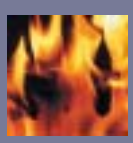
COLT

Smoke Control in Apartment Buildings

Smoke Control ·
Solar Shading ·
Daylighting ·
Louvre ·
Air Handling ·
Climate Control ·



Smoke Control

Introduction

There are two main requirements for providing smoke control in high rise apartment buildings, depending on the size and individual details. These are:

Smoke Control for Means of Escape

and

Smoke Control for Fire-fighting

Both applications can be engineered to perform in an emergency situation by utilising either:

A) Natural Ventilation

or

B) Pressurisation

A) NATURAL VENTILATION

There are two types of natural ventilation that can be used within high rise apartment buildings:

Corridor & Lobby Ventilation

Ventilators may be installed into the walls at the end of corridors, which automatically open in the event of a fire. With enclosed corridors and lobbies, a combined system of smoke dampers, ducting or smoke shafts and natural ventilators can be required.

Stairwell Ventilation

Ventilators may be installed within a stairwell to create a safe exit route for occupants and a safe means of entry for fire-fighters.

In most residential applications, corridor ventilation, lobby ventilation and stairwell ventilation work in tandem with each other providing maximum smoke protection.

Colt has the technical design experience and products specifically suited to all situations.

“It’s not the fire that kills - it’s the smoke”.

B) PRESSURISATION

Pressurisation is a technique used for protecting escape routes against the ingress of deadly smoke by maintaining the pressure within the escape route at a higher level than that in adjacent spaces.

A pressurisation system consists of two main components:

Supply Air (air injected into the area to be protected)

Air Release (air and smoke is released from the adjoining fire area)

For further information regarding the design and installation of a smoke pressurisation system please refer to Colt leaflet No. PD34 or contact Colt International Ltd.

This brochure has been designed to give a basic understanding of protecting residential apartment buildings with smoke control systems by utilising natural ventilation.

Introduction to Means of Escape

MEANS OF ESCAPE

Regardless of the location of a fire, once people are aware of it, they should be able to proceed safely along a recognisable escape route to a place of safety. In order to achieve this, it may be necessary to protect the route.

In large or complex residential buildings, a smoke control system is a way of keeping means of escape routes clear of smoke.

Smoke ventilators are installed to help maintain smoke free corridors, lobbies and stairwells to enable the occupants to evacuate the building quickly and safely.

THE LAW

The term 'fire precautions' includes matters which are the subject of legal requirements under specific fire precautions legislation including The Building Regulations.

Distance and the time it takes to travel that distance, is the key to means of escape. Regulations require self closing fire doors and smoke detectors to alert the occupier and reduce the spread of fire, but importantly, the greatest distance from one apartment door to the stairs entrance (point of escape) should be no more than 7.5 metres, where escape is only in one direction.

People are unwilling to travel more than a few metres through smoke to make their escape, before panic sets in. All possible circumstances of the occupier must also be taken into account, for example their age, families with children and people with disabilities.

Nothing should be left to chance.

"Arson is still the cause of most fires in residential apartments".

BUILDING DESIGNERS

Building designers and building owners share a responsibility to limit the potential for damage and tragedy caused by fire. Choice of building materials, layout of escape routes, number of exits and the installation of alarms together with the installation of a smoke control system are all key building design considerations.

Using the principles of ventilation and containment, occupants can escape more quickly and in greater safety, whilst fire-fighters can see and tackle the fire source.

Smoke control systems have a critical role to play in building design.

REGULATIONS

Further information can be obtained from:

The Building Regulations 1991, Fire Safety Approved Document B, Part B1.

Left and cover shot

A residential apartment building, built by Berkeley Homes (Hampshire) Limited, is situated within the Gosport Marina development.

Two vertical smoke shafts with smoke dampers on each floor are installed to protect the corridors and stairwells from smoke in the event of a fire. Both shafts have a Stairwell Ventilator at the top for smoke extract and ventilators at the bottom to provide fresh air inlet.

All dampers are hidden by Colt Universal Louvre.

