Easivent's quick guide to...

Stairwell AOVs

WHAT is a stairwell AOV?

A stairwell AOV is an automatic opening ventilator (AOV) which provides at least 1.0m^2 of free area when open*.

The installation is always located at the highest point in an evacuation stairwell and can take a number of forms.

The most common types of stairwell ventilators are:

- Louvred
- Hatch
- Windows
- Roof windows

*The required dimensions are stipulated in the Building Regulations 2013 (*Approved Document B (fire safety) volume 2: buildings other than dwellinghouses (2006 edition incorporating the 2010 and 2013 amendments*).

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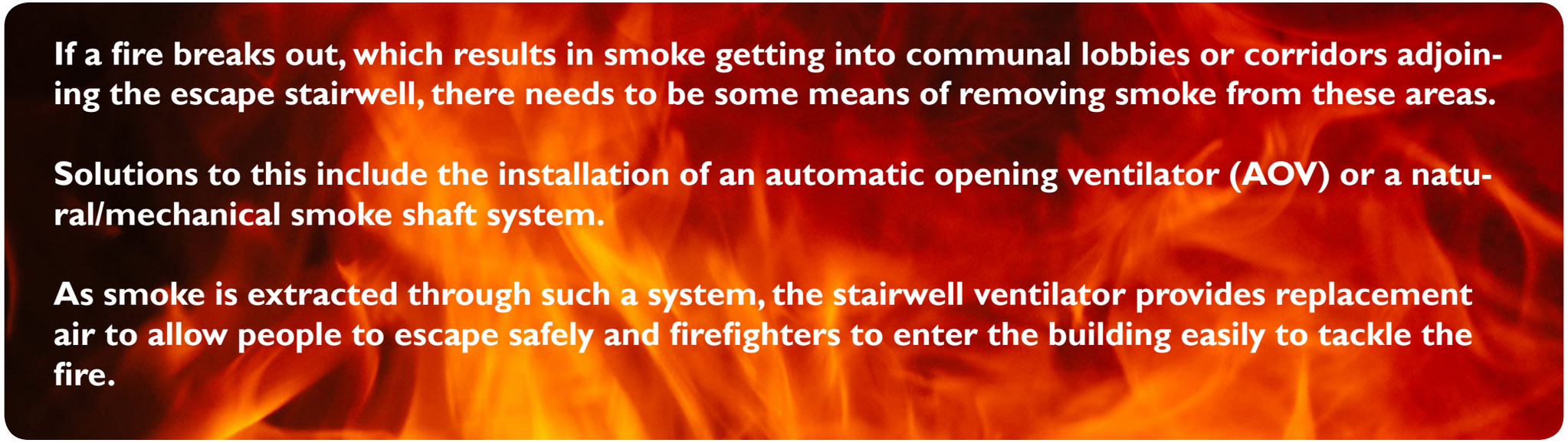
WHY do I need a stairwell AOV?

A stairwell ventilator usually serves one of two purposes:

- It removes any smoke that gets in the stairwell of small buildings
- More commonly it provides replacement air for a lobby smoke extract system in large buildings



If a fire breaks out, which results in smoke getting into communal lobbies or corridors adjoining the escape stairwell, there needs to be some means of removing smoke from these areas.

Solutions to this include the installation of an automatic opening ventilator (AOV) or a natural/mechanical smoke shaft system.

As smoke is extracted through such a system, the stairwell ventilator provides replacement air to allow people to escape safely and firefighters to enter the building easily to tackle the fire.

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WHERE is a stairwell AOV installed?

Residential buildings

Stairwell AOVs are commonly used in the stairwells of flats where protecting the common escape routes is of paramount importance. The exact requirements for ventilating such buildings are stipulated in Approved Document B of the Building Regulations 2013. There are two main categories:

- **Small single stair buildings**

Small single stair buildings are those which have a top floor less than 11m above ground, with no more than three storeys above ground floor level. The stair does not connect with a covered car park or ancillary accommodation unless via a ventilated lobby. In such buildings, there is no requirement to protect the lobby. A ventilator at the head of the staircase that can be operated remotely from the fire service access level is required.

- **Buildings over 11m**

For buildings with a top floor exceeding 11m, there is a requirement to provide some means of protecting corridors and communal lobbies with access to the escape stairwell in order to control smoke.
This can be done by natural or mechanical means:

- Natural ventilation, either using AOVs directly to the outside or through a shaft up to the roof. A stairwell ventilator will be required with both options.
- Although not yet contained within the Building Regulations, mechanical smoke shaft systems are commonly used instead of natural shafts as they occupy less space in the building. These systems also require a stairwell vent for air inlet purposes.

