

Model guideline on building supervision requirements for pressure ventilation systems

(Model Pressure Ventilation Systems Guideline - M-DBA-RL)¹

As of 21 October 2025

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1 Scope

On the basis of § 85a(1)(1) MBO [Musterbauordnung – Model Building Code] in conjunction with § 33(2)(3) and § 35(8)(3)(2) MBO, this Guideline specifies the building regulations, in particular the fire protection requirements for components, types and building products of pressure ventilation systems and other systems for the protection of stairwells (purge air systems).

This Guideline applies to pressure ventilation systems if they are required by building regulations for smoke control or insofar as they are subject to building regulations with regard to fire protection.

The Guideline also applies to other systems for the protection of stairwells (purge air systems) where the ingress of smoke does not need to be completely prevented.

2 Terms

- 2.1 Pressure ventilation systems

¹ Notified as per Directive (EU) 2015/1535 of the European Parliament and of the Council, of 9 September 2015, laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (OJ L 241, 17/9/2015, p. 1).

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Pressure ventilation systems are systems that ensure a continuous airflow with constant positive pressure in the area to be protected. This is achieved via the air path from the outside air intake through the area to be protected, via outflow openings, possibly with overflow openings to other areas.

2.2 Door opening force

The door opening force within the meaning of this Guideline is the maximum force required that must be applied to the door handle when opening a door during operation of the pressure ventilation system.

3 Planning, design and execution

3.1. Structure of pressure ventilation systems

Pressure ventilation systems are made up of all components and equipment required for their function. This includes in particular fans, ventilation ducts, butterfly valves, closures of overflow openings, smoke extraction valves and devices for activating and controlling the system.

Pressure ventilation systems use fans to introduce smoke-free outside air into the areas to be protected.

This air must be directed into the areas to be protected at one or more points.

To ensure continuous flow through the area to be protected, a suitable outflow opening must be provided at its highest point. The closure of this opening can be used for pressure control.

Additional openings for smoke extraction are not required in pressurised stairwells and pressurised elevator shafts.

Foreseeable adverse weather conditions must be taken into account insofar as they are relevant for the design and effective operation of the pressure ventilation system.

Air from the areas to be protected may flow directly into the open air, insofar as is necessary for control-related reasons and for compliance with the required positive pressure limits.

3.2 Pressure ventilation systems for safety stairwells

For pressure ventilation systems in safety stairwells, the building code requirements are considered fulfilled if the system is set up and designed as follows:

The air must:

- flow to the vestibule and the vestibule door of the fire-affected floor at an average speed of at least 2.0 m/s – based on the free door cross-section – when the door of the safety stairwell is open and
- flow throughout the entire cross-section of these doors in the same direction (flow path) and be discharged there in such a manner that smoke cannot penetrate into the areas to be protected.

The following must be taken into account when designing the pressure ventilation system:

- doors on floors not affected by the fire leading to the safety stairwell and from the safety stairwell to the outside must not be kept open at all times, must be self-closing and,
- only doors of a single flow path from the safety stairwell to the vestibule and from the vestibule to the fire floor are open for the design case.

Pressure ventilation systems as per the annex meet the building supervision requirements for systems of this type without further engineering design.

Fire brigade access routes to reach the access floor of the fire brigade lift should not form part of the spaces intended for exiting the stairwell to the outside.

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3.3 Pressure ventilation systems for fire service lifts

Pressure ventilation systems for fire service lifts meet the building code requirements if the air volume flow, with the door open, flows from the vestibule of the fire service lift to the floor affected by the fire at an average velocity of at least 0.75 m/s – based on the free door cross-section.

3.4 Other systems for the protection of stairwells (purge air systems)

Other systems for the protection of stairwells can be mechanically operating ventilation systems that serve as a special precaution within the meaning of § 35(8) MBO, support natural smoke extraction and flush out smoke gases that have entered the stairwell with outside air (purge air systems).

The requirements for purge air systems are considered fulfilled for buildings of building classes 4 and 5 if the systems are set up and designed as per the following system:

- a. The supply air volume flow rate is at least 10 000 m³/h.
- b. No negative pressure may occur in the stairwell opposite the floors. Sections 3.5, 3.6 – with the exception of the requirements for automatic activation –, 3.8 to 3.11 and Sections 5 and 6 continue to apply.
- c. The outflow must occur at the highest point of the stairwell and must not be influenced by wind.
- d. The positive pressure in the stairwell relative to the outside must not fall below a value of 25 Pa on the top floor of the stairwell with the doors to the stairwell closed.
- e. Doors to the stairwell must be self-closing. This also applies to the door to the outside.
- f. The ventilation system must be able to be switched on and off by fire brigade personnel at the entrance from the outside to the stairwell. Furthermore, the purge air system must automatically start operating when the opening for smoke extraction is closed.

