

**SECTION 23 34 00
HVAC FANS**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
3. Ensure that a power circuit is shown for each fan.
4. For Seismic restraint requirements see specification Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS can be obtained from VA Masters.
5. Show input/ output points for fans on control drawings.
6. Ensure VFDs are based on present and future CFMs where applicable.
7. Ensure fans selected meet noise criteria listed in specification Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
8. Coordinate with VA Standard details all support and vibration isolation requirements:
 - a. 23 34 00-01 Power Type Roof Ventilator
 - b. 23 34 00-02 Low Silhouette Exhaust or Intake Hood

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Fans for heating, ventilating and air conditioning.
- B. A complete listing of common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- C. Product Definitions: AMCA 99 Standards Handbook, Definitions.

1.2 RELATED WORK

SPEC WRITER NOTE: Retain one of two paragraphs below.

- A. //Section 01 00 01 GENERAL REQUIREMENTS (Major NCA Projects)//
- B. //Section 01 00 02 GENERAL REQUIREMENTS (Minor NCA Projects)//
- C. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Section 01 42 19, REFERENCE STANDARDS.
- E. Section 01 81 11 SUSTAINABLE DESIGN REQUIREMENTS.

F. //Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.//

SPEC WRITER NOTE: If Section 13 05 41 is included in this project the section shall be obtained from VA Masters.

G. //Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//

H. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items which are common to more than one section of Division 23.

I. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC EQUIPMENT.

J. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.

K. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.

L. //Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

M. Section 26 29 11, MOTOR STARTERS.

1.3 APPLICABLE PUBLICATIONS

SPEC WRITER NOTE: Make material requirements agree with requirements specified in the referenced Applicable Publications. Verify and update the publication list to that which applies to the project, unless the reference applies to all mechanical systems. Publications that apply to all mechanical systems may not be specifically referenced in the body of the specification, but, shall form a part of this specification.

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Air Movement and Control Association International, Inc. (AMCA):

99-2010.....Standards Handbook

210-2007.....Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating

300-2014.....Reverberant Room Method for Sound Testing of Fans

C. American Society for Testing and Materials (ASTM):

B117-2011.....Standard Practice for Operating Salt Spray (Fog) Apparatus

D1735-2014.....Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 34 00, HVAC FANS", with applicable paragraph identification.
- C. Manufacturers Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
 - 1. Fan sections, motors, and drives.
 - 2. Centrifugal fans, motors, drives, accessories, and coatings.
 - a. In-line centrifugal fans.
 - b. Utility fans and vent sets.
 - 3. Prefabricated roof curbs.
 - 4. Power roof and wall ventilators.
 - 5. Centrifugal ceiling fans.
 - 6. Propeller fans.
 - 7. //Packaged hood make-up air units.//
 - 8. Certified Sound power levels for each fan.
 - 9. Motor ratings types, electrical characteristics, and accessories.
 - 10. Roof curbs.
 - 11. Belt guards.
- D. Certified fan performance curves for each fan showing liters per second (L/s) versus static pressure, efficiency, and horsepower for design point of operation and at 110 percent of design static pressure.
- E. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
 - 1. Include complete list indicating all components of the systems.
 - 2. Include complete diagrams of the internal wiring for each item of equipment.
 - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- F. //Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician

and dated on the date of completion, in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

- G. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

1.5 QUALITY ASSURANCE

- A. Refer to paragraph, QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Fans and power ventilators: Bear the AMCA performance seal.
- C. Fans and power ventilators: Comply with the following standards:
1. Testing and Rating: AMCA 210.
 2. Reverberant Room Method for Sound Testing of Fans: AMCA 300.
- D. Vibration Tolerance for Fans and Power Ventilators: Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- E. Performance Criteria:
1. Provide fans and motors capable of stable operation at design conditions and at 110 percent pressure.
 2. Lower than design pressure drop of approved individual components may allow use of a smaller fan motor and still provide the safety factor. When submitted as a deviation, a smaller motor may be approved in the interest of energy conservation. The Contractor shall be responsible for making necessary changes to the electrical system.
 3. Select fan operating point as follows:
 - a. Forward curved and axial fans: Right-hand side of peak pressure point.
 - b. Airfoil, backward inclined or tubular: Near the peak of static efficiency.
- F. Safety Criteria: Provide manufacturer's standard screen on fan inlet and discharge where exposed to operating and maintenance personnel.
- G. Corrosion Protection:
1. All steel: Mill-galvanized, or phosphatized and coated with minimum two coats, corrosion resistant enamel paint. Manufacturers paint and paint system shall meet the minimum specifications of: ASTM D1735 water fog and ASTM B117 salt spray.
 2. If flammable gas, vapor, or combustible dust is present, the fan construction shall be as recommended by AMCA's Classification for Spark Resistant Construction.

1.6 AS-BUILT DOCUMENTATION

SPEC WRITER NOTE: Coordinate O&M Manual requirements with Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects) or Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects). O&M manuals shall be submitted for content review as part of the close-out documents.

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be //in electronic version on CD or DVD// inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.
- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them in Auto-CAD version //____// provided on CD or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

PART 2 - PRODUCTS**2.1 CENTRIFUGAL FANS**

- A. Standards and Performance Criteria: Refer to paragraph, QUALITY ASSURANCE. Record factory vibration test results on the fan or furnish to the Contractor.

SPEC WRITER NOTE: Coordinate Fan arrangement with the equipment schedule on drawings.

