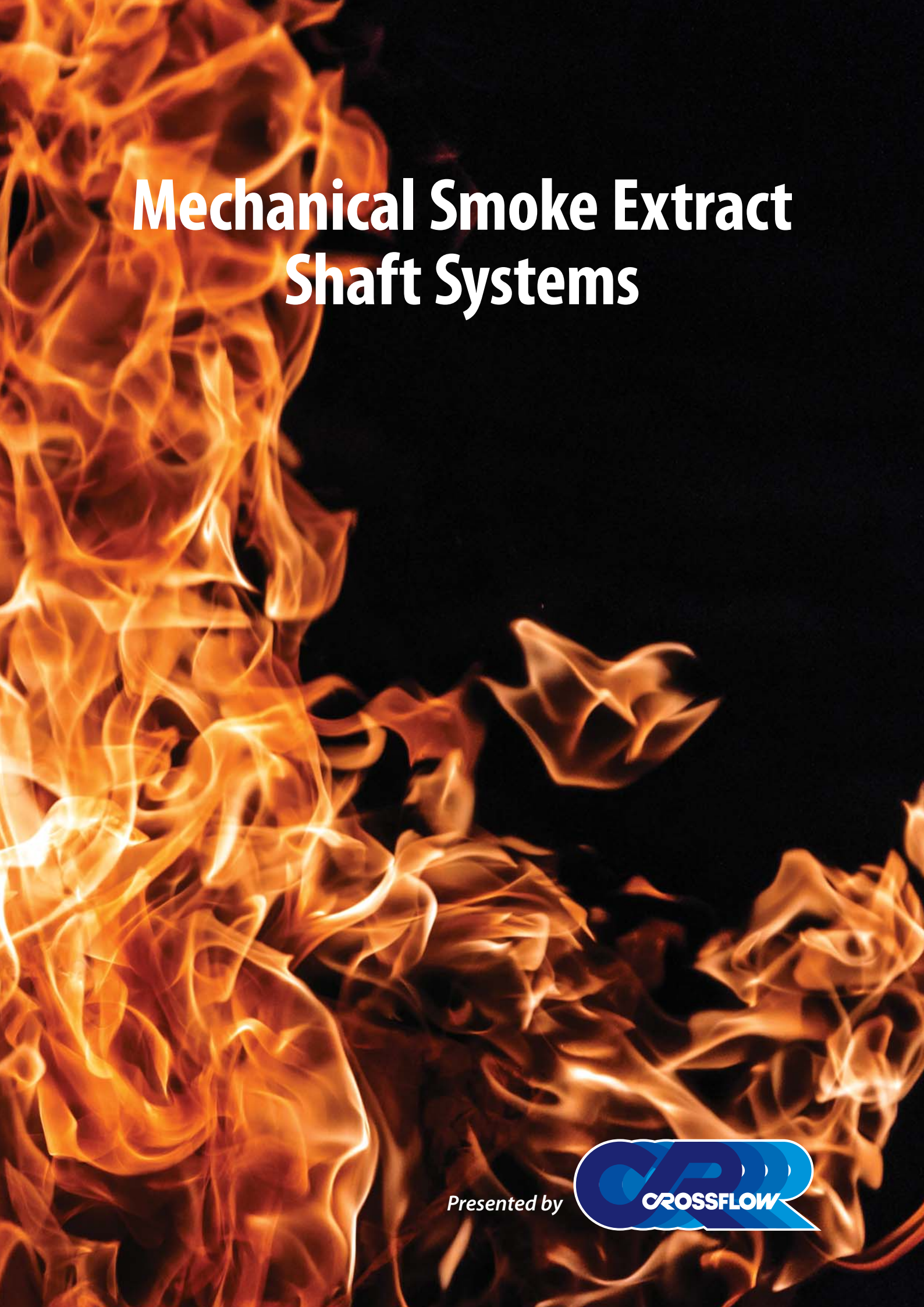


Mechanical Smoke Extract Shaft Systems

Presented by CROSSFLOW

Mechanical Smoke Extract Shaft Systems

Why Choose Crossflow?

