PART 1: GENERAL

1.01 Related Documents:

A. The design guidelines contained herein includes the requirements for fan systems and appurtenant devices at The University of Texas at Austin. It is the intention of this document to provide a standard for fan applications at the University that represents the highest level of quality and consistency possible; it is not intended to be a guide specification.

1.02 Quality Assurance:

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of centrifugal fans, of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards that are Standard at the University:

1. AMCA Compliance: Centrifugal fans must the AMCA Certified Ratings Seal. Sound rate centrifugal fans in accordance with AMCA 300 "Test Code for Sound Rating Air Moving Devices".

2. ASHRAE Compliance: Test and rate centrifugal fans in accordance with ASHRAE 51 (AMCA 210) "Laboratory Methods of Testing Fans for Rating".

3. UL Compliance: Provide centrifugal fan electrical components which have been listed and labeled by UL.

1.03 Submittals:

A. Product Data: Submit the following product data to the University of Texas project manager: manufacturer's technical product data for centrifugal fans, including specifications, capacity ratings, fan performance curves with operating point clearly indicated, gages, finishes of materials, dimensions, weights, accessories furnished, and installation.

B. Shop Drawings: Submit assembly-type shop drawings showing fan dimensions, required clearances, construction details, and field connection details.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to fan units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
D. Maintenance Data: Submit maintenance instructions, including lubrication instructions, type of lubricant, motor and drive replacement and including belts, and recommended spare parts lists. In accordance with Division One requirements, include maintenance data, product data, shop drawings, and wiring diagrams in maintenance manuals.

E. Motor Data: Submit Manufacturer’s Product Data indicating compliance with Motor Standard Section 15170.

PART 2: PRODUCTS

2.01 Centrifugal Fans/Steel:

A. General: Provide centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled, Class II construction (minimum).

B. Fan Units: Provide factory-assembled and tested fan units consisting of housing, wheel, fan shaft, bearings, and side support structure. Clean, condition, and prime paint sheet metal parts prior to final assembly. Apply final coat of enamel to exterior surfaces after assembly.

C. Housings: Provide curved scroll housings; lockseam construction for sizes 24" to 40", spot welded construction for sizes 44" to 60", and continuous weld construction for sizes 66" and larger. Provide horizontally split housings, bolted together for sizes 66" and larger. Provide spun inlet cones and duct connections.

D. Wheels: Provide backwardly inclined plate-type blades for sizes 22" and smaller, non-power-overloading backwardly inclined airfoil blades for sizes 24" and larger. Weld blades to wheel rim and hub plate. Key wheels to shafts. True and dynamically balance wheels after assembly.

E. Shafts: Construct of AISI 1040 or 1045 solid hot-rolled steel, turned and polished.

F. Bearings: Provide heavy-duty, grease-lubricated, precision anti-friction ball or roller, self-aligning, pillow block type bearings selected for minimum average life (AFBMA L50) of 100,000 hours.

G. Bearings: Provide extra heavy-duty, grease-lubricated, tapered double spherical rollers, pillow block type bearings selected for minimum average life (AFBMA L50) of 400,000 hours.

H. Drive: Provide V-belt drive, selected for 1.4 service factor. Provide adjustable pitch sheave, selected for midpoint at design conditions, include belt guard, split
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2.02 **Vibration Control:**

A. Provide as scheduled, one of the following types of vibration isolators, with number and size of isolators selected by manufacturer.

1. **Base Type B:** Structural steel rails or base.
2. **Base Type C:** Concrete inertia base.
3. **Isolator Type 3:** Spring floor isolator or hanger.

2.03 **Accessories:**

A. Provide the following accessories as indicated and/or scheduled:

1. **Scroll Bypass Dampers:** Provide aluminum scroll bypass dampers equipped with opposed airfoil blades. Provide extruded vinyl seals on blades, low friction bearings, and positive control linkage for manual or automatic operation.

2. **Access Doors:** Provide access door in scroll housing, with latch-type handles, flush mounted for uninsulated housings, and raised-mounted for insulated housings.

3. **Inlet Vanes:** Provide radial inlet vanes in fan inlets, containing one more vane than blades on fan. Provide linkage for manual or automatic operation; connect linkages on double width fans for single operator.

4. **Inlet Screens:** provide heavy wire mesh inlet screens on fan inlets, mounted inside of fan bearings.

5. **Discharge Dampers:** Provide heavy gage steel, opposed blade design discharge dampers in fan outlet. Provide linkage for manual or automatic operation.

6. **Drain Connections:** Provide minimum 3/4" threaded coupling drain connection at lowest point of housing.

