SECTION 23 34 00

HVAC FANS

1.0 GENERAL

1. DESCRIPTION
   1. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
   2. This Section 23 34 00 and the accompanying drawings cover the provision of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the fans as specified herein and as shown. These fans include, but are not limited to the following:
      1. Roof-mounted centrifugal exhaust fans
      2. Inline fans
      3. Ceiling/cabinet fans
      4. \*\*Parking garage jet fan
      5. Vane axial fan
2. INTENT
   1. It is the intent of this Section of the specifications to provide complete, operable, adjusted fans as shown and specified which are free of excessive noise, vibration and airflow fluctuations.
3. BASIS OF DESIGN
   1. The basis of design is as scheduled. Any proposed substitutions shall be proven equal in all aspects to the equipment specified as the basis of design. Particular attention is called to the requirements of Section 23 05 00.
4. ACCEPTABLE SUBSTITUTE MANUFACTURERS
   1. Acceptable substitute manufacturers are Carnes, Cook, Acme, PennBarry, Twin City, Price, and Greenheck. Acceptable manufacturers for kitchen grease exhaust fans are Captive-Aire, Viking, and Greenheck.

2.0 PRODUCTS

1. GENERAL REQUIREMENTS
   1. All non-filtered fans shall be factory tested, rated and certified in accordance with the requirements of AMCA Standard No. 210 and shall be labeled accordingly. Filtered fans may be non-labeled but must be rated in an AMCA approved laboratory in accordance with 210.
   2. All roof-mounted fans shall be constructed such that water cannot enter the building through the fan regardless of whether or not the fan is operating. Fans shall be provided with drain connection and piped to the nearest roof drain as applicable.
   3. Fans installed outside or otherwise subject to weather shall have a weatherproof enclosure over the motor compartment. All components, including VFDs, shall have enclosures and be appropriate for the installation locations.
   4. All roof-mounted fans shall be provided complete with roof curbs. Roof curbs shall be of aluminum construction, insulated, canted and complete with wood nailer strips. Insulation shall meet NFPA 25/50 flame spread/smoke developed ratings.
   5. Fan and curb shall be provided and installed in accordance with manufacturer’s requirements and recommendations for hurricane wind speed at installation location, as required.
   6. For buildings over three stories, fans that serve three stories or more, shall be provided and installed with motor-operated dampers interlocked to fan operation. Coordinate with Division 26 and Controls SubContractor.
   7. Motor-operated dampers for stair pressurization fans and stair pressurization relief shall fail open. All dampers in life safety systems shall fail in “safe” position.
   8. All exhaust fans shall be provided complete with gravity-type backdraft dampers.
   9. All belt-drive assemblies shall be mounted on vibration isolators.
   10. All motors on belt-drive assemblies shall be mounted on slide bases to provide adjustment of belt tension.
   11. All belts in belt drives shall be rated for not less than 150% of the connected motor horsepower.
   12. All belt-drives driven by a 5 HP or larger motor shall be multiple belt arrangements.
   13. All belt-drives shall be adjustable to a minimum speed variation of plus or minus 20% of the design RPM.
   14. All centrifugal fan wheels shall be statically and dynamically balanced.
   15. All electric motors and equipment shall be UL labeled.
   16. Refer to Division 26 of these specifications and to the electrical Contract Drawings for electrical characteristics and connections to all equipment. Coordinate all electric motors and other equipment with these electrical documents.
   17. Fans with variable-frequency drives (VFDs) shall have shaft grounding ring and appropriate insulation class.
   18. All exposed motors and belts shall be protected with enclosures or guards in accordance with OSHA requirements.
   19. Life safety fans (i.e. stair pressurization, elevator hoistway pressurization, smoke control, etc. shall have 1.5 times the number of belts necessary for the scheduled performance with no less than two (2) belts.
2. ROOF-MOUNTED CENTRIFUGAL EXHAUST FANS
   1. Roof-mounted centrifugal exhaust fans shall be Greenheck Model G for direct drive fans and Greenheck Model GB for belt-drive fans, or an approved equal, as scheduled.
3. CEILING/CABINET EXHAUST FANS
   1. Ceiling/cabinet exhaust fans shall be Greenheck Model CSP (inline/cabinet) or Greenheck Model SP (ceiling) with integral grille, or an approved equal. \*\*Fans shall be provided with speed controller for balancing.
4. \*\*SIDEWALL CENTRIFUGAL EXHAUST FANS
   1. Fans shall be wall centrifugal exhausters with air discharge away from wall and waterproof design so that water cannot enter the building through fan housing whether or not fan is operating. Where indicated on the drawings to be spark resistant, fans shall comply with AMCA 99-401 for Type A construction. Fan shall be equipped with a backdraft damper on inlet and a birdscreen on outlet.
   2. Fan shall have aluminum housing enclosing the motor and drive, an aluminum shroud enclosing the fan wheel and an aluminum curb cap. Curb cap shall have a 1” wide by ¼ ” thick foam rubber gasket factory applied to the underside perimeter of curb cap. An internal power wiring post shall extend from motor compartment through curb cap. Where wiring post penetrates housing and curb cap, penetrations shall be sealed. A ¼ ” diameter static pressure tube shall be factory installed through fan housing at the inlet side of the fan wheel. Exposed end of tube shall have a plastic cap.
