

**SECTION 23 34 00
HVAC FANS**

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 - 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 ADDITIONAL RELATED DOCUMENTS

- A. Related Division 23 Sections include the following:
 - 1. "Vibration Controls for HVAC" for requirements for fan vibration isolators and vibration bases.
 - 2. "Common Motor Requirements for HVAC Equipment" for general motor requirements.
 - 3. "Air Duct Accessories" for dampers and flexible duct connectors.

1.3 SUMMARY

- A. This Section includes the following types of fans:
 - 1. Square inline centrifugal fans
 - 2. Centrifugal ceiling exhaust cabinet fans

1.4 ACTION SUBMITTALS

- A. Product Data: Including specialties, accessories, and the following:
 - 1. Certified full range fan performance curves with system operating conditions indicated.
 - a. Fans shall be selected for sea level unless noted otherwise on the Drawings.
 - b. Fans shall be selected for 70 degrees F. air, unless noted otherwise on the Drawings.
 - 2. Certified fan sound power ratings.
 - 3. Motor ratings and electrical characteristics plus motor and fan accessories.
 - 4. Materials thicknesses and finishes.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Fan speed controllers.
- B. Shop Drawings: From manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.
- C. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field-installed wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fans, for inclusion in Operating and Maintenance Manuals.
 - 1. Data shall include detailed instructions for bearing maintenance, including lubrication intervals, lubricant type, and procedures.

1.7 QUALITY ASSURANCE

- A. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal. All fans shall be AMCA rated for both sound and performance.
 - 1. Certify sound-power level ratings according to 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." Comply with AMCA 311 and label fans with the AMCA-Certified Ratings Seal.
 - 2. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Comply with AMCA 211 and label fans with the AMCA-Certified Ratings Seal.
 - 3. Fans, except for power roof and wall ventilators, wall mounted propeller fans, and fans with motors smaller than 5 HP, shall have a fan efficiency grade (FEG) of no less than 67, when tested in accordance with AMCA 205 "Energy Efficiency Classification for Fans", and shall have a design point efficiency within 15 percentage points of the maximum total efficiency, in compliance with the 2018 International Energy Conservation Code.
- B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code".
- D. Bearing fatigue life / ratings and the term "air handling quality" shall be as defined by the American Bearing Manufacturers Association (AMBA).
- E. UL Standards: All fans shall be listed to UL 705.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Lift and support units with the manufacturer's designated lifting or supporting points.
- B. Deliver fan units as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.
- C. While in storage and after installation but before system startup, when recommended by the fan manufacturer, inspect and maintain fans once per month. Keep a record of inspection and maintenance performed. At each inspection, rotate the fan wheels by hand to re-distribute lubricant and alter the static bearing load.

1.9 SEQUENCING, SCHEDULING, AND COORDINATION

- A. Coordinate the size and location of structural steel support and framing members.
- B. Coordinate fan motor size, starter type, local disconnecting means, voltage, and phase with the Division 26 Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Square Inline Centrifugal Fans:
 - a. Aerovent (Series SCDD)
 - b. Cook (Loren) Co. (Series SQN-D).
 - c. Greenheck Fan Corp. (Series SQ).
 - d. Twin City Fan & Blower (Series DSI).
 - e. Or equal as approved by the Professional.
 - 2. Centrifugal Ceiling Exhaust Cabinet Fans:
 - a. Cook (Loren) Co. (Gemini Series)
 - b. Greenheck Fan Corp. (Series SP)
 - c. Twin City Fan & Blower (Series T/TL).
 - d. Or equal as approved by the Professional.

2.2 SQUARE INLINE CENTRIFUGAL FANS

- A. General: Provide centrifugal, square, in-line type fans at locations indicated on the Drawings. Provide accessories specified herein and indicated or scheduled on the Drawings. Fans shall be direct-driven .
- B. Fan Housing: Square design constructed of heavy gauge galvanized steel with duct collars and minimum 1/2" thick internal coated fiberglass insulation. Fan housing shall be equipped with removable service panels for access to the motor, and fan wheel. Fan design shall permit single or dual side discharge arrangements, and installation in the horizontal or vertical.
- C. Fan Wheel: Aluminum single inlet / single width backward inclined centrifugal or mixed flow type, statically and dynamically balanced and overlapping a spun inlet venturi.
- D. Motor: Isolated from the airstream. Provide direct drive units with a motor cover. Motor shall be heavy duty with permanently lubricated sealed ball bearings. Wheel shaft shall be ground and polished and mounted in permanently sealed pillow block bearings. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds.
 - 1. Single phase direct drive units shall have electrically commutated (EC) type motors with:
 - a. Integral speed adjustment dial for use by the TAB Agent during balancing.

