

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING  
SECTION 23 34 16 – CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Ventilation Contractor
  - a. Backward-inclined centrifugal fans.

1.2 SUBMITTALS

A. Product Data:

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.

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.

C. CLOSEOUT SUBMITTALS

1. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

D. MAINTENANCE MATERIAL SUBMITTALS

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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.
- C. Capacities and Characteristics:
1. Total Airflow: See Schedule on plans
  2. External Static Pressure: See Schedule on plans
  3. Housing Material: Aluminum.
  4. Wheel Material: Aluminum.
  5. Brake Horsepower: See Schedule on plans
  6. Drive Type: See Schedule on plans
  7. Fan Rpm: See Schedule on plans
  8. Motor:
    - a. Motor Enclosure: Open, drip proof, totally enclosed, fan cooled.
    - b. Efficiency: Premium efficient.

## 2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

- A. Description:
1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
  2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
  3. Factory-installed and -wired disconnect switch.
- B. Housings:
1. Formed panels to make curved-scroll housings with shaped cutoff.
  2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
  3. Horizontally split, bolted-flange housing.
  4. Spun inlet cone with flange.
  5. Outlet flange.
- C. Backward-Inclined Wheels:
1. Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades, and fastened to shaft with set screws.
  2. Welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate.
- D. Shafts:
1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.

2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
  3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- E. Prelubricated and Sealed Shaft Bearings:
1. Self-aligning, pillow-block-type ball bearings.
- F. Grease-Lubricated Shaft Bearings:
1. Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.
- G. Grease-Lubricated Shaft Bearings:
1. Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.
- H. Belt Drives:
1. Factory mounted, with adjustable alignment and belt tensioning.
  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 larger motors. Select pulley 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.
  5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
  6. Motor Mount: Adjustable for belt tensioning.
- I. Accessories:
1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
  2. Scroll Drain Connection: **NPS 1 (DN 25)** steel pipe coupling welded to low point of fan scroll.
  3. Companion Flanges: Rolled flanges for duct connections of same material as housing.
  4. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
  5. Discharge Dampers: Assembly with parallel blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
  6. Inlet Screens: Grid screen of same material as housing.
  7. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
  8. Spark-Resistant Construction: AMCA 99.

9. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
10. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

## 2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

## 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/ASHRAE 51, "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- 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.
- D. Equipment Mounting:
- E. Curb Support: Install roof curb on roof structure, level and secure, according to "The NRCA Roofing and Waterproofing Manual," Low-Slope Membrane Roofing Construction Details Section, Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure centrifugal fans on curbs, and coordinate roof penetrations and flashing with roof construction.
- F. Install units with clearances for service and maintenance.
- G. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to fans to allow service and maintenance.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
  - 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. See Section 230593 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.
  - 10. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 233416