Smoke Control (means of escape)

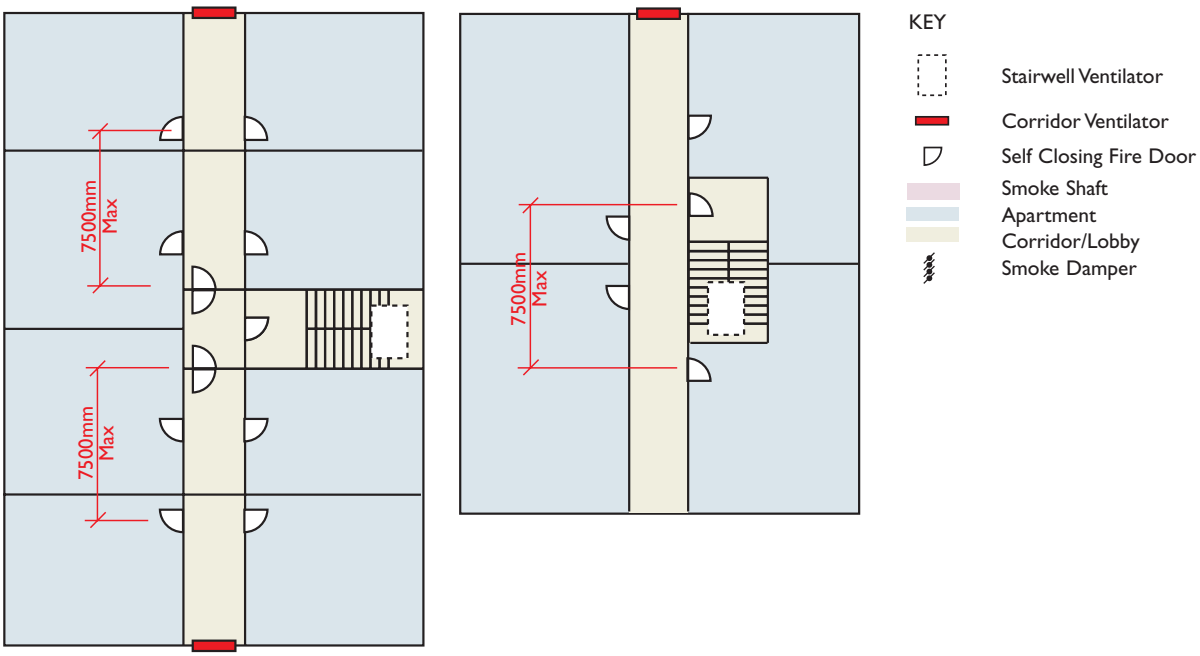
TYPICAL INSTALLATIONS

Figure A

This corridor has two dead ends. An automatically opening ventilator must be installed within the walls at both ends for smoke extraction.

Figure B

Due to the fact that the apartment door furthest away from the stairwell entrance is within 7.5m, only one automatically opening ventilator is required within the corridor.



"People are unwilling to travel more than a few metres through smoke to make their escape".

Figure C

Each apartment opens straight onto an enclosed corridor. A separate shaft with an automatically opening ventilator at one end must be incorporated.

To protect the stairwell, another automatically opening ventilator must be installed at high level in the stairwell (normally on the roof). This is applicable to all four diagrams on these pages.

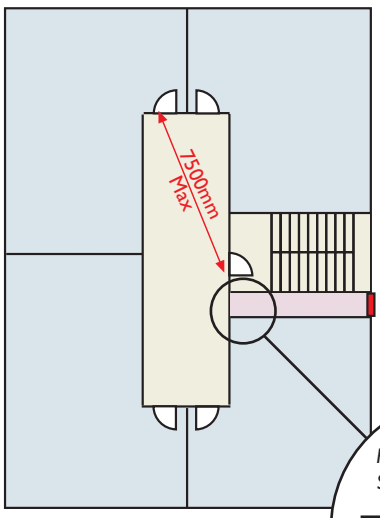


Figure 1.

