CHOOSING A SUPPLIER

Choosing the supplier of your smoke control system for your shopping centre really might be a life or death situation.

Colt is committed to the design and supply of effective smoke control systems. That is, systems that will perform in the event of an emergency.

Colt refuses to deviate from best design practice in determining the expected fire size. Decision makers must guard against proposals which minimise equipment requirements by using incorrect fire sizes as the basis for the system design.

It is simply a false and potentially deadly economy.

DESIGN SERVICE

You will be reassured to know that Colt has a wealth of experience in designing smoke control systems for shopping centres and has an impeccable track record to match.

Colt offer a free design service from technical advice at the initial design stages, through to the maintenance of the system.

Full CAD facilities are available complete with a fully detailed engineered report.
CONFIDENCE

Before you make your decision on a smoke control supplier, you will want to be reassured that the company you pick has the track record, experience and aftersales service to rival anyone in their fields.

By investing in innovation, products, services and people, Colt has established itself as a world leader in smoke ventilation control.

UK TRACK RECORD

Aberavon Shopping Centre, Aberavon
Bluewater Park, Kent
Brunel Centre, Bletchley
Bullring, Birmingham
Calder Square, Falkirk
Cannock Shopping Centre, Cannock
Castle Quay, Banbury
Central Milton Keynes, Milton Keynes
Chimes Shopping Centre, Uxbridge
Churchside Arcade, Rugby
Coopers Square, Burton-upon-Trent
Corn Exchange, Doncaster
Corn Exchange, Leeds
Crystal Peaks, Sheffield
Eagle Centre, Derby
Eldon Square, Newcastle Upon Tyne
Festival Place, Basingstoke
Frenchgate Centre, Doncaster
Grafton Centre, Cambridge
Grosvenor Centre, Northampton
Gunwharf Quays, Portsmouth
Hastings Shopping Centre, Hastings
House of Fraser, Guildford
Jacksons Landing, Hartlepool
Kingfisher Centre, Redditch
Kingsbury Court, Aylesbury
Lakeside Shopping Centre, Thurrock
Medowhall, Sheffield
Merrion Centre, Leeds
Merry Hill Centre, Dudley
Metro Centre, Gateshead
Midsummer Place, Milton Keynes
Millburn Gate, Durham
Milton Keynes Food Centre, Milton Keynes
Orchard Square, Sheffield
Pavilions Shopping Centre, Birmingham
Princes Quay, Hull
Rawson Market, Bradford
Regency Arcade, Leamington Spa
Ridings, Wakefield
Royal Priors, Leamington Spa

Saddlers Centre, Walsall
Sainsbury’s Millennium Store, Greenwich
Starcity, Birmingham
St Johns, Leeds
Stratford Shopping Centre, London
Swan Centre, Lincoln
Swan Centre, Eastleigh
Tamworth Shopping Centre, Tamworth
The Bridges, Leeds
The Forum, South Shields
The Oracle, Reading
Touchwood Court, Birmingham
Trafford Centre, Manchester
Union Arcade, Bury
Victoria Centre, Harrogate
Victoria Centre, Nottingham
Weston Favell, Northampton
West Quay Retail Park, Southampton
West Quay Shopping Centre, Southampton
White Rose, Leeds
In recent years, the development of the shopping centre concept has grown in significance and complexity with the phenomenal increase in the number of proposals being submitted for consideration. Today, every major town and city has at least one such centre.

To the design teams, each project represents a new challenge; an opportunity to be creative and innovative - but it can also mean significant problems.

The principle task of the team is to create a building on time and within budget which fully meets the requirements of the client. But there are many other influences, such as building regulations and codes, that could have a major impact on the design.

**HOW DO FIRES START**

The cause of all fires can be generally divided into two categories, Accidental or Malicious ignition (arson). Arson is still the largest cause of fire in occupied buildings, however the main cause of death and casualties is smoke.

**SMOKE**

Killer facts:

Over 4000 fires occur in retail outlets every year.

On average, large fires cause over £5 Million pounds of damages every year in shops. (This excludes fires under £250,000)

Following the outbreak of a small fire in a shop, it can take less than three minutes to fill a mall with smoke.

It can take 30 minutes to evacuate a mall, taking into account parents with children, the elderly and the disabled.

