



BSI Standards Publication

Smoke and heat control systems

Part 13: Pressure differential systems (PDS) — Design and calculation methods, installation, acceptance testing, routine testing and maintenance

National foreword

This British Standard is the UK implementation of EN 12101-13:2022. Together with BS EN 12101-6:2022, it supersedes BS EN 12101-6:2005, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/25, Smoke, heat control systems and components.

A list of organizations represented on this committee can be obtained on request to its committee manager.

The UK committee emphasizes that BS EN 12101-13:2022 deals with the design of systems to be used in specific applications described therein. Both BS EN 12101-6:2022 and BS EN 12101-13:2022 should be considered in their entirety and only for the types of applications described. No clauses, designs or values in whole or in part should be used in isolation or as justification for system designs that are outside the scope of these standards.

This standard is not intended for corridor/lobby extract or Mechanical Smoke Ventilation Systems (MSVS). These systems generally create a lower pressure in protected spaces, such as lobbies and corridors and are outside of the scope of this standard.

It is the opinion of the UK committee that BS EN 12101-6:2005 contained useful guidance for applications commonly used in the UK. National Annex NA identifies these applications along with explanations of how BS EN 12101-13:2022 can be used to achieve similar design intent. While National Annex NA is informative, the UK committee believes UK users would benefit from referring to the Annex.

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Published by BSI Standards Limited 2022

ISBN 978 0 539 24261 4

ICS 13.220.99

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This British Standard was published under the authority of the Documents Standards Policy and Strategy Committee on 30 September 2022.

Amendments/corrigenda issued since publication

Date	Text affected
31 October 2022	Correction to national foreword

English Version

Smoke and heat control systems - Part 13: Pressure differential systems (PDS) - Design and calculation methods, installation, acceptance testing, routine testing and maintenance

Systèmes pour le contrôle des fumées et de la chaleur -
Partie 13 : Systèmes à différentiel de pression (SDP) -
Méthodes de conception et de calcul, installation, essais
de réception, essais périodiques et maintenance

Rauch- und Wärmefreihaltung - Teil 13:
Differenzdrucksysteme - Rauchschutz-Druckanlagen
(RDA) - Planung, Bemessung, Einbau,
Abnahmeprüfung, Funktions-Tests, Betrieb und
Instandhaltung

This European Standard was approved by CEN on 14 February 2022.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	7
4 Design objectives	8
4.1 General.....	8
4.2 Protection of means of escape.....	8
4.3 Protection of firefighting routes.....	8
4.4 Property protection	8
4.5 Additional functions	8
5 Normative requirements	9
5.1 General.....	9
5.2 Application of Class 1 and Class 2	10
5.3 Response delay – time period definitions.....	10
5.4 Door opening force.....	12
5.5 Pressure differential systems.....	12
5.6 Pressurization systems.....	14
6 Interaction.....	29
6.1 General.....	29
6.2 Requirements.....	30
7 Equipment and components – specification and installation.....	31
7.1 General.....	31
7.2 Software based fire control systems.....	32
7.3 Automatic control of a PDS.....	32
7.4 Manual control of a PDS.....	32
7.5 Description of components and their requirements	34
8 Testing and measuring	43
8.1 General.....	43
8.2 Preconditions	43
8.3 Tests.....	44
8.4 Minimum number of tests; floor positions and other information	45
8.5 Test procedures.....	47
9 Additional considerations for design and testing.....	54
9.1 General.....	54
9.2 Parameters for consideration during design and performance testing	54
10 Documentation	55
10.1 General.....	55
10.2 Requirements by the authorities having jurisdiction	55
10.3 Technical description of the PDS.....	55
10.4 “As built/installed” information.....	55
10.5 Controls	56
10.6 Components list (inventory) and datasheets	56

10.7	Completion certification	57
11	Testing and Maintenance, design changes, faults, routine testing and operation	57
11.1	General	57
11.2	Records.....	57
11.3	Building design changes.....	58
11.4	Faults.....	58
11.5	Routine testing	59
11.6	Maintenance	61
Annex A (informative)	Calculation procedures	62
Annex B (informative)	Design example and possible calculation procedures.....	81
Annex C (informative)	Further information on wind and temperature effects	91
Annex D (informative)	Guidance for PDS design for buildings taller than 60 m	94
Annex E (informative)	(Example) PDS drawing.....	99
Annex F (informative)	Documentation and responsibilities in the process	100
Annex G (informative)	(Example) PDS concept report	103
Annex H (informative)	(Example) PDS test report	106
Annex I (informative)	Risk assessment – List of potential disturbances	114
Annex J (informative)	Practical suggestions for successful commissioning	116
Annex K (normative)	Labelling.....	117
Bibliography		118

