

- 1 General
- 1.1 **SUMMARY**
 - .1 Section Includes
 - .1 Labour, Products, equipment and services necessary to complete the Work of this section.
- 1.2 **REFERENCE STANDARDS**
 - .1 Comply with the latest edition of the standards referenced herein:
 - .1 Fans: Designed and constructed in strict conformity with the AMCA Standards and bearing the "Certified Rating Seal".
 - .2 Applicable sections of CSA C22.2 No. 113 for fan construction and installation.
 - .3 Occupational Health and Safety Act, O.Reg 851.
- 1.3 **SUBMITTALS**
 - .1 Shop Drawings
 - .1 Submit Shop Drawings in accordance with Section 01 33 00.
 - .2 Submit manufacturer's certified Shop Drawings to the Consultant and include:
 - .1 Complete information on fan construction and performance.
 - .2 Performance curves over full range from shut-off to free delivery.
 - .3 Drive details.
 - .4 Make, type and catalogue number of bearings.
 - .5 State hour rating of bearings when specified.
 - .6 Proof of Canadian manufacturer or manufactured in Canada.
 - .2 Operation and Maintenance Data
 - .1 Submit printed operating instructions and maintenance data in accordance with Section 01 33 00.
 - .3 Maintenance Materials
 - .1 Provide and turn-over to Owner at time of Substantial Completion one V-belt set for each size used.
 - .1 Where more than one fan uses the same set size, provide only one set.
 - .4 Warranty
 - .1 It shall be minimum of 5 years on fan housing, bearings, fan wheel.

2 Products

2.1 **GENERAL REQUIREMENTS**

.1 Performance Ratings

- .1 Type, size and capacity shown on Drawings for each specific application and conforming to requirements of manufacture, operation and performance as specified.
- .2 Select fan size, operating rpm and rating point on stable head flow curve with smooth characteristics.
- .3 Operating at least 20% below first critical speed when operating at maximum speed for class of construction.
- .4 Dynamically and statically balance wheels of free standing or unitary fans to acceptable tolerances relative to size and speed.

.2 Cleaning and Metal Protection

- .1 Thoroughly clean interior and exterior surfaces of fans including screens, at factory with approved de-greasing agent to CGBS 1-GP-181M+ Amdt-Mar-78.
- .2 Apply a coating of red oxide or zinc chromate primer unless special protective coating is specified.
 - .1 Exception: Fans constructed of galvanized steel or aluminum.

.3 Materials

- .1 Fan casings: Heavy gauge steel or spun aluminum construction, as specified by model number.
 - .1 Explosion proof construction (non-sparking) where listed in schedules.

.4 Bearings

.1 Service life

- .1 To L10 life standard in accordance with latest AFBMA code.
- .2 Unitary, axial and free standing fans: 200,000 (60,000) (80,000) (100,000) hour service.
- .3 Other fan bearings: 8,000 hour service.

.2 Type

- .1 Grease lubricated ball or roller type fan bearings with ample thrust provision to prevent end play during normal life of bearings.
- .2 Smaller than 36 mm diameter: Cartridge type.
- .3 36 mm diameter and larger: Shaft adapter sleeve type bearings utilizing horizontally split pillow blocks and mechanical flinger type grease valves.
- .4 Shafts smaller than 56 mm diameter, interference fit bearings may be used in lieu of adapter sleeve type.