7. **Extended Grease Lines:** Extend grease lines from bearings to outside of inlet duct flange, terminate with grease fitting.

8. **Heat Slingers:** Provide metal disc between bearings and fan wheel, to dissipate heat from shaft.

9. **Spark-Resistant Construction:** Provide AMCA construction option: **Split Housings:** Provide flanged, horizontally split housings as indicated.

   b. **Shaft Seals:** For single width fans, provide tight seal around shaft on drive side.

   c. **Special Coatings:** Provide protective coatings on fans as indicated.
2.04 **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering centrifugal fans which may be incorporated in the work include, but are not limited to, the following:

A. ACME  
B. Barry Blower; A Marley Co.  
C. Buffalo Forge Co.  
D. Champion Blower and Forge, Inc.  
E. Cook Fans  
F. Greenbeck Fans  
G. ILG Industries, Inc.  
H. Industrial Air, Inc.  
I. New York Blower Co.  
J. Twin City Fan and Blower Co.  
K. Engineer-approved equivalent

2.05 **Centrifugal Fans/Fiberglass Reinforced Plastic:**

A. **General:** Fiberglass fans are intended for chemically corrosive application.

B. **Fan Units:** The Standard fans are factory-assembled and tested fan units consisting of housing, wheel, fan shaft, bearings, and fan support stand. The exterior of the fan housing shall be coated with an industrial grade gel coat, free from surface imperfections, a pigment to achieve the desired color and an inhibitor to prevent ultra-violet degradation.

C. **Housings:** The fans are to be constructed in sections with flange joints utilizing stainless steel bolts and appropriate gasketing. The resins used to fabricate the fans shall be premium grade, fire retardant and selected for chemical environment. The fiberglass reinforcement shall be an industrial commercial grade of glass mat or woven roving, such as manufactured by Owens-Corning and shall have a suitable coupling agent to provide a bond between the glass reinforcement and the resin.
D. **Wheels**: The wheels shall be fabricated similarly to the housings with a cast iron back plate or imbedded hub in the wheel and keyed to a polished steel shaft. The wheels shall be backward inclined and statically and dynamically balanced. The completed fan shall be mechanically tested by the manufacturer before shipment.

E. **Bearings**: Provide a heavy-duty, grease lubricated, precision anti-friction ball or roller bearing, pillow block type and selected for a minimum average life of 200,000 hours.

F. **Motors**: Provide energy efficient motors in accordance with Division-15 section. "Electrical Provisions of Mechanical Work".

G. **Drive**: Provide V-belt drive selected for 1.4 service factor. Provide an adjustable pitch sheave for the motor and select for the midpoint of the pitch diameter for the design rpm. Include bent guard with opening for tachometer.

2.06 **Vibration Control**:

A. Provide as scheduled one of the following types of vibration isolators, with the number and size of the isolators as selected by the manufacturer.


2. Close a spring mount with aluminum housing top and bottom separated with a neoprene rubber stabilizer and with an external adjusting mounting screw.

2.07 **Accessories**:

A. Provide the following accessories as indicated and/or scheduled:

1. **Access Doors**: Provide access doors in the scroll housing bolted with gaskets.

2. **Drain Fitting**: Provide a 1 inch threaded coupling in the bottom of the scroll housing.

3. **Flanged inlet and outlet**.

2.08 **Available Manufacturers**:

A. Subject to compliance with requirements, manufacturers offering fiberglass reinforced plastic centrifugal fans, provide one of the following:

1. Beverly Pacific Corporation
2. The Ceilcote Company
3. Peabody Sunstrand

2.09 **Utility Fans**
A. **General:** Provide utility fans of sizes and arrangement as indicated, and of capacities and having accessories as schedules.

B. **Fan Units:** Provide factory-assembled and tested fan units consisting of housing, wheel, fan shaft, bearings, and fan drive. Clean, condition, and prime paint sheet metal parts prior to final assembly. Apply final coat of enamel to exterior surfaces after assembly.

C. **Housings:** Construct of heavy-gage steel with side sheets fastened to scroll sheets by means of deep lock seam. Provide round inlet collar, slip joint discharge duct connection. Construct housings to be convertible to 8 standard discharges. Provide adjustable motor supports.

D. **Wheels:** Provide forward curved or backward inclined wheels as scheduled. Provide swaged hubs. Balance wheels statically and dynamically.

E. **Shafts:** Construct of AISC 1040 ground and polished steel. Apply rust-preventive coating.

F. **Bearings:** Provide self-aligning, grease-lubricated, pillow block type bearings, selected for minimum average life (AFBMA L50) of 200,000 hours.

