

Colt International Ltd

Ventilation solutions for overheated common corridors in apartment buildings
CPD Technical Seminar 2020





Certification

of CPD course provision

This is to certify that

Colt International Ltd

has been registered as a CPD Course Provider by
The Chartered Institution of Building Services Engineers (CIBSE)

Accredited from 1 June 2019 to 31 May 2021

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Colt have a number of CPD accredited topics including:

- Car park ventilation
- The general principles of smoke control
- Pressurisation
- Smoke shafts
- Overheating common corridors
- Smoke and fire curtains
- Louvre
- Evaporative cooling



A brief history of Colt

Colt International Limited



Founded in

1931

2019 UK turnover

£38.4 million

2019 Group turnover

£180.4 million

Manufacturing facilities in
UK, Holland & Germany



Expertise built on proven experience | www.coltinfo.co.uk

Accreditations and Memberships

Colt International Limited



Accreditations

- Altius Gateway
- CHAS
- Construction Line
- Safe Contractor
- Worksafe Contractor
- RoSPA



Chas Accredited



PPQ still required by clients



**CERTIFICATED INSTALLER OF
ACTIVE FIRE PROTECTION**



Memberships





Smoke Control



Climate Control



Louvre & Shading

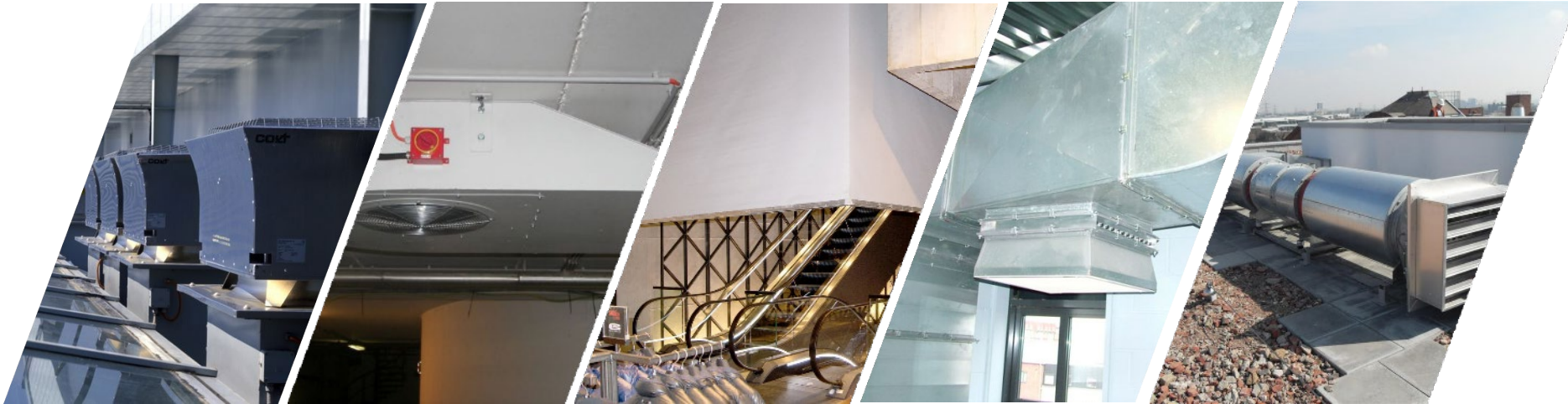


Service





Smoke Control



SHEVS
Smoke and Heat
Exhaust Systems

Car Park
Ventilation

Smoke
Containment

Pressurisation
Systems

Smoke Shaft
Systems





Climate control



Natural
Ventilation

Mechanical
Ventilation /
HVAC

Evaporative
Cooling

Industrial Heating



Performance & Screening Louvre

Colt International Limited



Louvre



Screening

Ventilation &
Rain Defence

Shading

Acoustic



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Service



24 hour call out

Nationwide Coverage

Spare Parts

Surveys



The quest for energy efficiency (ADL and BREAM) has led to very good sealing and insulation in residential buildings and an increase in district heating schemes.

This has unintended consequences for stair lobbies, corridors and entrance halls, which tend to overheat, resulting in unpleasant conditions for residents and possible issues maintaining cold water supply temperatures.



Caspian Wharf, a Berkeley Homes development, uses a district heating system and therefore overheating in the common corridors was a concern for the design team.

Using smoke control for day-to-day ventilation

Ventilation solutions for overheated common corridors in apartment buildings 2020



Q: What can you do to avoid heat building up in these common areas?

A: Use the existing smoke control system for day-to-day ventilation.

The simple solution is to use the ventilation equipment which is already providing smoke control to these areas.

Natural or mechanical smoke ventilation systems may be adapted for day-to-day ventilation use.



Q: Will you require additional equipment or modifications?

A: Yes, but the amount varies

If your building has a **multiple shaft smoke control system**, it can readily be configured to provide day-to-day ventilation with minimal additions.

If the building has a **single shaft system**, you will need inlet air. You could provide it from the stair, using a weathered roof smoke vent. In this case, you will need fire rated smoke dampers between the stair and the corridor.

You will need to consider fan noise, as noise levels considered acceptable for emergency use will not be acceptable for day-to-day ventilation use.



- Approved Document B to the Building Regulations (ADB)
- BS 9991
- BS EN 12101 / BS 8519
- Smoke Control Association Guide
(free download from www.feta.co.uk)



Smoke ventilation requirements

Ventilation solutions for overheated common corridors in apartment buildings 2020



In multi-storey residential buildings, the main escape route is always **via common corridors and/or lobbies** to protected stairs.

Smoke spread to the corridor from a fire in an apartment is unavoidable as the occupants make their escape.

The 2006 version of ADB requires staircases and common corridors / lobbies which adjoin a staircase to be ventilated.

The ventilation system allows the smoke in the corridor to be cleared and largely prevents smoke from entering the staircase, assisting escape for occupants of higher storeys should the whole building need to be evacuated.



ADB Requires:

- All corridors/lobbies adjoining stairs to be ventilated by either natural or mechanical means.
- Stairs to be ventilated by a vent with a free area of 1.0m² from the top storey to outside.

Activation:

- In a single stair building, the vents should be automatic via smoke detectors in the common access space.
- If a multi-stair building, the lobby ventilation can be manual, **BUT** the vent at the top of the stair must be interlinked to open at the same time.