Crossflow is a family run company with over 45 years technical expertise. We are a solutions provider offering a wide range of specialised products and are proud to be partners with manufacturers and suppliers throughout Europe who are innovate market leaders in our field. We provide a turnkey package, designed, installed and commissioned by experienced and professional engineers who are specifically trained in all aspects of our products. Our aim as a Ventilation Specialist is to provide a Smoke Ventilation Solution for individual projects that is reliable effective and code compliant. A system that exceeds building regulations whilst satisfying architectural and fire engineering requirements.

Regulation Requirements for Heat and Smoke Control

Regulation Requirements: *Fire Fighting Shafts should be designed and installed in accordance with a number of legislative requirements:*

Technical Guidance Document B 2006 (Fire Safety): This is the primary piece of Building Regulation Legislation that describes the national guidance on fire safety in new buildings of every kind.

BS 9991: 2015 – Fire Safety in Design, Management and use of Residential Buildings and **BS 9999: 2017** – Fire Safety in Design, Management and use of Building – both of these two documents give a more detailed designed requirement than **TGD-B 2006**. **BS 9991** is relevant to residential buildings/ accommodation (excluding hotels) whilst **BS 9999** relates to commercial buildings covering the four main areas that influence Fire Safety measures namely :

- Fire safety management
- The provisions of means of escape
- The structural protection of escape facilities and the structural stability of the building in the event of a fire
- The provision of access and facilities for fire fighting.

Smoke Control Association (SCA) – Guidance on Smoke Control to Escape Routes in Apartment Buildings (Flats & Maisonettes) – this document provides guidance on design parameters for smoke control systems in apartment buildings and recommends design calculations for CFD models/simulations.

Where are Smoke Shafts used?

- Protected corridors where compartment travel distance exceeds maximum distance and when external ventilation is not possible.
- Protected lobby ventilation for all small residential buildings where lobby travel distances exceed 4.5m and when external ventilation is not possible.
- Protected lobby ventilation as part of a fire fighting shaft, where the top floor is over 18m from ground level or 20m in TGD-B and when external ventilation is not possible.

Types of Smoke Shafts

- **BRE Shaft** – 3.0 m² cross sectional area naturally ventilated – tested by British Research Establishment to 101 storeys.
- **Naturally Ventilated Shaft** – minimum of 1.5m² area smaller version of the BRE Shaft – Maximum aspect ratio 2:1 which means smallest dimension must be more than 850mm. Suitable where space is limited.
- **Mechanical Shaft** – any size but generally > 0.6m² area. Suitable where space is limited. Consists of mechanical fans to assist extraction of smoke, at the same volumetric rate as a BRE Shaft.

System Description

1. A In multi-storey buildings, the main escape route is via a common corridor and or lobbies or a protected stairs.

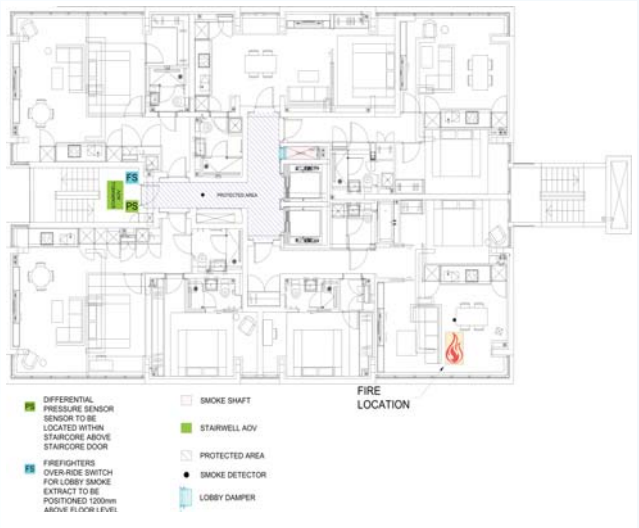
B In the event of a fire, smoke can easily spread from the fire compartment and quickly fill corridors/lobby during evacuation phase with doors opening for a short period of time, making escape difficult for occupants.