Smoke flows along the shaft and out via the external wall mounted ventilator.

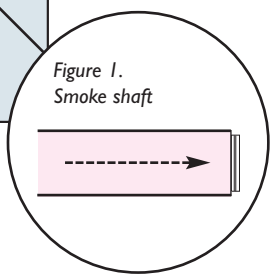


Figure 1.
Smoke shaft

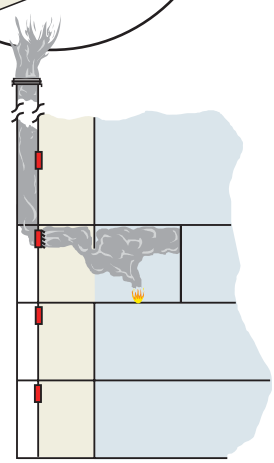
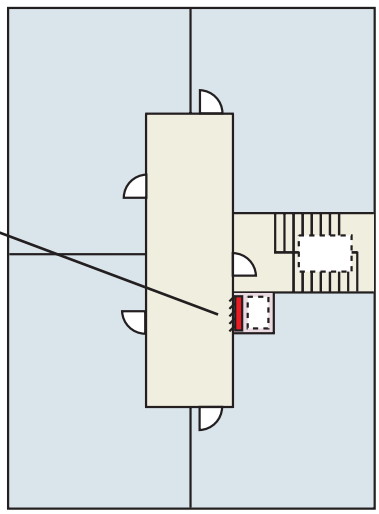


Figure D

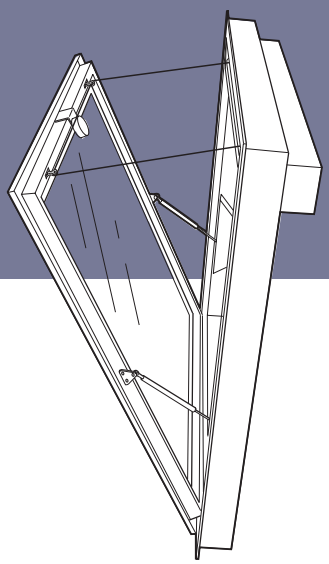
A fire damper, normally hidden by front louvres, is installed directly into a purpose built fire shaft. On detection of smoke, the alarm is raised triggering the damper to open.

At the top of the shaft is a natural ventilator which simultaneously opens creating a 'chimney effect'. Smoke flows into the shaft and is exhausted out through the ventilator on the roof.



Fire doors are sometimes preferred to dampers when facing onto a lobby or corridor. Colt can supply actuators to automatically open and close fire doors when linked into the OPV 2000 control system.

Smoke Control (corridor ventilation)



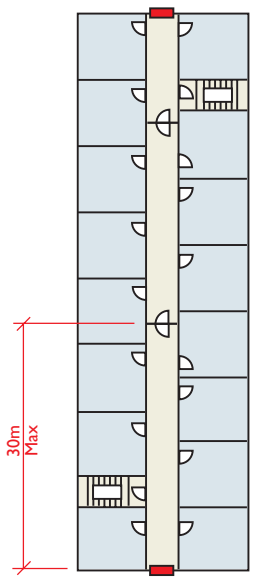
INTRODUCTION

Please refer to Figures A and B on page 5.

Escape is generally firstly through corridors. Long corridors (over 30m) must be sub-divided by self closing fire doors to stop the spread of smoke into other areas. Automatically opening ventilators must also be installed into the outer walls to allow the ventilation of smoke and gases.

When a fire spreads from a dwelling into a corridor, the smoke will quickly collect under the ceiling and will make its way along the corridor, gradually getting lower and lower, making escape much harder.

Ventilators must have a minimum of 1.5m^2 free area to conform to regulations.