- E. Electrical: Flexible wiring leads shall be provided from the fan motor to an external mounted junction box and NEMA 1 disconnect switch. Mount the switch on the fan housing unless explicitly indicated otherwise on the Drawings.

2.3 CENTRIFUGAL CEILING EXHAUST CABINET FANS

- A. General: Provide ceiling exhaust fans at locations shown. Provide accessories specified herein and indicated or scheduled on the Drawings. Fan shall be UL-507 listed and approved for installation directly above a shower.
- B. Housing: Acoustically insulated, galvanized steel.
- C. Integral Backdraft Damper: Aluminum.
- D. Fan: Centrifugal double inlet / double width fan wheel, constructed of galvanized steel, polypropylene, or aluminum, with the fan inlets perpendicular to and remote from inlet grille, with direct drive EC-type motor.
 - 1. Electrically commutated (EC) type motors shall be provided with:
 - a. Integral speed adjustment dial for use by the TAB Agent during balancing.
- E. Inlet grille: Aluminum with an off-white baked enamel finish, or white plastic.
- F. Electrical: Terminal box on housing with disconnect switch.
- G. Mesh Filter: Washable aluminum mesh filter mounted directly behind the inlet grille.

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Install fans level and plumb, in accordance with manufacturer's written instructions.

- B. Install unit to permit access for maintenance.
- C. Install parts and accessories shipped loose.
- D. Ceiling Fans: Suspend units from structure; use galvanized steel straps.
- E. Support suspended fans from structure using threaded steel rods and spring vibration isolator hangers.
- F. Provide vibration isolation for all suspended fans, and where indicated on the Drawings.
 - 1. Isolators shall may be furnished by the fan manufacturer, however the isolators shall comply with the requirements for vibration-control devices and thrust restraints as specified in Division 23 Section "Vibration Controls for HVAC."
- G. Arrange installation of units to provide access space around fans for service and maintenance.
- H. Label units according to requirements specified in Section 230553 "Identification for HVAC."

3.3 CONNECTIONS

- A. Duct installations and connections are specified in Division 23 Section "Ductwork".
- B. Provide flexible duct connectors on duct connections to fans as specified in Division 23 Section "Air Duct Accessories", except where specifically prohibited.
- C. Install ducts adjacent to power ventilators to allow service and maintenance.
- D. Connect wiring and ground equipment according to applicable Division 26 provisions.

3.4 ADJUSTING AND CLEANING

- A. Adjust damper linkages for proper damper operation.
- B. For direct drive fans, set VFD operating speed or adjust the ECM motor dial or speed controller as required to achieve design airflow.
- C. Lubricate bearings.
- D. Clean unit interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.
- E. For coated, or paint finished fans, inspect the coating or paint finish for chips, scratches, and abrasions of the finish. Repair damaged finish as recommended by the fan manufacturer using a coating equal in performance to, with an equal or greater dry film thickness as, the factory-applied finish.

3.5 FIELD QUALITY CONTROL

- A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
 - 1. Remove shipping blocking and bracing.

2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
 3. Perform cleaning and adjusting specified in this Section.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearings operations.
 5. Lubricate bearings and other moving parts with factory-recommended lubricants.
 6. Disable automatic temperature control operators.
- B. Starting procedures for fans:
1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
 2. Measure and record motor electrical values for voltage and amperage.
- C. Shut unit down and reconnect automatic temperature control operators.
- D. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for procedures for fan testing, adjusting, and balancing.

3.6 DEMONSTRATION

- A. Demonstration Services: Train Client Agency's maintenance personnel on the following:
1. Procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 2. Familiarization with contents of Operating and Maintenance Manuals.
- B. Schedule training with at least 7 days' advance notice.

END OF SECTION