C Smoke entering the stairs can also make escape difficult for occupants/residents on higher levels.

2. BS9991 – Three types of systems have been mentioned in order to achieve the required ventilation, namely a pressurisation system, a mechanical smoke ventilation system or a natural smoke ventilation system.

3. Crossflow has designed and developed a mechanical smoke shaft ventilation system specifically for firefighting stair cores to provide an equivalence or better than a natural smoke shaft ventilation system as specified in **BS 9999, BS 9991, TGD-B 2006** and is compliant with recommendations and guidance provided by the **Smoke Control Association (SCA) 2015**.

4. This should allow evacuation of all occupants and safe access for fire fighters through the stair core. Conditions are considered tenable when visibility towards normal objects is greater than 10m. Furthermore temperatures should be below 60ºC @ 2m above the floor and temperature of the smoke layer should remain lower than 200ºC (radiation intensity <2.5 kw/m²).



Plan Drawing

- Smoke Shaft construction is typically formed from either a fire resistant shaft board, double thickness plaster board, blockwork or concrete.
- The Smoke Shaft should be sized at no less than 0.6m² with an aspect ratio of no greater than 2:1 and have a maximum pressure drop of 50 Pa between highest and lowest point.
- The shaft should be predominately straight, vertical, fire rated to match the building requirements and well sealed against air leakage with a maximum leakage rate of 3.8m³ /L/m² @ 50 Pa pressure differences. This is to be tested and verified by the main contractor.
- The shaft is connected to each protected lobby with a 60 mins fire rated damper at high level tested and certified to **BSEN 12101-8**.

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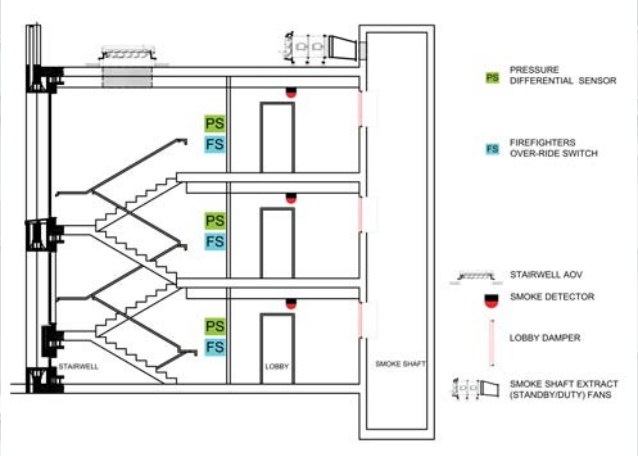
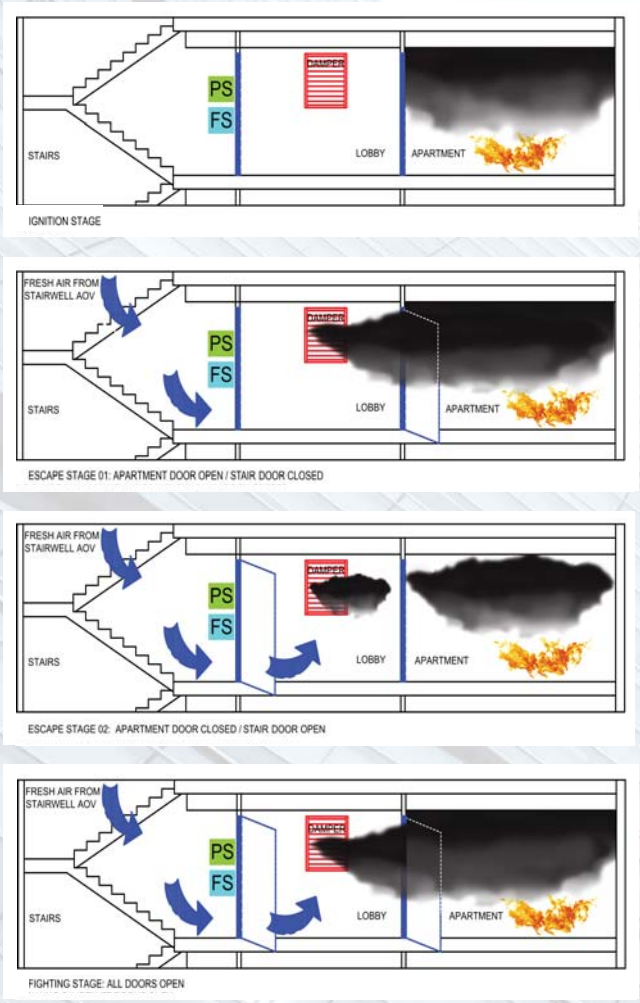
- Air inlet is provided via the stairs from the final exit door and a ventilator/AOV at the head of the stairs. No air inlet is required at the base of the shaft.
- A pressure differential switch is located at each level to monitor the Pa difference between the lobby and stairs.
- A fireman override switch is located on each level in the stair core.



