SECTION 233423 – HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.
2. Centrifugal wall ventilators.
3. Ceiling-mounting ventilators and cabinet fans.
4. In-line centrifugal fans.
5. Filtered supply fan.
7. Utility vent sets.

1.2 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 gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Dimensions and service clearance requirements.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. 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.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705. Power ventilators for restaurant exhaust applications shall comply with UL 762.

PART 2 - PRODUCTS
2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CENTRIFUGAL ROOF VENTILATORS

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

1. Manufacturers:
   b. Cook, Loren Company.
   c. Greenheck Fan Corp.

B. Housing: Removable, spun-aluminum, down-discharge dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone. Provide upblast type where scheduled on Drawings.

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. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
   2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
   3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
   4. Motorized Dampers: Where scheduled on Drawing, parallel-blade dampers mounted in curb base with Belimo 2-position, line-voltage 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. Configuration: Self-flashing without a cant strip, with mounting flange.
   2. Overall Height: 12 to 14 inches.
   4. Damper Tray: Provide damper tray in roof curb where dampers are indicated to be provided with ventilators.
   5. Sound Curb: Curb with sound-absorbing insulation matrix.
   7. Burglar Bars: 1/2-inch thick steel bars welded in place to form 6-inch squares.
10. Grease Trough: Continuously welded aluminum with removable lid mounted on subbase or curb.

2.3 CENTRIFUGAL WALL VENTILATORS

A. Description: Belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and accessories.

1. Manufacturers:
   b. Cook, Loren Company.
   c. Greenheck Fan Corp.

B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.

C. Fan Wheel: 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. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
   2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
   3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.
   4. Motorized Dampers: Parallel-blade dampers mounted in curb base with 2-position, line voltage, electric actuator; wired to close when fan stops, where scheduled on Drawings.

2.4 CEILING-MOUNTING VENTILATORS AND CABINET FANS

A. Description: Centrifugal fans designed for installing in ceiling or wall, or for concealed in-line applications.

1. Manufacturers:
   a. Cook, Loren Company.
   b. Greenheck Fan Corp.

B. Housing: 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, 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:
   1. Isolation: Rubber-in-shear vibration isolators.
   2. Manufacturer’s standard roof cap with curb or wall cap, and transition fittings.

2.5 IN-LINE CENTRIFUGAL FANS

A. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor, drive assembly, mounting brackets, and accessories.

   1. Manufacturers:
      a. Cook, Loren Company.
      b. Greenheck Fan Corp.
      c. Hartzell Fan, Inc.

B. Housing: Square, galvanized steel frame with galvanized removable side panels, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or suspended mounting.

C. Direct-Driven Units: Motor encased in housing outside of airstream, 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. Extended lubricating tubes are not required if permanently lubricated ball bearings are provided.

E. Fan Wheels: Aluminum, backward-inclined blades welded to aluminum hub.

F. Accessories:
   1. Companion Flanges: For inlet and outlet duct connections.
   2. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
   3. Motor and Drive Cover (Belt Guard): Coated steel to match cabinet.

2.6 FILTERED SUPPLY FANS

A. Description: Factory-fabricated, -assembled, -tested, and –finished, direct or belt driven, centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly and accessories.
1. Manufacturers:
   b. Cook, Loren Company.
   c. Greenheck Fan Corp.

B. Housing: Formed and reinforced, removable, galvanized steel panels, attached to a galvanized steel fan base, with insulated top cover, outside-air hood and washable aluminum filter.

C. Fan: DWDI, centrifugal, forward curved type of painted steel with scroll housing.

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. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

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. Configuration: Self-flashing without a cant strip, with mounting flange.
   2. Overall Height: 12 to 14 inches.

2.7 PROPELLER FANS

A. Description: Belt-driven or direct-driven propeller fans consisting of a fan support frame, venturi, propeller, fan shaft, bearings, motor, drive assembly, and accessories.

