

Smoke and Heat Ventilation Systems

RWAupdate



Active
components
in fire rescue
strategies

Safety:
from design to
acceptance and
maintenance

Stairwell smoke ventilation

ZVEI:

Specialist group
for electrically driven
smoke ventilation
and natural ventilation



Stairwell smoke ventilation: Active components in fire rescue strategies

The stairwell is often the only means of escape and rescue in a building and in the event of a fire a reliable system of smoke ventilation can save lives. When it comes to smoke ventilation systems in stairwells, the most critical factors involved apart from the quality of the components are competent planning and implementation within the building. This is because escape and rescue in the event of fire can only be guaranteed if high quality products are competently installed and professionally maintained.

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1. Certified products, systems and installers

The members of the „Specialist group for electrically driven smoke and heat ventilation systems and natural ventilation“ of the ZVEI have put their smoke ventilation systems for stairwells through a range of tests in order to document their current standard of quality. Member firms of the „Specialist group of installers“ of the ZVEI and competent firms authorized by the manufacturers provide the guarantee, on the basis of their certification, that they deliver professional results in all phases of design, installation and maintenance.

2. Design of stairwell smoke ventilation systems

All smoke ventilation systems in accordance with Building Rules List C Part 3.10 must be designed to comply with the requirements of the applicable building regulations in the respective federal state. This includes the specification of the required smoke ventilation opening, with the critical points for effective smoke ventilation being the position, size and opening width. Equally critical are the number and positions of automatic and manual activation devices. The manufacturers and specialist ZVEI member installer firms for smoke ventilation systems provide the guarantee for the competent design, installation and commissioning of these important fire protection devices.

3. Installation and acceptance inspections

The correct and professional installation and commissioning of the smoke ventilation system must be carried out in compliance with installation regulations and applicable standards. Compliance is guaranteed if the work is undertaken by a ZVEI manufacturer or ZVEI installer.

4. Maintenance

Proper maintenance covers all the measures required to ensure that the smoke ventilation system is maintained in a ready for use state and in proper working order. The actuation and control elements, opening units, energy supply lines and accessories must be checked once a year to make sure they are in proper working order and ready for use. If it is necessary they have to be repaired only use original spare parts from the relevant manufacturer.



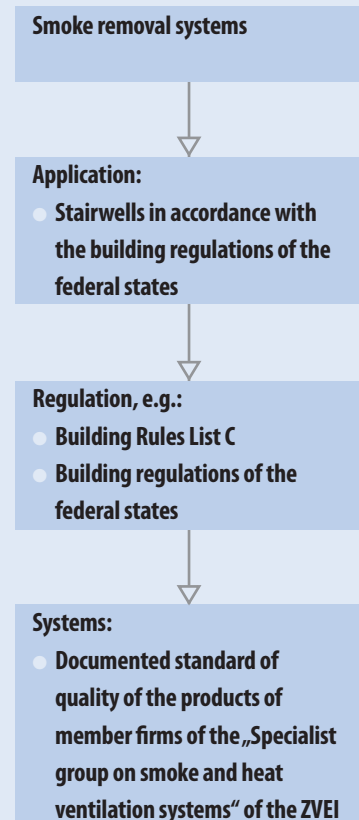
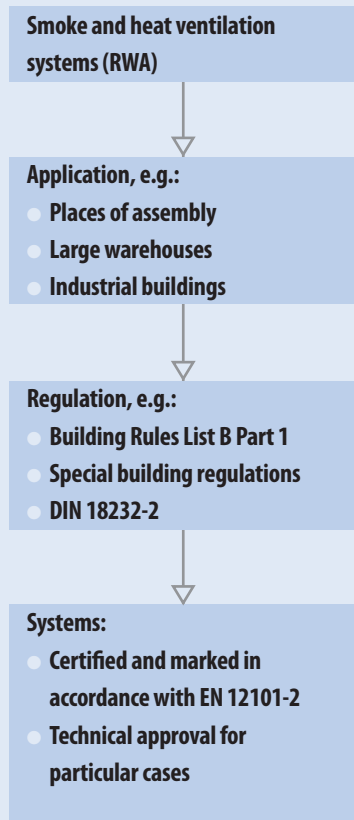


Legal background for the smoke ventilation of premises

The requirement for smoke ventilation systems is enshrined in various regulations and building regulations. These are covered by the building regulations of the federal states and the special building regulations, and include, for example, the regulations on places of assembly and shopping centers and the regulations on multi-storey buildings, industrial buildings and hospitals. Depending on the specific area of application the objectives are divided into either keeping the area on fire and the escape route largely free of smoke by ensuring that a low-smoke area is formed close to the floor (smoke ventilation), and smoke ventilation following evacuation (smoke removal). In terms of definition the building regulations of the federal states distinguish between smoke ventilation systems for stairwells and smoke and heat ventilation systems for industrial buildings and places of assembly on the basis that the former are referred to as systems for „smoke removal“. The following diagram shows how these are covered by the statutory building regulations.



