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**Part 1            General**

**1.1               RELATED REQUIREMENTS**

- .1      Section 23 05 00 – Common Work Results for HVAC
- .2      Section 23 05 49.01 – Seismic Protection Systems.
- .3      Section 23 38 13 – Commercial Kitchen Hoods

**1.2               REFERENCES**

- .1      American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
  - .1      ANSI/AMCA Standard 99-2010, Standards Handbook.
  - .2      ANSI/AMCA Standard 210-2007/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
  - .3      ANSI/AMCA Standard 300-2008, Reverberant Room Method for Sound Testing of Fans.
  - .4      ANSI/AMCA Standard 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2      The Master Painters Institute (MPI)
  - .1      Architectural Painting Specification Manual - current edition.
    - .1      MPI #18, Primer, Zinc Rich, Organic.

**1.3               ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Product Data:
  - .1      Submit manufacturer's instructions, printed product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- .3      Shop Drawings:
  - .1      Submit drawings stamped and signed by professional engineer registered or licensed in Canada and OIQ member.
  - .2      Provide:
    - .1      Fan performance curves showing point of operation, mechanical power bhp, useful power (kW) and efficiency.
    - .2      Sound rating data at point of operation.
  - .3      Indicate:
    - .1      Details on motors, sheaves, bearings, shaft and access for lubrication if applicable.
    - .2      Minimum performance achievable with variable speed controllers as appropriate.

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**1.4 MATERIAL/MAINTENANCE/REPLACEMENT MATERIAL SUBMITTALS**

- .1 Where materials or products are specified by their trademark, consult the Instructions to Tenderers document for the procedures to follow regarding the request for approval for materials or product replacement.
- .2 Extra Materials:
  - .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
    - .1 Provide:
      - .1 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
        - .1 Bearings and seals.
        - .2 Addresses of suppliers.
        - .3 List of specialized tools necessary for adjusting, repairing or replacing.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, ideally indoors or in a clean, dry, well ventilated area and in accordance with manufacturer's recommendations.
  - .2 Store and protect HVAC fans from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
  - .2 Capacity: flow rate, total and static pressure, mechanical power (bhp), efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
  - .3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.
  - .4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.
  - .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210. Supply unit with ANSI/AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

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## **2.2 FANS GENERAL**

- .1 Motors:
  - .1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment supplemented as specified herein.
  - .2 For use with variable speed controllers, as appropriate.
  - .3 Power, type and features as specified in the mechanical tables on plan.
- .2 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards fan safety screens as indicated and as specified in Section 23 05 13 - Common Motor Requirements for HVAC Equipment, dampers and vanes and as indicated.
- .3 Factory primed before assembly in colour standard to manufacturer.
- .4 Scroll casing drains: as indicated.
- .5 Finish on fume hood exhaust fans and fume cupboard : According to section 23 38 13 – Commercial Kitchen Hoods.
- .6 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .7 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- .8 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

## **2.3 CENTRIFUGAL FANS**

- .1 Fan wheels:
  - .1 Welded steel or aluminum construction.
  - .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
  - .3 Air foil blades, as indicated.
- .2 Bearings:
  - .1 Heavy duty, grease lubricated, ball or spherical roller, self-aligning, pillow block design with oil retaining, dust tight seals. Bearings for Class I fans to be designed for an average minimum life of 50,000 hours L-10 and 250,000 hours L-50 life when rated at the fan's maximum catalogued operating speed. Bearings for Class II and III fans to be designed for an average minimum L-10 life in excess of 750,000 hours when rated at the fan's maximum catalogued operating speed. Bearing lubrication lines and grease fittings are to be extended to the outer tube wall for easy accessibility.
- .3 Housings:
  - .1 Tubular design, arrangement 4 or 9 as indicated, continuously welded construction. Housings of square design, lock seams or sheet metal panel construction are not acceptable substitutes. Inlet cone to be aerodynamically designed and spun providing a minimum separation of airflow. Wheel diameters and outlet areas to be in accordance with the standard dimensions adopted by

AMCA for tubular centrifugal fans. Designs to conform with AMCA Standard 99-2411.