Pressurisation systems, which are an approved mechanical smoke control system, are more complex than the above extract systems and do not require a stairwell ventilator to operate.

- **Other buildings containing firefighting shafts**

Buildings with a top floor more than 18m above fire service access level should contain a designated shaft and appropriate lift for use by firefighters. These require smoke control measures which will include a stairwell ventilator where natural and mechanical extract are employed.

WHAT else can a stairwell ventilator be used for?

As well as smoke removal and fresh air replenishment, it can be used for:

- **Daily ventilation:** To evacuate heat or to provide fresh air to a lobby smoke shaft system when it is used for environmental ventilation

- **Daylight:** The stairwell ventilator may also be used to provide daylight to an internal stairwell (using a product with glass, plastic blades or a lid)

- **Roof access:** It may also be used as a roof access hatch

Daily ventilation

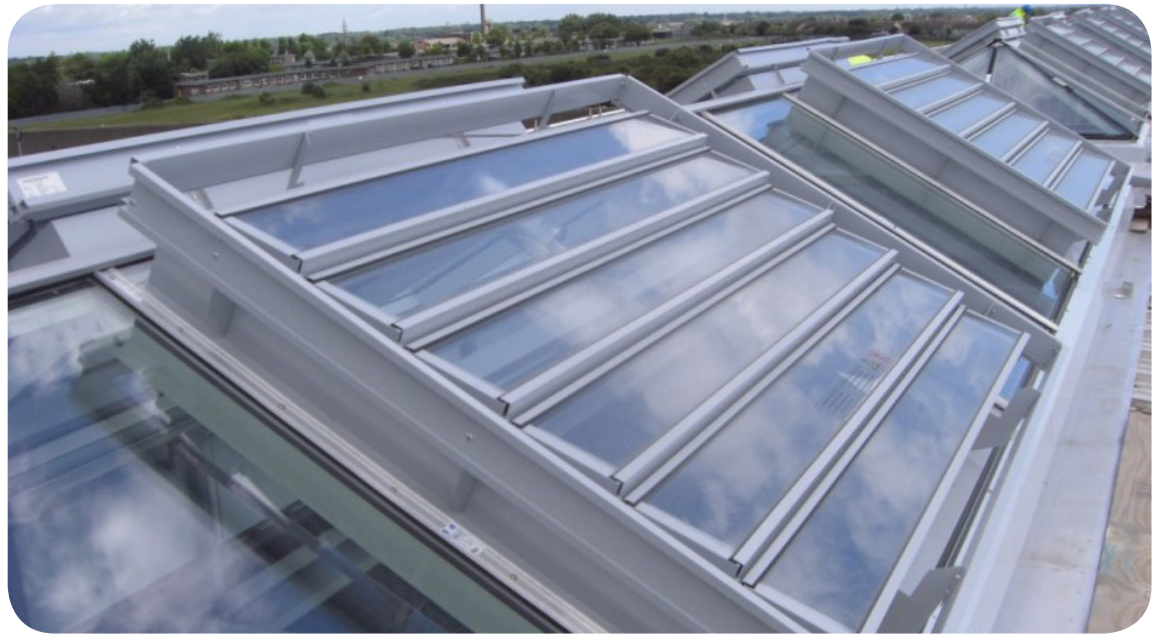
The stairwell ventilator may be used to evacuate heat or to provide fresh air to a lobby smoke shaft system when it is used for environmental ventilation. This can be achieved by using a ventilator with additional weathered ventilation dampers.

A standard ventilator with an additional rain sensing controller can also be used; it will close the ventilator in bad weather. The rain sensor will usually be a cost-effective solution in installation costs but prevent the use of the ventilator in warm, wet weather. Therefore this may prove to be a false economy.

Daylight

The stairwell AOV may also be used to provide daylight to an internal stairwell.

This is done by selecting a product with either glass or plastic blades or a lid in the case of a hatch. For example, a glass bladed louvre or a polycarbonate hatch vent are perfect for providing light.



Roof access

The stairwell AOV may also be used as a roof access hatch (as seen in the picture below). This will require the opening mechanism to be designed in such a way that it doesn't obstruct access through the hatch.