European foreword

This document (EN 12101-13:2022) has been prepared by Technical Committee CEN/TC 191 “Fixed fire-fighting systems”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2022, and conflicting national standards shall be withdrawn at the latest by October 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document together with EN 12101-6 supersedes EN 12101-6:2005 which will be withdrawn.

This document has the general title “Smoke and heat control systems” and consists of the following parts:

- Part 1: *Specification for smoke barriers*;
- Part 2: *Specification for natural smoke and heat exhaust ventilators*;
- Part 3: *Specification for powered smoke and heat exhaust ventilators*;
- Part 4: *Installed SHEVS systems for smoke and heat ventilation* (published as CEN/TR 12101-4);
- Part 5: *Design and calculation for smoke and heat exhaust ventilation systems using a steady-state fire* (published as CEN/TR 12101-5);
- Part 6: *Specification for pressure differential systems*;
- Part 7: *Smoke control duct sections*;
- Part 8: *Specification for smoke control dampers*;
- Part 10: *Power supplies*;
- Part 11: *Design, installation and commissioning requirements for enclosed car parks*;
- Part 12: *Design and calculation for smoke and heat exhaust ventilation systems using a time dependent fire*;
- Part 13: *Pressure differential systems (PDS) - Design and calculation methods, installation, acceptance testing, routine testing and maintenance*.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document covers information and requirements on the design and calculation methods, installation, acceptance testing, routine testing and maintenance of Pressure Differential Systems (PDS). PDSs are installed in buildings to prevent smoke in hazardous amounts from entering into protected spaces via leakage paths through physical barriers (e.g. cracks around closed doors) or open doors by using pressure differentials.

The requirements and test methods for kits used in PDS are published in EN 12101-6. For certain components as part of the kits, additional tests must be carried out in accordance with Part 6 prior to the kit test.

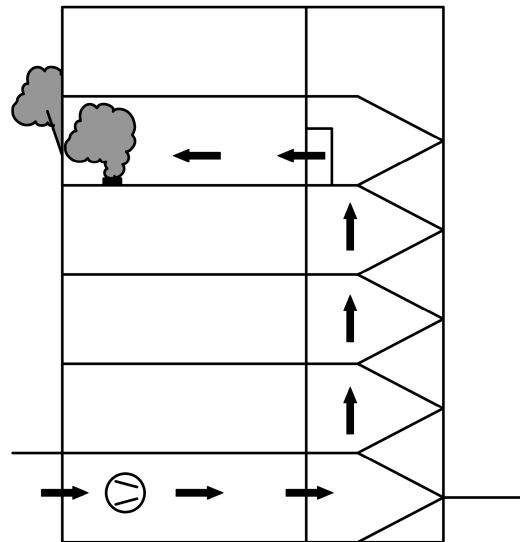


Figure 1 — Pressurization (General)

Pressure differential systems provide a means of maintaining tenable conditions in protected spaces, that are required to be kept free of smoke – e.g. escape routes, firefighting access routes, firefighting lift shafts, lobbies, staircases, and other spaces. It is necessary to determine where the fresh air supply for the PDS is to be introduced into a building as well as where that air and smoke will leave the building and what paths it will follow in the process, including during firefighting (e.g. with fire compartment door open) and in the event of likely events such as window failure.

By means of a PDS, a positive pressure difference is always achieved between the protected space and the unprotected space. This is achieved by pressurizing the protected space(s) (see Figure 1).

The aim therefore is to establish a pressure gradient from the protected space to the unprotected space while the doors are closed and an airflow from the protected space via the unprotected space to outside when specific doors are open.

The figures that accompany the text in this document are informative and are intended for clarification purposes only.

It is recommended that the designer should discuss the design and evacuation concept, including safety targets, with the authorities having jurisdiction, early in the building design process.

NOTE 1 From experience gained since EN 12101-6 was first published, this document now simply prescribes two systems only and these are specifically described in terms of the closed-door differential pressure and the open-door velocity only. Consequently the 10 Pa previously required in some scenarios is now withdrawn.