3.5 Door opening force

The operation of the pressure ventilation system must not result in doors in escape routes no longer being able to be opened due to high pressure differences. The maximum door opening force is 100 N. This must not be exceeded at the doors of the vestibule, even if one of the two doors is open. After opening and closing doors to the emergency stairwell or vestibule, the setpoint must be restored within 3 seconds.

For reasons of barrier-free use of the building, additional technical or organisational measures may be necessary.

3.6 Activation and shutdown in case of fire

Pressure ventilation systems must be automatically activated in the event of a fire. Where automatic fire alarm systems are required or available, they must activate the pressure ventilation systems.

If no fire alarm system is present, the alarm must be activated at least by suitable activation devices.

The activation devices must be controlled via smoke detectors positioned in the area of access to the safety stairwell (excluding vestibules) and to the fire service lift vestibule. Smoke detectors pursuant to the DIN EN 54 series of standards are suitable for detection.

If pressure ventilation systems are to be manually activated, switches must be used that are positioned between 0.85 m and 1.05 m above the ground. The switches shall be marked with a clearly legible sign that reads 'Pressure ventilation system'. The signage may be placed on the switch or the housing, or must be permanently affixed in its immediate vicinity. The colour of the switches may not be red.

Necessary outflow openings may only be controlled automatically.

The pressure ventilation system must be operational and effective within 120 seconds of activation.

A safety-related control concept must be developed for the operation of the pressure ventilation system.

When operating the pressure ventilation system via programmable systems, the programming status must be documented. The change in the programming status or changes to the operating and system software constitutes a significant change in the pressure ventilation system.

If smoke is detected in the outside air at the intake point of the pressure ventilation systems, the operation of the system must be automatically interrupted until the outside air is again free of smoke.

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Switching off the pressure ventilation system in the event of fire is not permitted; in addition, it must be possible for fire brigade personnel to deactivate and restart the pressure ventilation system at the access point from the outside to the stairwell.

3.7 Operational safety and functional safety

If there is only an internal safety stairwell available in certain buildings subject to inspection, operational backup equipment must take over the function of the equipment required to maintain positive pressure in the event of failure.

All equipment and components required for operation, such as switchgear assemblies (complete control units and regulating units) and fans of the pressure ventilation system, must be positioned in such a way that the pressure ventilation system remains effective for a sufficiently long time.

Outflow valves and pressure control valves are components that do not require redundancy.

3.8 Outside air intake

The outside air intake required for a pressure ventilation system must be arranged in such a way that no smoke can be drawn in.

This requirement is deemed to have been met if

1. the outside air intake takes place at a maximum of 3 m above the ground surface,
2. if the outside air intake is at least 2.5 m away from operable windows, doors and gates, as well as other openings in the exterior walls and from exterior walls with combustible building materials and exterior wall coverings, and
3. a lateral distance of 10 m to any openable windows, doors and gates located below the outside air intake is maintained.

Doors leading from the stairwell of this pressure ventilation system to the outside are disregarded.

3.9 Outside and supply air ducts

These ducts must be designed in accordance with the fire protection requirements for ventilation systems in terms of fire resistance and fire behaviour. Fire and smoke dampers must not be used in these ducts.

The dampers in the outside air or supply air duct must assume their intended position when the pressure ventilation system is in operation.

3.10 Exhaust air routing

To ensure airflow through the vestibules, combustion gases must be extracted from the unit affected by the fire.

This can be done via:

1. Windows or other façade openings on two opposite sides of the façade,
2. Smoke extraction ducts without fans or
3. Smoke extraction ducts with smoke extraction fans.

Where necessary, automatically opening windows or openings to smoke extraction ducts should be provided.

Outlets and outflow openings shall be placed such that the effectiveness of the pressure ventilation system is ensured even in adverse weather conditions.

Outgoing air openings (outlets) of ducts from which combustion gases may escape into the ambient air must be arranged or designed as per the fire protection requirements for ventilation systems. MVV TB [Model Administrative Provisions – Technical Building Rules] Section A 2.2, seq. no. A 2.2.1.11, Section 5.1.2 No. 1). Fire dampers may not be used.