.4 Shafts

- .1 ASTM A-108 steel, grade 1040/1045, precision turned, ground and polished. Shaft's first critical speed to be at least 125% of the fan's maximum operating speed for each fan class.
- .5 Variable volume control devices:
  - .1 Mounted by fan manufacturer.
  - .2 Adjustable inlet vanes: operated from a mechanism linked to each damper vane. Support each vane at ends in bronze bearings. On DWDI fans interconnect vanes to operate in unison. Provide locking devices for manual operation.
  - .3 Variable speed drives: refer to Section 25 30 02 – Field Control Devices

**2.4 DIRECT DRIVE SQUARE IN-LINE CENTRIFUGAL FANS**

- .1 Fan housing of square design, constructed of heavy gauge galvanized steel and includes square duct mounting collars. Two (2) removable access panels located perpendicular to the motor mounting panel permit easy access to all interior components. Centrifugal wheel is backward inclined design, statically and dynamically balanced, constructed of aluminium and includes a wheel cone carefully matched to the inlet cone.
- .2 Permanently lubricated motors are carefully matched to the fan loads and are readily accessible for maintenance.
- .3 Provide a safety switch and handy box with factory wiring done between motor and handy box. When solid-state speed controllers are specified, these are to be mounted on the fan casing and factory wired to the handy box unless indicated otherwise.
- .4 Accessories and options
  - .1 12 mm (½") aluminium screen to provide protection at inlet or outlet for nonducted applications.

**2.5 BELT DRIVE SQUARE IN-LINE CENTRIFUGAL FANS**

- .1 Fan housing of square design, constructed of heavy gauge galvanized steel and including square duct mounting collars. Two (2) removable access panels located perpendicular to the motor mounting panel permit easy access to all interior components. Centrifugal wheel is backward inclined design, statically and dynamically balanced, constructed of aluminium and includes a wheel cone carefully matched to the inlet cone.
- .2 Motors are heavy-duty ball bearing type carefully matched to the fan load. Motors and drives are mounted out of the air stream and readily accessible for maintenance. Fan shafts are mounted in permanently sealed, lubricated pillow block ball bearings. Bearings are selected for a minimum life (L50) of 200,000 hours at maximum operating speed. Pulleys are adjustable and sized for a minimum of 150% of the installed motor horsepower; supply fans with pulleys installed and adjusted to specified RPM.
- .3 Provide a safety switch and handy box with factory wiring done between motor and handy box.

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.4 Accessories and options

- .1 12 mm (½") aluminium screen to provide protection at inlet or outlet for non ducted applications.

**2.6 COMMERCIAL HOOD EXHAUST FAN**

- .1 Units approved by U.L. 762 « Restaurant Exhaust Appliances », proven for continuous operation in ambiante conditions of 205 °C (400 °F), and compliant to NFPA 96 « Vapor Removal for Cooking Equipment ».
- .2 Housing built heavy gauge aluminum, reinforced for maximum rigidity; base in 3003 aluminum alloy with welded corners for maximum protection against the elements. Grease is channeled and drained at a single point in the base. The drain includes a pivoting spout recess for grease in an accumulation box.
- .3 Centrifugal wheel with backward curved impeller blades with no possibility of overloading, statically and dynamically balanced; Extra strong self-aligning ball bearings, grease lubricated and selected for a minimum service life (L50) of 200,000 hours at maximum operating speed; shaft protected against corrosion constructed so that the first critical speed is at least 30% above the maximum speed of operation.
- .4 Entirely enclosed motor for heavy duty service with ball bearings. Motor, drive shafts and axle are mounted on anti-vibration mounts. Adjustable pulleys chosen for a minimum of 150% of the installed motor power; provide fans with pulleys installed and adjusted to the speed specified in rpm.
- .5 Integrated junction box and switches, weatherproof, factory assembled and connected; ventilated adapted curb meeting NFPA 96 standards; hinges and chains at the base of the curb for easy inspection and maintenance.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for HVAC fans installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 FAN INSTALLATION**

- .1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

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- .2 Provide sheaves and belts required for final air balance.
  - .3 Bearings and extension tubes to be easily accessible.
  - .4 Access doors and access panels to be easily accessible.

### **3.3 ANCHOR BOLTS AND TEMPLATES**

- .1 Size anchor bolts to withstand seismic acceleration and velocity forces according to Section 23 05 49.01 – Seismic Protection Systems

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**