Legal background



Stairwell smoke
ventilation

If a fire protection strategy has been developed, please take this into account for design and implementation.

Legal background

This interpretation of the legal position has been confirmed by the Conference of the Federal State Ministries Competent for Building and Housing (Bauministerkonferenz der Länder [ARGEBAU]), as documented in the following letter.



Definition of natural smoke and heat ventilation devices in relation to the requirements of the building regulations of the federal states; *Your enquiry dated 16 February 2007*

Ladies and Gentlemen,

By letter dated 12 June 2007 you made an enquiry to the supreme building control authorities of the federal states as to whether it automatically follows from the requirements of the building regulations of the federal states in respect of smoke removal that the use of building products in accordance with the Building Products Guideline (Bauprodukttrichtlinie) - in this particular case the use of natural smoke and heat ventilation devices in accordance with DIN EN 12101-2 - is a mandatory requirement.

The representatives of the federal states have agreed in this regard to refer your question to the Building Control Committee of the Conference of the Federal Ministries Competent for Building and Housing (ARGE-BAU), in whose name I wish to advise as follows:

Where smoke removal is required under the provisions of the statutory building regulations this does not in itself automatically mean that products in accordance with DIN EN 12101-2 (namely smoke and heat ventilation devices which are components of smoke and heat ventilation systems) have to be used as a mandatory requirement.

Where the (general) requirement for smoke removal is given more detailed specification to the extent that only certain (geometric) opening areas are allowed to be provided for the purposes of smoke removal, the Building Control Committee is of the view that this does not mean that the use of a smoke and heat ventilation system, and therefore devices in accordance with DIN EN 12101-2 as components of such a system, is a mandatory requirement.

The situation is different where the use of a smoke and heat ventilation system is explicitly required by a provision in the statutory building regulations (such as in Section 16 (3) of the Standard Assembly Room Building Regulations). If a natural smoke and heat ventilation system is installed in order to meet the requirements of this provision, smoke and heat ventilation devices used as components in the system must of course comply with requirements of Building Rules List B Part 1, No. 1.1.17 of DIN EN 12101-2.

Yours sincerely,
Jade, Ltd. Ministerialrat (Senior Ministry Official)

Excerpt from the adjacent letter from the Amt für Bauordnung und Hochbau, Hamburg (Planning and Building Control Authority, Hamburg), dated 10 July 2007.



Definition of natural smoke and heat ventilation devices in relation to the requirements of the building regulations of the federal states; *Your enquiry dated 12 June 2007*

Ladies and Gentlemen,

I concur with the views expressed by the Building Control Committee in the letter you received dated 4 July 2007. However, I wish to draw your attention to a special situation in Hamburg, since the requirements set out by the Building Control Committee are given concrete form in this case.

According to Section 33 (3) 2 of the HBauO, inside stairwells are only permitted if there is no danger of smoke preventing them being used for an adequate period of time. This rather vague legal concept is given more detailed definition in Prüfdienst BTA (BPD 2/2005). This specifies that inside stairwells are permitted in buildings where the floor of the highest habitable room in the building does not exceed 13 m above specified ground level, as long as they have a natural smoke ventilation system. The required size of the smoke ventilation opening is defined in Section 33 (3) HBauO.

The smoke ventilation devices in the aforementioned cases are part of a natural smoke ventilation system, which means that the statutory building product requirements of the Building Rules List apply. In Hamburg, Building Rules List (Bauregelliste [BRL]) 2006/1 currently applies. This requires that all natural smoke ventilation systems have to bear the CE mark of conformity in accordance with DIN EN 12101-2 (Building Rules List B Part 1, No. 1.17.1).

Yours sincerely,
J. Binder

Excerpt from the adjacent letter from the Bayerisches Staatsministerium des Innern, Munich (Bavarian Ministry of the Interior, Munich), dated 4 July 2007.