PRODUCT

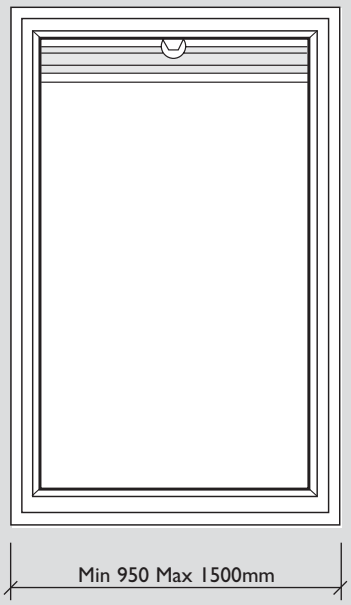
The Colt Kameleon (Corridor Ventilator) is a non-thermally broken natural glazed ventilator designed to ventilate corridors and stairwells in the event of a fire.

It has a slimline profile and a discreet window appearance with a minimum free area of 1.5m^2.

OPERATION

The ventilator is actuated by two gas springs to open and a tubular motor using cables to close. The unit is held shut by electro-magnets.

On loss of power (230v ac) the motor disengages and the gas springs push the lid open with gravity assistance. The motor design includes an electronic clutch to control the rate of opening which is automatic.



AERODYNAMIC PERFORMANCE

The Colt Kameleon (Corridor Ventilator) has been designed to maintain a geometric measured throat area of 1.5m^2. The opening angle has been limited to 28-30° to reduce operational load, this also optimises the area of the opening that is shielded from face winds when open. An opening angle of 28° ensures that there is an equal or greater opening area around the lid as through the throat of the ventilator.

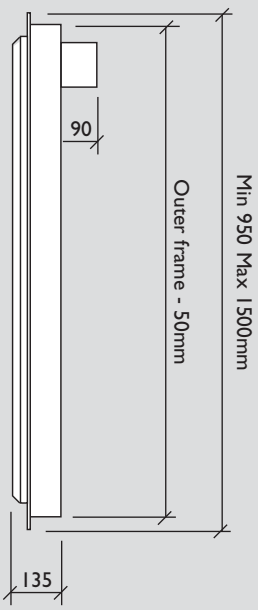
OPTIONS

Standard - Factory fixings, visible gas springs.

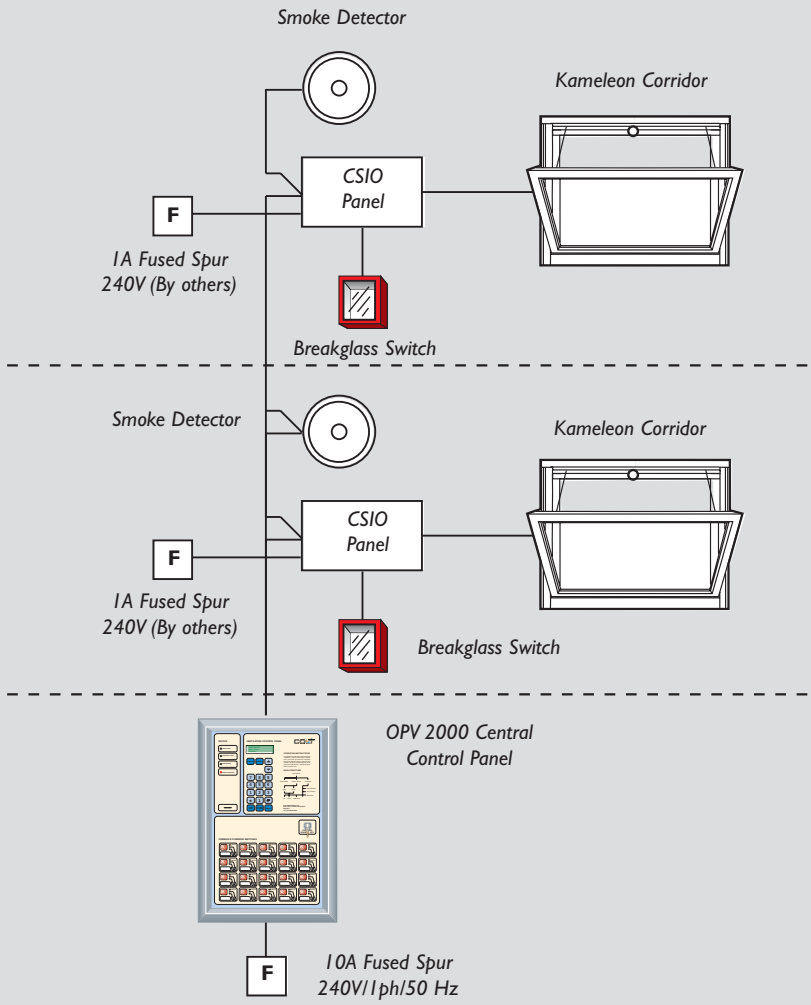
Tamper-proof - All fixings have tamper-proof heads, gas springs are covered.

