

SECTION 233413 - AXIAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Tubeaxial fans.
 - 2. Mixed-flow axial fume hood exhaust fans.

1.3 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Include rated capacities, furnished specialties, and accessories for each fan.
 - 2. Certified fan performance curves with system operating conditions indicated.
 - 3. Certified fan sound-power ratings.
 - 4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 5. Material thickness and finishes, including color charts.
 - 6. Dampers, including housings, linkages, and operators.
 - 7. Fan speed controllers.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For axial fans to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

Delete this paragraph if not using Belt driven equipment – direct drive is preferred.

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

AMCA compliance is an optional requirement and not necessarily available from all manufacturers.

- A. AMCA Compliance:
 - 1. Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.
 - 2. Operating Limits: Classify according to AMCA 99.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 TUBEAXIAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aerovent; a Twin City Fan Company.
 - 2. Carnes Company HVAC.
 - 3. Chicago Blower Corporation.
 - 4. Greenheck.
 - 5. Loren Cook Company.
 - 6. New York Blower Company (The).
 - 7. Trane.
- B. Description: Fan wheel and housing, factory-mounted motor with belt drive (not preferred) or direct drive, an inlet cone section, and accessories.

- C. Housings: Steel with flanged inlet and outlet connections.
- D. Wheel Assemblies: Cast or extruded aluminum with airfoil-shaped blades mounted on cast-iron wheel plate keyed to shaft with solid-steel key.

Retain first paragraph and subparagraphs below for belt-driven fans. Direct drive fans are preferred. Use direct drives whenever possible. Edit section for project and remove belt driven reference.

- E. Drives: Factory mounted, with final alignment and belt adjustment made after installation.
 - 1. Service Factor Based on Fan Motor Size: 1.5.
 - 2. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
 - 3. Fan Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
 - 4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 - 5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 - 6. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet. Utilize pin and clip quick connect mounting.
 - 7. Motor Mount: Adjustable base.
 - 8. Shaft Bearings: Radial, self-aligning ball or roller bearings utilizing eccentric locking collar style shaft lock.
 - a. Ball-Bearing Rating Life: ABMA 9, L10 of 200,000 hours.
 - b. Roller-Bearing Rating Life: ABMA 11, L10 of 200,000 hours.
 - c. Extend lubrication lines to outside of casing and terminate with grease fittings. Tubing shall be pre-charged with lubricants.

F. Accessories:

Retain only applicable subparagraphs below.

- 1. Companion Flanges: Rolled flanges of same material as housing.
- 2. Inspection Door: Bolted door allowing limited access to internal parts of fan, of same material as housing.
- 3. Propeller Access Section Door: Short duct section bolted to fan inlet and outlet allowing access to internal parts of fan for inspection and cleaning, of same material as housing.
- 4. Swingout Construction: Assembly allowing entire fan section to swing out from duct for cleaning and servicing, of same material as housing.
- 5. Mounting Clips: Welded to fan housing, of same material as housing.
- 6. Horizontal Support: Pair of supports bolted to fan housing, of same material as housing.
- 7. Vertical Support: Short duct section with welded brackets bolted to fan housing, of same material as housing.
- 8. Inlet and Outlet Screens: Wire-mesh screen on fans not connected to ductwork, of same material as housing.
- 9. Backdraft Dampers: Butterfly style, for bolting to the discharge of fan or outlet cone, of same material as housing.
- 10. Shaft Seal: Elastomeric seal and Teflon wear plate, suitable for up to 300 deg F (149 deg C).
- 11. Motor Cover: Cover with side vents to dissipate motor heat, of same material as housing.

12. Inlet Vanes: Adjustable; with peripheral control linkage operated from outside of airstream, bronze sleeve bearings on each end of vane support, and provision for manual or automatic operation of same material as housing.
 13. Inlet Bell: Curved inlet for when fan is not attached to duct, of same material as housing.
 14. Inlet Cones: Round-to-round transition of same material as housing.
 15. Outlet Cones: Round-to-round transition of same material as housing.
 16. Stack Cap: Vertical discharge assembly with backdraft dampers, of same material as housing.
- G. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
1. Direct-Driven Units: Encase motor in housing outside of airstream.
- H. Vibration Isolators: Spring isolators having a static deflection of 1 inch (25 mm).

2.3 MIXED-FLOW AXIAL FUME HOOD EXHAUST FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck.
 2. Strobic Aire.
 3. Loren Cook Company.

Direct drive fans are preferred. Use direct drives whenever possible. Edit section for project and remove belt driven reference.

- B. Description: Mixed flow, high plume, roof mounted, belt (not preferred) or direct drive with impeller mounted directly to motor shaft. Induction shall take place downstream of fan impeller. Overall total mass discharge up to 270 percent of design flow rate.
- C. Mixed flow impeller with combination axial/backward curved blades, welded steel construction.
- D. Nonstall and nonoverloading characteristic with stable operation at any point on the fan curve. Publish discharge volume for all fans at specified primary exhaust flow
- E. Fan assembly capable of being mounted on roof curb without need for guy wire supports.
- F. Stationary discharge guide vane section.
- G. Twin FRP discharge nozzle with passive third central stack capable of generating an aspiration effect.
- H. Steel or composite entrainment windband to provide secondary induction of outside air.
- I. PTFE gaskets shall be provided at all companion flanged joints.

- J. Fasteners, combination 316 stainless steel and Monel to prevent binding.
- K. Prepare all steel and aluminum surfaces by blasting or chemical etching.
- L. Coating, polyurethane enamel, 4 mils thick.
- M. Spark resistant construction per AMCA C.
- N. Fan dynamic balance not to exceed 0.5 mil, peak to peak, at the blade pass area when operating at fan frequency.
- O. Inlet mixing plenum:
 - 1. Heavy gauge steel construction, continuously welded and capable of supporting fan without guy wire supports.
 - 2. Hinged access door and safety screen over primary air inlet.
 - 3. Coating, same as specified for fan.
- P. Motors: Isolated from primary exhaust air stream and visible and accessible from fan exterior for inspection and service. Motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment." Mount factory supplied disconnect switch at the height that can be reached from the fan platform.
- Q. Accessories:
 - 1. Include rubber-in-shear pad type vibration isolators.
 - 2. Dampers:
 - a. Bypass dampers: Stainless steel, opposed blade with extended shaft for connection to electric operator provided by fan manufacturer.
 - b. Isolation dampers: Stainless steel, parallel blade with extended shaft for connection to electric operator provided by fan manufacturer..
 - c. Rated for fan shutoff pressure and equal to Ruskin Model CD80AF1 or CD80AF2.
 - d. Provide screened rain hoods on bypass dampers.
 - 3. Internal drain system to prevent rain water from entering duct system..
 - 4. Bolted access doors for impeller inspection.

2.4 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 axial fans level and plumb.
- B. Vibration control devices are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch (25 mm). Vibration-control devices are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- E. Install units with clearances for service and maintenance.
- F. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

Direct drive fans are preferred. Use direct drives whenever possible. Edit sections for project and remove belt driven reference.

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust belt tension.
 6. Adjust damper linkages for proper damper operation.
 7. Verify lubrication for bearings and other moving parts.
 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 9. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 10. Shut unit down and reconnect automatic temperature-control operators.
 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Lubricate bearings.

END OF SECTION 233413