Smoke extraction ducts in pressure ventilation systems serve to discharge the air flowing through the pressure ventilation system to the respective usage unit into the open air.

The openings in these ducts leading to the floors must be secured with smoke extraction dampers.

If dampers are required for control in these ducts, hot gas control dampers must be used.

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3.11 Overflow openings

The vestibules of safety stairwells and fire service lift shafts must be able to be purged with air via overflow openings even when the doors are closed.

Overflow openings must have a minimum diameter of 0.1 m or dimensions of 0.1 m x 0.1 m.

In walls between vestibules and necessary corridors or usage units, overflow openings must be equipped with closures that have the same fire resistance rating as the wall.

No fire resistance requirements are placed on the closure of the overflow opening between the stairwell and the vestibule; a damper that closes when air flows towards the stairwell is sufficient.

Closures of the overflow openings between the fire service lift shaft and the vestibule must be designed such that, when the doors are open, air flows from the vestibule of the fire service lift to the floor affected by the fire as per Section 3.3.

No fire resistance requirements are placed on the closure of the overflow opening between the fire service lift shaft and the vestibule; a damper driven by a motor or other means is sufficient.

The closures may not be controlled via a smoke-activated device.

3.12 Windows in the stairwell

Windows must only be able to be opened with a tool or key. Windows must always be closed except during maintenance or cleaning.

3.13 Simultaneity of flow

Pressure ventilation systems for fire service lift shafts and safety stairwells must be able to be operated independently of each other.

For the design of the components and ventilation and smoke extraction ducts for outflows that are shared by the pressure ventilation systems, the higher requirements for operation of only one of the systems must be applied, as per the requirements from Section 3.2 for the consideration of a single flow path.

3.14 Energy supply

Pressure ventilation systems required by building supervision regulations must be supplied with power for a sufficient period of time and remain functional even in the event of a general power outage.

For pressure ventilation systems in buildings without a prescribed dedicated emergency power supply system, the supply-side tap before the main switch of the low-voltage main distribution board (LVMD) in the building is sufficient.

For other systems for the protection of stairwells (purge air systems) as a special precaution, the supply-side tap before the main switch of the low-voltage main distribution board (LVMD) in the building is sufficient.

4 Construction products and types of pressure ventilation systems

4.1. General

For the construction of the pressure ventilation systems, building products and construction methods are to be used as per the provisions set out in MVV TB Annex 14.

Pressure ventilation systems consist of building products and components (e.g. fans, butterfly and shut-off valves, outflow elements, overflow elements, measuring devices, control, regulating and safety devices, air-carrying ducts) that are necessary for the function of the pressure ventilation system.

Construction products for pressure ventilation systems must be selected and used, taking into account, in particular, the installation position, the required temperature resistance, the required volume flow, the pressure difference, as well as wind and snow loads.

The pressure ventilation systems and other systems for the protection of stairwells (purge air systems) must be maintained in such a way that operational safety and effectiveness are guaranteed at all times. This also applies to the necessary building products and their interaction.

A functional test must be carried out at least annually as part of demonstrating operational safety and effectiveness. For mechanically acting building products, this means at least the mechanical move-

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ment, e.g. a complete closing or opening, putting the drives into operation. The energy intended for the respective construction product must be used for the functional test.

If manufacturer specifications stipulate shorter intervals for functional testing, these must be observed.

4.2 Fans

Fans may be operated with frequency converters, provided they are suitable for this purpose.

The operation of fans in a pressure ventilation system must not impair the evacuation of people or the communication of the fire brigade. This is considered fulfilled if the sound pressure level in the stairwell at a distance of 5 m from the supply air outlet does not exceed 85 dB(A).

For fire service lifts, a maximum sound pressure level of 80 dB(A) generated by the pressure ventilation system is permitted at a distance of 0.5 m from the microphone in the lift car, on the fire service access level and at the control panel for emergencies and inspections.

4.3 Closures of overflow openings

It is sufficient to use a fire damper without a duct connection as per DIN EN 15650, classification EI 90 ($v_e i \rightarrow o$) S as per DIN EN 13501-3:2010-02, to close the overflow opening between the vestibule and the required corridor or usage unit.

Fire dampers with a mechanical shut-off element may only be used in pressure ventilation systems with the axis position of the mechanical shut-off element that has been verified by the fire resistance test as per DIN EN 1366-2:1999-10. The nominal release temperature of the fire dampers' thermal release device may not exceed 72 °C.