Extra Security - Additional electro-magnet, burglar mesh (2.5mm welded to frame).

Glass - 6, 8, 10 single, 7mm wired and 24mm double glazed (subject to size).



TYPICAL CONTROL CONFIGURATION



DIMENSIONS

Minimum frame width = 950mm in increments of 1mm up to maximum 1800mm

Minimum frame height = 900mm in increments of 1mm up to maximum 2000mm

SIZING

Assume building opening of 1300mm

Select of body width of 1295mm (5mm tolerance) and subtract 104mm (frame dimension

1295mm - 104mm = 1191mm throat width

Now divide 1.5m² by throat width = 1500 ÷ 1191 = 1259

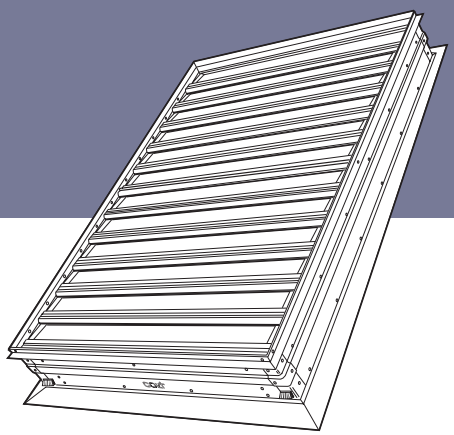
add 229mm for frame and control box = 1488m

Therefore the body size to be ordered is 1295mm x 1488mm

INSTALLATION

90° only, bottom hung.

Smoke Control (stairwell ventilator)



INTRODUCTION

Refer to Figures A, B, C and D on pages 5 and 6.

There are three types of stairwell:

Unprotected

- Not used for means of escape (therefore no requirement for Smoke Control)

Protected

- 'Fire sterile' area which leads to places of complete safety outside the building.

Fire-fighting*

- A protected stairwell used by the Fire Service to enter a building in the event of a fire. A lobby normally separates it from the accommodation.

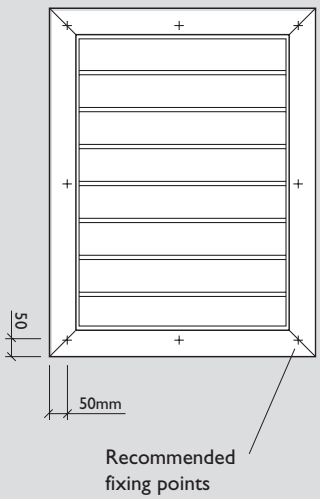
(* Refer to page 12)

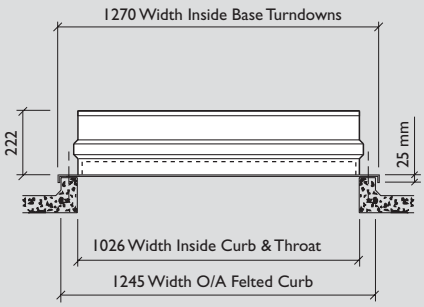
PRODUCT

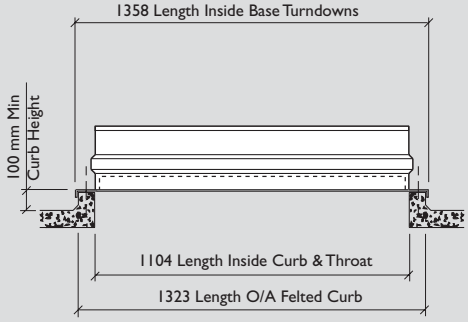
The Stairwell ventilator is a low profile, roof or wall mounted louvred natural ventilator which is designed to provide heat and smoke exhaust ventilation in protected stairwells within residential apartments, hotels, shops and offices.

