

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION EM-02-10
CHLORINE ROOM VENTILATION

1. VENTILATION CAPACITY

1.1. Chlorination Plant Room Using 50 kg Chlorine Cylinders

Chlorination plant room using 50 kg chlorine cylinders shall have a ventilation rate of not less than 12 air changes per hour.

1.2. Chlorine Drum Stores

Chlorine drum store, or combined chlorine drum store and chlorination plant room, shall have a ventilation capacity of not less than 18 m³/hr per square metre of floor area.

1.3. Chlorination Plant Room Using 1-tonne Chlorine Drums

Chlorination plant room using 1-tonne chlorine drums, but is separated from chlorine drum store, shall have a dual-rate ventilation system of not less than 6 and 12 air changes per hour for low flow and high flow ventilation respectively.

2. VENTILATION ARRANGEMENT

2.1. General

The ventilation system shall have naturally aspirated intake and forced exhaust. All the air intakes and the exhausts shall be located at the highest possible level or at roof. Exhaust air shall be collected inside the room at low level and ducted to the exhaust opening for discharge. The air intakes, exhausts and ducts shall be so arranged that no stagnant air pockets shall be created inside the room and no exhaust air shall be drawn into the intake.

2.2. Ventilation Fans and Ancillary Equipment

Ventilation fans and ancillary equipment for plant room ventilation shall comply with relevant Water Supplies Department Standard Specification. All electrical equipment shall be suitable for 380V 3-phase or 220V single phase 50 Hz supply.

Equipment such as fan motor enclosures, fan blades, fan housings, louvres and ventilation ducts which are susceptible to attack by the chemical flumes in the plant room shall be protected with suitable chemical resistant coating.

2.3. Ventilation Ducts

Ductwork provided shall comply with the latest edition of the Specification for Sheet Metal Ductwork issued by the Heating and Ventilating Contractors' Association (HVCA) (DW/144).

Ventilation ducts shall be fabricated with hot dip galvanized steel sheet to BS EN 10143, Grade 22 and of thickness not less than 1.5mm. The ducts shall be so constructed that pressure losses due to eddies or vortices are minimised and no noise or vibration is created or transmitted. Face panels shall be stiffened and creased to prevent "drumming".

All ductwork shall be secured by hangers, brackets or other appropriate means of support. All mild steel components shall be hot dip galvanised to BS EN 10143, Grade 22 also. Flexible joints shall be provided at fan inlet and outlet connections. Access/maintenance openings shall be provided at appropriate locations to facilitate inspection, cleaning and disinfection of the interior.

The nominal air speed inside the duct shall not exceed 10 m/s. Multiple duty and standby ventilation fans may share one duct provided that the specified air speed and the sound level are not exceeded when the designed maximum number of fans are running and that no short circuit paths are created when not all fans are running.

2.4. Inlets and Outlets

Stainless steel fixed louvres with removable wire mesh screens shall be provided for the air inlets and outlets. The nominal air speed through the intake louvres shall not exceed 2.5 m/s.

2.5. Louvre Shutters

In addition to the fixed louvres, automatic louver shutters shall be provided to prevent chlorine gas from escaping into the atmosphere in the event of a leak. The inlet shutters shall be electrically operated and interlocked with the respective fan starters. The outlet shutters shall be operated by the air flow either mechanically or by gravity means.

2.6. Fire Dampers

Fire dampers shall be provided in air ducts at the following locations for fire compartmentation:

- (a) where a duct passes through a floor slab or a fire resisting wall which is expressly built for the purpose of preventing the spread of fire;
- (b) other locations as required by the Building Regulations (Ventilating Systems), Hong Kong; and
- (c) other locations as specified in the Particular Specification.

The fire damper shall have a fire rating not less than that of the wall or floor slab in which it is situated. The damper shall be held in open position and shall be closed automatically at a temperature of 72°C unless otherwise specified.

3. CONTROL AND MONITORING

3.1. Chlorine Leak Monitoring

One set of chlorine leak monitoring system comprising at least two detectors, one monitor and one chlorine concentration indicator shall be provided for each chlorine room or other location as specified in the Contract. The monitor shall have two independently adjustable alarm settings with the low level setting at 1 ppm and the high level setting at 3 ppm both set in the factory. The chlorine detectors shall be located at the most effective interception points for leaked chlorine gas and shall be readily accessible for maintenance. The chlorine concentration indicator shall have a range of 0-20 ppm. The monitor shall be powered by the uninterruptible d.c. supply at the control and monitoring panel. An audible alarm and a flashing warning lamp shall be provided at the entrance of the room to indicate the alarm condition.

