CONSTRUCTION SPECIAL SPECIFICATION

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POWER VENTILATORS

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POWER VENTILATORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section and the work indicated on the Drawings compose the work for providing the power ventilators.

B. This Section includes the following types of power ventilators:

1. Roof/wall-mounted supply fans.

2. Roof/wall-mounted exhausters.

3. Ceiling-mounted ventilators.

1.02 QUALITY ASSURANCE

A. Design, manufacture, and test fans in accordance with Underwriter's Laboratories (UL) 705 "Power Ventilators."

B. Use UL listed and labeled fans and components.

C. Use motors and electrical accessories that comply with National Electrical Manufacturers Association (NEMA) standards.

D. Provide components and installation according to National Fire Protection Association (NFPA) 70 "National Electrical Code."

1.03 REFERENCES

A. Anti-Friction Bearing Manufacturers Association (AFBMA) Standard 9 for ball bearings

B. AFBMA Standard 11 for roller bearings

C. Air Movement Contractors Association (AMCA) Standard 210/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 51, Laboratory Methods of Testing Fans for Rating

D. AMCA Standard 300, Test Code for Sound Rating

E. AMCA Standard 301, Method for Calculating Fan Sound Ratings From Laboratory Test Data

F. CFR Volume 29, Part 1910.7

G. Institute of Electrical and Electronic Engineers (IEEE) Standard 112, Test Method B

H. NEMA 1

I. NEMA Standard MG 1

J. NFPA 70, National Electrical Code

K. UL 705, Power Ventilators

1.04 SUBMITTALS

A. Make submittals according to this Section, Section 15010, and Section 01330.

B. Submit product data for selected models, including specialties, accessories, and the following:

1. Certified fan performance curves with system operating conditions indicated. Performance curves are to be corrected to 5,200 ft. altitude.

2. Certified fan sound power ratings.

3. Motor ratings and electrical characteristics plus motor and fan accessories.

4. Materials gages and finishes.

5. Dampers, including housings, linkages, and operators.

C. Submit shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

D. Submit wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field- installed wiring.

E. Submit maintenance data in operating and maintenance manual as specified in Section 01330.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 15010.

1.06 SEQUENCING

A. Coordinate the installation of roof curbs, equipment supports, and roof penetrations specified in Division 7.

B. Coordinate the size and location of structural steel support members.

1.07 EXTRA MATERIAL

A. Furnish one additional complete set of belts for each belt-driven fan.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide fans by one of the following:

1. Cook (Loren) Co.

2. Greenheck Fan Corp.

A. Provide fans that are factory fabricated and assembled, factory tested, and factory finished with indicated capacities and characteristics.

B. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.

1. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan's class.

C. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor: 1.4.

D. Belts: Oil-resistant, nonsparking, and nonstatic.

E. Motors and Fan Wheel Pulleys: Adjustable pitch for use with motors through 15 horsepower (hp); fixed pitch for use with motors larger than 15 hp. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.

1. Belt Guards: Provide steel belt guards for motors mounted on the outside of the fan cabinet.

F. Shaft Bearings: Provide type indicated, having a median life "Rating Life" (AFBMA (L(50)) of 200,000, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.

G. Factory Finish: The following finishes are required:

1. Sheet Metal Parts: Prime coating prior to final assembly.

2. Exterior Surfaces: Baked-enamel finish coat after assembly.

H. The following factory tests are required:

1. Sound Power Level Ratings: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating." Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.

2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51 - Laboratory Methods of Testing Fans for Rating.

2.03 CENTRIFUGAL ROOF EXHAUSTER

A. General Description: Belt-driven or direct-drive as indicated, centrifugal consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, curb base, and accessories.

B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; square, one-piece, hinged aluminum base with venturi inlet cone.

C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:

1. Pulleys: Cast-iron, adjustable-pitch.

2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

3. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.

4. Fan and motor isolated from exhaust air stream.

E. Accessories: The following items are required:

1. Bird Screens: Removable 1/2-inch (in.) mesh, 16-gage, aluminum or brass wire.

2. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base, factory set to close when fan stops.

3. Roof Curbs: Prefabricated, heavy-gage, galvanized steel; mitered and welded corners; 2-in.-thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for sloped roof decks; and 2-in. wood nailer. Size as required to suit roof opening and fan base. Provide for required slope of the roof.

a. Overall Height: 12 in..

2.04 AXIAL ROOF VENTILATORS

A. General Description: Belt-driven or direct-drive as indicated, axial fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, curb base, and accessories.

B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; and square, one-piece, hinged, aluminum base.

C. Fan Wheel: Aluminum hub and blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:

1. Pulleys: Cast-iron, adjustable-pitch.

2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

3. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.