It is principally applied to protect means of escape for occupants, who would otherwise remain trapped inside the premises, and to create a safe means of access for fire fighters.

The stairwell ventilator has a free area of 1.0m^2 to 1.5m^2.







REGULATIONS

(Non fire fighting). Where a protected stairwell without opening windows at each upper storey will form part of a development, Building Regulations Approved Document B recommends the provision of a vent at the top having a clear openable area of not less than 1.0m^2.

The Stairwell ventilator complies to BS 5588 Parts 1,5 & 6 and is fail safe open on loss of power and is manufactured to BS 7346 Part 1 - Specification for Natural Smoke & Heat Exhaust Ventilators.

Developed from the Colt Seefire Ventilator, with over forty years of active service, the Colt Stairwell Ventilator is one of the most durable and reliable ventilators available today.

OPTIONAL EXTRAS

Paint finish to any RAL colour
Burglar guard
Break glass switch
Battery back-up unit
Bird guard, Insect guard
Firemans override switch
Alternative base details

CONTROL

Stairwell ventilators should be controlled by clearly visible manual switches at the top of the stairwell and close to the final exit from the stairwell. The optional break glass switch or firemans override switch are recommended for this.

Stairwell Ventilator with OPV 2000 Control System.

INSTALLATION

The Stairwell can be installed vertically or horizontally and is equally effective as a corridor ventilator.

Smoke Control (lobbies and enclosed corridors)

PROTECTION OF LOBBIES

So why is it important for lobbies to have smoke protection?

Most small modern apartment buildings have the apartments opening directly onto the lobby which contains the lifts and leads to the stairs.

This is the main route for escape and safe exit from the building.

Imagine a number of residential dwellings that lead directly onto a central lobby and a fire starts in one of them. Smoke will quickly spread from the dwelling through open doors, and could quickly fill the lobby.

This single central lobby is the ONLY means of escape for the occupants. If they can't see the exits due to thick dense smoke with more and more people gathering into the lobby to make their escape, the result would be catastrophic.

Using an engineered system of smoke dampers and natural ventilation, linked into the building's fire detection system, smoke will be vented from the lobby on detection of a fire.

DESIGN PRINCIPLES

Figures C and D on pages 5 & 6 relate to designing a typical smoke control system within lobbies.

Smoke dampers on each floor installed into the lobby wall either lead off into ducting or into a specially constructed smoke shaft.

At both ends of the ducting or shaft are natural louvred ventilators, installed externally on the roof or vertically on the outside walls.

On detection of a fire, the damper on the fire floor and the external natural ventilator will open. This creates a chimney effect, drawing the smoke through the ducting or shaft and out of the building.

Other dampers on the remaining floor will remain shut, eliminating the chance of smoke leakage to other areas.

Louvre grilles are placed in front of the dampers to make them more aesthetically pleasing.

The louvres can be painted to match the interior, blending with the environment.

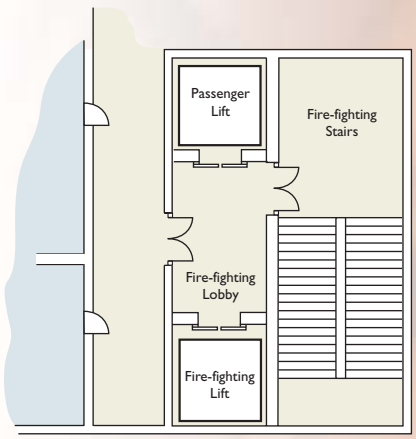


Figure E

Fire-fighting shafts.