G. **Drives:** Provide V-belt drives for fractional horsepower motors selected for 1.2 service factor. Provide V-belt drives for integral horsepower motors selected for 1.4-service factor. Provide adjustable pitch sheave, selected for midpoint at design conditions. Include belt guard or weather cover. Include openings for tachometer.

### 2.10 Vibration Control:

A. Provide as scheduled, one of the following types of vibration isolators, with number and size of isolators selected by manufacturer.

1. **Base Type A:** No base, isolators attached directly to equipment.
2. **Base Type B:** Structural steel rails or base.
3. **Isolator Type 2:** Rubber floor isolator or hanger.
4. **Isolator Type 3:** Spring floor isolator or hanger.

### 2.11 Accessories:

A. Provide the following accessories as indicated and/or scheduled:

1. **Backdraft Dampers:** Provide gravity-actuated dampers on fan discharge, counterweighted, with interlocking aluminum blades with felt edges in steel frame.

2. **Access Doors:** Provide gasketed access door, with latch-type handles, in fan housing.
3. **Scroll Dampers**: Provide single blade damper at top of fan scroll, with linkage adjustable and locked to fan housing.

4. **Spark-Resistant Construction**: Provide AMCA construction option A, B, or C as indicated.

5. **Inlet Screens**: Provide removable heavy wire mesh inlet screens on fan inlets.

6. **Special Coatings**: Provide protective coatings on fans as indicated.

7. **Drain Connections**: Provide 3/4" threaded coupling drain connection at lowest point of housing.

8. **Weather Hoods**: Provide protective weather hood with stamped vents over motor and drive compartment.

2.12 **Available Manufacturers**:

A. Subject to compliance with requirements, manufacturers offering utility fans, which may be incorporated in the work, include, but are not limited to, the following:

1. Acme Engineering and Mfg. Corp.
2. Aerovent Inc.
3. Aladdin Heating Corp.
5. Barry Blower; A Marley Co.
7. Brod and McClung-Pace Co.
9. Central Blower Co.
10. Champion Blower and Forge, Inc.
11. Chelsea Fans and Blowers; Torin HVAC Div. Clevepak Corp.
12. Cincinnati Fan and Ventilator Co., Inc.
13. Clarage Fan Co.; Zurn Industries, Inc.
14. Cook Fans
15. Greenbeck Fans
16. Hartzell Fan Inc.
17. ILG Industries, Inc.
19. Penn Ventilator Co., Inc.
22. Quietaire Corp.
23. Trane (The) Co.
24. Twin City Fan and Blower Co.
2.13 Tubular Centrifugal Fans:

A. General: Provide tubular centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled.

B. Fan Units: Provide factory-assembled and tested fan units consisting of housing, wheel, fan shaft, bearings, straightening vanes, and motor support. Clean, condition, and prime paint sheet metal parts prior to final assembly. Apply final coat of enamel to exterior surfaces after assembly.

C. Housings: Construct housings of low carbon steel with continuous-weld construction, braced to prevent vibration or pulsation. Provide streamlined inlet and outlet configurations.

D. Wheels: Provide airfoil type blades and welded construction. Statically and dynamically balance wheels before assembly, and balance again in assembled unit at design rpm.

E. Shafts: Construct of solid hot-rolled steel, turned and polished. Design to operate at no more than 70% of first critical speed at top of speed range of fan's class.

F. Bearings: Ball or roller, self-aligning pillowblock type, with grease lines extended to outside of housing. Select bearings for minimum average life (AFBMA L10) of 40,000 hours.

G. Drive: Provide V-belt drive, selected for 1.4 service factor. Provide adjustable pitch sheave, selected for midpoint at design conditions. Include belt guard.

H. Arrangement: Provide arrangement 1 for floor-mounted fans and arrangement 9 for ceiling mounted fans.

2.14 Vibration Control:

A. Provide as scheduled, one of the following types of vibration isolators, with number and size of isolators selected by manufacturer.

1. Base Type A: No base, isolators attached directly to equipment.
2. Base Type B: Structural steel rails or base.
3. Base Type C: Concrete inertia base.
4. Isolator Type 2: Rubber floor isolator or hanger.
5. Isolator Type 3: Spring floor isolator or hanger.
2.15 **Accessories:**

A. Provide the following accessories as indicated and/or scheduled:

1. **Companion Flanges:** Provide flanges on inlet and outlet to accommodate slip connection for ductwork.

2. **Weather Cover:** Provide weatherproof cover with ventilation slots to fit over motor and drive for outdoor installations.

3. **Ceiling Brackets:** Provide structural angles welded to housing to accommodate rod hangers for ceiling-hung fans.