Stairwell smoke
ventilation



Requirements of the standard building regulations (MBO) and the building regulations of the federal states (without „safety stairwells“) Dated: 15.11.2009

Federal state	Source	Dated	Smoke vent when?	
	MBO (Standard Building Regulations) Smoke ventilation: Section 35 (8) 3 Ventilation: Section 35 (8) 1 and 2	November 2002, in the version dated October 2008	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Baden-Württemberg	Smoke ventilation: Section 11 (5) of the implementing regulations (AVO) to supplement Sec. 28 of the federal state building regulations (LBO) Ventilation: Section 11 (2) 1 of the implementing regulations (AVO) to supplement Sec. 28 of the federal state building regulations (LBO)	08. Aug 95 in the version of the regulation dated 25. Apr 07; the amending law (ÄndG), adopted by the parliament of the Land on 04. Nov 09, is not taken into account for lack of implementing regulations (AVO)	In the case of stairwells required in buildings containing more than five storeys and in the case of inner stairwells required in buildings, by means of a smoke outlet.	
Bavaria 2008	LBO (Federal State Building Regulations) Smoke ventilation: Article 33 (8) 3 Ventilation: Article 33 (8) 1 and 2	In the version of publication dated 14. Aug 07, last amended by law dated 27. Jul 2009 (valid from 1. Aug 2009)	Stairwells	
Berlin	LBO (Federal State Building Regulations) Smoke ventilation: Section 35 (8) 3 Ventilation: Section 35 (8) 1 and 2	29. Sep 2005 in the version dated 07. Jun 2007	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Brandenburg	LBO (Federal State Building Regulations) Smoke ventilation: Section 31 (10) 2 and 3, and (11) Ventilation: Section 31 (10) 1, and (11)	17. Sep 2008	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m, excluding residential buildings with no more than 2 residential units.	
Bremen	LBO (Federal State Building Regulations) Smoke ventilation: Section 35 (8) 3 Ventilation: Section 35 (8) 1 and 2	Revised version of the LBO adopted by the parliament of the Land on 01. Oct 2009	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Hamburg	LBO (Federal State Building Regulations) Smoke ventilation: Section 33 (8) 3 Ventilation: Section 33 (8) 1 and 2	14. Dec 2005 in the version dated 17. Feb 2009	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Hesse	LBO (Federal State Building Regulations) Smoke ventilation: Section 31 (6) 3 Ventilation: Section 31 (6) 1 and 2	18. Jun 2002 in the version dated 06. Sep 2007	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Mecklenburg West Pomerania	LBO (Federal State Building Regulations) Smoke ventilation: Section 35 (8) 3 Ventilation: Section 35 (8) 1 and 2	18. Apr 2006	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Lower Saxony	LBO (Federal State Building Regulations) Smoke ventilation: Section 34 a Ventilation: § 34	13. Jul 1995, revised issue dated 10. Feb 2003, last amended 14. Nov 2006	No regulations	
North Rhine Westphalia	LBO (Federal State Building Regulations) Smoke ventilation: Section 37 (12) Ventilation: Section 37 (11) 1 and 2	01. Mar 2000 in the version of the law dated 28. Oct 2008	In the case of buildings containing more than 5 storeys above ground level and for inner stairwells required in buildings	
Rhineland-Palatinate	LBO (Federal State Building Regulations) Smoke ventilation: Section 34 (11) Ventilation: Section 34 (10)	24. Nov 1998 in the version dated 04. Jul 2007	In the case of buildings containing more than 5 storeys above ground level and for stairwells required in buildings where not adjacent to an external wall	
Saarland	LBO (Federal State Building Regulations) Smoke ventilation: Section 35 (5) 3 Ventilation: Section 35 (5) 1 and 2	18. Feb 2004 in the version dated 21. Nov 2007	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Saxony	LBO (Federal State Building Regulations) Smoke ventilation: Section 35 (8) 3 and 4 Ventilation: Section 35 (8) 1 and 2	28. May 2004 in the version dated 30. Jul 2008	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Saxony-Anhalt	LBO (Federal State Building Regulations) Smoke ventilation: Section 34 (8) 3 Ventilation: Section 34 (8) 1 and 2	20. Dec 2005	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Schleswig-Holstein	LBO (Federal State Building Regulations) Smoke ventilation: Section 36 (8) 3 Ventilation: Section 36 (8) 1 and 2	22. Jan 2009	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	
Thuringia	LBO (Federal State Building Regulations) Smoke ventilation: Section 33 (8) 3 Ventilation: Section 33 (8) 1 and 2	16. Mar 2004 in the version dated 05. Feb 2008	In the case of inner stairwells required in buildings and stairwells required in buildings with a height of more than 13 m	