An alarm is often not heard, when it is, people often ignore it or misunderstand the situation.

Once the alarm has been raised, people do not necessarily react as expected.

Over 4000 fires occur in retail outlets every year.
“Experience shows it can take 30 minutes to totally evacuate a shopping centre”.

GUIDANCE AND REGULATIONS

Many regulations and codes have to be met and the safety and comfort of the building’s occupants must be the priority.

Reference can be made to the following:

BS 5588 Part 10 - Fire precautions in the design, construction and use of buildings,

Code of practice for shopping centres

BRE 186 - Design principles for smoke ventilation in enclosed shopping centres

BRE 368 - Design methodologies for smoke and heat exhaust ventilation

BS 7346 - Components for smoke and heat control systems

EN12101 - Smoke and heat control systems

SPRINKLER SYSTEMS

Sprinklers and smoke control do different, but complementary jobs. A sprinkler system will control the size of the fire and thus reduce the amount of smoke generated.

In shopping centres it is generally recommended to protect shop units with sprinklers to control the fire size, but not to install sprinklers in the malls to prevent overcooling of smoke and the risk of wet and slippery surfaces on escape routes.
Protection of People
(means of escape)

THE PROTECTION OF PEOPLE

With as many as 100,000 people in one day visiting some of the largest centres, the burden of responsibility carried by the design team is awesome. The increasing size and complexity of each new scheme leads to unique design problems when it comes to protecting those within the building against fire, by ensuring their safe evacuation.

The problem is particularly acute with shopping centres that incorporate a central atrium or those which have multi-storeys.

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 shopping centres, a smoke control system is an effective way of keeping means of escape routes clear of smoke.

Smoke ventilators are installed to help maintain smoke free escape routes and stairwells to enable occupants to evacuate the building quickly and safely.

Most significant factors concerning fire - such as evacuation time and rate of fire growth - are time dependent, and subject to a high degree of variation.
“An alarm is often not heard. When it is, people often ignore it or misunderstand the situation”.

BUILDING DESIGNERS

Building owners and building designers 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, designers can ensure that occupants can escape quickly and safely and that fire-fighters can see and tackle the fire source.

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

One in four businesses never recover from a serious fire.

Smoke can travel at a speed of over 2m/s (5 mph), this is faster than the probable escape speed of an occupant.

This fire exit shows the effects of smoke with a time difference of just a few minutes.
Smoke Control
(general principles)

Figure A
Smoke from a fire in an enclosed area, rises in a plume to the ceiling. As it rises, air is entrained into it which in turn increases the volume of the smoke.

As the smoke reaches the ceiling, a layer is formed, this is referred to as the smoke layer. Control of this layer is the main task of a smoke ventilation system.

Figure B
Smoke can fill a room in just a few minutes. Thick smoke can obscure exits signs and doorways, making escape hazardous and slow.

The typical speed of smoke travel is between 1 and 2 m/s. This can be faster than the escape speed of an occupant.

When the smoke reaches a dead end, it will dip down and be drawn back towards the fire, possibly confusing occupants and causing them to move towards the fire.

Figure C
By using smoke ventilation and smoke barriers, drop down smoke curtains for example, the smoke layer is contained above a pre-calculated height (normally 3m minimum) and is either extracted naturally or with mechanical assistance by ventilators installed in the ceiling.
“4% of all building fires happen in shops, that equates to over 4000 every year”.

Photographs (above & below).

Starcity, Birmingham.
Through contractors Carillion and working for Crown House Engineering, Colt supplied OPV glazed Meteors in the atrium and OPV Seefires for the staircases, lobbies and corridors. Automatic smoke curtains were also supplied.
SYSTEM DESIGN

The design procedures for smoke control in multi storey shopping centres are more complex than single storey buildings. This is largely because the geometry of the building is significant, and shopping centres tend to have multiple levels, complex layouts with junctions and changing roof lines.

Fire on the ground floor is clearly the worst case scenario. With potentially thousands of people within the shopping centre at any one time, engineered systems are required to channel the smoke to designated areas without affecting other floors.

Channelling screens are required to limit the width of the plume and reduce the mass flow of smoke. This can be achieved by either fixed screens or automatic drop down curtains.

