement: Adjustable to eight standard positions.
- C. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
- D. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L<sub>50</sub> of 200,000 hours.
- E. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
  1. Service Factor Based on Fan Motor: 1.5
  2. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
  3. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
  4. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
- F. When only design solution requires exposure to weather, specify weather covers with quick release fasteners for ease of access to belts and bearings.
- G. Greaseable bearings for all accessible fans. Zerks shall be located outside of fan housing and extended where otherwise difficult to access.

## **2.03 CENTRIFUGAL ROOF VENTILATORS**

- A. Description: Belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle or extruded-aluminum, rectangular top; square, one-piece, aluminum base with venturi inlet cone.
  1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
  1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
  4. Fan and motor isolated from exhaust airstream.
- E. Accessories:
  1. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
  2. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
  3. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
  1. Overall Height: 12 inches.

## **2.04 AXIAL ROOF VENTILATORS**

- A. Description: Belt-driven or direct-driven axial fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; square, one-piece, hinged, aluminum base.
- C. Fan Wheel: Steel hub and blades.
- D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
  - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  - 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  - 3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
- E. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
  - 1. Overall Height: 12 inches.

## **2.05 CEILING-MOUNTING VENTILATORS**

- A. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.
- B. Housing: Heavy gauge steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
  - 1. Grille: Stainless-steel, louvered grille with flange on intake and thumbscrew attachment to fan housing.
  - 2. Motor speed not to exceed 1150 RPM.

## **2.06 IN-LINE CENTRIFUGAL FANS**

- A. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.
- B. Housing: Split, only Cook requires split housing to service fan, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Driven Units: Factory wired to disconnect switch located on outside of fan housing.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- F. Accessories.

## **2.07 PROPELLER FANS**

- A. Description: Belt-driven or direct-driven propeller fans consisting of fan blades, hub, housing, orifice ring, motor, drive assembly, and accessories.
- B. Housing: Galvanized steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- C. Fan Wheel: Replaceable, [cast-aluminum] [extruded-aluminum], airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- D. Belt-Driven Drive Assembly: resiliently mounted to housing, statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
  - 1. Service Factor Based on Fan Motor: 1.4.
  - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

- a) Ball-Bearing Rating Life: ABMA 9, L<sub>10</sub> of 100,000 hours.
- 4. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
- 5. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
- 6. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
- 7. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
- E. Accessories:
  - 1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
  - 2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
  - 3. Wall Sleeve: Galvanized steel to match fan and accessory size.
  - 4. Weathershield Hood: Galvanized steel to match fan and accessory size.
  - 5. Weathershield Front Guard: Galvanized steel with expanded metal screen.

## **2.08 MOTORS**

- A. Comply with requirements in Division 23.
- B. Enclosure Type: guarded dripproof.
- C. Belt-drive motors over 5 HP shall have dual push-pull adjustment screws for the motor mounts. For retrofits, require that the motor mounts be replaced if not of this type.
- D. When fans and/or motors are located in a hazardous environment or are handling an explosive or potentially-explosive airstream, specify spark-resistant fan construction and explosion-proof motors, as required. The fan should be specified to meet AMCA Spark Resistant Construction, Type A, B, or C as required. The fan and motor should both be well grounded.
- E. If the design fan RPM at design airflow rate and pressure approaches within 10% of the maximum safe fan RPM as listed by the manufacturer for that class of fan, specify a more heavy-duty class of fan. This will provide a safety margin to allow for adverse field conditions which can increase the fan system pressure. This margin of safety can also perhaps allow for some possible future changes.

## **2.09 Drives:**

- A. Provide direct drive fans where possible.
- B. Single belt drives shall not be used on equipment with 1 HP motor and above.
- C. Drives shall always be installed with provisions for center distance adjustment.
- D. Motors shall be located on their respective motor bases allowing for 1/6 of the total motor base travel for installation of new belts with remaining 5/6 of the travel available for belt tightening
- E. Arc of contact on the smaller sheave should not be less than 120 degrees.
- F. Ratios of sheaves should not exceed 8 to 1.
- G. Belt speed should not exceed 5000 feet per minute.
- H. A full and free circulation of air should be around the drive at all times.
- I. Drives operating in explosive atmosphere or potentially explosive should be well grounded and be equipped with static conducting non-sparking belts.
- J. Provide OSHA-approved belt-drive covers with tachometer access, with side made of expanded metal.
- K. Rated for 150 percent (minimum) of fan motor power.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install power ventilators level and plumb.

- B. Support units using spring isolators having a static deflection of 1 inch. Vibration devices are specified in Specification Section 23 05 48 Mechanical Sound and Vibration.
  - 1. Secure vibration control to concrete bases using anchor bolts cast in concrete base.
- C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section Cast-in-Place Concrete.
- D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- E. Support suspended units from structure using threaded steel rods and spring hangers.
- F. Install units with clearances for service and maintenance.
- G. Label units according to requirements specified in Specification Section 23 05 53 Identification for HVAC.
- H. All roof mounted fans and equipment need to comply with Section 07 72 00 Roof Curbs
- I. Install fan inlet and outlet screens for personnel protection when no ductwork will be present.

**END OF SECTION 23 34 23**