NOTE 2 It is recommended that an engineered solution for a PDS should adopt the functional requirements set out in this document where appropriate, inclusive of Table 1 as a minimum, in the absence of any national requirements.

1 Scope

This document gives calculation methods, guidance and requirements for the design, installation, acceptance testing, routine testing and maintenance for pressure differential systems (PDS).

PDSs are designed to hold back smoke at a leaky physical barrier in a building, such as a door (either open or closed) or other similarly restricted openings and to keep tenable conditions in escape and access routes depending on the application.

It covers systems intended to protect means of escape e.g. staircases, corridors, lobbies, as well as systems intended to provide a protected firefighting space (bridgehead) for the fire services.

It provides details on the critical features and relevant procedures for the installation.

It describes the commissioning procedures and acceptance testing criteria required to confirm that the calculated design is achieved in the building.

This document gives rules, requirements and procedures to design PDS for buildings up to 60 m.

For buildings taller than 60 m the same requirements are given (e.g. Table 1), but additional methods of calculation and verification are necessary. Requirements for such methods and verification are given in Annex D, but the methods fall outside the scope of this document [e.g. Additional mathematical analysis and/or Computational Fluid Dynamics (CFD)].

Routine testing and maintenance requirements are also defined in this document.

In the absence of national requirements and under expected ambient and outside conditions, the requirements in Table 1 are fulfilled by the PDS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12101-2, *Smoke and heat control systems - Part 2: Natural smoke and heat exhaust ventilators*

EN 12101-3, *Smoke and heat control systems - Part 3: Specification for powered smoke and heat control ventilators (Fans)*

EN 12101-6, *Smoke and heat control systems - Part 6: Specification for pressure differential systems - Kits*

EN 12101-7, *Smoke and heat control systems - Part 7: Smoke duct sections*

EN 12101-8, *Smoke and heat control systems - Part 8: Smoke control dampers*

EN 12101-10, *Smoke and heat control systems - Part 10: Power supplies*

EN 13501-4, *Fire classification of construction products and building elements - Part 4: Classification using data from fire resistance tests on components of smoke control systems*

ISO 21927-9, *Smoke and heat control systems - Part 9: Specification for control equipment*

EN 16763, *Services for fire safety systems and security systems*

EN 12259-1, *Fixed firefighting systems - Components for sprinkler and water spray systems - Part 1: Sprinklers*

EN 54 (all parts), *Fire detection and fire alarm systems*

EN 60770-1, *Transmitters for use in industrial-process control systems - Part 1: Methods for performance evaluation*

EN 60751, *Industrial platinum resistance thermometers and platinum temperature sensors*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 13943 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

accommodation

any part of the construction works which is not part of the protected escape route

3.2

air inlet

connection from the outside of the building to allow air entry

3.3

authorities

authorities having jurisdiction

AHJ

organizations, officers or individuals responsible for approving pressure differential systems, e.g. the local/national fire and building control authorities having jurisdiction, or other approved third parties

3.4

barometric relief damper

damper which opens automatically without a controlled actuator at a specific pressure to allow pressure relief by providing flow of air to outside

3.5

control panel

multi-operational device to activate and/or control a PDS.

3.6

fire compartment

space (room or set of rooms) contained by boundaries with classified fire resistance

3.7

pressurized space

space (e.g. lift shaft, staircase, lobby, corridor, or other compartment) in which the air pressure is maintained at a higher level than that in the space where a fire is located

3.8

protected space

space where the design prevents smoke entry

3.9

smoke and heat exhaust ventilation system

SHEVS

system in which components are jointly selected to exhaust smoke and heat in order to establish a buoyant layer of warm gases above cooler, cleaner air

3.10

stack effect

movement of air into and out of buildings, resulting from air buoyancy

3.11

unpressurized space

space adjacent to or separate from the protected space where the pressure and airflow are not controlled by the PDS

4 Design objectives

4.1 General

The following design objectives are addressed in this document and can be selected to match the required application.

4.2 Protection of means of escape

It is essential that tenable conditions for life safety are maintained in protected spaces for as long as they are likely to be in use by the building occupants.