- .3 Bearings in air stream
 - .1 Well secured extended grease lubricating lines unless bearing is easily accessible through man-size access door.
 - .2 Pack bearings with low temperature grease in factory.
- .4 Axial flow fans
 - .1 Conform to these Specifications except where inner cylinder mounting methods are used or dimensions do not permit it and special or flange mounted type bearings are required.
- .5 Grease fittings, for fans driven by motors 0.375 kW (1/2 HP) and larger
 - .1 Provide bearings with Zerk or Alemite grease fittings, with provision for automatic relief of lubricant pressure to outside of fan, away from wheel and visible from maintenance location.
 - .2 Use service fittings and relief fittings easily accessible from maintenance locations and at separate and opposite sides of bearing housing.
- .5 Motors and Drives
 - .1 Motor ratings
 - .1 To Section 23 05 13.
 - .2 Type, kW (HP) rating, motor speed and electrical characteristics shown on Drawings.
 - .3 Capable of satisfactory operation over range of performance from shut-off to run-out at 110% of rated rpm at point of selection.
 - .2 Drive and belt guards: To Section 23 05 01.
- .6 Accessories
 - .1 Fans with variable inlet vanes
 - .1 Operating mechanisms to provide simultaneous adjustment of vanes.
 - .2 Motor operated mechanisms to be suitable for adaptation of motor operator provided under Division 25.
 - .3 Quick opening access doors in scroll casing.
 - .4 On DWDI fans interconnect vanes in each inlet to operate in unison.
 - .5 Provide locking device for manual operation.
 - .2 Casing drains
 - .1 Fans discharging vertically through roof: Fitted with 38 mm casing drains.

- .3 Roof mounted fans
 - .1 Factory mounted unfused disconnect switches wired to motor terminals.
 - .2 Conduit or wiring post running through fan housing so that wiring may be run to line side of disconnect switch from below roof without disturbing
- .4 Roof curbs for roof mounted fans and ventilators
 - .1 Prefabricated insulated galvanized steel sheet curbs for mounting to roof deck.
 - .2 Prefabricated insulated galvanized steel sheet curbs for mounting to roof deck.
 - .3 Minimum curb height: 300 mm on every side, or as dimensioned on Drawings.

2.2

FAN TYPES

.1 Centrifugal Fans

.1 Arrangements

Fan Type	Arrangement
Belt driven single inlet single width (SWSI) fans up to and including 915 mm wheel diameter	#1 or #2
Belt driven single inlet single width (SWSI) fans with wheel diameter larger than 915 mm diameter	#3
Belt driven double width double inlet (DWDI) fans	#3
Belt drive plenum (plug) fans, single width single inlet (SWSI) fans	#3
Direct connected double width double inlet (DWDI) fans	#7
Direct connected single inlet single width (SWSI) fans	#8
Utility sets	#10
Tubular single width single inlet (SWSI) fans	#1 or #9

- .2 Fan wheels
 - .1 Backward curved or backward inclined for fan wheels less than 686 mm diameter.
 - .2 Single or double thickness backward curved air foil blades for fan wheels 686 mm diameter and larger.
- .3 Fan casing
 - .1 Continuous seam welded.
 - .2 Inlet mounting collar.
 - .3 Outlet flanged collar.
- .4 Plenum (plug) fans
 - .1 Safety screen enclosure around fan and motor fabricated from steel angle and expanded metal mesh.
 - .2 Access covers to fan and motor shaft ends for speed measurements.

- .5 In-line cabinet fans
 - .1 Single wheel SWSI centrifugal fans with motor and V-belt drive.
 - .2 Removable panels for access to internal parts.
 - .3 Internally lined cabinet with 50 mm thick rigid acoustic insulation.
 - .4 Expanded metal mesh over insulation on floor.
 - .5 Motor pre-wired to external junction box.
 - .6 Mounting ring or brackets for vertical or horizontal suspension from overhead structure.
 - .7 Belt guard, motor and drive.
 - .8 Hanger brackets.
 - .9 Inlet and outlet cones.
 - .10 Quick-opening access door.
 - .11 External grease and relief fittings to each bearing.
 - .12 Variable inlet vanes and linkage where noted.
- .6 Ceiling cabinet fan / in-line cabinet fan
 - .1 Fan wheel
 - .1 Centrifugal direct drive type.
 - .2 High strength polymer material.
 - .3 Forward curved.
 - .2 Motor
 - .1 Continuous duty, permanently lubricated, thermally protected.
 - .2 Resilient motor mounts to eliminate vibration.
 - .3 Casing
 - .1 Heavy gauge steel.
 - .2 Acoustic lining.
 - .3 Painted for corrosion resistance.
 - .4 Built-in backdraft damper.
 - .5 Outlet connection for round duct.
 - .6 Integral mounting flanges to allow for ceiling installation.
- .7 Tubular centrifugal fans
 - .1 Characteristics and construction as for centrifugal fan wheels.