Common Corridors can be ventilated:

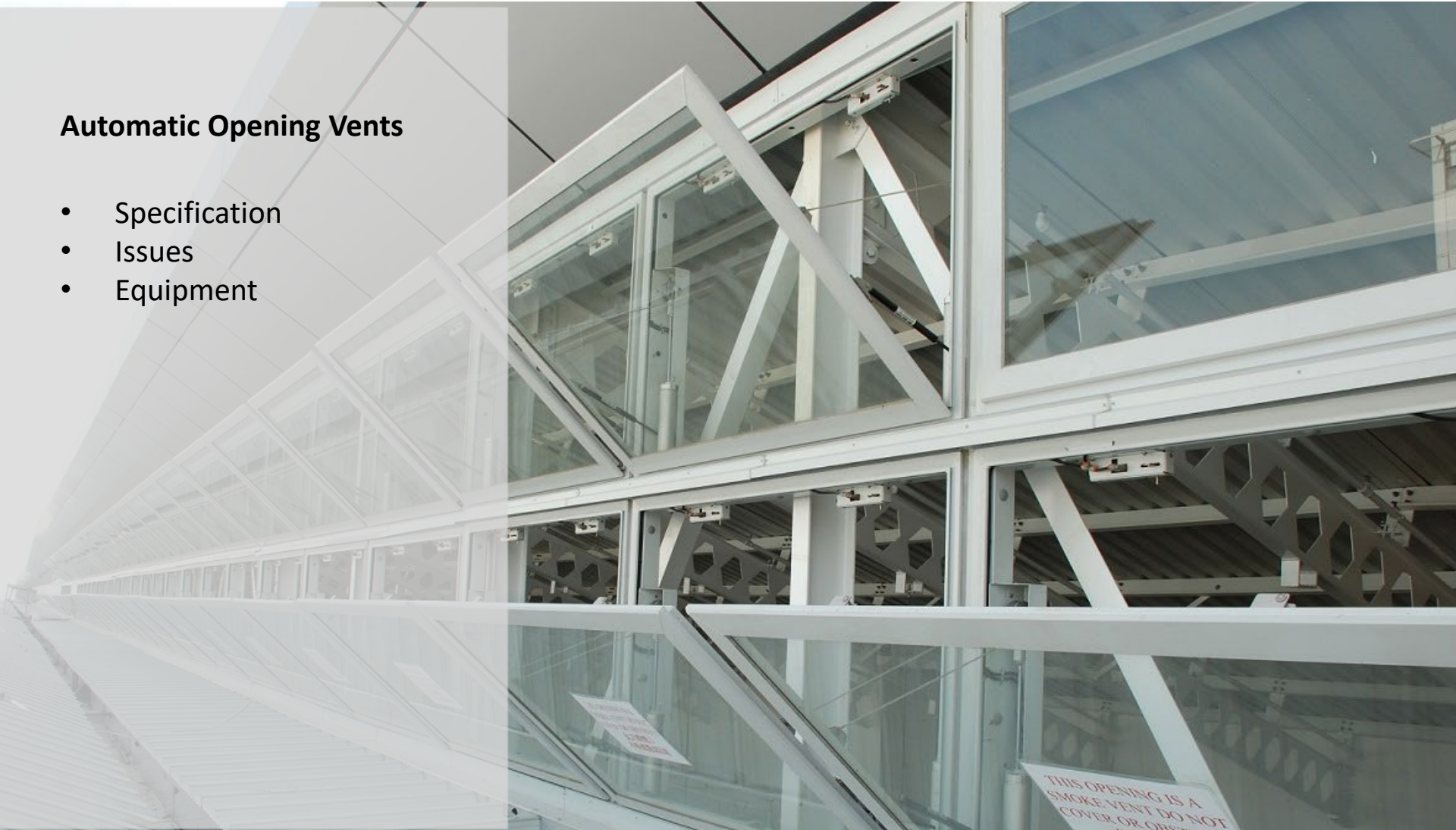
- Naturally – using AOV.
- Naturally using shafts/chimneys.
- Mechanically, using shafts.
- Mechanically, using pressure differentials, in accordance with BS EN 12101-6: 2005.

All of these can be adapted to provide some means of day-to-day environmental control - we'll look at each in turn



Automatic Opening Vents

- Specification
- Issues
- Equipment



Automatic Opening Vent (AOV) systems

Ventilation solutions for overheated common corridors in apartment buildings 2020

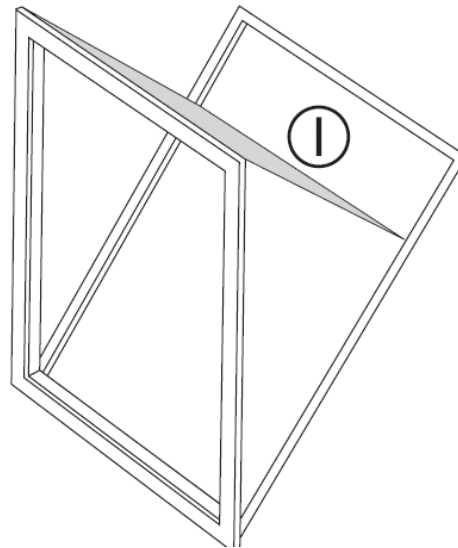


Lobbies / corridors should be ventilated by an AOV with a free area of at least 1.5m²

AS PER CURRENT VERSION
OF ADB:

1.5m² can only be achieved via
open area at 90° to direction of
airflow, ie area ①.

Total Area = ① only = 1.5m²

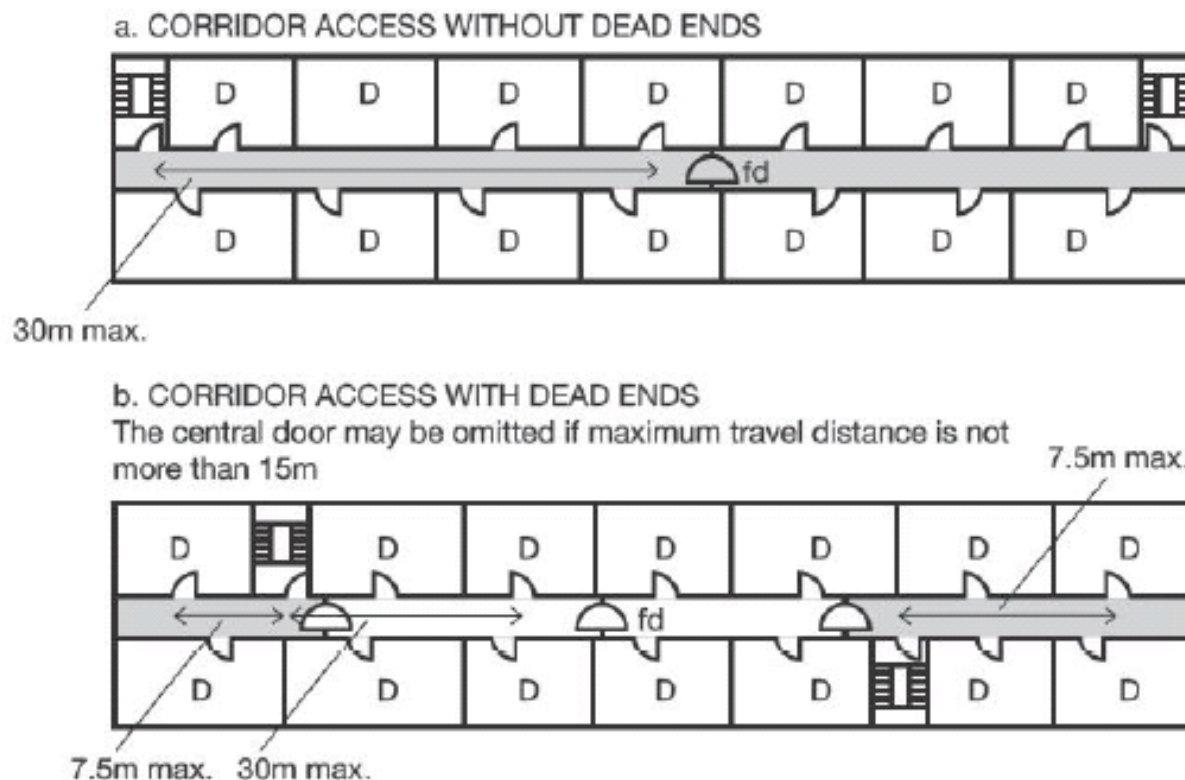


To achieve 1.5m², a 1.5m wide vent opening to 30° needs to be at least 2.0m high and the stroke of the motor will need to be around 1.2m