4.3 Protection of firefighting routes

To enable firefighting operations to proceed efficiently, protected firefighting access routes shall be maintained essentially free of smoke so that access to the fire-affected storey can be achieved without the use of breathing apparatus. The pressure differential system shall be designed so as to limit the spread of smoke into the dedicated firefighting route under normal firefighting conditions, but not compromising means of escape or firefighting objectives which remain the top priority.

4.4 Property protection

The spread of smoke shall be prevented from entering sensitive spaces such as those containing valuable equipment, data processing and other items that are particularly sensitive to smoke damage.

NOTE The purpose of a pressure differential system, whether used for the protection of means of escape, firefighting operations or property protection, has a significant influence on the system design and specification. It is therefore essential that the fire safety objectives are clearly established and agreed with the appropriate authorities having jurisdiction at an early stage in the design process.

4.5 Additional functions

If designed accordingly, the PDS may have a secondary function as a ventilation system, provided that it shall close the ventilation system down and switch to operation specifically as a PDS alone when a smoke alarm is received.

5 Requirements

5.1 General

For this document the PDS will only have to deal with one fire at any one time, following generally accepted practice. Designs and calculations will reflect this approach to fulfil the normative requirements of this document.

The PDS shall be designed in such a way, that the PDS can fulfil its function throughout the required operating time (e.g. 30, 60, 90 min) in accordance with national requirements.

If there is more than one PDS installed in a building, each PDS shall have its own control system. The failure of any one PDS control system shall not negatively affect any other PDS.

Therefore, in operation, pressure differential and airflow velocity criteria shall only be required to be met on the fire floor, but it shall be proven that the PDS can meet these requirements on all floors during acceptance testing, but not necessarily at the same time. It is not acceptable for the PDS to draw smoke into the protected space.

The PDS shall be triggered automatically by smoke detectors in accordance with EN 54 series. This may also be achieved by the PDS receiving smoke signals from a separate fire/smoke detection system. There shall be at least one single smoke detector on each floor installed on the unprotected side of the door to the protected space (e.g. in the corridor or lobby). The smoke detection system may be zoned to cover the whole building. Once the fire has been detected in a defined place by either smoke detection or a fire detection system, the PDS shall be activated. Any stray smoke, which may be detected in another place or in the protected space on another floor shall not change the operation of the PDS.

If there is a smoke detector or fire alarm activation within the protected space (e.g. staircase) before smoke has been detected on a specific floor, this shall not lead to activation of the PDS.

Any additional signals from smoke detectors or fire detection systems shall be ignored by the PDS.

NOTE 1 Early detection is given when smoke detectors are placed in spaces with fire load (e.g. accommodation), and not in the lobby or corridor, for example. However, if placing smoke detectors in accommodation or other areas, access for maintenance and testing shall be provided.

Each escape and rescue route, protected by PDS, shall be a stand-alone system (e.g. independent fan, ductwork, controls).

NOTE 2 PDSs for staircases and firefighters lift shafts, connected in one common lobby, are handled as one PDS, however consideration should be given to the use of separate fans for the staircase and for the firefighting lift shafts to give easier control and balancing of airflows.

Stack effect, convective airflow, airflow resistance, external wind etc. are amongst other influences which can adversely affect the function of a PDS and therefore shall be taken into account.

The following parameters are defined for the design and shall be met and confirmed by the acceptance test on site:

- Maximum door opening force (N);
- Minimum pressure differential (Pa);
- Minimum air flow velocity (m/s);
- Maximum response delay (s) – defined by initiation, operation and response times.

Table 1 — Design requirements of a PDS

Parameter	Class 1	Class 2
Door opening force	$\leq 100 \text{ N}$	
Pressure differential	$\geq 30 \text{ Pa}$	
Airflow velocity	$\geq 1 \text{ m/s}$	$\geq 2 \text{ m/s}$
Initiation time	$\leq 60 \text{ s}$	
Operation time	$\leq 120 \text{ s}$	
Response time	$\leq 5 \text{ s}$	

NOTE Refer to Clause 8 when measuring the normative requirements given in Table 1.

5.2 Application of Class 1 and Class 2

5.2.1 Class 1

Class 1 will be required:

- in buildings with automatic water extinguishing systems using quick response sprinkler according to EN 12259-1 (with response time index (RTI) ≤ 50) which operate in response to temperatures $\leq 72 \text{ °C}$; or
- in residential buildings up to 30 m or below the high-rise buildings limit (in accordance with national requirements); or
- in residential buildings, if there are at least two rooms without fire load between the protected space and the potential fire source and self-closing doors are present; or
- if accepted by authorities having jurisdiction.