Smoke Control (fire-fighting)

"Fire-fighters must be able to quickly identify and safely tackle the fire at source".

INTRODUCTION

Fire-fighting shafts provide smoke free access to the upper floors of a building and allow the fire fighters to attack the fire from a position of relative safety. Fire-fighting shafts are necessary in certain tall buildings or buildings with deep basements. Buildings with large volume floor areas may also require fire-fighting shafts.

Fire-fighting shafts (see figure E) may consist of at least one or more of the following combinations:

A protected staircase

A protected lobby

A fire-fighting lift

REGULATIONS

Tall buildings where the floors extend higher than the maximum reach of a fire service appliance (18 metres) must contain a fire-fighting shaft with at least one fire-fighting lift.

Guidance on the requirement and design of fire-fighting shafts is contained in Building Regulations Approved Document B and British Standard BS 5588 Part 5.

DESIGN

There are many considerations for designing a smoke control system for fire-fighting shafts. These include the layout of the building, the wind pressure, whether the system is naturally ventilated or pressurised, the size of ventilator required and many more.

Colt offer a free technical design service on all projects undertaken. Please contact Colt for further information.

SMOKE CONTROL

One method to effectively minimise the risk of smoke entering the fire-fighting shaft is the provision of natural smoke ventilators.

Ventilators are normally manually controlled by the fire service.

For fire-fighting shafts, the recommendations in BS 5588 Part 5 includes a ventilator with a clear opening area of not less than 5% of the horizontal cross section of the shaft. The $1m^2$ ventilator size is normally sufficient but larger sizes can be provided on request.

There is also a requirement to ventilate the stairs and lobby. Each floor of the stairwell must have at least 15% ventilation and 25% of the horizontal cross section area is required for lobbies.

Smoke Control (dampers & ventilators)

WHAT IS A SMOKE DAMPER?

A motorised louvred damper that opens or closes on detection of a fire alarm.

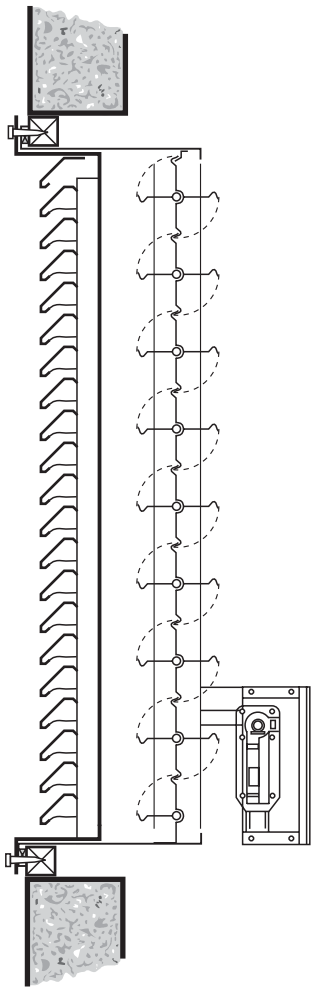
A smoke damper is designed to operate in one of two possible modes:

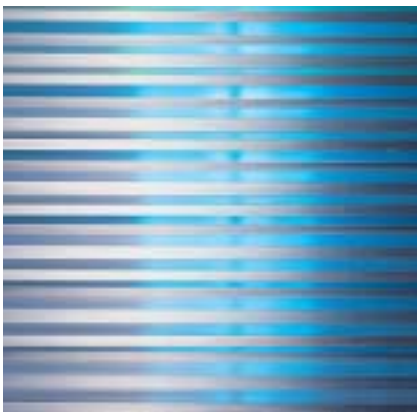
The first is to automatically open to allow smoke to pass through the damper into ducting or special smoke shafts.

The second is to stay shut on remaining floors so as not to allow any leakage of smoke or fire spread onto the other floors.