Automatic Opening Vent (AOV) systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



Note that some layouts, though ADB compliant, don't ventilate all corridor sections

AOV can be used for day-to-day ventilation, but:

- Ventilation is single sided, has no separate inlet, has poor temperature control
- Potential for maglocks on cross corridor doors for through flow?
- Vents must close on fire, except for the fire floor
- Consider finger trapping
- Consider fall protection – up to 1.1m from floor level
- Control requirements
 - Temperature Sensors (internal and external)
 - Rain Sensor



Natural shaft systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



Natural shaft systems

- Specification
- Issues
- Equipment



If a shaft system is used, the following criteria should be met:

- Be closed at the base.
- Have a minimum cross-sectional area of 1.5m^2 with a minimum dimension of 0.85m in either direction.
- Extend at least 0.5m above the highest structure within 2m.
- Extend 2.5m above the ceiling of the highest level served by the shaft.

The vent into the shaft, the vent at the top of the shaft and any safety grilles in the shaft should all have a minimum free area of 1.0m^2 .



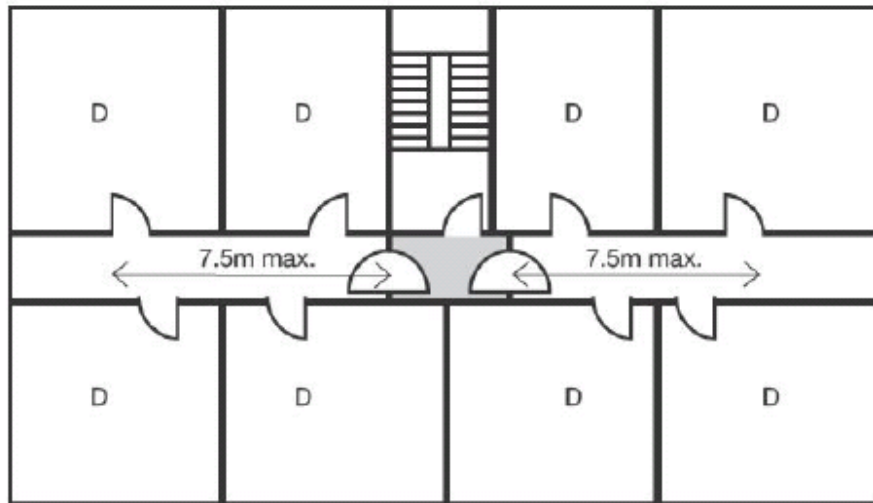
Construction

- The shaft should be constructed from non-combustible material and the vents should be E30S rated.
- The shaft should be vertical with no more than 4m at an inclined angle (max 30°)

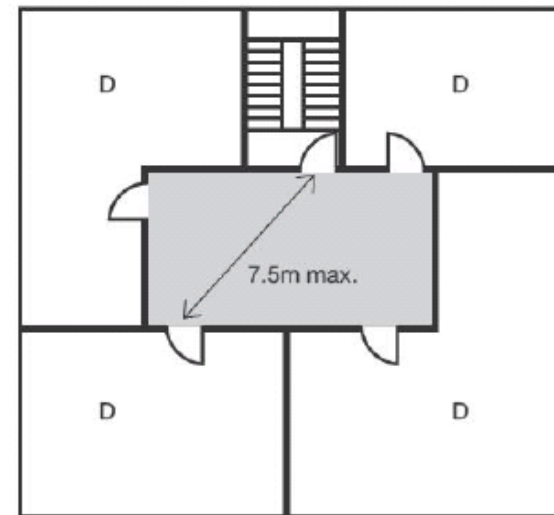
Operation

On detection of smoke in the corridor, the vent on the fire floor, at the top of the shaft and the top of the stair should all open simultaneously – vents on all other levels should remain closed.

a. CORRIDOR ACCESS DWELLINGS



b. LOBBY ACCESS DWELLINGS



Natural shaft systems

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Internal Damper to shaft, concealed by decorative grille, or Fire Door:



Natural shafts can be used for environmental ventilation, but:

- There is no permanent air inlet unless specially provided
- Is lobby geometry and vent location suitable?
- Ventilation rate and temperature control is variable (with time and with floor)
- Risk of cross contamination between floors
- Add an environmental extract fan to overcome the above issues?
- Vents must close on fire, except for the actual fire floor
- Motorised doors have issues with finger trapping and access to the shaft
- Control requirements
 - Temperature Sensor (internal and external)
 - Rain Sensor



Natural shaft systems - Equipment

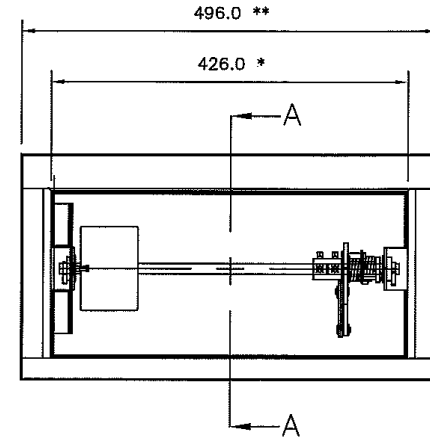
Ventilation solutions for overheated common corridors in apartment buildings 2020



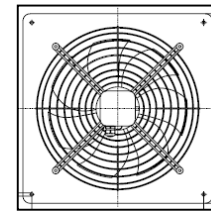
+
Corridor
temperature
sensor



+ Small fire dampers for
environmental use



+
environmental
fan and
ventilator?



+
Ceiling
grilles?



Maglocks?