1. Manufacturers:
   b. Cook, Loren Company.
   c. Greenheck Fan Corp.

B. Venturi: Heavy-gage, painted steel, with welded corners; formed venturi inlet cone.

C. Support Frame: Heavy-gage steel designed to securely support the motor and propeller.

D. Propeller: Formed Steel or aluminum, or cast aluminum blades as indicated, securely fastened to a steel or aluminum hub. Entire propeller assembly to be statically and dynamically balanced.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

F. Accessories:
1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Shutter: Counterbalanced, parallel-blade, backdraft shutter mounted in wall sleeve; factory set to close when fan stops.
4. Motorized Shutter: Parallel-blade shutter mounted in wall sleeve with 2-position, line voltage, electric actuator; wired to close when fan stops, where scheduled on Drawings.
5. Wall Sleeve: Galvanized steel or aluminum, as indicated, sleeve with fixed exterior flange and adjustable interior flange for mounting fan through wall.
6. OSHA Wire Guard: Painted steel designed to provide OSHA compliant protection from fan.
7. Weather Hood: Galvanized steel hood with bird screen sized to prevent moisture entrainment on intake applications.
8. Shutter Guard: Painted steel or aluminum, as indicated on drawings, designed to protect shutter from vandalism or damage.

2.8 UTILITY VENT SETS

A. Description: Factory-fabricated, -assembled, -tested, and –finished, direct-or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, support structure, and accessories.

1. Manufacturers:

   a. Aerovent; a Twin City Fan Company.
   b. Buffalo Forge Co./Howden Fan Co.
   c. Cook, Loren Company.
   d. New York Blower Company (The).

B. Housing: Formed and reinforced galvanized steel or aluminum as schedules on Drawings, curved scroll housings with shaped cutoff, spun-metal inlet bell, and doors or panels to allow access to internal parts and components.

1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
2. Fabrication Class: AMCA 99, Class I.
3. Special Coatings: [Thermoplastic vinyl][Epoxy][Synthetic resin][Phenolic][Color-match enamel][Polytetrafluoroethylene][Vinyl ester][Hot-dip galvanized][Powder-baked enamel]; [None]<Insert manufacturer and trade name.>

C. Wheels:

1. Backward-Inclined Fan Wheels: Steel or aluminum, as scheduled on Drawings, construction with curved inlet flange, back plate, backward-inclined blades welded or riveted to flange and back plate; cast-iron or cast-steel hub riveted to back plate and fastened to keyed shaft with set screws.
2. Forward-Curved Fan Wheels: Black-enameded or galvanized steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; cast-steel hub swaged to back plate and fastened to keyed shaft with set screws.
3. Special Coatings: [Thermoplastic vinyl][Epoxy][Synthetic resin][ Phenolic][Color-match enamel][Polytetrafluoroethylene][Vinyl ester][Hot-dip galvanized][Powder-baked enamel]; [None]<Insert manufacturer and trade name.>

D. Shafts:
1. 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.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed to top of fan’s speed range.

E. Bearings: Prelubricated and sealed shaft bearings, self-aligning, pillow-block-type.
1. Ball-Bearing Rating Life: ABMA 9, L_{10} of 100,000 hours.
2. Roller-Bearing Rating Life: AMBA 11, L_{10} of 100,000 hours.

F. Belt Drives:
1. Description: Factory mounted, with final alignment and belt adjustment made after installation, 1.5 service factor.
2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulleys so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

G. Accessories:
1. Weather Cover/Belt Guard: Galvanized-steel or aluminum sheet with ventilation slots, bolted to housing. Weather cover shall also serve as an OSHA-complaint belt guard.
2. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
3. Scroll Drain Connection: NPS 1 steel pipe coupling welded to low point of fan scroll.
5. Companion Flanges: Galvanized steel, for duct connections.

2.9 MOTORS

A. Comply with requirements in Division 15 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Guarded dripproof, unless indicated otherwise on Drawings.

2.10 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support cabinet fans, in-line centrifugal fans and utility vent sets using vibration isolators as indicated on Drawings. Vibration-[and seismic]-control devices are specified in Division 15 Section "Vibration [and Seismic] Controls for HVAC Piping and Equipment."


C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

D. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 7 for installation of roof curbs.

E. Ceiling Mounting Ventilators: Suspend units from structure; use steel wire or metal straps.

F. Install units with clearances for service and maintenance, minimum 36-inches on all sides.

G. Label units according to requirements specified in Division 15 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories.

B. Make final duct connections to cabinet fans, in-line centrifugal fans, and utility vent sets with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

C. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
C. Shut unit down and reconnect automatic temperature-control operators.

D. Refer to Division 17 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

E. Replace fan and motor pulleys as required to achieve design airflow.

F. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

END OF SECTION