With multi storey shopping centres, especially those with central open malls, the design of the smoke control system must be considered on a floor by floor basis.

Looking at figure G for example, the smoke layers in the mall must be contained above the second floor ceiling level. If a fire broke out on the lowest floor, the height of rise of the smoke plume through the mall would make this impractical.

To avoid this situation, a solution would be to remove smoke from the lowest floor without it entering the central mall. This can be achieved by extracting the smoke with the help of powered ventilation and smoke dampers. Automatic smoke curtains could be used to contain the smoke in the floor of origin.

Figure D.

The red arrows depict the predicted movement of smoke, whilst the white arrows show the direction of fresh air movement without smoke ventilation.

Figure E.

With smoke ventilation.
Figure F.
Channelling screens limit the spread of smoke under balconies, reducing the amount of ventilation required.

Figure G.
There are many ways to ventilate a multi-storey complex depending on the actual design and layout of the building.

This illustration depicts three different methods:

1. Ventilation utilising the central atrium.

2. Ventilation direct from the fire floor using ventilators in an external wall.

3. Ventilation direct from the fire floor using a fire rated mechanical extract system.
INLET AIR

Inlet air is an important element of a smoke control system.

For a smoke control system to operate effectively, inlet air must be provided via a dedicated source, remote from the smoke reservoir.

Possible solutions are as follows:

a) Utilising adjacent non fire zones (natural ventilation)

b) Low level inlet ventilation located below the designed smoke layer.

c) Opening entrance doors automatically.

Figure H.

This illustration shows a two zoned system where the ventilators in the fire zone are providing extract and the adjacent zone is providing air inlet.

Figure I.

A single zone where adjacent zones are not required, therefore an air inlet source needs to be provided at low level either by automatically opening ventilators or by automatically opening doors.

This solution is also applicable if the shopping centre is mechanically ventilated.
Shenley Pavillions, Milton Keynes. Automatic opening ventilators provide air inlet above the entrance doors.

Pavilions Shopping Centre, Birmingham. Glazed ventilators provide discreet inlet air to the upper levels of the smoke control system.
NATURAL VENTILATORS

Natural ventilation has always played a strategic role in Colt’s approach to smoke control systems.

A natural louvred ventilator can provide the dual benefit of day-to-day climate control and smoke control. Depending on the louvre blade option, it can also provide natural daylight.

Louvred ventilators can be installed vertically or horizontally and have optional blade types, including:
- Aluminium
- Translucent Polycarbonate
- Glass

Available in a variety of product types to suit each building application, natural ventilators are increasingly specified by building designers who are sensitive to the conflicting demands of energy conservation and occupier safety and comfort.

Associated Products:
- Seefire
- FCO (Façade Clear Opening)
- WCO (Weathered Clear Opening)
House of Fraser, Guildford. OPV controlled FCO Ventilators with polycarbonate louvres are installed at high level within the main glazed central atrium.

Colt OPV controlled Seefires are installed along the malls to provide automatic smoke control and dual purpose natural ventilation during the summer months.

Cooper’s Square, Burton-upon-Trent. The refurbished shopping centre in Burton-upon-Trent has a smoke control installation which includes over 100 Seefire louvred ventilators installed into the roof glazing system.

Gunwharf Quays, Portsmouth. Colt OPV controlled Seefires installed into Colt Glazing system. Fixed glass smoke curtains are also installed at high level.
Smoke Control
(natural glazed ventilators)

Starcity, Birmingham.
Colt Meteor Glazed Flap Natural Extract Ventilators installed within the main central atrium with OPV Seefires on the staircases, lobbies and corridors.

Automatic smoke curtains were also supplied.
Natural glazed ventilators are essentially a controllable fire rated window that offers the benefit of smoke control ventilation, combined with the additional benefit of day-to-day ventilation.

Glazed flap ventilators such as the Colt Meteor have large unobstructed openings combined with high performance levels, and are suited for installations from horizontal through to vertical.

The Colt Kameleon is a more discreet ventilator and has a smaller frame with hidden controls to integrate better into its surroundings.

Both the Meteor and the Kameleon have excellent air leakage performance levels (lower than louvred ventilators) and can help meet the requirements of Building Regulations part L2.