Section Drawing

- On detection of smoke in the lobby the fire alarm signals the Crossflow System Control Panel. The damper on the fire level will automatically open to allow smoke to enter the shaft. The dampers on all other levels will lock out closed to prevent smoke spread to upper floors. The stairwell AOV will automatically open to allow inlet air into the stair core.
- Also on Smoke Detection, the duty fan will start to extract the smoke via the shaft. The fan flow rate is controlled via the pressure differential sensors located in the stairwell on the fire floor.
- The pressure differential sensor ensures that the pressure difference between the stair core and the lobby does not exceed 15 Pa with all doors closed.
- The fans will continue to run until the fire alarm is fully reset.



4 Stage Fire Scenario

- The fireman's over ride switch on each level operate independently. Once a fireman's override switch is activated the pressure differential switch is by passed and the fans run at full speed. The door to the stair core should be held open when the system is in this mode as the lobby will depressurise if the door is closed.
- Should the duty fan fail the standby fan will be automatically started with a changeover time of 10 secs.

System Components

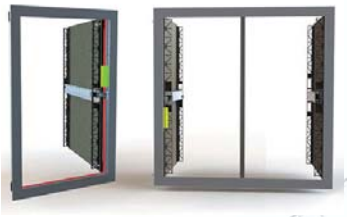


Damper - Advantage

Purpose designed and tested for lobby to shaft application

- Damper with lobby grille
- 24vDC motor drive open/drive closed on fire alarm re-set
- 60 mins fire rated
- CE marked
- Tested and Certified to BSEN12101 - Part 8
- Size dependent on Pa requirements
- Available in standard RAL colours





Damper - Kamouflage

Purpose designed and tested for lobby to shaft application

- Door type damper
- 24vDC motor drive open/pull closed on fire alarm re-set
- 60 mins fire rated
- CE marked
- Tested and Certified to BSEN12101 - Part 8
- Size dependent on Pa requirements
- Standard finish can be painted, veneered or wallpapered etc

Fans

- ELTA long cased axial fans D&S
- Smoke Vent 300ºC for 2 hours
- Volume m³/s project specific
- BS7346-2 (EN 12101-3)



Stairwell AOV

- Brakel Eura Louvre type AOV
- Brakel MonoTherma Flap type AOV
- CE Marked
- EN12101-2
- 1.0m² free area

