

**DIVISION 23**

**HEATING, VENTILATING AND AIR CONDITIONING  
(HVAC)**

**SECTION 23 3413  
LARGE DIAMETER FAN**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Large Diameter Fan
- B. Accessories

**1.02 RELATED REQUIREMENTS**

**1.03 REFERENCES**

- A. International Organization of Standardization (ISO)
- B. National Electric Code (NEC)
- C. Underwriters Laboratory (UL)

**1.04 SUBMITTALS**

- A. See Section 01 3323 – Submittals, for submittals procedures.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Closeout Submittals: Submit owner manual, operations manual, and warranty documents specified herein.
- D. Submittals: Drawings detailing product dimensions, weight, and attachment methods. Specify electrical and installation requirements, features, and controller information.

**1.05 QUALITY ASSURANCE**

- A. The fan assembly, as a system, shall be Intertek/ETL-certified and built pursuant to the guidelines set forth by UL standard 507 and CSA standard 22.2 No. 113.
- B. The fan shall be compliant with NFPA 13 – National Electric Code (NEC).
- C. Controllers shall comply with National Electrical Code (NEC) and Underwriters Laboratory (UL) standards and shall be labeled where required by code.
- D. The fan and any accessories shall be supplied by a single manufacturer.
- E. ISO 9001-certified.
- F. Fabricator and Installer Qualifications: Company experienced in the installation of large diameter fans.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.
- B. The fan and its components must be stored in a safe, dry location until installation.
- C. The wall control components shall be new, free from defects, and factory tested. The product shall be packaged in static shielding materials for ESD protection.

**1.07 WARRANTY**

- A. The manufacturer shall replace any products or components defective in material or workmanship for the customer free of charge (including transportation charges within the USA), pursuant to the complete terms and conditions of the non-prorated warranty in accordance to the following schedule:

Airfoils	Lifetime (Parts)
Hub	Lifetime (Parts)
Motor	15 years (Parts)
Gearbox	15 years (Parts)

Variable Frequency Drive	15 years (Parts)
Wall Control Components	1 year (Parts)
All other fan components	15 years (Parts)
Labor	1 year

## PART 2 PRODUCTS

### 2.01 MANUFACTURER

- A. Manufacturer: Delta T Corporation, dba Big Ass S, PO Box 11307, Lexington, Kentucky 40575. Phone: (877) 244.3267 Fax: (859) 233.0139. Website: [www.bigassfans.com](http://www.bigassfans.com).
- B. MacroAir, 794 S. Allen Street, San Bernardino, CA 92408. Phone: (866) 668.3247.
- C. Hunter Fan Company, [www.hunterindustrialfan.com](http://www.hunterindustrialfan.com)

### 2.02 HIGH VOLUME, LOW SPEED FAN

- A. Complete Unit equal to: Big Ass Fans "Powerfoil X3.0"; fan model: "PFX3-14".
- B. Fan Diameter: 14 FT. (4.3m)
- C. Fan Weight: 254 lb. (115kg)
- D. Regulatory Requirements:
  - 1. The entire fan assembly (without light kit) shall be Intertek/ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2.
  - 2. Sustainability Characteristics: The fan shall be designed to move an effective amount of air for cooling and de-stratification in a variety of applications over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
  - 3. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.
- E. Onboard Fan Control:
  - 1. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be prewired to the motor using a short run of lexible donuit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller with: NEMA L6-30P Twist-Lock Plug
- F. Airfoil System:
  - 1. The fan shall be equipped with eight (8) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the bug and interlocked with zinc plated steel retainers.
  - 2. The fan shall be equipped with eight (8) Powerfoil winglets on the ends of the airfoils and eight (8) AirFences positioned on the airfoils at the optimum location for performance. Both winglet and AirFence shall be molded of polypropylene. The standard color the winglet and AirFence shall be "Safety Yellow".
- G. Motor:
  - 1. The fan motor shall be an AC induction type inverter rated at: 1725 RPM, 200-240/400-480 VAC, 50/60 Hz, three-phase
  - 2. The motor shall be totally enclosed, fan cooled (TEFC) with an IP44 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous

operation in  $-30^{\circ}\text{F}$  to  $122^{\circ}\text{F}$  ( $-34^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ ) ambient conditions.

3. The motor shall have a C-face attachment that shall enable technicians to detach the motor for easy field service. The C-face motor adapter shall be designed to work with the NitroSeal™ gearbox.

#### H. Gearbox

1. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X series. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage gearing, a hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range.
2. The gearbox shall be equipped with a hollow shaft threaded to accept a  $\frac{3}{4}$ " NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.

#### I. Mounting Post

1. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.

#### J. Mounting System

1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The mounting yoke shall be of ASTM A-36 steel, welded construction, at least  $\frac{3}{16}$ " thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.
2. All mounting bolts shall be SAE Grade 8 or equivalent.