An addition of manual controls to facilitate the opening and closing both from inside and from the roof can be installed.

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WHAT are the most common types of stairwell ventilator?

- **Louvred ventilator:** Provides discharge of smoke and fumes through motorised blades along the length of the frame (choice of blade types)

- **Louvred ventilator with weatherproof ventilation:** As above, but also contains separate side-mounted daily ventilation louvres to allow fresh air input without opening the whole louvre (to provide daily ventilation even in wet weather)

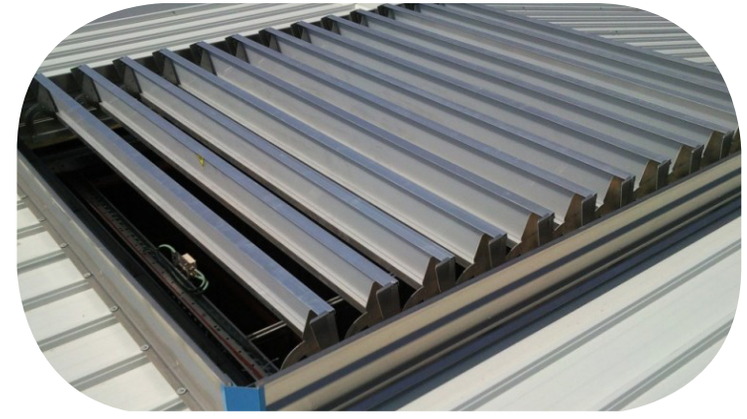
- **Roof hatch:** Provides discharge of smoke and fumes with an opening angle of 140 degrees

- **Actuated vertical window:** It is preferable and more effective for the window to be bottom hung and outward opening.

- **Actuated roof window:** Roof windows are often used for ventilation and may also be used for smoke evacuation (subject to compliance with regulations)

Louvre

The louvre provides discharge of smoke and fumes through motorised blades along the length of the frame.

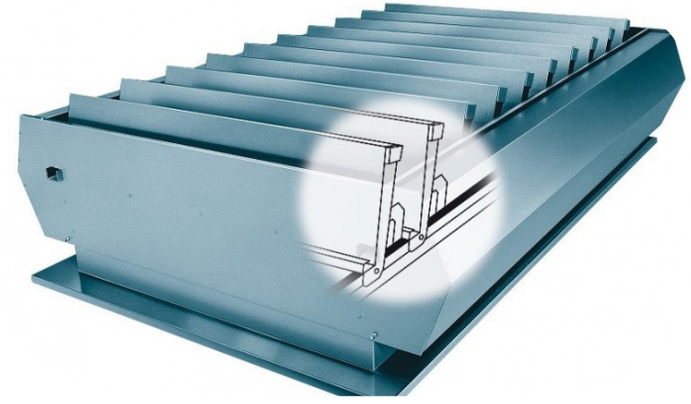


A choice of blades are available with standard and insulated aluminium, 8mm or 16mm polycarbonate (transparent or opal) and single or double-glazed panels.

It is recommended that insulated blades and frames are used to prevent future condensation problems.

Louvre with weatherproof ventilation

As above but also contains separate 24V, side-mounted daily ventilation louvres to allow fresh air input without opening the whole louvre. This means that daily ventilation can be provided even in wet weather.



Different styles of blades are available with standard and insulated aluminium, 8mm or 16mm polycarbonate (transparent or opal) and single or double-glazed panels.

