

SECTION 233416
CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract", "Special Conditions", and "Division 1 – General Requirements" form a part of this section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. This Section includes the following:
 - 1. Centrifugal Utility Fans

1.4 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base air ratings on sea-level conditions.
- B. Operating Limits: Classify according to AMCA 99.
- C. Fan Unit Schedule: The following information is described in an equipment schedule on the Drawings and on the plans.
- D. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- E. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

1.5 SUBMITTALS - Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:

- A. Certified fan performance curves with system operating conditions indicated.

- B. Certified fan sound power ratings.
 - C. Motor ratings and electrical characteristics plus motor and electrical accessories.
 - D. Material gages and finishes, including color charts.
 - E. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.
- 1.6 Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.
- 1.7 Maintenance data for fans to include in the operation and maintenance manual specified in Division 1 and in Division 23 Section "Common Work Results for Mechanical."
- 1.8 QUALITY ASSURANCE
- A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
 - B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
 - C. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - D. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
 - E. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.
 - F. NEMA Compliance: Motors/electrical accessories comply with NEMA standards.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
 - B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
 - C. Lift and support units with manufacturer's designated lifting or supporting points.

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements; verify clearances.
- B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

1.11 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fans that may be incorporated in the Work include, but are not limited to the following:
 - 1. Greenheck Fan Corp.
 - 2. PennBarry
 - 3. Loren Cook Company
 - 4. Or equal approved by the Professional.

2.2 GENERAL

- A. Vibration isolation shall be provided for all units.

2.3 CENTRIFUGAL UTILITY FANS

- A. Description: Belt driven or direct driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.
- B. Housing:
 - 1. Fan housing is to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.
 - 2. Fan shall be of airtight construction with the scroll panel material formed and embedded into the side panels. All interior and exterior surface untreated steel shall be coated with a high-performance powder coating.
 - 3. Housing and bearing support shall be constructed of bolted framework.
 - 4. An OSHA compliant belt guard shall be included to completely cover the motor pulley and belt(s).

- C. Fan Wheel:
 - 1. The fan wheel shall be of the single width backward inclined centrifugal type.
 - 2. Fan Wheel shall be statically and dynamically balanced to balance grade G6.3 per ANSI S2.19.
 - 3. The wheel and fan inlet shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency.
- D. Fan Motors and Drive:
 - 1. Motors shall meet or exceed EISA (Energy Independence and Security Act) efficiencies. Motors to be NEMA T-frame, 1170, 1770 or 3500 RPM in 60 Hz, (1425 or 2900 in 50 Hz) Open Drip Proof (ODP), Totally Enclosed Fan Cooled (TEFC) or Explosion Proof (EXP).
 - 2. Drive belts and sheaves shall be sized for 150% of the fan operating brake horsepower, and shall be readily and easily accessible for service, if required.
 - 3. Movable motor plate with adjustment screws to make belt tensioning operations.
 - 4. Fan shaft to be turned and polished steel that is sized so the first critical speed is at least 25% over the maximum operating speed for each pressure class.
 - 5. Fan shaft bearings shall be Air Handling Quality, bearings shall be heavy-duty grease lubricated, self-aligning or roller pillow block type.
 - 6. Air Handling Quality bearings to be designed with low swivel torque to allow the outer race of the bearing to pivot or swivel within the cast pillow block. Bearings shall be 100% tested for noise and vibration by the manufacturer. Bearings shall be 100% tested to insure the inner race diameter is within tolerance to prevent vibration.
 - 7. Bearings shall be selected for a basic rating fatigue life (L-10) of 80,000 hours at maximum operating speed for each pressure class {Average Life or (L-50) of 400,000 hours}.
- E. Accessories:
 - 1. VFD Control Panel with VG HOA Interface and disconnecting means: Program for ramp start with thermal overload protection mounted inside fan housing, factory wired through internal aluminum conduit.

2.4 FACTORY FINISHES

- A. Sheet Metal Parts: Enamel or prime coat before assembly. Do not prime coat aluminum parts.

2.5 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 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the fans. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Install fans according to manufacturer's written instructions.
- C. Coordinate roof curb installation with roof installer.
- D. Install units with clearances for service and maintenance.
- E. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
- B. Electrical: Conform to applicable requirements in Division 26 Sections.
- C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation of fans, including duct and electrical connections, alignment of fan shaft and motor shaft, alignment of pulleys, belt adjustments, and lubrication, and to report results in writing.

3.5 ADJUSTING

- A. Adjust ramped start to 10 seconds for full speed.
- B. Lubricate bearings.

3.6 CLEANING

- A. After completing installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.
- B. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.7 COMMISSIONING

- A. Final Checks before Startup: Perform the following operations and checks before start-up:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnects.
 - 3. Perform cleaning and adjusting specified in this Section.
 - 4. Verify lubrication for bearings and other moving parts.
- B. Starting procedures for fans are as follows:
 - 1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM and set ramped start to 10 seconds..
 - 2. Measure and record motor voltage and amperage.
- C. Replace fan and motor as required to achieve design conditions.

END OF SECTION 233416