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ARAB ENGINEERING

## 8 EXHAUST FANS

### 8.1 GENERAL

#### 8.1.1 Scope

- 1 This Part details the requirements for all types of extract fans as specified in the contract.
- 2 Related Sections and Parts are as follows:

Section 1 General  
Section 21 Electrical

#### 8.1.2 References

- 1 The following Standards are referred to in this Part:  
BS 848.....Fans for general purpose  
BS 5000.....Rotating electrical machines of particular types or for particular applications

## 8.2 EXHAUST FANS

### 8.2.1 General

- 1 The make and design of the exhaust fans shall be approved by the Engineer and evidence supporting the claimed noise efficiencies shall be submitted for approval prior to placing the order. Where fans are fitted with noise attenuators full details of the attenuators shall be given.
- 2 Belt driven fans shall be fitted with pulleys suitable for V-belts. The pulleys shall be fixed by taper lock type bushes and shall be secured to the fan and motor shaft by keys fitted into machined keyways.
- 3 All fans which are to large or heavy to be man handled safety shall be provided with eyebolts or other lifting facilities to enable mechanical lifting equipment to be used.
- 4 The whole fan assembly shall be fully finished against corrosion.
- 5 Access shall be provided to carry out all necessary maintenance required.
- 6 The electrical terminal box shall be located to allow for easy connection and disconnection the electrical supply.
- 7 Where required suitable guards shall be installed to protect against all moving parts including the motor.
- 8 All motors are to be positioned to permit effective ventilation of the motor and all components of the fan and motor are to be suitable to withstand the temperature conditions expected.
- 9 All fans shall be installed to avoid vibration and noise to the ductwork or building fabric.
- 10 Each fan motor shall be designed to drive its respective fan when the fan is operating at a speed or pitch angle 10 % in excess of that required to meet the fan performance.
- 11 Where required flexible connections shall be installed at both the inlet and outlet of each fan.
- 12 All extract fans shall have the direction of rotation discharge direction and arrangement to suit the space conditions.
- 13 All extract fans shall be provided with an electrical isolator adjacent to the unit.
- 14 The fan motors shall be insulated to a minimum of a Class 'B' insulation

- 15 All fans shall be capable of operating at ambient temperatures of 50 °C and the casing material shall be able to withstand sun radiation temperature upto 85° C.
- 16 The noise ratings for each fan shall not exceed the levels specified in the QGEWC regulations for the area being served.
- 17 All fans used for life safety operations or hazardous operations shall be subject to Civil Defence Department approval.
- 18 The extract fans shall be axial, centrifugal or mixed flow as detailed in the Project Documentation.

### **8.2.2 Centrifugal Extract Fans**

- 1 The centrifugal extract fans shall be of the non-overloading type.
- 2 The fan housing shall be rigidly built and braced. Where the fan scroll is 450 mm or more in width an access door with frame and gasket shall be provided. All access doors shall be fabricated so that the inner surface is flush with the inside of the fan scroll.
- 3 The fans shall not produce excessive noise as compared to units of like size and power when used with the specified vibration isolation.
- 4 The fan manufacturer shall provide for approval for each fan, certified sound power ratings with a octave band analysis and also the volume, horsepower, pressure characteristic curves from shut-off to free delivery.
- 5 The fan impeller shall have ample strength and shall be statically and dynamically balanced to avoid vibration.
- 6 The blades shall be designed to ensure quiet and efficient operation.
- 7 The fans shall be V-belt driven unless otherwise indicated.
- 8 The motor pulley shall be an adjustable type for two (2) grooves or less. Drives requiring three (3) grooves or more shall be the variable pitch type.
- 9 Drives for fractional horsepower motors may have one belt rated at 200 % of motor horsepower. All other fans shall have not less than two belts and shall have sufficient capacity to drive the fan with one belt broken.
- 10 The fans shall be provided with belt and pulley guards manufactured of perforated metal or other approved material. Covers shall be provided in the guard for the fan and motor shafts for ease of taking tachometer readings without removal of the guard.
- 11 The fan motor shall be sized to drive its respective fan when the fan is operating at a speed 10 % in excess of that required to meet the fan performance. No motor shall operate within the service factor.
- 12 All fans discharging directly up though the roof shall be equipped with a 40 mm casing drain which shall be connected to the nearest floor drain.
- 13 All fans shall be factory coated with one coat of primer and one coat of machine enamel. The interior of the fans shall be painted as per the manufacturer's standard.
- 14 The fan shaft shall be supported by least two roller or ball bearings with easy access to the lubrication points where required.
- 15 All fans scheduled to be located outdoors shall be furnished with weather proof motor and drive housings.

### **8.2.3 Axial Extract Fans**

- 1 Axial flow fans shall be capable of giving the design flow when tested to BS 848.
- 2 The fan casing shall be constructed of mild steel plates with angle stiffeners, with the easing hot dip galvanised after manufacture.
- 3 The inlet and outlet of the axial flow fans shall be flanged for connection to the system.
- 4 The casing shall cover both impeller and motor so that the fan can be removed without disturbing adjacent ductwork or other components of the system.
- 5 A flame proof external terminal box shall be fitted on the casing.
- 6 All lubrication points shall be extended to outside the casing and in a position that will permit easy access.
- 7 The impellers shall be die cast in aluminium and x-rayed after manufacture.
- 8 The impeller shall be capable of running continuously at 20 % in excess of the rated speed.
- 9 The impeller shall be keyed and locked to the shaft, which shall be statically and dynamically balanced and tested at over speed prior to dispatch from the manufacturer's works.
- 10 The blade angle shall be adjustable over at least a 30 ° range with markings at the base to indicate the blade angle.
- 11 All motors are to be positioned to permit effective ventilation of the motor and all components parts of the fan and motor are to be suitable to withstand the temperature conditions expected.
- 12 A suitable support is to be provided for each fan. The frame is to be fabricated from rolled steel channel with adequate cross members for bolting the fan in position.
- 13 Anti-vibration mountings and flexible connection shall be provided to isolate the fans from the adjacent ductwork and building fabric.