Associated Products:
- Meteor
- Kameleon

Above: The Chimes Shopping Centre, Uxbridge. Colt worked closely with the design team and the contractors Costain Skanska Joint Venture, on the design and installation of the smoke ventilation system which included 88 Colt Mk4 Glazed Kameleon Ventilators and 6 trapezoid shaped, double flapped Meteor Ventilators.

Left: Midsummer Place, Milton Keynes. OPV Mk4 Kameleons installed into glazing within all the malls and the boulevard. Colt also provided automatic drop down curtains and staircase ventilators.
Smoke Control
(powered extract and dampers)
POWERED EXTRACT

Some scenarios, as previously illustrated, require the smoke to be discharged from the building via fire rated ducting. Roof mounted powered extract units can assist in this.

Powered extract is also used when positive wind pressure will occur at ventilator locations, normally due to taller buildings being within close proximity. Natural ventilation may not perform as required in this situation, and powered extract must be used.

Bullring, Birmingham.
Specially designed powered extract ventilators and Seefire inlet ventilators were designed and installed by Colt.

Festival Place, Basingstoke.
Powered fans connected within ducting are used for the extraction of smoke. Colt Seefire ventilators are used for terminal cowls.

A complete air handling system was also designed and installed by Colt.

Aupark Shopping Centre, Slovak Republic.
A large number of powered exhaust ventilators in conjunction with natural ventilators and smoke curtains were installed as part of a complete smoke control system.
SMOKE BARRIERS

The need to form smoke barriers means that large spaces must be divided at high level. These divisions between smoke barriers can be a building feature such as a permanent screen or a failsafe automatic smoke curtain operated on detection of smoke. Permanent screens are often constructed from glass.

BS 5588 part 10 recommends that smoke barriers should be arranged to prevent smoke from a shop unit flowing into more than one reservoir.

Modern shopping centres with high glass rooflights allow deep smoke barriers which creates an efficient smoke control system. Conversely, low narrow malls often found in refurbishment projects present additional challenges due to the limited height available to obtain an effective solution.
“Fire-fighters must be able to quickly identify and safely tackle the fire source”.

House of Fraser, Guildford. Automatic drop down smoke curtains were installed around the atria for smoke containment. A pressurisation system was also installed for the staircases.

Channelling screens can be positioned for every shop unit facing the mall however, it may be justifiable to increase the span of the channelling screens over two or more shop units.

W = channelling width
Smoke Control
(control systems)

OPV

The Colt OPV 2000 is an intelligent electronic control system, which uses the latest Echelon Neuron Chip for its communications network.

OPV 2000 revolutionises the control and operation of natural smoke ventilators and readily incorporates all other addressable equipment into the total smoke control system.

As life safety equipment, all OPV 2000 components meet the most stringent manufacturing and test procedures.

TOTAL CONTROL FLEXIBILITY

Each natural ventilator or addressable unit can be controlled individually and as part of the specified automatic control system.

The control software is configured to suit the automatic scheme requirements and should these change, it is a simple matter to re-program the software accordingly.

TOTAL SAFETY

OPV 2000 incorporates a patented safety system. The microprocessors in each natural ventilator control module are able to distinguish emergency data signals from normal operating signals, which will be ignored if the battery charge level reaches a critical state. This means that battery power will always be protected for emergency use.
“OPV 2000 is one of the most sophisticated smoke control systems available”.
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

Thorough commissioning by experts is essential. We recommend that our specialist staff, commission and certify the system.

MAINTENANCE & TESTING

BS 5588: It is essential for the safety of the occupants of a shopping centre, that all fire safety equipment is regularly checked.

THE FIRE REGULATIONS - MAINTENANCE

“Where necessary in order to safeguard the safety of employees in the case of fire, the workplace and any equipment and devices provided in respect of the workplace under regulations 4 and 5 shall be subject to a suitable system of maintenance and be maintained in an efficient state, in efficient working order and in good repair.”

Clearly it is important to ensure the reliability and safe operation of fire safety equipment. This is best done by using a competent person to carry out periodic servicing and any necessary repairs. A record of the work carried out on such equipment and system will help to demonstrate compliance with the law.

Colt Service Limited can test and certify that your system complies with the relevant fire safety codes.

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