Mechanical shaft systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



Mechanical Shaft systems

- Specification
- Issues
- Equipment



Mechanical shaft systems

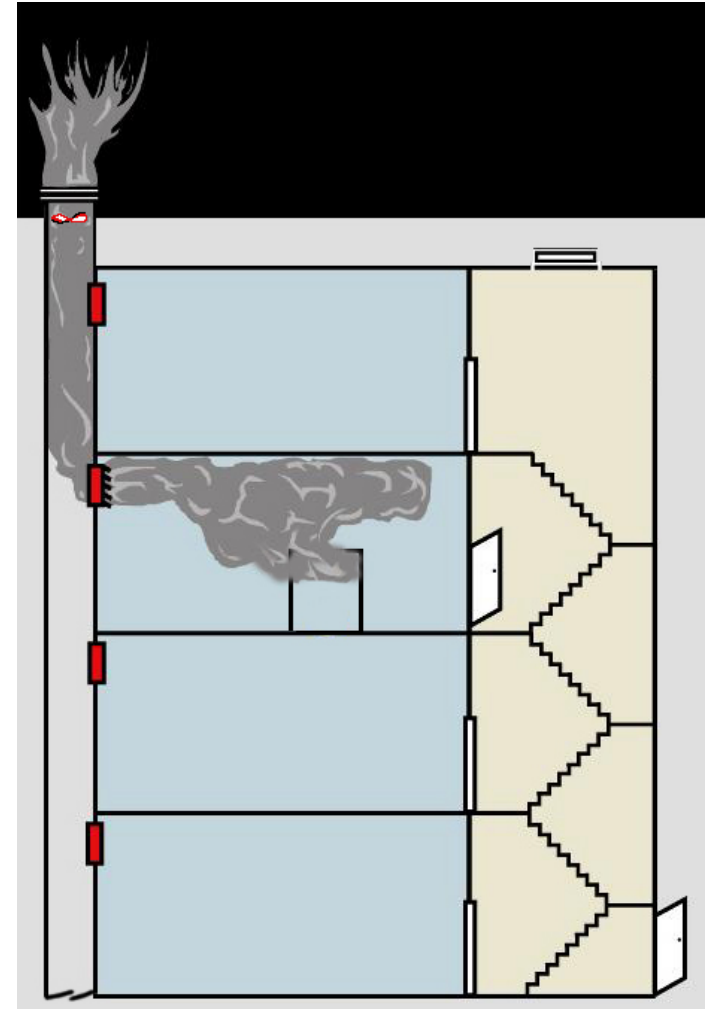
Ventilation solutions for overheated common corridors in apartment buildings 2020

Approved Document B permits the use of mechanical ventilation for smoke control of common escape routes but gives no design guidance on how to design such a system. The Smoke Control association guide provides much of the missing guidance.

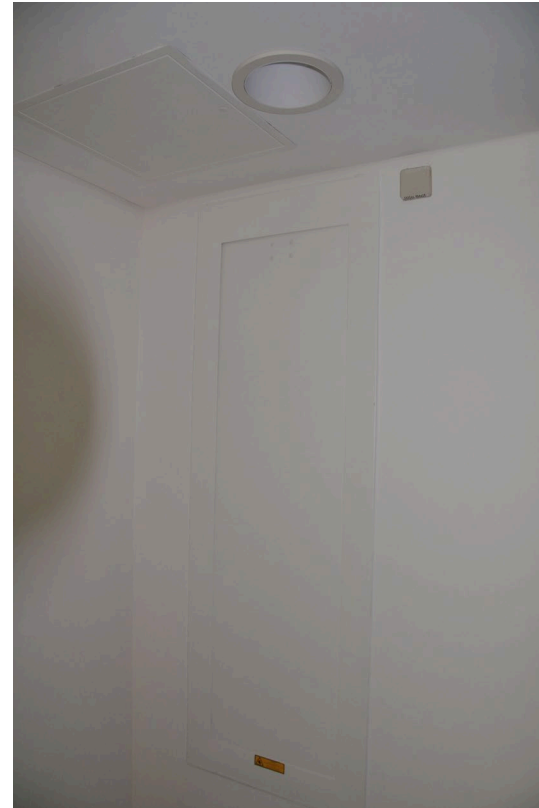
The main objective is to keep smoke from entering the staircase, unless the system has been designed to trade off extended travel distances.

Typically:

- 0.6m² shaft
- 0.8m² damper
- Run and standby fan
- 1.0m² stair vent
- Standby Generator
- Fire rated cabling



Internal Damper to shaft, concealed by decorative grille, or bottom hinged flap:



Mechanical shafts can be used for environmental ventilation, but:

- There is no permanent air inlet unless specially provided
- Is lobby geometry and vent location suitable?
- Vents must close on fire, except for the actual fire floor
- Flap vents have issues with finger trapping
- Fan noise becomes an important issue
- Control requirements
 - Temperature Sensor (internal and external)
 - Rain Sensor



Mechanical shaft systems - Equipment

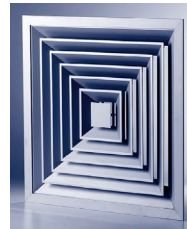
Ventilation solutions for overheated common corridors in apartment buildings 2020



+
Corridor Temperature Sensor



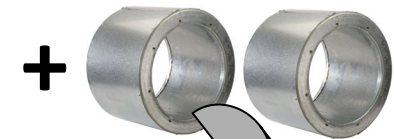
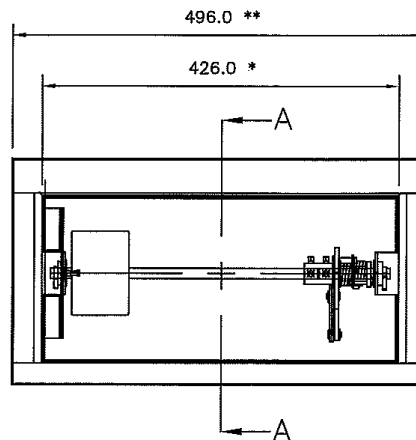
+
Ceiling Grilles



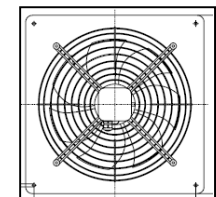
+
Variable Speed Drive for Extract/Supply Fans



+
Small Fire Damper for Environmental use



OR add a separate, quieter fan



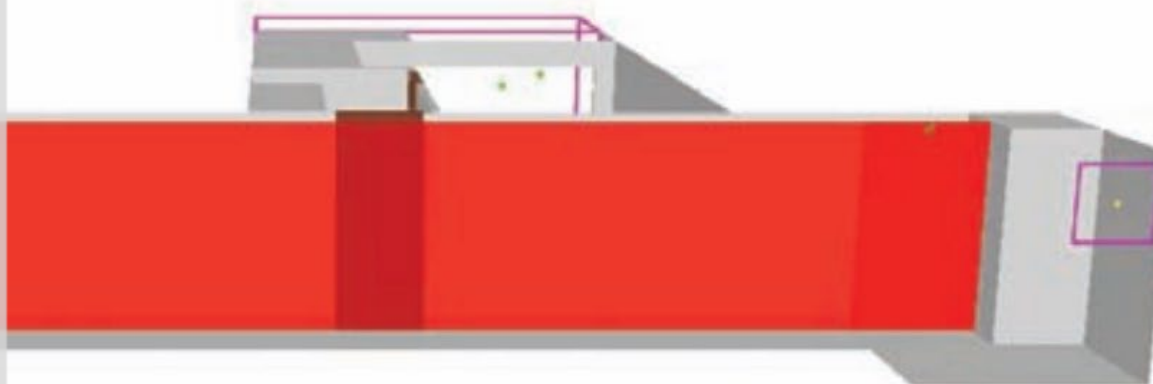
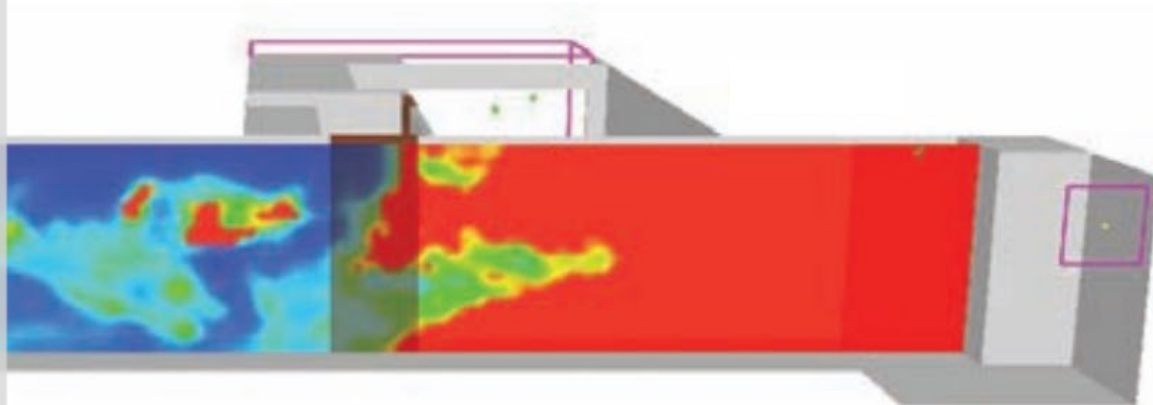
Extended travel distance systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