(LBO) regarding smoke ventilation and natural ventilation of „required stairwells“



Smoke vent where?	Smoke vent size?	Operation points where?	Ventilation
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell; windows may be designed for use as smoke outlets if they are situated at a sufficiently high position.	Clear area of at least 1 m ²	Must be capable of being opened from the ground floor. Smoke outlets may be required to be capable of being operated from other positions. Exceptions may be permitted.	Required stairwells must be located adjacent to an external wall and in each floor of the stairwell above ground level must have windows which are capable of being opened.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows measuring at least 0.6 m x 0.9 m (width x height) which are capable of being opened, have a spandrel of no more than 1.20 m in height, and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 5 % of the building area, but no less than 1 m ²	Ground floor and upper-most landing.	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing. Clause 4: In the case of stairwells with a building area of over 40 m ² , special precautions must be taken to provide support for rescuing of persons.	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing.	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing.	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
No regulations	No regulations	No regulations	Stairwells must be capable of being ventilated. Stairwells adjacent to an external wall must have windows, with the exception of residential buildings with no more than two residential units.
At the head of the stairwell	Clear area of at least 5 % of the building area, but no less than 1 m ²	Ground floor and upper-most landing. Exceptions (from all requirements) may be permitted.	Required stairwells located adjacent to an external wall must have windows measuring at least 0.5 m ² on each floor, and these must be capable of being opened.
At the head of the stairwell	Clear area of at least 5 % of the building area, but not less than 1 m ²	Ground floor and upper-most landing. Other operating points may be required. Exceptions from all requirements may be permitted.	Required stairwells must be capable of being ventilated. In the case of stairwells adjacent to the external wall in category 3 + 4 buildings, every floor above ground level must have windows measuring at least 0.6 m x 0.9 m (width x height) which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing.	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.
At the head of the stairwell	Clear area of at least 1 m ²	Ground floor and upper-most landing	Required stairwells: Every floor above ground level must have windows with a clear area of at least 0.5 m ² which are capable of being opened and which lead directly into the open.



Stairwell smoke ventilation



Qualified and competent installer firms for smoke ventilation systems

The specialist firm for installing smoke ventilation systems in stairwells should hold a certificate of competence to prove that the firm is suitably qualified. This documents that the responsible personnel at the firm have suitable training and professional experience and also have in-depth knowledge of smoke ventilation. The continuous initial training and further training of the firm's personnel in respect of products, the state-of-the-art in technology and applicable standards and regulations is provided by the manufacturer of the systems and components, and the ZVEI Academy provides support for this process.



The owners/operators of smoke ventilation systems are duty-bound to have their system serviced at regular intervals to ensure that it is always in proper working order. In so doing they considerably reduce the risk of damage and harm and third party liability risk in the event of an incident. For the maintenance of smoke ventilation systems, a qualified installer firm is also a competent partner. The ZVEI installer certificate or a manufacturer's certificate of competence provides verification of the required competence.

