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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.
   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, L50 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.
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.
   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.
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.
a) Ball-Bearing Rating Life: ABMA 9, L₁₀ 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.


E. Accessories:

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.


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