5.2.2 Class 2

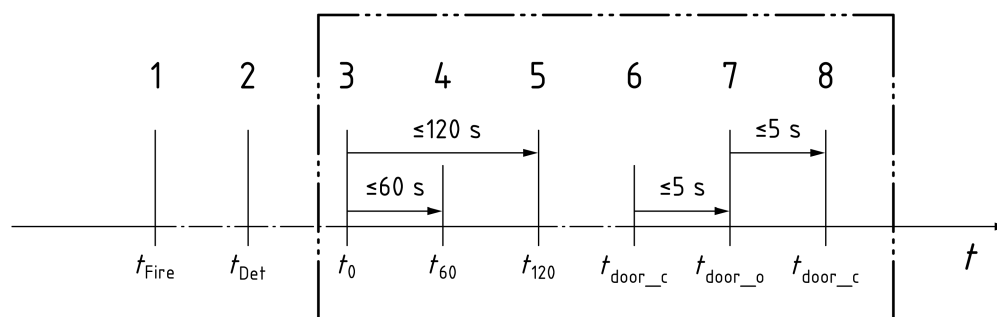
Class 2 will be required:

- where Class 1 is not applicable; or
- if required by authorities having jurisdiction.

5.3 Response delay – time period definitions

5.3.1 General

For the successful design and operation of the PDS, the initiation, operation and response times shall meet the requirements stated in Table 1, as further explained below and in Figure 2. The times for the start and detection of the fire are outside the scope of this document.



Key

1	t_{Fire}	start of a fire
2	t_{Det}	detection of the fire
3	t_0	activation of the Pressure Differential System (PDS)
4	t_{60}	initiation time
5	t_{120}	operation time
6	$t_{\text{Door_c}}$	time door closed
7	$t_{\text{Door_o}}$	time door open
8	$t_{\text{Door_c}}$	time door closed
t		time

NOTE The times within the scope of this document are shown in the key.

Figure 2 — PDS Response delay - time period definitions

5.3.2 The start of a fire (t_{Fire})

This is the point of the start of the fire (shown in Figure 2). It is outside the scope of this document and the results but is included to show the relationship to the other times specifically defined.

5.3.3 Detection of a fire (t_{Det})

This is the point of the detection of the fire (shown in Figure 2). It is outside the scope of this document and the results but is included to show the relationship to the other times specifically defined.

5.3.4 Activation of the PDS (t_0)

This is the point of the PDS activation and occurs as soon as the PDS receives an alarm signal from the detection system (Figure 2).

5.3.5 Initiation time (t_{60})

The initiation time is the time period which starts at the activation of the PDS (t_0) and ends after 60 s, by which time all the necessary components shall be in the correct operating position (e.g. damper, vents) - see Table 1 and Figure 2 - and the fan shall have started.

5.3.6 Operation time (t_{120})

The operation time is the time period which starts⁴ at the activation of the PDS (t_0) and ends after 120 s, by which time the PDS shall be in its fully operational status (see Table 1 and Figure 2).

5.3.7 Response times (t_{door_c} , t_{door_o})

The response time is the time period under which the PDS shall achieve the objective of either the pressure differential requirements (including maximum door opening force) or the air velocity requirements as the door is opened (5 s) and closed (5 s) (see Table 1 and Figure 2).

NOTE The requirement for the response time of 5 s in this document is with regard to site variances to allow a site tolerance on the test performed in EN 12101-6.

5.4 Door opening force

5.4.1 General

The PDS shall be designed so that the opening force at the door handle does not exceed 100 N. This requirement shall be met on all floors including the fire floor and for each door within the escape routes, when the PDS is in operation.

The characteristics of doors and their door closers (size, closing force and location of door handle) shall be taken into account when designing the PDS (see calculation information in Annex A).

All doors shall be kept closed while the PDS is in operation to maintain fire compartmentation except when manually or intentionally opened for escape or firefighting. All doors between pressurized and unpressurized spaces shall be fitted with automatic closing mechanisms including the final exit door (e.g. door closers with brake mechanism, to prevent accidents).

Door opening forces apply to all doors leading to protected spaces and to the outside as long as the PDS is in operation.