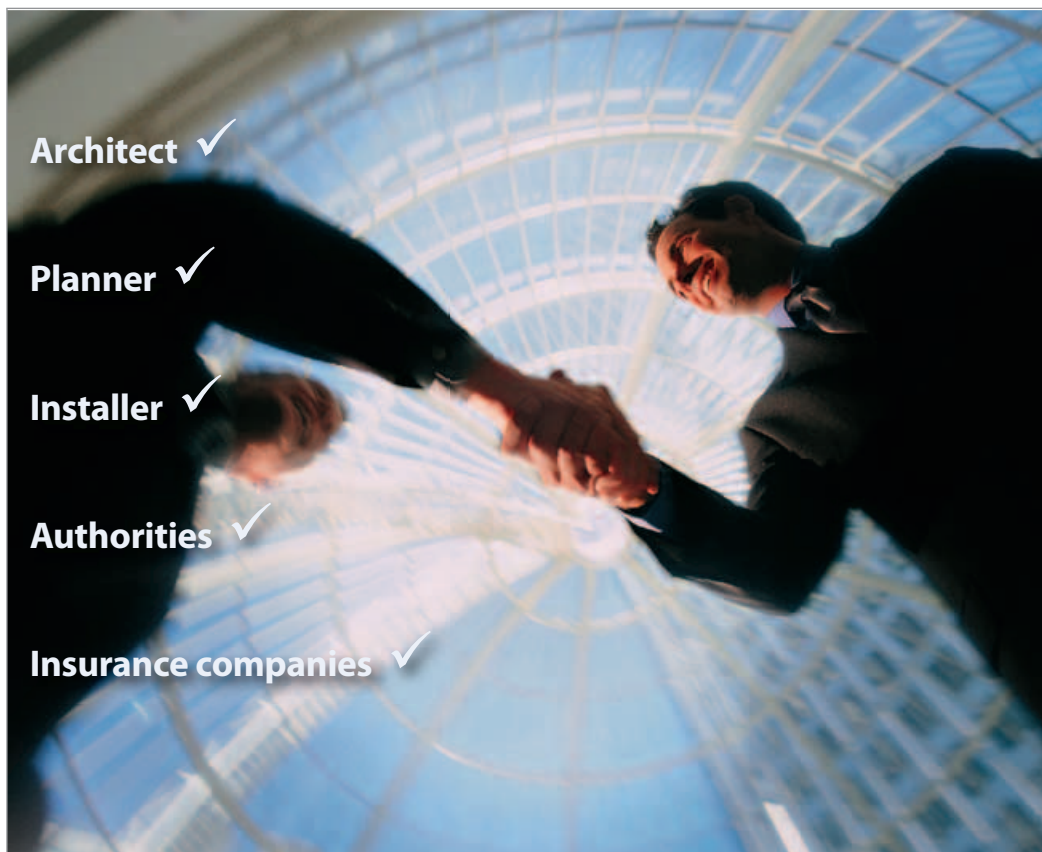


Stairwell smoke
ventilation

Benefits for owners and users

ZVEI manufacturers offer high quality products for the smoke ventilation of stairwells. These fire protection systems not only fulfill safety aims, they also offer architects and planners as well as owners and users a whole host of genuine benefits:

- Clear and transparent documentation of compliance with regulations is provided for every phase of the project.
- ZVEI manufacturers provide detailed documentation for their products.
This documentation makes it easier to gain approval from the building control authorities.
- The safety standard in the building is visibly raised.
- Architects and clients are provided with a better basis for comparing and assessing specialist firms.
The installer can prove that he uses high quality products and installs them conforming with regulations. This minimises the risk of complaints and costly supplementary demands for performance.
- The user/operator can furnish documentation at any time that he has a high quality smoke ventilation system which has been correctly installed. This substantially reduces the user's/operator's third party liability risk.
- The planning risk for the architect and specialist planner/designer is reduced.