MCC Control Panel

- CE Marked
- Conforms to IEC 61439-01
- Conforms to the EMC directive

Mechanical Smoke Extract Shaft Systems

Fireman's Override Switches

- Smoke Vent
- EN 12101 – 9
- Colour: Orange

Pressure Differential Sensor

- Dwyer Magnesense II
- CE marked

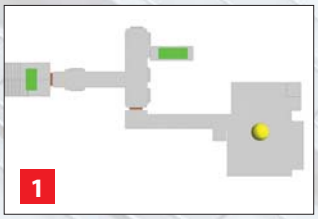
ABB Touchscreen Panel

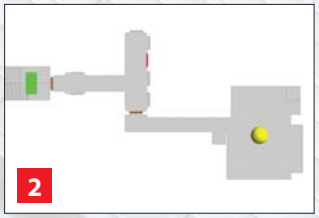
- CE Marked
- EN61000-6

CFD Study : Code Compliant Natural Shaft v Mechanically Ventilated Shaft

Blake Tower, Barbican, London

- Former YMCA Building with 20 no. levels above ground floor
- Client: Redrow PLC
- Approving authority : London Fire & Emergency Planning Authority
- 74 no. Luxury Apartments
- 1 no. Mechanical smoke shaft
- 3 no. levels below ground floor
- 16 no. levels above ground floor
- BS 9991 and SCA compliant
- Sprinklered apartments
- 1MW heat release rate
- 4.5m³/s Mechanical exhaust





Code compliant natural ventilation system components - Overview (1)

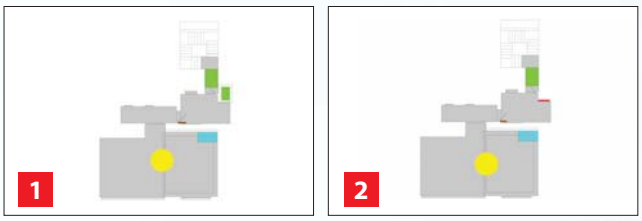
The AOV on top of the shaft and stair core is depicted in green, and the relevant doors in brown. The yellow spot marks the fire location.

Mechanical ventilation system – Overview (2)

The AOV on top of the stair core is depicted in green, the exhaust in red and the relevant doors in brown. The yellow spot marks the fire location.

Lansdowne Place, Ballsbridge, Dublin 4

- Mixed use development
- Client: Chartered Land
- 215 no Luxury apartments
- 6 no. Mechanical smoke shafts
- 4 no. Natural smoke shafts
- BS 9991 and SCA compliant
- 6MW heat release rate
- 5.6m³/s mechanical exhaust



Code compliant natural ventilation system components - Overview (1)

The AOV on top of the shaft and stair core are depicted in green, and the relevant doors in brown. The yellow spot marks the fire location. The vent to outside as per SCA document is depicted in light blue.

Mechanical ventilation system – Overview (2)

The AOV is depicted in green, the exhaust in red and the relevant doors in brown. The yellow spot marks the fire location. The vent to outside as per SCA document is depicted in light blue.

Installation and Commissioning

- Installation by a competent, suitably trained and experienced engineer in accordance with the manufactures instructions and technical specification- BS7346-8 (7) 2013
- Commissioning – BS7346-8 (8) 2013

  The responsibility of the commissioning engineer is to verify that the system operates correctly in the manner designed and that the installation workmanship is of an adequate standard. It is there necessary for the commissioning engineer to be provided with the agreed specification of the system.
- Maintenance BS7346-8 (9) 2013

  As an integral part of the life safety systems and firefighting strategy, the mechanical shafts must perform as designed in the event of an emergency. In order to ensure this, a schedule of preventative maintenance should be undertaken. EN 12101 & BS 9999 stipulates that the life safety systems should be serviced by a competent specialist contractor. A minimum of one full service and three inspections should be taken annually. Crossflow operate a Service and Maintenance Division providing statutory inspection and maintenance requirements as well as 24 hour/7day/365 call out cover.

Projects

Here are some prestigious projects Crossflow have been involved with.

Balham Hill, Clapham, London

1 no. Ext. Corridor mechanical smoke extract system

1 no. Mechanical smoke extract shaft

Charlemont Street, Dublin

4 no. Mechanical smoke extract shafts

1 no. Car park mechanical smoke extract system

Lambeth Palace View, London

2 no. Mechanical smoke extract shafts

1 no. Car park mechanical smoke extract system

No. 1 Albert Quay, Cork

2 no. Mechanical smoke extract shafts

1 no. Car park mechanical smoke extract system

Catherine House, Portsmouth

3 no. Mechanical smoke extract shafts

2 no. Natural smoke extract shafts

1 no. Car park mechanical smoke extract system

Westminster Quarter, London

4 no. Mechanical smoke extract shafts

1 no. Car park mechanical smoke extract system

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