E. Filters: Filters are permanent, washable, 2-in. aluminum mesh-mounted in aluminum filter channel.

F. Accessories: The following items are required:

1. Bird Screens: Removable, 1/2-in. mesh, 16-gage aluminum or brass wire.

2. Dampers: Counter-balanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

3. Roof Curbs: Prefabricated, heavy-gage, galvanized steel; mitered and welded corners; 2-in.-thick, rigid fiberglass insulation adhered to inside walls; built-in cant and mounting flange for sloped roof deck; and 2-in. wood nailer. Size as required to suit roof opening and fan base. Provide for required slope of the roof.

a. Overall Height: 12 in..

2.05 CEILING-MOUNTED VENTILATORS

A. General Description: Centrifugal fan designed for installation in ceiling or concealed inline applications.

B. Housing: Galvanized 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.

D. Grille: Aluminum with white baked enamel finish, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories: Manufacturer's standard, wall cap, and transition fittings as indicated.

2.06 MOTORS

A. General

1. Apply requirements below to motors covered by this Section except as otherwise indicated.

2. Motors 1 horsepower (hp) and Larger: Polyphase.

3. Motors Smaller Than 1 hp: Single-phase.

4. Frequency Rating: 60 Hz.

5. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):

   a. Motors smaller than 1 hp: 120 V circuit, 115 V - motor rating.

   b. Motors 1 hp and larger: 480 V circuit, 460 V - motor rating.

6. Service factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10 percent of motor voltage rating.

7. Provide permanent-split capacitor classification motors for shaft-mounted fans and capacitor start classification for belted fans.

8. Capacity: Minimum size as indicated. If not indicated, sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.

9. Temperature Rise: 50 degree (deg) Celsius (C) maximum temperature rise at 40 deg C ambient for continuous duty at full load (Class A Insulation).

10. Motor Speed: Single, multiple, or variable as indicated.

11. Motor Construction: NEMA Standard MG 1.

    a. Bases: Adjustable.

    b. Bearings: The following features are required:

        1) Ball or roller bearings with inner and outer shaft seals.

        2) Grease lubricated.

        3) Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

    c. Enclosure Type: The following features are required:

        1) Open drip-proof motors where satisfactorily housed or remotely located during operation.

        2) Guarded drip-proof motors where exposed to contact by employees or building occupants.

    d. Noise rating: Quiet.

    e. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.

12. Starters, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 16.

B. Polyphase Motors

1. Squirrel-cage, induction-type, general-purpose conforming to the following requirements except as otherwise indicated.

2. NEMA Design Letter Designation: "B," unless specifically designated "C" for high starting torque.

3. Service Factor: 1.15.

4. Energy Efficient Motors: Nominal efficiency equal to or greater than that stated in NEMA MG 1, table 12-6C for that type and rating of motor.

5. Variable Speed Motors for Use With Solid-State Drives: Energy efficient, squirrel-cage induction, design B units with ratings, characteristics, and features coordinated with and approved by drive manufacturer.

6. Internal Thermal Overload Protection For Motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.

7. Bearings: Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading of the application, unless noted otherwise.

C. Single-Phase Motors

1. Conform to the following requirements except as otherwise indicated.

2. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application.

a. Permanent Split Capacitor.

b. Split-Phase Start, Capacitor-Run.

c. Capacitor-Start, Capacitor-Run.

3. Service Factor: 1.35.

4. Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.

5. Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.

6. Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, pre-lubricated sleeve bearings may be used for other single phase motors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect areas and conditions, with Installer present, for compliance with requirements for installation tolerances, roof curbs, equipment supports, and other conditions affecting performance of fans.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION/APPLICATION/ERECTION

A. General

1. Install fans level and plumb, in accordance with manufacturer's written instructions. Support units as described below, using the vibration control devices indicated.

a. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.

1) Installation of roof curbs is specified in Division 7.

b. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.

2. Arrange installation of units to provide access space around air- handling units for service and maintenance.

B. Connections

1. Duct installations and connections are specified in other Division 15 sections. Make final duct connections with flexible connections.

2. The following requirements apply:

a. Electrical power wiring is specified in Division 16.

b. Temperature control wiring and interlock wiring are specified in Section 13943.

c. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.03 FIELD QUALITY CONTROL

A. Arrange and pay for a factory- authorized service representative to perform the following:

2. Inspect the field assembly of components and installation of fans including ductwork and electrical connections.

3. Prepare a written report on findings and recommended corrective actions.

3.04 ADJUSTING AND CLEANING

A. Adjust damper linkages for proper damper operation.

B. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

3.05 COMMISSIONING

A. Provide labor, material, equipment, etc., required to facilitate the commissioning process. Perform tests and verification procedures required by the commissioning process when requested by the Commissioning Authority and directed by the General Contractor. See Section 15995.

3.06 DEMONSTRATION

A. Provide for a factory-authorized service representative to start-up equipment, to demonstrate, and to train personnel.

B. See Section 15995.

END OF SECTION