Impulse Ventilation

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MECHANICAL VENTILATION

When it is not possible to provide sufficient natural ventilation, the only option is to provide a mechanical means of ventilating a car park. This can be achieved using either a traditional ducted system or the more flexible impulse system.

WHAT IS IMPULSE VENTILATION?

Impulse ventilation is a system intended for the ventilation of enclosed and basement car parks without the use of ducting within the body of the car park. It may also be used in loading bays, warehouses, for service roads and tunnels, although these are likely to be designed with slightly different criteria.

Impulse ventilation differs from the conventional ducted ventilation system in a few principle ways:

- Ducting is replaced by impulse fans to provide control of the airflow within the car park.
- Smoke management and control, which is usually not possible with a ducted system, is a key feature of the impulse system.

THE IMPULSE VENTILATION SYSTEM – DESIGN & COMPONENT

The design of an impulse ventilation system is based on the same standards as a ducted system. The latter still refers to the current authority's (BOMBA) regulation requirement which states that, during emergency ventilation, the total capacity is based on 12 ACH and 6 ACH for normal ventilation.

The actual design of the ventilation system will usually be carried out by fan manufacturers, who may also perform a computational fluid dynamics simulation to analyse the stagnant air in a location. They will also assist in the commissioning of the system as most Building Control authorities now insist on witnessing a cold smoke demonstration of airflow within a car park under simulated fire conditions.

Like a ducted system, the main extract and makeup air fans are still required to provide the necessary airflow rate. The impulse fans control air direction, making sure that all parts of the car park are ventilated and that there are no stagnant areas. Unlike the main extract fans, impulse fans are not designed to handle high volumes, but they are designed for thrust. The thrust capability of impulse fans can influence the quantity of air that the fan is capable of inducing and controlling. Similar to the main extract fans, impulse fans are also fire rated and can withstand 250°C for two hours.

The CO monitoring system enables the ventilation rate to vary according to the amount of traffic movement and the level of exhaust pollution. This inevitably will result in substantial savings in energy costs. An addressable fire detection system enables the position of a fire to be accurately located, so the system can respond appropriately.

Components of an impulse ventilation system

The control panel contains a computer which is programmed to reflect the cause and effect programme for the system. Besides the starters, overloads and switches necessary to operate the various system components, all the contacts for interfaces to remote monitoring are also built into the control cabinet.

ADVANTAGES OF IMPULSE VENTILATION

- **Cost savings on building and mechanical equipments investment**
  Building height can be reduced due to the flexibility of the installation of the fans. Thus total air flow will decrease which help to reduce the power of the main exhaust and makeup air fans. Besides smaller mechanical fans, the gent set sizes will become smaller also.

- **Energy saving**
  The impulse ventilation system can be easily linked to CO monitoring which enables the system to react to the level of pollution within a car park. Depending on the pollution level, either more impulse fans are activated to increase air mixing thereby reducing the concentration of CO gases, or the airflow rate is increased to extract the polluted air more quickly. Lower airflow rates can also reduce the amount of attenuation needed, since the rate of extract overnight can be reduced when there is very little, if any, traffic movement.

- **Higher efficiency**
  Impulse ventilation incorporates a fully addressable fire detection system. This includes multi-criteria detector heads which detect smoke as well as heat. This provides early detection of a fire and its location. The accurate location of a fire enables the ventilation system to respond appropriately. It is able to provide a signal to a remote indication to display the fire's location, thus enabling the fire service to determine the most suitable route to approach the fire.

  Once a fire is detected and its location established, the impulse ventilation system will switch to smoke extract mode, thus increasing the rate of ventilation through the main extract fans and activating only the impulse fans necessary to control the flow of smoke.

- **Space and completion period**
  The smaller sized main exhaust and make up air fans allow the use of smaller fan rooms or eliminate the need altogether. With the elimination of ductworks, the duration of ventilation work will be reduced. ■

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