Extended travel distance systems

- Specification
- Issues
- Equipment



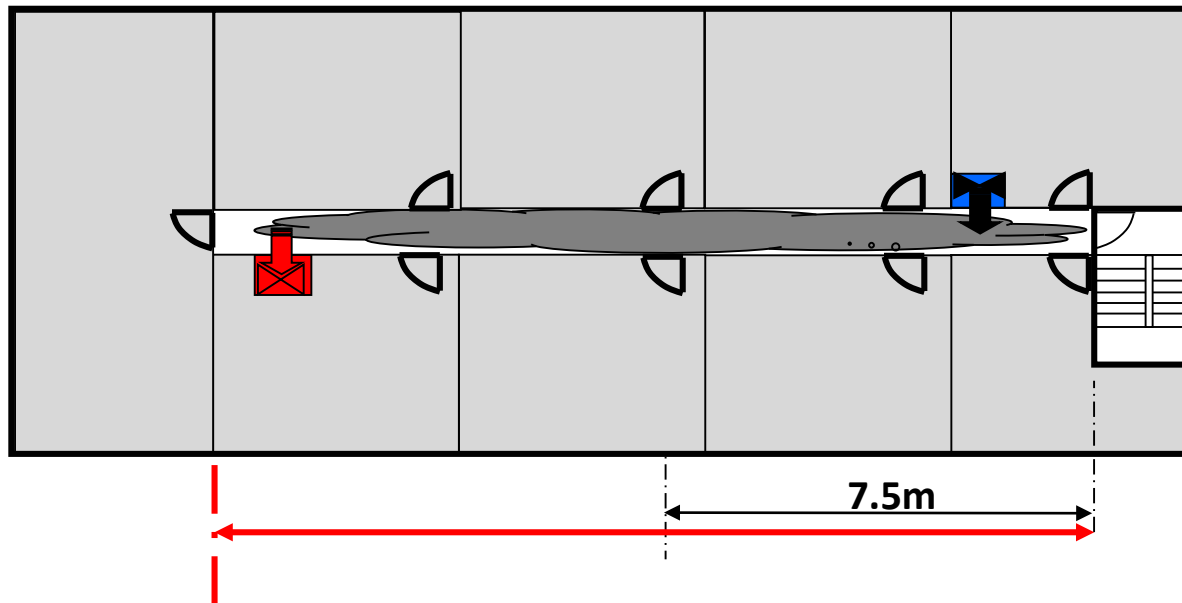
Extended travel distance systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



It has become common practice for architects to gain design flexibility by extending dead end travel distances beyond 7.5/15m using improved smoke ventilation as a compensating feature

Extended corridor systems generally require dedicated inlet and exhaust

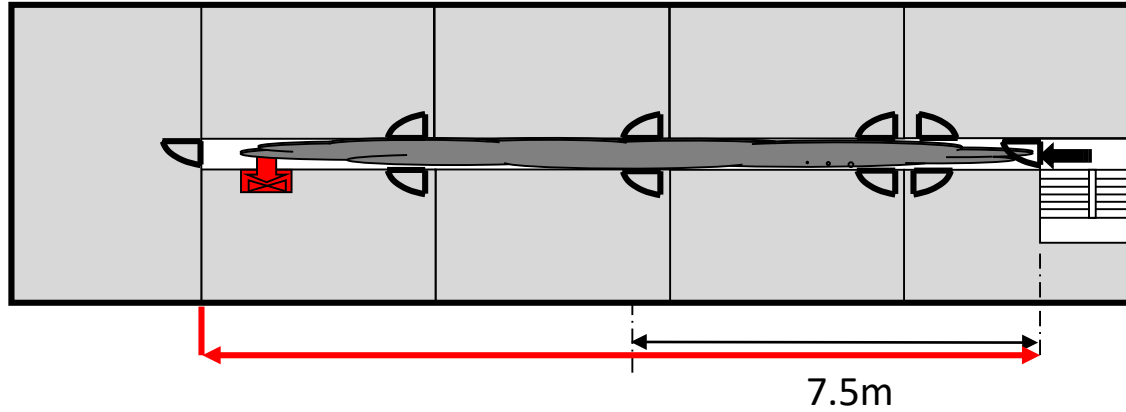


Extended travel distance systems

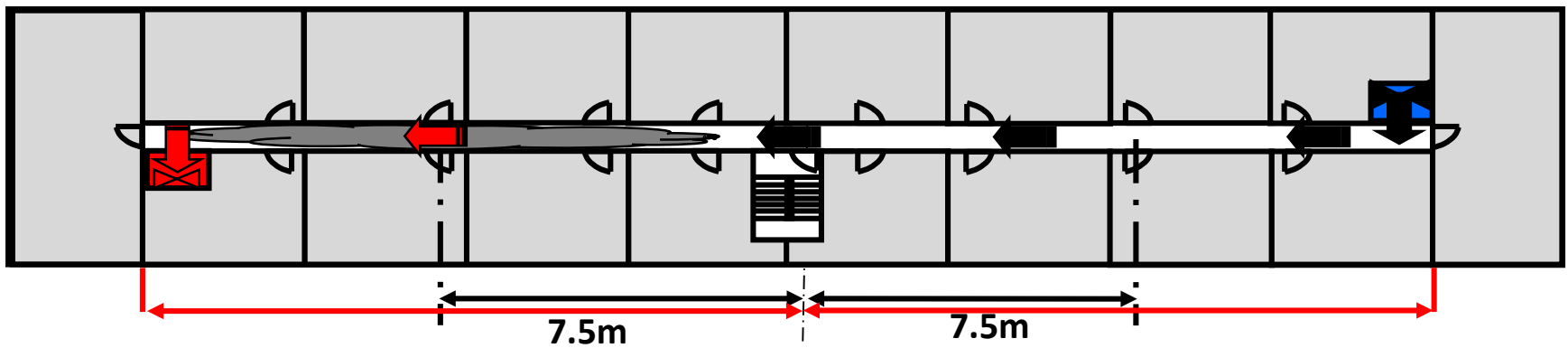
Ventilation solutions for overheated common corridors in apartment buildings 2020