- B. Fan arrangement, unless noted or approved otherwise:
1. DWDI fans: Arrangement 3.
 2. SWSI fans: Arrangement 1, 3, 9 or 10.
- C. Construction: Wheel diameters and outlet areas shall be in accordance with AMCA standards.
1. Housing: Low carbon steel, arc welded throughout, braced, and supported by structural channel or angle iron to prevent vibration or pulsation, flanged outlet, inlet fully streamlined. Provide lifting clips, and casing drain. Provide manufacturer's standard access door. Provide 15 mm (1/2 inch) wire mesh screens for fan inlets without duct connections.
 2. Wheel: Steel plate with die formed blades welded or riveted in place, factory balanced statically and dynamically.
 3. Shaft: Designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fans class.
 4. Bearings: Heavy duty ball or roller type sized to produce a B-10 life of not less than 40,000 hours, and an average fatigue life of 200,000 hours.
 5. Belt Drives: Factory installed with final alignment belt adjustment made after installation.
 6. Motors and Fan Wheel Pulleys: Adjustable pitch for use with motors through 11 kW (15 hp), fixed-pitch for use with motors larger than 11 kW (15 hp). Select pulleys so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
 7. Motor, adjustable motor base, drive, and guard: Furnish from factory with fan. Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC for specifications. Provide protective sheet metal enclosure for fans located outdoors.
 8. //Furnish variable speed fan motor controllers where shown on the drawings. Refer to Section 26 29 11, MOTOR STARTERS and to Section

23 05 11, COMMON WORK RESULTS FOR HVAC for controller/motor combination requirements.//

- D. In-line Centrifugal Fans: Provide inlet and outlet flanges, bolted access door, and arrangement of 1, 4, or 9 supports as required.
- E. Utility Fans, Vent Sets, and Small Capacity Fans: Class 1 design, arc welded housing, spun intake cone. For centrifugal fans apply for wheel diameters 300 mm (12 inches) and larger. Requirement for AMCA seal is waived for wheel diameters less than 300 mm (12 inches).

SPEC WRITER NOTE: Designate the fans that are required to be explosion proof in the Fan Schedule.

- F. Explosion Proof Fans: If flammable gas, vapor, or combustible dust is present, the fan construction shall be as recommended by AMCA's Classification for Spark Resistant Construction.

2.2 PREFABRICATED ROOF CURBS

SPEC WRITER NOTE: Coordinate with height of roof curb shown on drawings.

- A. Construction: Galvanized steel, with continuous welded corner seams, 50 mm (2 inch) wall thickness, treated wood nailer 40 mm (1-1/2 inch) thick, 48 kg per cubic meter (3 pound) density rigid mineral fiberboard insulation with metal liner, built-in cant strip (except for gypsum or tectum decks). For surface insulated roof deck provide raised cant strip to start at the upper surface of the insulation. Curbs shall be built for pitched roof or ridge mounting as required to keep top of curb level.
- B. Curb Height: 300 mm (12 inches) above finished roof.

2.3 ROOF OR WALL POWER VENTILATOR

- A. Standards and Performance Criteria: Refer to Paragraph, QUALITY ASSURANCE.
- B. Type: Centrifugal fan, backward inclined blades.
- C. Construction: Aluminum, completely weatherproof, for curb or wall mounting, exhaust cowl or entire drive assembly readily removable for servicing, aluminum bird screen on discharge, UL approved safety disconnect switch, conduit for wiring, vibration isolators for wheel, motor, and drive assembly. Provide self-acting backdraft damper.
- D. Motor and Drive: Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC. Bearings shall be pillow block with B-10 average life of 200,000 hours.

2.4 CENTRIFUGAL CEILING FANS (SMALL CABINET FAN)

- A. Standards and Performance Criteria: Refer to Paragraph, QUALITY ASSURANCE.
- B. Steel housing, baked enamel finish, direct-connected fan assembly, //attached grille//. Integral backdraft assembly, //wall// //roof// cap, and insect screen.
- C. Motor: Shaded pole or permanent split capacitor, sleeve bearings, supported by steel brackets in combination with rubber isolators.
- D. //Ceiling Grille: White plastic egg crate design, 80 percent free area.//

2.5 PROPELLER FANS

SPEC WRITER NOTE: Show on drawings whether fan is belt-driven or direct-driven.

- A. Standards and Performance Criteria: Refer to Paragraph, QUALITY ASSURANCE.
- B. Belt-driven or direct-driven fans as indicated on drawings.
- C. Square steel panel, deep drawn venturi, arc welded to support arms and fan/motor support brackets, baked-enamel finish. Provide wall collar for through-wall installations.
- D. Motor, Motor Base, and Drive: Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- E. //Wall Shutter: Fan manufacturer's standard, steel frame, aluminum blades, heavy duty stall type electric damper motor, spring closed.//
- F. Wire Safety Guards: Provide on exposed inlet and outlet.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.
- B. Install fan, motor, and drive in accordance with manufacturer's instructions.
- C. Align fan and motor sheaves to allow belts to run true and straight.
- D. Bolt equipment to curbs with galvanized lag bolts.
- E. Install vibration control devices as shown on drawings and specified in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.

3.2 PRE-OPERATION MAINTENANCE

- A. Lubricate bearings, pulleys, belts, and other moving parts with manufacturer recommended lubricants.
- B. Rotate impeller by hand and check for shifting during shipment and check all bolts, collars, and other parts for tightness.
- C. Clean fan interiors to remove foreign material and construction dirt and dust.

3.3 START-UP AND TESTING

- A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. Verify proper operation of motor, drive system, and fan wheel.
- C. Check vibration and correct as necessary for air balance work.
- D. After air balancing is complete and permanent sheaves are in place perform necessary field mechanical balancing to meet vibration tolerance in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- E. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- F. //The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and Commissioning Agent. Provide a minimum notice of 10 working days prior to startup and testing.//

3.4 //COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.//

3.5 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for //four// // // hour//s// to instruct each VA personnel responsible in the operation and maintenance of units.
- B. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

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