#### K. Hub

1. The fan hub shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, eight (8) aluminum spars and one (1) aluminum spacer fastened with a pin and collar rivet system.
2. The hub shall be secured to the output shaft of the gearbox by means of (10) high strength bolts. The hub shall incorporate five (5) safety retaining clips made of  $\frac{1}{4}$ " (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

#### L. Safety Cable

1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be  $\text{Ø}\frac{3}{8}$ " (1 cm) diameter and fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged Nicopress® sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
2. Field construction of safety cables is not permitted.

#### M. Wall Controller

1. Regulatory Requirements: The fan speed control system shall be compliant with NFPA 70-2011—National Electric Code (NEC).
2. Sustainability Characteristics: The system shall be designed to automatically control the speed of Big Ass Fans from the locations of the wall controller and upper temperature sensor to maximize energy savings and user comfort. The system shall be designed specifically for high volume, low speed Big Ass Fans, and receives information from user-determined settings and temperature sensors.
3. Good workmanship shall be evident in all aspects of installation.
4. The wall control shall be a digital keypad device with an internal temperature sensor. It shall be wall-mounted centrally within the fan zone at head height using two (2) provided 6-32 x  $\frac{7}{8}$ " pan head screws and four (4) provided 6-32 countersink.

5. The wall controller shall be enclosed in a cast zinc cover measuring 3.86" (9.8 cm) x 7.25" (18.4 mm) x 1" (2.5 cm) and be made of heavy-duty steel.
  6. The wall controller includes a Class II AC Adapter power cord.
  7. The wall controller only provides a speed reference for the fan. Start and stop functions are controlled by the auxiliary controller.
  8. The mounting location shall meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
- N. Upper Temperature Sensor
1. The upper temperature sensor shall be mounted in the upper portion of the fan zone either by using a provided I-Beam clamp, or by using four (4) provided mounting screws.
  2. The upper temperature sensor shall measure 1.9" (4.8 cm) x 4" (10.2 cm) x 1" (2.5 cm).
- O. Auxiliary Controller
1. The fan is equipped with an auxiliary controller capable of providing 100% control of all fan functions. The auxiliary controller shall be a digital keypad device mounted within a cast zinc cover. The cover shall be capable of mounting to a standard switch box.
  2. Equipped with touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming. Communication between the fan VFD and auxiliary controller is by a standard CAT5 (or higher) Ethernet cable. The auxiliary control should come standard with 150 ft of factory-assembled CAT5 Ethernet cable.
  3. Equipped with a simple diagnostic program to identify faults in the system. Provisions shall be made for retrieving fan operation and diagnostic data (fault messages) through the auxiliary controller.
- P. Fire Control Panel Integration
1. Includes a 10-30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.
- Q. Extension Tube and Guy wires: Include and install 4 ft. extension tube to allow appropriate clearances around fan blades; Include guy wires as required by fan manufacturer to limit the potential for lateral movement.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Mounting structure must be able to support weight and operational torque of fan. Consult structural engineer if necessary.
- B. Fan location must be free from obstacles such as lights, cables, or other building components.
- C. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.
- D. Each fan requires dedicated branch circuit protection.
- E. Route power to within six (6) feet of the wall controller location. If additional distance is needed to power the wall controller, consult the alternative wiring method instructions in the Installation Guide.

### **3.02 INSTALLATION**

- A. The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle iron for bar joist applications. Big Ass Fans recommends consulting a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.
- B. Minimum Distances
  1. Airfoils must be at least 10 ft (3 m) above the floor.
  2. Installation area must be free of obstructions such as lights, cables, sprinklers or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.
  3. The structure the fan is attached to shall be capable of supporting a torque load of up to

300 ft·lb (407 N·m)  
of torque

- C. The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters. Additional details are in the Big Ass Fans 3.2 Installation Manual.
- D. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
  - 1. The maximum fan diameter shall be 24 ft (7.3 m).
  - 2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
  - 3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
  - 4. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72 – National Fire Alarm and Signaling Code.
- E. The wall control shall be installed by a factory-certified installer according to the Installation Guide.
- F. The customer shall supply 2-conductor shielded cable (18–22AWG stranded) to connect the wall control components to the fan's variable frequency drive. The maximum distance between the wall controller and the upper temperature sensor shall be 1000 ft (305 m).
- G. Installation areas must be free of obstructions such as lights, cables, sprinklers, or other building structures.
- H. The components of the wall control must not be mounted adjacent to or above radiant heaters, near HVAC ventilation intakes or exhausts, on poorly insulated exterior walls, in roof decking, or near radiant heat sources, and must be mounted so that they are exposed adequately to circulated air. Additional mounting guidelines can be found in the Installation Guide.

**END OF SECTION**