#### **8.2.4 Roof Mounted Extract Fans**

- 1 The roof mounted extract fans shall meet the appropriate requirements as detailed in the general section.
- 2 The cowls and bases shall be of a weather proof material such as galvanised after manufacture, aluminium, aluminium magnesium alloy or glass fibre.
- 3 Cases shall be formed so as to ensure a weather proof fitting.
- 4 Provision for access to the fan components shall be provided.
- 5 The fans shall be provided with back draught dampers and/or fire release dampers where indicated.
- 6 Bird guards of not greater than 25 mm mesh shall be provided as an integral part of the unit.
- 7 The fans shall be mounted on a weather proof curb at least 200 mm above the finished roof level.

#### **8.2.5 Twin Fan Toilet Extract Units**

- 1 The unit casing shall be manufactured in epoxy coated aluminium alloy and shall house the twin fan assemblies.
- 2 Each fan shall be a double inlet forward curved centrifugal impeller running in an individual scroll.
- 3 The impeller may be either direct driven or belt driven depending upon the fan duty.

- 4 Direct driven fans shall incorporate a volume control damper on the suction side to regulate the volume to the required duty.
- 5 The motors shall be manufactured to BS 5000 TEFV type with sealed for life bearings.
- 6 The fans shall be fitted with air flow sensors and shall discharge into a common plenum through a linked shutter system.
- 7 Motors and flow sensors shall be pre-wired to a fitted isolator accessible from outside the unit.
- 8 The toilet extract units shall be supplied for either roof mounting duct mounting or installation within a plant room as indicated on the drawings.
- 9 The toilet extract units shall be supplied with auto change over panels with duty/standby selector switch, run/fail indication lamps and cyclic relay for duty sharing.

#### **8.2.6 Wall and Window Mounted Extract Fans**

- 1 Extract fan shall be of the propeller type suitable for wall/window mounting.
- 2 The fan construction shall be of moulded plastic
- 3 Motors shall be of the shaded pole induction type enclosed in an aluminium alloy case and protected by a thermal over load cut out.
- 4 The motor bearings shall be self alignment sealed for life type.
- 5 The fans shall be provided with a solenoid operated back draught shutters. The solenoid shall open and close the back draught damper silently as the fan is switched ON and OFF.

#### **8.2.7 Propeller Type Extract Fans**

- 1 The impeller shall be of steel or aluminium and the blades shall be fixed to the hub or the blades and hub shall be formed in one piece.
- 2 The bearings shall be ball, roller or sleeve type sealed for life or with accessible lubrication points.
- 3 The propeller fans may be ring mounted diaphragm mounted or diaphragm mounted in a casing. The casing shall be longer than the length of the motor and fan.
- 4 The casing shall be of steel construction with flanged ends and shall incorporate an inspection door.
- 5 The terminal box shall be mounted externally on the casing.
- 6 The tip speed of the fans shall not exceed 20 m/s.
- 7 Inlet and outlet grilles shall be installed on the fans incorporating gravity back draught damper.

#### **8.2.8 Kitchen and Smoke Extract Fans**

- 1 The fans shall be especially designed for smoke and kitchen extract
- 2 The fans can be either belt or direct driven with the motor fixed on resilient mountings outside the air stream.
- 3 Kitchen extract fans shall be fitted with a housing drain and grease trap easily removable for cleaning.
- 4 The fans shall be suitable for removal of smoke and grease laden vapours.

#### **8.2.9 Protectively Coated Extract Fans for Corrosive or Hazardous Use**

- 1 Where the fans are required to handle corrosive toxic flammable explosive or high temperature gases the materials and construction shall be required to suit the application and all relevant safety regulations shall apply.
- 2 Bearing and lubrication arrangements shall be suitable for the conditions expected.
- 3 Where protective coating is required to use with corrosive gases the coating shall cover all parts of the complete fan, motor and casing assembly which will be in contact with the corrosive gases.
- 4 No fan shall be installed if the protective coating has been damaged in any way.
- 5 The impeller casing shall be as specified in the Project Documentation.
- 6 All fans shall be subject to Civil Defence Department approval.
- 7 The fan motors for hazardous use or required to handle flammable or explosive gases shall be flame proof.

#### **8.2.10 Bifurcated Extract Fans**

- 1 Bifurcated extract fans shall be axial type fans.
- 2 The motor shall be completely out of this air stream.
- 3 The motor may be placed between the two halves of the casing in the external air or may be placed within the casing provided that effective ventilation is given to the motor.
- 4 The fan motor and bearings shall be suitably rated for operation at the temperature they may experience.
- 5 The fan construction and installation shall be specified for axial extract fans in Clause 8.2.3 of this Part.

#### **8.2.11 In-Line Extract Fans**

- 1 In-line extract fans shall be centrifugal, axial or mixed flow type fans as detailed in Project Documentation.
- 2 The construction and installation shall be as specified
  - (a) centrifugal fans Clause 8.2.2
  - (b) axial/mixed flow Clause 8.2.3.
- 3 The casing shall be rigidly constructed of mild steel or aluminum alloy and shall be stiffened and braced to obviate drumming and vibration.
- 4 Mounting feet shall be provided for bottling to a base or supports.
- 5 The inlet and outlet shall terminate with flanges to facilitate installation and removal.
- 6 Access panels shall be provided and shall be sized to facilitate maintenance.

**END OF PART**