4.4 Hot gas control dampers

For hot gas control dampers, the test requirements must be met at elevated temperature as per DIN EN 12101-6:2022-11; the classes demonstrated this way as per the relevant standard for the tested product properties must be specified.

The building code requirements are considered fulfilled if the classification of heat resistance corresponds to the requirements specified for the construction project. It must be carried out in accordance with DIN EN 12101-6:2022-11, Annex B.

5 Confirmation of conformity

The execution of a type as per this Guideline requires confirmation of conformity as per § 16 a(5) MBO.

6 Technical documentation

In addition to the construction documents*, the following documents must be prepared in order to assess whether the requirements of the M-DBA-RL are met. These requirements allow for maintenance as well as for pre-commissioning and recurring checks of the conformity of the pressure ventilation system with this Guideline.

Pressure ventilation systems in safety stairwells

Without further engineering design, the building supervision requirements for the design of safety stairwells in buildings with no more than 10 stories and a building height of 30 metres are considered met if

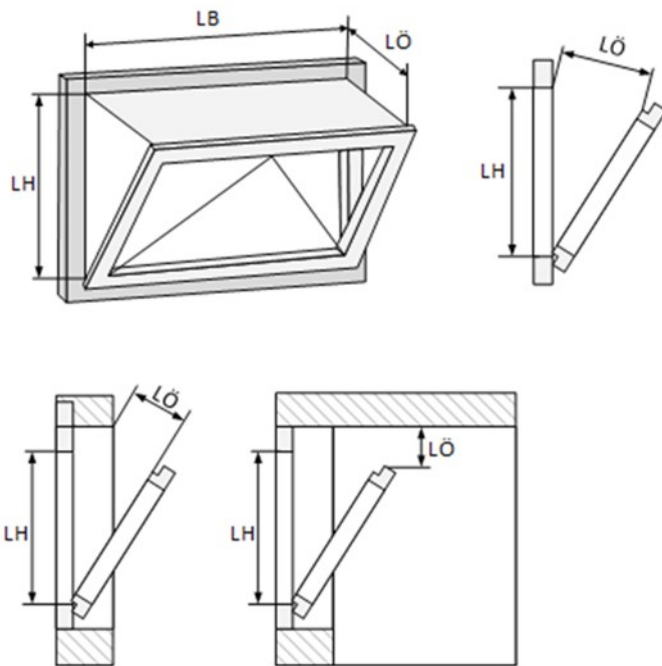
1. the outflow from the floor affected by the fire occurs via two opposite façade sides,
2. as a function of door size, the supply air volume flow rate and at least the required outflow air areas as per the table are achieved,
3. a pressure-controlled outflow opening is located at the top of the stairwell, which is open when the stairwell doors are closed and generates a pressure difference as per the table, and closes within a maximum of 3 seconds when the stairwell and vestibule doors on the fire floor are open,
4. the maximum door opening force with the pressure ventilation system switched off is a maximum of 35 N,
5. the staircase is at least 1.2 m wide, has a stairwell width of at least 0.3 m and a stairwell length of at least 2.25 m and
6. the supply air in the stairwell is evenly distributed and introduced with supply air points at intervals of no more than 3 floors.

If the width of the stairwell is at least 0.8 m and the length is at least 2.25 m, then, contrary to Point 6, an air supply point at the lowest point of the stairwell is sufficient.

Table:

Required supply air volume flows, pressure differences and outflow air areas as a function of the door size

Maximum door size Width x height	0,9m x 2,0m	1,0m x 2,0m	1,2m x 2,1m
Supply air volume flow	14 000 m ³ /h + 400 m ³ /h x number of floors	16 000 m ³ /h + 400 m ³ /h x number of floors	20 000 m ³ /h + 400 m ³ /h x number of floors
Minimum required free outflow area on each façade side of the building on the floor affected by the fire	1,1 m ²	1,2 m ²	1,5 m ²
Maximum positive pressure from the stairwell to the atmosphere on the top floor	50 Pa	45 Pa	40 Pa
Minimum positive pressure from the stairwell to the atmosphere on the top floor	30 Pa	30 Pa	30 Pa



The geometrically determined area is to be calculated as follows:

$$A_{\text{geo}} = \text{CW} \times \text{CO up to a maximum of } A_{\text{geo}} = \text{CW} \times \text{CH}$$

with CO = Clear Opening
 CW = Clear Width
 CH = Clear Height

A_{geo} = geometric free area