   3. Fan wheel shall be backward inclined centrifugal type with aluminum construction. On belt driven units, shaft bearing shall be self-aligning, pillow block ball type. Bearings not permanently sealed and lubricated shall have grease fittings.
   4. Fan shall be Greenheck Model CWB or approved equal.
5. \*\*PARKING GARAGE JET FANS
   1. Jet fans shall be \*\*Greenheck Model GJI or GJX as specified on the drawings, or an approved equal.
   2. Fan housing to be aerodynamically designed with integral discharge vanes for improved throw.
   3. Fan shall have integrated speed dial or potentiometer for local speed setting. Speed control to be field convertible to 0-10 VDC control signal option.
   4. Fan shall have an inlet and outlet guards to protect fan impeller and prevent foreign materials entering fan inlet and outlet.
   5. Fan impeller shall be mixed flow or airfoil design and be statically and dynamically balanced.
   6. Motor support framework to be constructed of steel that is suitable to handle the weights of the motor and impeller, and thrust weight. Motor supports within the fan housing to be welded to the fan casing.
   7. \*\*[GJX only] Provide sound attenuators, 2” double walled construction with outer wrap as rolled steel and inner wrap perforated steel. Attenuator length shall be minimum two fan diameters.
6. \*\*VANE AXIAL FANS
   1. GENERAL REQUIREMENTS
      1. Fans shall be direct drive, \*\*Arrangement 4, with capacities and sizes as indicated on schedules.
      2. Fan blade angle shall be continuously adjustable from 0 degrees to a maximum of 32 degrees while fan is in motion. Blade shall fail safe to 0 degrees pitch in the event of power loss to the control system.
      3. The diametrical arm shall be operated by a \*\*pneumatic \*\*electric\*\* actuator mounted externally to the fan casing. Actuator shall be double acting cylinder type to eliminate hysteresis. No diaphragm or return spring type will be permitted.
         1. Pneumatic actuators shall have a 3-15 psi signal response.
         2. Electric actuators shall have a 4-20 milliampere signal response.
      4. Fan blades shall be 356-T6, heat-treated, high-strength aluminum alloy, having a true airfoil section, and having both camber and twist. Each blade shall be sized for its diameter and shall not be cut down from longer blade sections.
      5. The fan hub section shall be 356-T6, heat-treated, high-strength aluminum alloy; mounted to a standard, foot mounted motor inside the fan casing. The motor shall be \*\*TEAO \*\*ODP\*\*, NEMA Design "B", Class "F" insulated. It shall be clamped to the hub by a single axial clamping bolt with heavy sectioned washer.
      6. The impeller shall be placed on the inlet side of the fan, before the motor; and shall be designed so that the blade operating linkage need not be disturbed if removal is necessary. Both motor and impeller shall be removable from the inlet side of the fan. The actuator bearing housing shall be designed to provide quick access to the motor shaft without removing other impeller components.
      7. The fan control mechanism shall require no more than bi-annual internal lubrication.
      8. Fan casing shall be constructed from a minimum 3/8" thick steel. Casing and end flanges shall be continuously welded by ASME, Code IX, qualified Welders. Certification shall be provided. Guide vanes shall be minimum 3/16" and shall support the foot mounted motor. They shall be continuously welded to a rigid motor base and the housing.
      9. Fan shall include an early-warning, fail-safe mechanism, which, in the event of motor bearing or thrust bearing failure, will prevent impeller "melt down" due to a sudden high moment of radial torque.
      10. Fan shall include extended copper motor grease leads; and rigid walled extended electric leads to an external mounted conduit box.
      11. Horizontal mounting feet or clips, or vertical mounting clips; inlet bell with safety screen; outlet cone, (conventional) (diffuser) (acoustical diffuser) type shall be provided, as required.
      12. Fan shall be balanced to a maximum of 0.5 mil double amplitude, peak to peak; throughout the fan's total pitch range.
      13. Fan total efficiency shall not be less than 75% at design operating conditions, and shall not vary more than + 10% over the entire range of the design system curve.
   2. LOW LEAKAGE PARALLEL DAMPER
      1. The damper shall be of a true round shape, not cut from a square body. The casing shall be of hot rolled steel construction and be a minimum of 14 gauge thickness.
      2. All casing weldments shall be continuous to avoid any possibility of system leakage. A mating flange of the same diameter of the outlet cone, or fan shall be provided on the inlet side of the damper. It shall be drilled to match the casing or cone hole pattern.
      3. There shall be a minimum of two damper blades made of hot rolled steel. They shall be suitable for a minimum backpressure of 10" water gauge. They shall be of the automatic gravity type; closing to form a tight seal that will not allow more than 0.5% leakage.
   3. FINISH
      1. After fabrication, fan and damper shall be cleaned, primed, and coated with two coats of a synthetic polymer based, non-photochemically reactive, industrial enamel in a color as selected by the Architect during submittal review.

3.0 EXECUTION

1. INSTALLATION
   1. Fans shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.
2. ADJUSTMENT
   1. The fans shall be tested and adjusted after installation to provide the capacities indicated.

END OF SECTION