Inlet via Staircase



Push-pull, often reversible

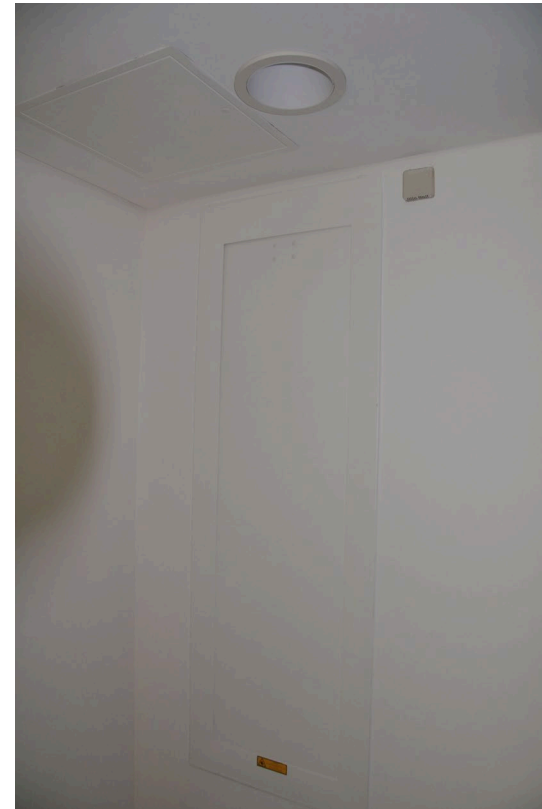


Extended travel distance systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



Internal Damper to shaft, concealed by decorative grille, or bottom hinged flap:



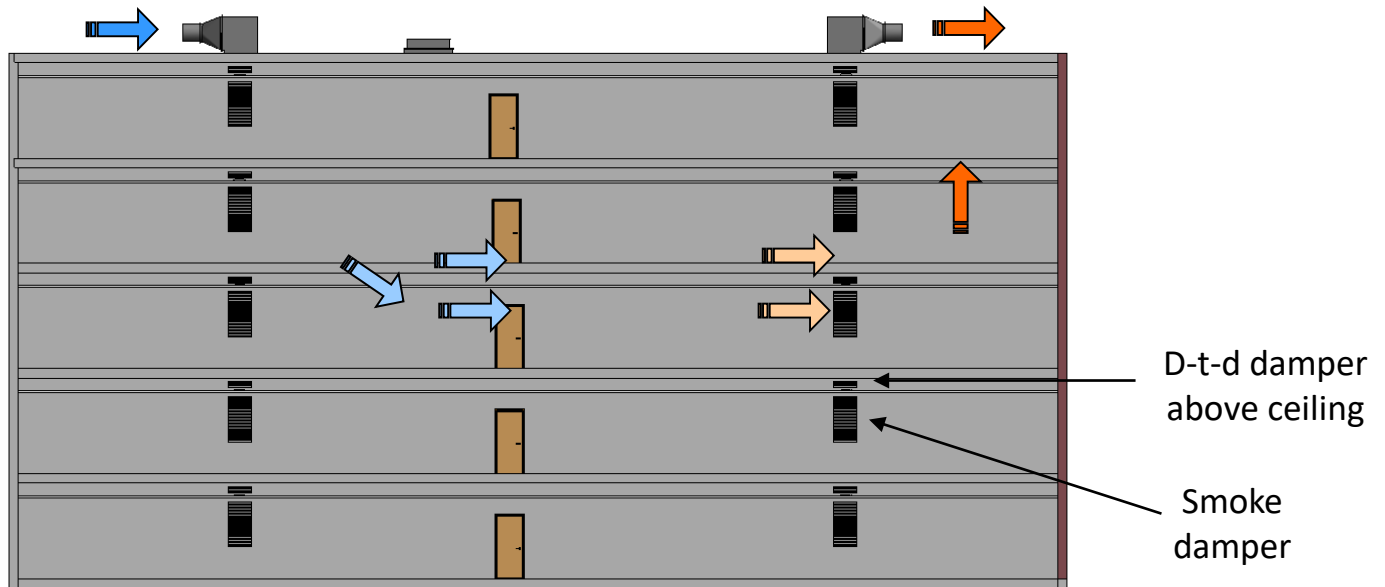
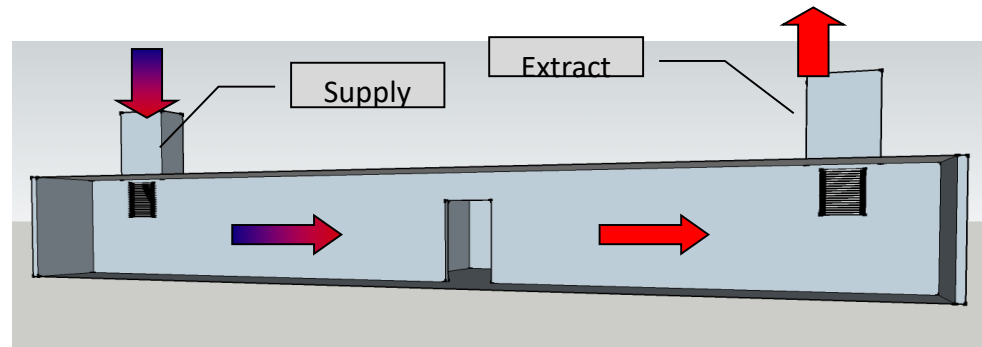
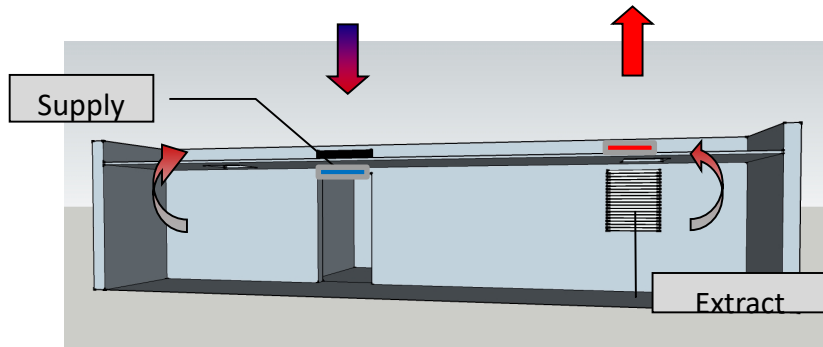
Extended travel distance systems can be used for environmental ventilation, but:

- Dedicated inlet air provision already exists and is usually well located
- Although if via part open stair door an alternative may be needed
- Vents must close on fire, except for the actual fire floor
- Flap vents have issues with finger trapping
- Fan noise becomes an important issue
- Control requirements
 - Temperature Sensor (internal and external)
 - Rain Sensor



Extended travel distance systems

Ventilation solutions for overheated common corridors in apartment buildings 2020



Extended travel distance systems - Equipment

Ventilation solutions for overheated common corridors in apartment buildings 2020