4. **Inlet Vanes:** Provide radial inlet vanes in fan inlets with linkage suitable for either manual or automatic operation.

5. **Access Doors:** Provide access door in housing, located over wheel in accessible position, hinged with latch-type handles, flush mounted for uninsulated housings, raised-mounted for insulated housings.

6. **Spark-Resistant Construction:** Provide AMCA construction option: A, B, or C as indicated.

7. **Drain Connections:** Provide 3/4" threaded coupling drain connection at lowest point of housing.

8. **Screens:** Provide heavy mesh removable screens on fan inlet and outlet.

9. **Special Coatings:** Provide protective coatings on fans as indicated.

2.16 **Available Manufacturers:**

A. Subject to compliance with requirements, manufacturers offering tubular centrifugal fans, which may be incorporated in the work, include, but are not limited to, the following:

1. Acme Engineering and Manufacturing Corp.
2. Air Control Products, Inc.
3. Aladdin Heating Corp.
4. Barry Blower; A Marley Co.
5. Bayley Propellair Group; Lau Div. of Philips Industries, Inc.
7. Chelsea Fans and Blowers; Torin HVAC Div. Clevepak Corp.
8. Cook (Loren) Co.
9. Industrial Air, Inc.
11. H. K. Porter Co., Inc.
13. Twin City Fan and Blower Co.
2.17 Inline Centrifugal Fans:

A. General: Provide inline centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled.

B. Housing: Aluminum split housing, constructed of spun aluminum, with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Specify ball bearing motor encased in housing so as to be out of air stream. Provide factory wiring to disconnect located on outside of fan housing.

D. Belt-Drive Units: Request ball bearing motor mounted on adjustable base, with adjustable sheaves. Provide enclosure around belts. Provide lubricating tubes from fan bearings to outside of fan housing.

E. Wheel: Aluminum airfoil blades on aluminum hub.

2.18 Vibration Control:

A. Specify as required and schedule one of the following types of vibration isolators, with number and size of isolators selected by manufacturer.

1. Base Type A: No base, isolators attached directly to equipment.
2. Base Type B: Structural steel rails or base.
3. Isolator Type 2: Rubber floor isolator or hanger.
4. Isolator Type 3: Spring floor isolator or hanger.

2.19 Accessories:

A. If required, specify the following accessories as indicated and/or scheduled:

1. Volume Control Damper: If required, specify manual controlled volume damper in fan outlet with quadrant and lock.
2. Companion Flanges: If required, specify matching flanges on inlet and outlet to connect ductwork to fan.
3. Fan Guards: Request guards on inlets and outlets not connected to ductwork, constructed of expanded metal in removable frame.
4. Speed Control: For direct drive fans, specify variable speed switch with off-on control, and speed control for 100% to 50% of fan air delivery.
2.20 Available Manufacturers:

A. Subject to compliance with requirements, manufacturers offering inline centrifugal fans, which may be incorporated in the work, include, but are not limited to, the following:

1. Acme Engineering and Manufacturing Corp.
2. Cook (Loren) Co.
3. Penn Ventilator Co.

PART 3: EXECUTION

3.01 Inspection:

A. Examine areas and conditions under which centrifugal fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 Delivery, Storage and Handling:

A. Deliver centrifugal fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

B. Handle centrifugal fans carefully to avoid damage to components, enclosures, and finish. Do not install damaged components; replace and return damaged components to centrifugal fan manufacturer.

C. Store centrifugal fans in clean dry place and protect from weather and construction traffic.

D. Comply with manufacturer's rigging and installation instructions for unloading centrifugal fans, and moving them to final location.

3.03 Installation of Centrifugal Fans:

A. General: Request installation of centrifugal fans where indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices, to ensure that centrifugal fans comply with requirements and serve intended purposes.

B. Access: Specify access and service space around and over centrifugal fans as indicated, but in no case less than that recommended by manufacturer.

C. Support: Specify 4" high concrete pad under floor-mounted centrifugal fans.
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D. **Isolation:** Set centrifugal fans on vibration isolators; fasten in accordance with manufacturer's installation instructions.

E. **Verify** that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable to centrifugal fan Installer.

F. **Ductwork Connections:** Refer to Division-15 "Ductwork" sections. Provide flexible connections on inlet and outlet duct connections.

3.04 **Field Quality Control:**

A. **Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.**

3.05 **Adjusting and Cleaning:**

A. **Start-up, test, and adjust centrifugal fans in presence of manufacturer's authorized representative.**

3.06 **Spare Parts:**

A. **General:** Request furnishing to owner, with receipt, one spare set of belts for each belt driven centrifugal fan.

END OF STANDARD 15860