SMOKE DAMPER WITH LOUVRE SCREEN

Sectional view



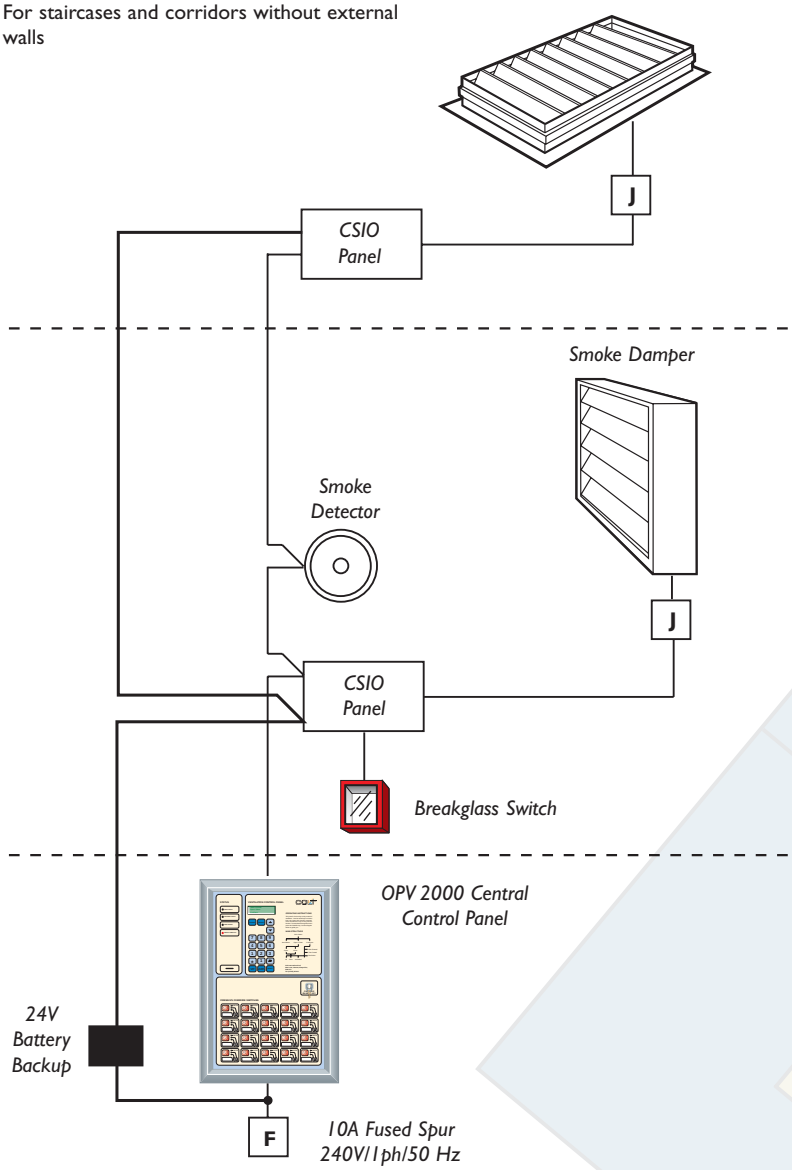


Louvres can be used to screen smoke dampers situated directly behind them.

"People generally can only make their escape through corridors, lobbies and staircases".

TYPICAL CONTROL CONFIGURATION

For staircases and corridors without external walls



COLT SERVICE

Part of the Colt Group of companies, Colt Service offers a comprehensive range of maintenance packages incorporating the maintenance and repair of all building services equipment including non Colt products.

Colt Service provide a 24 hour, 365 day emergency cover as standard.

COMMISSIONING

Proper commissioning by experts is essential. The performance of the system is as dependent upon the final leakage characteristics of the escape route as upon the pressurisation equipment. We recommend that our specialist staff commission and certify the system.

MAINTENANCE & TESTING

BS 5588 :

It is recommended that weekly testing of the system which includes smoke detection, emergency power supply and the automatic operation of the venting equipment, is carried out.

Annual measurements of pressures and flow rates to maintain efficiency levels are also recommended.

For further information on the testing, commissioning and maintenance of a pressurisation system, please consult Colt.

CPD MEMBER Construction CPD Certification Service

NBS Plus

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