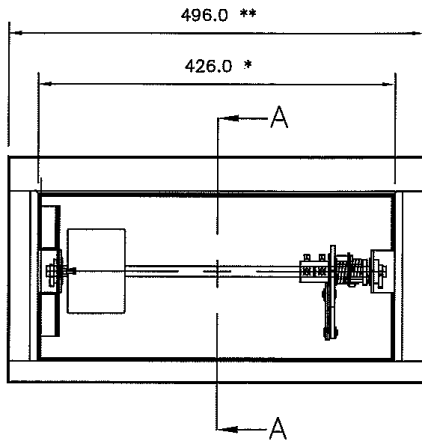


+
Corridor
Temperature
Sensor

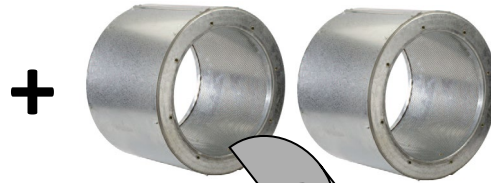


+

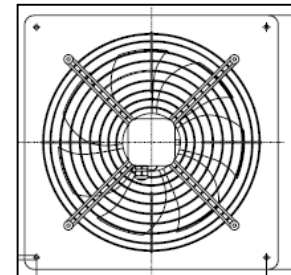
Small Fire Damper for
Environmental use



+ Variable Speed
Drive for
Extract/Supply
Fans



OR add a
separate,
quieter fan



Additional details to consider

Ventilation solutions for overheated common corridors in apartment buildings 2020



Additional details to consider

- Fans
- Rain defence
- Airflow
- Temperature
- Enhanced cooling



Details to consider - Fans

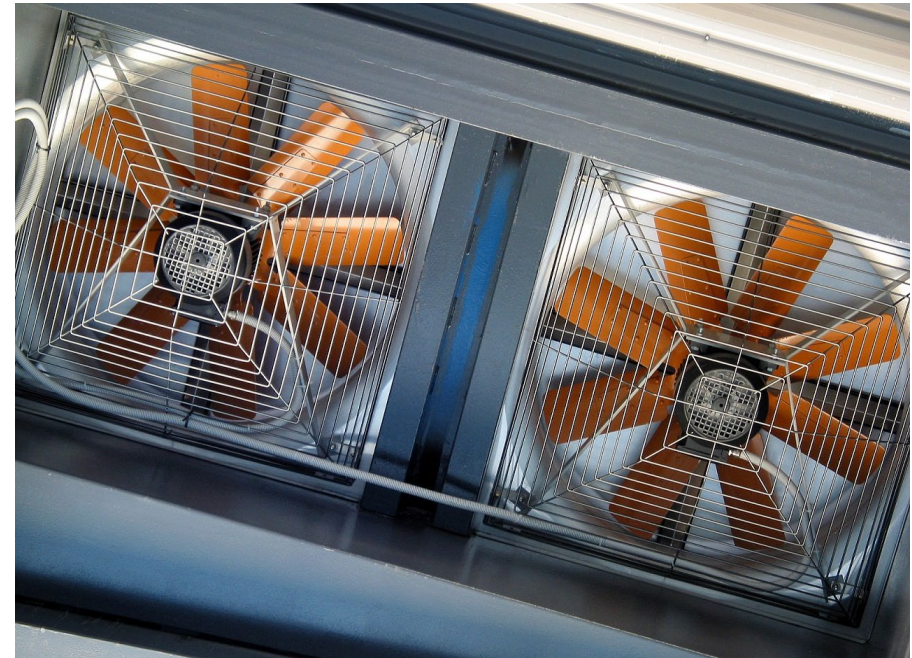
Ventilation solutions for overheated common corridors in apartment buildings 2020



Dual purpose smoke extract fans can be used, but:

- High tip clearance means low efficiency – high energy bills
- Smoke fans are generally noisy
- Future energy use restrictions from Europe may prohibit dual purpose fans on the basis of efficiency limits

Consider smaller secondary fans?



Details to consider - Fans

Ventilation solutions for overheated common corridors in apartment buildings 2020



Basic Smoke Control Installation



Dual purpose systems



Details to consider – Rain defence

Ventilation solutions for overheated common corridors in apartment buildings 2020

Dual purpose systems should consider rain entry

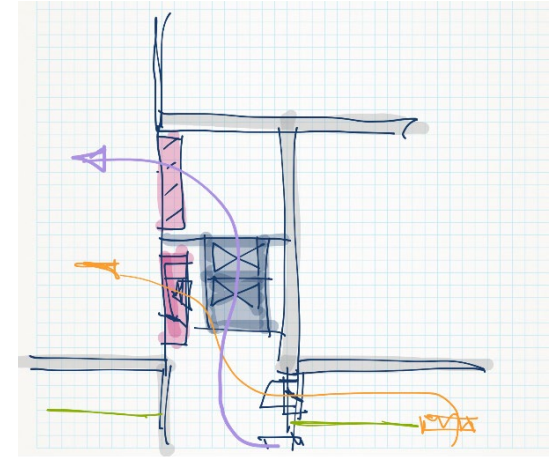


Details to consider – Air flow

Ventilation solutions for overheated common corridors in apartment buildings 2020

Balancing multiple floors can be difficult

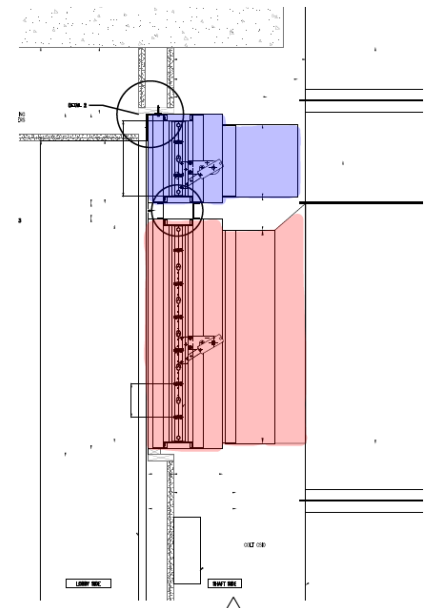
- Don't expect CIBSE levels of accuracy
- Limit number of floors ventilated simultaneously?
- Rotate groups of floors to be ventilated?
- Inherent balance - ground level supply, roof level extract?



Does ceiling void need to be ventilated too?

Are separate day-to-day dampers a cost effective benefit?

Night cooling?



Manage temperature expectations

- Don't expect A/C levels of accuracy
- Systems will alleviate stuffiness and limit overheating
- Corridors are transit spaces and don't need close control (except in high value buildings with demanding residents)