Door opening forces for doors along escape routes shall not exceed 100 N limit, if the PDS is in operation or not.

5.4.2 Doors (doors between pressurized and unpressurized spaces)

The opening force for these doors shall not exceed 100 N if the PDS is in operation or not.

All the requirements for the PDS in Table 1 shall be met on the fire floor despite the fact that, in some instances, the final exit door may not be completely closed.

NOTE 1 See also Annex A. Be aware that all combinations of door size and door closer cannot be acceptable as the 100 N value can be exceeded.

Where doors must open against pressure, the designer shall ensure that the door opening force does not exceed the requirements and that the door does not close with excessive force under the influence of the pressure (e.g. door closers with brake mechanism to prevent accidents).

If the door opening is aided by the pressurization (e.g. the final exit door), the designer shall ensure that either the door is kept closed, without causing excess door opening forces when the PDS is not in operation, or, if the door is not fully closed, the requirements of Table 1 are still met.

NOTE 2 As an option, door closers with dual functionality are available. If the PDS is not in operation, the door closer acts as a standard door closer. However, if the PDS is in operation, the door closer activates an additional, second door closer and increases the force used to close the door (e.g. the final exit door against the PDS).

5.5 Pressure differential systems

5.5.1 General

Pressure differential systems can be designed using overpressure (named pressurization).

The design of a PDS is influenced by the choice and definition of the protected and unprotected spaces together with the type and position of the air supply and air release routes.

The structure used in Clause 5 follows Figure 3.

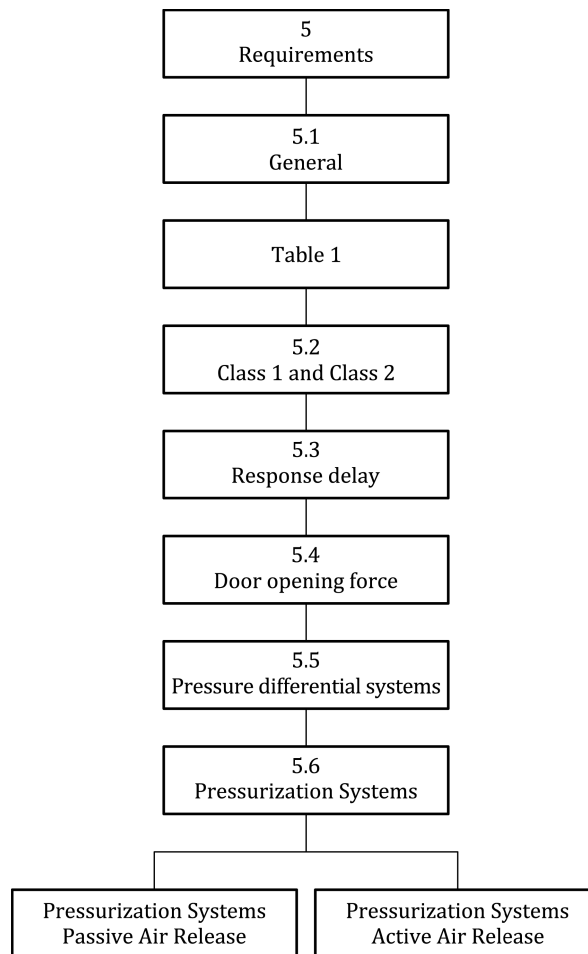


Figure 3 — Structure of the requirements depending on the system in use

5.5.2 PDS system types

5.5.2.1 General

Pressurization systems can be designed with passive (natural) or active (powered) air release;

NOTE See subclause 7.5 for component requirements.

5.5.2.2 Pressurization systems with passive air release

These systems have air supply fans which produce an overpressure within the protected space in reference to the unprotected space.

Air release is provided by means of controlled openings (e.g. natural vents to outside (in accordance with EN 12101-2), smoke control dampers (in accordance with EN 12101-8) to shafts).

Main feature of this system:

- controlled overpressure in the protected space (e.g. staircase).

5.5.2.3 Pressurization systems with active air release

These systems have air supply fans which produce an overpressure within the protected space in reference to the unprotected space.

Air release for these systems is provided by means of additional smoke control fans in accordance with EN 12101-3 (and EN 12101-6 when required), with associated ducts or shafts if appropriate to exhaust the hot air or smoke to the outside.