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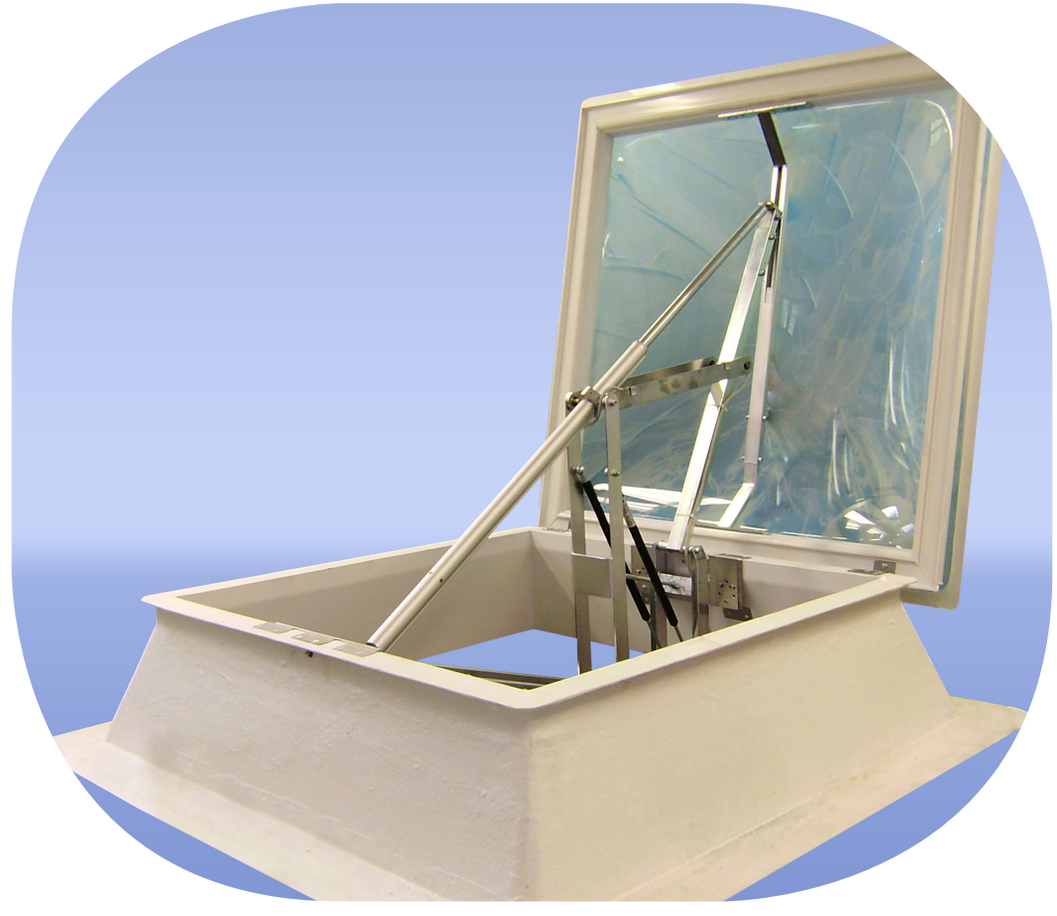
Hatch

The hatch AOV
provides discharge of smoke and fumes with an opening angle of 140 degrees.

It is available with either a solid aluminium insulated lid or a polycarbonate translucent panel.

The latter option can provide daylighting if required.

The roof hatch is not usually suitable for environmental ventilation.



Window or roof window

Actuated vertical window

It is preferable and more effective for the window to be bottom hung and outward opening.
To meet standards it must always provide the required free area as specified in Approved Document B. A range of actuators are available, including chain drives, linear and folding arms. These should be test-ed and CE marked to EN12101:2.

Actuated roof window

Roof windows are often used for ventilation and may also be used for smoke evacuation subject to compliance with regulations.

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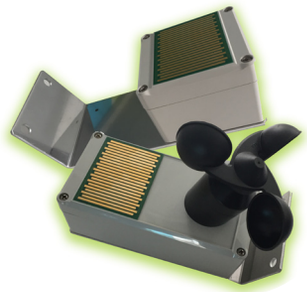
WHAT control system is needed for a stairwell ventilator?

Regardless of the product selected, the control method and components are fairly universal, comprising a power supply unit, manual switches and in some cases smoke detectors

- Power supply unit/control panel
- Override switches
- Smoke detectors
- Rain sensing controls
- Thermostats



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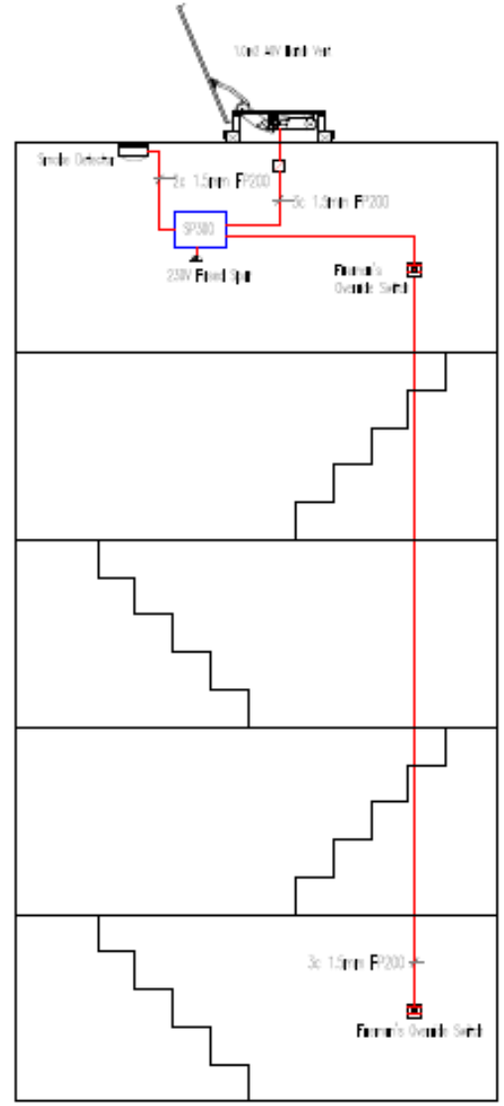
Controls schematic