Enhance conditions with active cooling provided by an Evaporative Cooling System



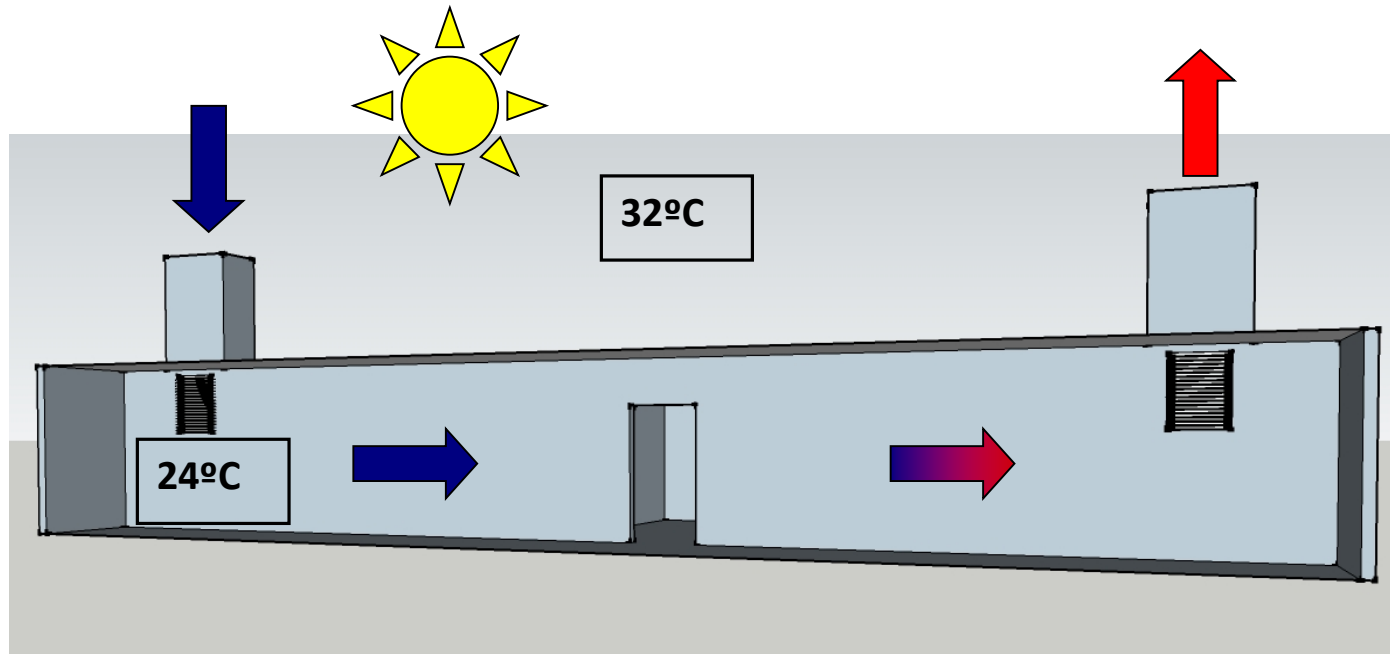
A ventilation system based on supplying outside air alone is able to achieve temperatures in the corridor typically 2-5°C above the outside ambient.

With Coolshaft we are able to reduce supply temperatures below outside ambient, providing active cooling in the corridors.

Details to consider – Enhanced cooling

Ventilation solutions for overheated common corridors in apartment buildings 2020

Corridor evaporative cooling system



Evaporative cooling and ventilation systems use the cooling power of water to reduce the temperature, creating a more favourable environment in corridors.

Running and maintenance costs are extremely low and the warmer the outside air, the more efficient evaporative cooling becomes.



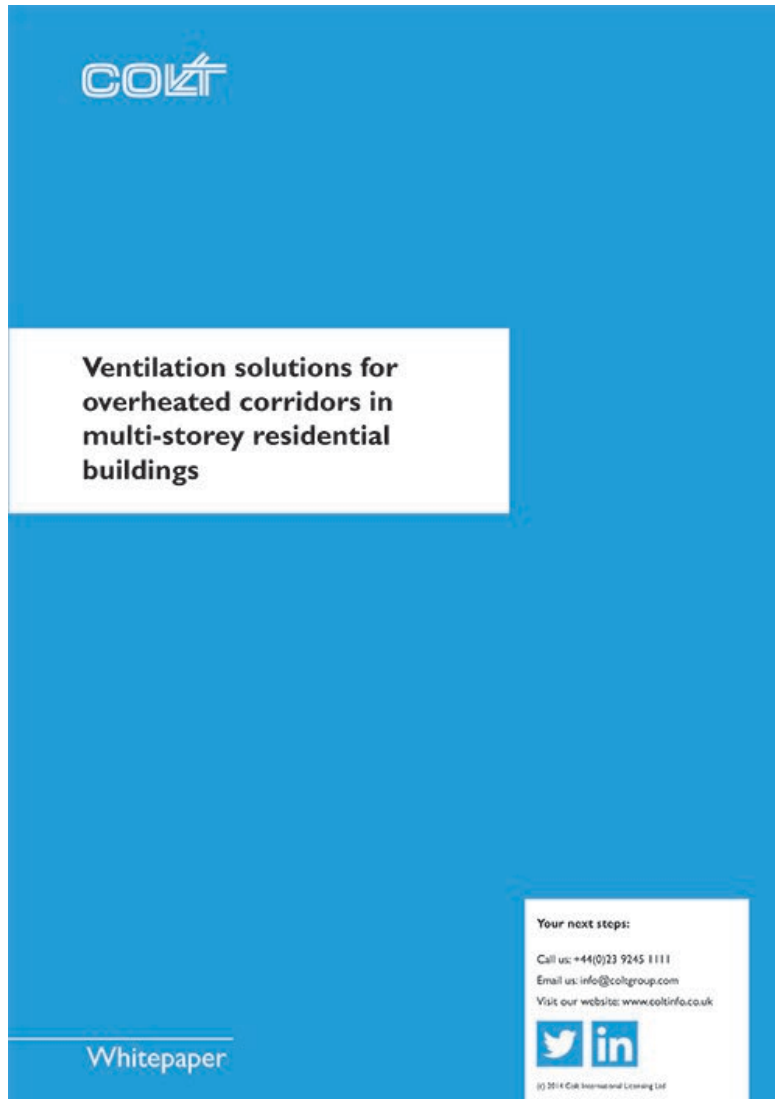
Evaporative Cooling:

- Offers a reduction in energy costs of up to 90% compared to conventional air conditioning
- Low cost of operation and maintenance
- Free from refrigerants, no F gas compliance
- Integrated water quality system, simple technology
- VDI 6022 certification for water hygiene
- Filtered air supply
- Decentralised, modular approach maximises reliability

Low Running Costs

10 hours per day during the summer months = £350 per year electricity costs for a typical installation



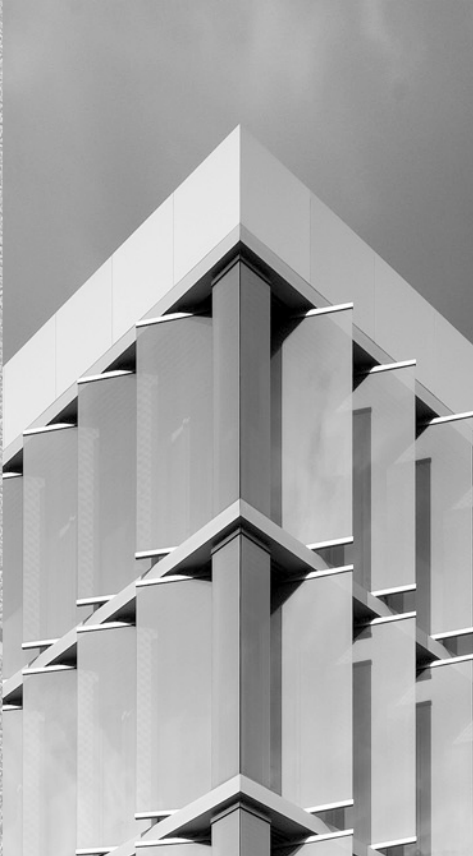


Whitepaper: Ventilation solutions for overheated corridors in multi-storey residential buildings

Download this and more at:

blog.coltinfo.co.uk/white-papers





Q&A Session...

COLT

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