Stairwell smoke
ventilation

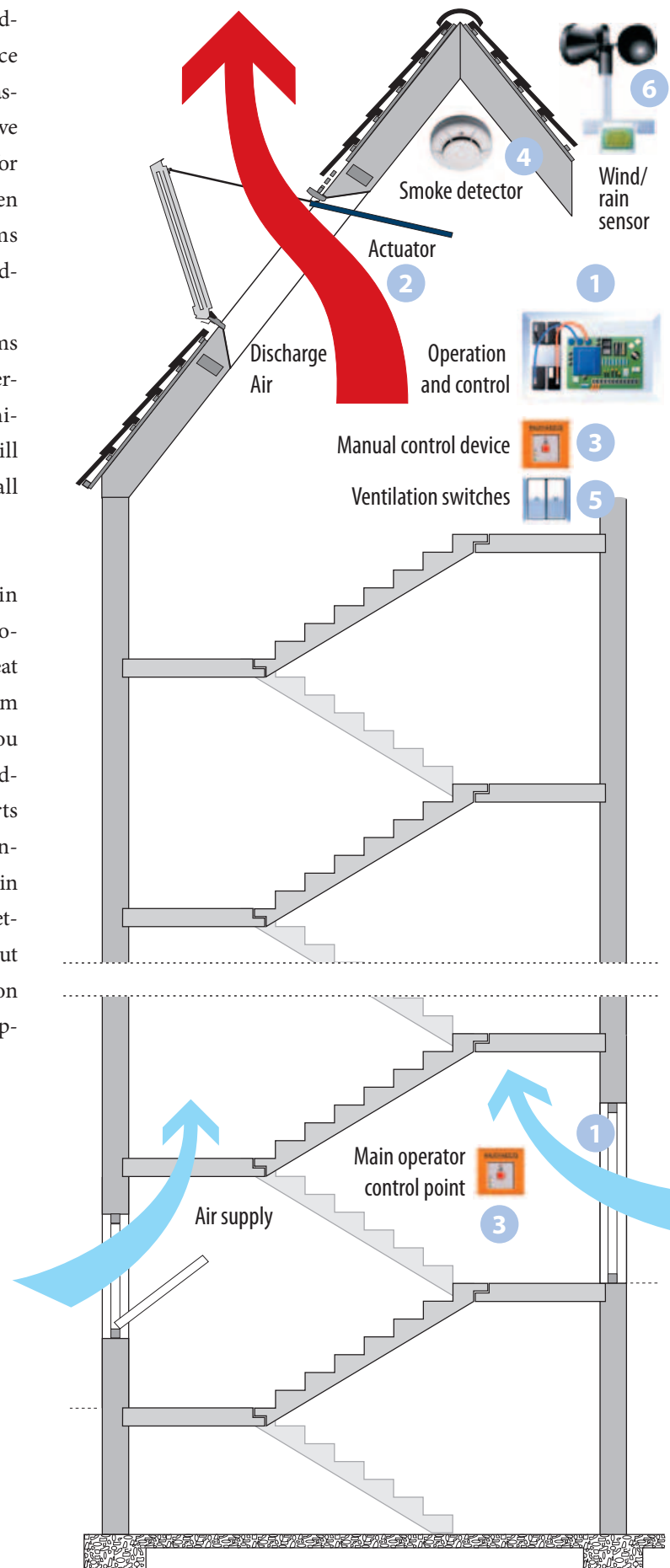


System solutions

These days in modern buildings the building service installations are of increasing importance. Innovative architecture often calls for innovative solutions when providing safety systems within often complex buildings.

Smoke ventilation systems need to be flexible and versatile to meet these architecture demands and still be capable of meeting all required safety criteria.

An optimum solution in this regard is electric motor driven smoke and heat ventilation systems from ZVEI manufacturers. You benefit from the outstanding flexibility of the parts and components, with increased building comfort in the process, while also meeting safety standards without any detrimental impact on the overall architectural appearance of the building.



Stairwell smoke
ventilation

Model tender text

The tender specifications set out below provide the specifications for a smoke ventilation system for stairwells in accordance with Building Rules List C. The system for smoke ventilation must be installed and function tested by a competent firm with authorization from the manufacturer or an installer with ZVEI accreditation.



Article text for smoke ventilation control system ①

Electric smoke ventilation control system (smoke and heat ventilation system), with integrated power supply, for the control of smoke ventilation actuators. Connection points for smoke and heat ventilation system switches, ventilation switches and automatic smoke detectors, including secondary power supply (e.g. rechargeable batteries) and cable monitors.

Make: _____

Type: _____

Article text for smoke ventilation actuator drive units ②

Electric smoke ventilation actuator drive unit for facade windows, roof vent flaps, dome lights or flat windows on pitched roofs. Tested for 11,000 up-and-down strokes under nominal load. Including required fastening brackets.

Make: _____

Type: _____

Article text for smoke removal trip switch ③

Smoke and heat ventilation system operating point in a surface-mounting version; design in accordance with DIN 14655 or DIN EN 12101-9 for manual switching of the smoke removal system; with alarm, monitoring and fault indication. Flush and covered close switch. Lockable housing.

Make: _____

Type: _____

Article text for automatic fire alarm ④

Smoke detectors should be based on the scattered light or transmitted light principle for the automatic activation of the smoke removal system. Tested to DIN EN 54-7.

Make: _____

Type: _____

Article text for ventilation switches (optional) ⑤

Ventilation switches for the infinitely variable actuation of the smoke ventilation openings for daily ventilation purposes.

Make: _____

Type: _____

Article text for weather control systems (optional) ⑥

Wind and rain sensors for the automatic closing of the smoke ventilation openings in ventilation mode.

Make: _____

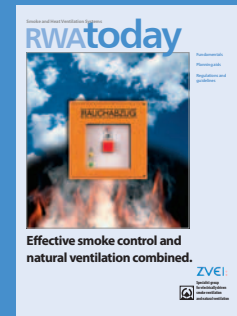
Type: _____

Article text for the installation of smoke removal systems

Installation and function testing in accordance with applicable standards and regulations and manufacturer's specifications and documentation.



More publications are available
from your specialist ZVEI firm or
direct from the ZVEI.



All publications are also available in German.

ZVEI:



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