- .2 (Direct drive motor) (Belt drive assembly).
 - .3 Smooth rounded inlet, and stationary guide vanes.
 - .2 Tube and Vane Axial Fans
 - .1 Fan
 - .1 Fabricated of welded steel with welded motor support.
 - .2 Quick-opening access door.
 - .3 External grease and relief fittings to each bearing.
 - .4 Streamlined inlet cone and discharge bell sections.
 - .5 Integral silencer casing.
 - .6 Reinforced legs for floor mounted units.
 - .7 Hanger brackets.
 - .8 Support bracket welded to side of casing for suspended units.
 - .2 Drives
 - .1 Direct driven: (Adjustable pitch) (Fixed pitch) (Fan blade with totally enclosed "air-over" motors and diameter of wheel hub at least equal to that of motor frame.
 - .2 Belt driven: (Fixed) (Adjustable) blade wheels with externally mounted open drip proof motors, internal belt fairing, external belt guards and adjustable motor mounts.
- .3 Roof Top Fans and Ventilators
 - .1 Upblast exhaust and downward supply air fans
 - .1 Suitable for mounting on curbed roof openings.
 - .2 Heavy gauge galvanized steel housing and windband.
 - .3 Finished inside and outside with sprayed asphalt.
 - .4 Heavy gauge curb cap.
 - .5 Gravity or spring assisted steel dampers as required, with magnetic catches to dampers to prevent rattling in closed position.
 - .6 TEAO motor.
 - .7 Weatherproof protective motor cover and belt-drive.
 - .8 Supply fans complete with 25 mm throwaway filters.
 - .2 Spun aluminum dome type fans
 - .1 Belt or direct driven as indicated in schedules.
 - .2 Spun aluminum housing.

- .3 Hinged or completely removable hood for access to motor and fan.
 - .4 Non-overloading centrifugal fan wheel.
 - .5 Multi-blade gravity backdraft damper and aluminum 13 mm mesh birdscreen.
- .3 Gravity relief vents
 - .1 Spun aluminum cover.
 - .2 Welded aluminum curb cap.
 - .3 Galvanized bird screen.
 - .4 Exhaust air outlets complete with backdraft dampers.
- .4 Penthouse type intake and exhaust hoods
 - .1 Extruded aluminum fixed louvres with birdscreens on inside.
 - .2 Insulated metal roof.
 - .3 Welded base to suit curbed opening and prefinished to later colour selection.
- .4 Ceiling Fans
 - .1 Multi-bladed propellers of sheet or airfoil shape.
 - .2 Permanently lubricated ball bearings suited for operation in any position.
 - .3 Direct driven, variable speed, with EC motor complete with controllers.
 - .4 Acceptable manufacturers:
 - .1 Big Ass Fans
 - .2 Altra Air (Envira North)
 - .3 MacroAir
- .5 Propeller Fans
 - .1 Wall type belt or direct driven propeller fans
 - .1 Multi-bladed propellers of sheet or airfoil shape steel within bell mouth entrance.
 - .2 Grease lubricated ball bearings suited for operation in any position.
 - .3 (Direct) (or) (belt) driven, with motor as indicated.
 - .4 Bird screen (and automatic backdraft dampers with gasketed edges).
 - .5 Wire guard on motor side.
 - .6 Support motor with substantial brackets or frame. Motors supported integrally with wire guard will not be accepted.