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HOW is a stairwell ventilator installed?

Most stairwell ventilators are mounted on the roof of the stairwell:

- **Flat roof**
- **Pitched roof**
- **Metal cladding**
- **Slate tile**

Also:

- **Wall-mounted**
- **Glazing**
- **Retro fitting actuators (automatically opening a window within the stairwell)**

Flat roof

The most common application of stairwell AOVs is installation on a flat roof. The ventilator will either be provided with a roof curb for building into the roof or it will be mounted onto a builder's work upstand.

Ideally, roof upstands should have a slight pitch of 3-5 degrees to help prevent rainwater collecting on the ventilator which could be thrown into the building when opened. In specifying the roof upstand dimensions it is important that sufficient tolerance is built in to allow for the weathering membrane and an allowance for expansion.

The internal area should be clear of obstructions e.g. steelwork which could reduce the effective area of ventilation and impede the operation of the ventilator.

Pitched roof

Louvred ventilators may be satisfactorily installed onto a pitched roof. This type of roof and ventilator is commonly found in large industrial buildings containing firefighting staircases. They can also be used in small single-stair buildings with slate or tiled roofs.

Ideally the ventilator should be positioned at the ridge of the roof with the top flange tucked under the ridge flashing.

If the ventilator is downslope from the ridge then it is recommended that the top flange is extended to the ridge with additional panels to ensure a weatherproof seal.

The simplest method of installing a stairwell ventilator into a pitched metal roof is to use a louvred ventilator with a folded aluminium base. The base will have angled turndowns at the sides and longer flanges at the top and bottom for weathering to the roof cladding.

Glazing

Ventilators can satisfactorily be built into patent glazing by designing the vent to replace a pane of glass and selecting a flange of the same depth as the glass.

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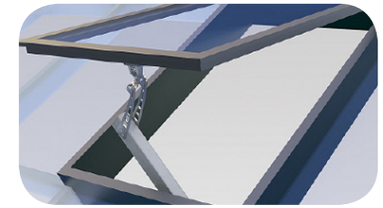
WHAT actuator do I need for my window type?

- **Rising sash:** It is possible to automate a vertical sash window using linear actuators

- **Top hung outward opening:** Most often controlled by a chain actuator, or for larger windows, a folding arm is a reliable option



- **Side hung:** A chain drive would be suitable subject to being able to deliver the required free area (otherwise a slit actuator or folding arm may be employed)

- **Bottom hung:** Most often controlled by a chain actuator, or for larger windows a folding arm is a reliable option

Actuator selection

The first step is to calculate how far the window needs to open using table C7 of Approved Document B. Then the best mounting position for the actuator is decided on with reference to clearance and likelihood of tampering. Then the required opening and closing force is calculated (see below) and a suitable product is selected to achieve the correct opening distance.

Calculation of opening force
This calculation is only valid for vertically mounted wall windows. For other installations a detailed calculation must be done.

F := force of the actuator (N)
S := stroke of the actuator (mm)
H := height of the wing frame (mm)
W:= weight of the wing frame (kg)

Required force of the actuator at specified stroke:

$$F = (W / 2) \times (S / H) \times 10 = (W \times S \times 5) / H$$

Maximum possible stroke of the actuator at a given force:

$$S = (2 \times F \times H) / (W \times 10) = (F \times H) / (W \times 5)$$

(Excerpt from EA K 50 Manual from Simon RWA. Section 4.2)

Under the Construction Products Regulations (CPR) it is a legal requirement to use only certified products for smoke ventilation. For more information see SCS Group's Technical Bulletin here.