Main features of these systems:

- controlled overpressure in the protected space (e.g. staircase, lobby, lift shaft).

5.6 Pressurization systems

5.6.1 General

Requirements for the installation and equipment, including the function of the various essential components involved, are described in the following and in subclause 7.5.

Figure 4 shows a typical pressurization system with staircase and firefighters lift shaft protection and air release in the façade(s).

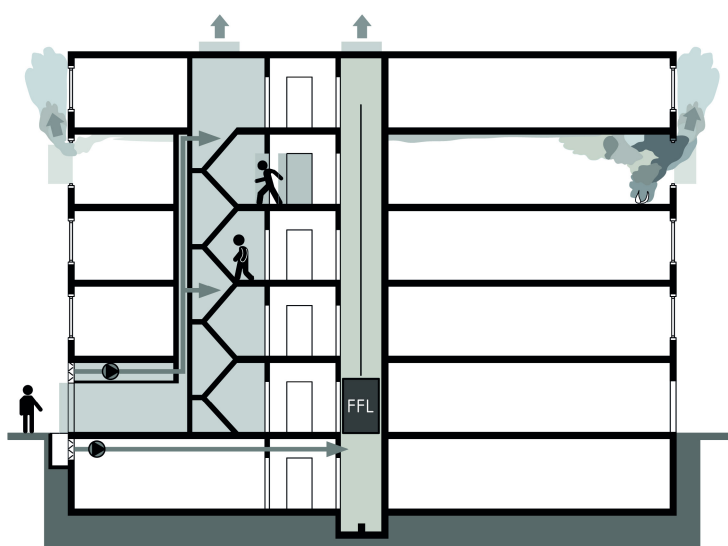


Figure 4 — Typical pressurization system

Examples of pressurization systems (floor plans) are described in subclause 5.6.3.

A firefighters' lift shaft, connected to the same lobby (see also Figure 6) as the staircase may have the same, or a separate air supply fan.

An example of a more complex pressurisation system is found in Annex E.

5.6.2 Connected lobbies and corridors

5.6.2.1 Connected lobbies

In most cases, the connected lobby is not protected in the same way as the protected staircase because, depending on the position of air release, there is only airflow if the relevant doors are all open at the same time (see e.g. Figure 7).

Examples of protected lobbies are shown in Figure 12 and Figure 13.

NOTE Additional pressurized spaces may have to be provided and this should be in accordance with project specific requirements and/or national requirements where they apply.

5.6.2.2 Connected corridors

Connected corridors are considered in the same way as above.

5.6.3 Design examples showing protected spaces and airflow directions for pressurization systems

5.6.3.1 General

The following floor plans represent examples of possible pressurization systems.

A key is given with each figure to indicate protected spaces, pre-conditions and other essential information. The protected areas are marked in grey.

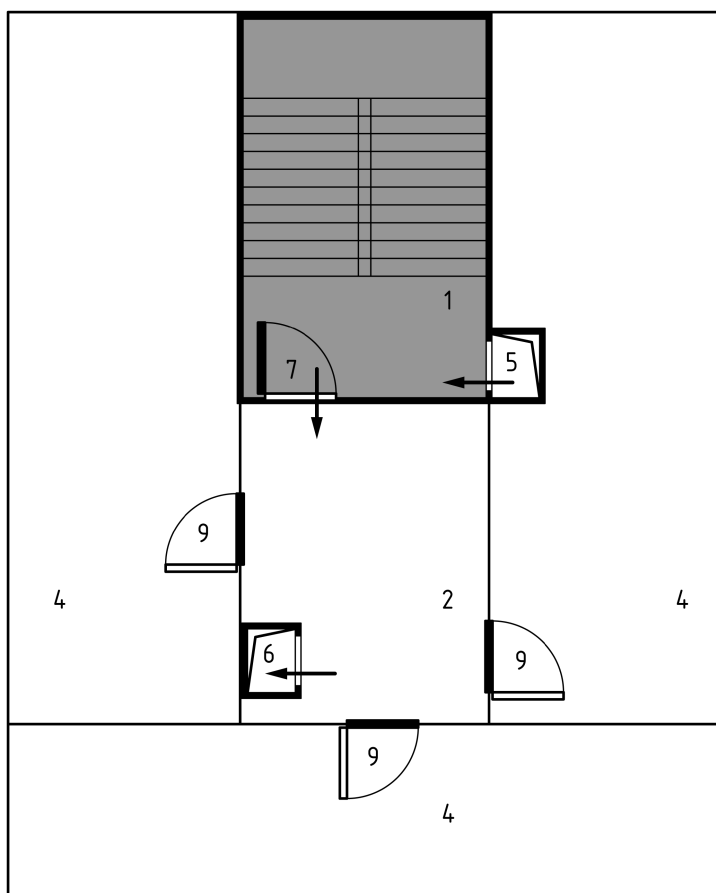
The air release path shall be designed in accordance with 5.6.7 and may be either by a shaft or by façade openings.