3.2. Control and Monitoring Panel

A control and monitoring panel shall be provided for each chlorine room. The panel shall be mounted on an external wall near the entrance. The panel and all externally mounted equipment shall have an IP 65 construction and weather proof finish. The following equipment shall be provided in this panel :

Fan starters with overload protection devices

Motorized louvre controllers

3-position system operation mode selector
(Low Ventilation/ High Ventilation/ Manual)

2-position fan duty selector
(No. 1 Duty/ No. 2 Duty or Low/ High, as applicable)

‘Chlorine Leak Emergency Alarm’ manual pushbutton
(latched, key released, mushroom headed type)

‘Start’ and ‘Stop’ pushbuttons for each fan

‘Open’ and ‘Close’ pushbuttons for each set of motorized louvres

‘Start’ and ‘Stop’ pushbuttons for the chlorine absorber (where specified)

‘On’ and ‘Tripped’ indicator lamps for each fan

‘Open’ and ‘Closed’ indicator lamps for the motorized louvres

‘On’ and “Tripped” indicator lamps for chlorine absorber (where specified)

‘High Chlorine Leak’ flashing indicator lamp

‘Low Chlorine Leak’ flashing indicator lamp

Other chlorine plant controls and alarms (where specified)

Audible alarm, ‘Accept’ pushbutton and ‘Reset’ pushbutton

Repeat contacts for remote alarm initiation

Chlorine leak monitor and indicator (where specified)

The alarm system shall operate from an uninterruptible d.c. power supply fed from dual sources (mains/rectifier and battery).

3.3. Automatic Control

When the system mode selector is in the ‘Low Ventilation’ position, the duty fan (or the low flow ventilation in the dual-rate system) shall operate and all the motorized louvres shall be opened. Failure of the duty fan shall automatically switch onto the standby fan. When the mode selector is in the ‘High Ventilation’ position, both the duty and the standby fans (or the high flow ventilation in the dual-rate system) shall operate and all the motorised louvres shall be opened.

On detection of a low level chlorine leak, all audible alarms and flashing warning lamps at the entrance of the rooms shall be activated.

On detection of a high level chlorine leak, all the ventilation fans shall stop, all the motorized louvres shall close and the chlorine gas absorber (where provided) shall operate automatically.

3.4. Manual Control

The ‘Manual’ position of the system mode selector shall be selectable only with a key. In this position, the selector shall afford independent manual control of the ventilation fans and the motorized air inlet louvres by overriding the high level chlorine leak interlocks in their control circuits. The chlorine leak alarm signals however shall not be inhibited. In installations which include chlorine gas absorbers, facilities shall be provided to manually control the individual components of the absorber system from the Control and Monitoring Panel.

3.5. Emergency Alarm

For all control modes, pressing of the emergency alarm pushbutton shall simulate a high level chlorine leak situation (i.e., fans shall trips, motorized louvres shall close, chlorine gas absorber, where provided, shall operate and all chlorine leak alarms shall be initiated).

4. EQUIPMENT

All electrical equipment shall be suitable for 220V single phase or 380V 3-phase 50 Hz supply. Fans shall be driven by squirrel cage induction motors to IEC 60034 with IP55 enclosure and class B insulation.

Items such as motor enclosures, fan blades, fan housings, louvres and ducts which are susceptible to attack by chlorine shall be protected with a chlorine-resistant coating.

All equipment used in chlorine rooms shall be of industrial safety type approved by Fire Services Department.

5. VENTILATION DESIGN

The ventilation design and the selection of equipment shall be based on the criteria stated in Clauses 5.1 - 5.3 of this Specification. Design calculations and performance data for fans, ducts and louvres shall be submitted for the approval of Water Supplies Department.

5.1. Fan Capacity

The fan capacity shall be determined with the following considerations :

- (a) The required ventilation rate in the room
- (b) Pressure drops associated with ducts and louvres
- (c) Back pressure at the exhaust not less than 5mm w.g.
- (d) Fan speed not exceeding 1500 r.p.m.

5.2. Noise Level

The sound pressure level caused by the ventilation system, at any frequency, measured at 1 metre shall not exceed 75 dBA.

5.3. Approval

The capacity, construction and layout of the ventilation system shall meet the approval of the Fire Services Department.