- .6 Acceptable Manufacturers
 - .1 Industrial Type Construction (In-line, Propeller Utility Sets, Upblast, Fume)
 - .1 Twin City Fan
 - .2 Chicago Blower
 - .3 New York Blower
 - .4 Northern Blower
 - .5 Barry Blower
 - .6 Carnes
 - .7 Aeroflow
 - .8 Aerovent
 - .9 Howden Fan Co.
 - .10 Wood Fans
 - .11 Canada Blower
 - .2 Ceiling Cabinet Fans
 - .1 Greenheck
 - .2 Twin City
 - .3 Carnes
 - .4 Aerovent
 - .5 PennBarry
 - .6 Loren Cook
 - .3 Small Propeller Fans
 - .1 Howden Fan Co.
 - .2 Greenheck
 - .3 Carnes
 - .4 Wood Fans
 - .4 Spun Aluminum Fans
 - .1 Greenheck
 - .2 Jenn Air
 - .3 Carnes
 - .5 Intake and Exhaust Hoods, Penthouses, Relief Vents
 - .1 Greenheck

- .2 Jenn Air
- .3 Carnes
- .4 Loren-Cook

2.3 CONTROL AND MONITORING SYSTEMS (***FUTURE*** BAS INTEGRATION)

- .1 Any vendors that are authorized dealers or distributors of the following control systems are acceptable:
 - .1 Delta Controls
 - .2 Reliable Controls
 - .3 Schneider Electric SmartX Series
 - .4 Distech Controls
 - .5 Johnson Controls Facility Explorer
 - .6 Honeywell CIPer series, Spyder Models 5 or 7
- .2 BAS System Integration:
 - .1 All control systems must be integrated to the City's J2 Innovations Fluid Integration (FIN) serve, including but not limited to the following:
 - .1 Graphical user interface (monitoring and control)
 - .2 Alarming
 - .3 Data Trending
 - .4 Data Archiving
 - .5 Project Haystack naming convention
 - .2 The installer must be licensed by J2 Innovations to sell, install, program and configure Fluid INtegration (FIN).
 - .3 Building Controllers (BC) must be Tridium Niagara JACE with the Haystack module and driver. The installer must be a licensed Tridium system integrator for any Tridium BCs or embedded or edge Niagara Framework products used. Soft JACE is not accepted.
- .3 Licensing Requirements
 - .1 Licenses shall be provided to and in the name of the City of Toronto
 - .2 Licenses shall be perpetual, transferrable, assignable and royalty free.
 - .3 **Tridium Licenses shall allow all workbench/supervisor brands complete system access and functionality.**
- .4 **Installer and Manufacturer Qualifications**
 - .1 **Installer shall have an established working relationship with Control System Manufacturer.**

- .2 Installer shall have successfully completed control system's control system training. Upon request, installer shall present record of completed training including course outlines.**
- .3 It is the intent of these specifications to define an open protocol state-of-the-art distributed computerized Building Management and Control System, which is user friendly, has known reliability, is extremely responsive, and which is to be designed, installed, implemented, and supported by a local office of approved bidders.**
- .4 BAS Contractor provides three locations for successful installations of similar open protocol computer-based systems. Sites provided must consist of more than 150 hardware inputs/outputs. Project sites must be local to the location of this project.**

3 Execution

3.1 **GENERAL**

.1 Fan Installation

- .1 Install fans complete with resilient mountings and restraining snubbers in accordance with Section 23 05 48.
- .2 Provide flexible connections on inlet and outlet ductwork in accordance with Section 23 33 00.
- .3 Align shafts, belt drive and motor, adjust belt tension and check motor rotation before start-up.
- .4 Protect motors and fans during construction and rotate fans, by hand, every month between delivery and acceptance of building.

.2 Air Balancing

- .1 Adjust variable pitch fan/motor sheaves during balancing to achieve specified air quantities.
- .2 Provide sheaves and belts for final air balance.

3.2 **FABRICATED GOOSENECK TYPE FRESH AIR INTAKE AND EXHAUST AIR HOODS**

- .1 Fabrication: Black steel construction.
- .2 Size, shape and arrangement as shown on Drawings.
- .3 Finish interior and exterior surfaces finished with rust inhibitive primer.

End of Section