The direction of the airflow shall be in accordance with the arrows in the Figures 5, 6, 7, 8, 9, 10, 11, 12, and 13.

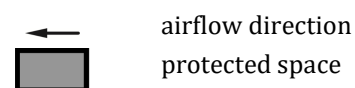
The air supply is shown as an individual supply to each protected space in some of the examples. However, this might be designed and solved in practice differently using qualified construction products (e.g. dampers) and in accordance with national requirements (see Figures 6, 8, 11, 12 and 13). In any variation the requirements of table 1 still have to be met.

NOTE The examples shown in this section are for pressurization only.

5.6.3.2 Example 1: Staircase protection (pressurization system)

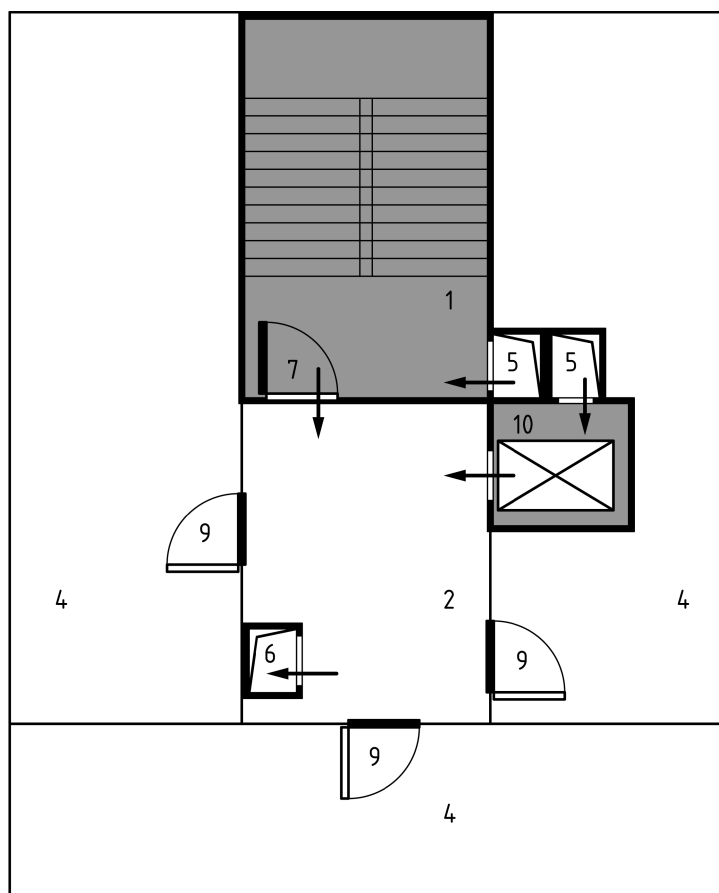
**Key**

1	staircase	6	air release
2	lobby	7	door to staircase
3	—	8	—
4	accommodation	9	door to accommodation
5	air supply	10	—

**Figure 5 — Pressurization system for a staircase with air release in the lobby****Preconditions**

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) an Air Transfer Damper (ATD) may be installed (in accordance with national requirements);
- door (7) shall be equipped with a door closer;
- in the absence of national requirements, door(s) (9) may be equipped with door closers.

5.6.3.3 Example 2: Staircase, firefighters lift, and/or other lift shaft(s), protection (pressurization system)



Key

1	staircase	6	air release
2	lobby	7	door to staircase
3	—	8	—
4	accommodation	9	door to accommodation
5	air supply	10	firefighters' lifts, or other lift shaft(s), that require protection

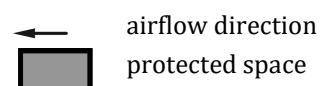
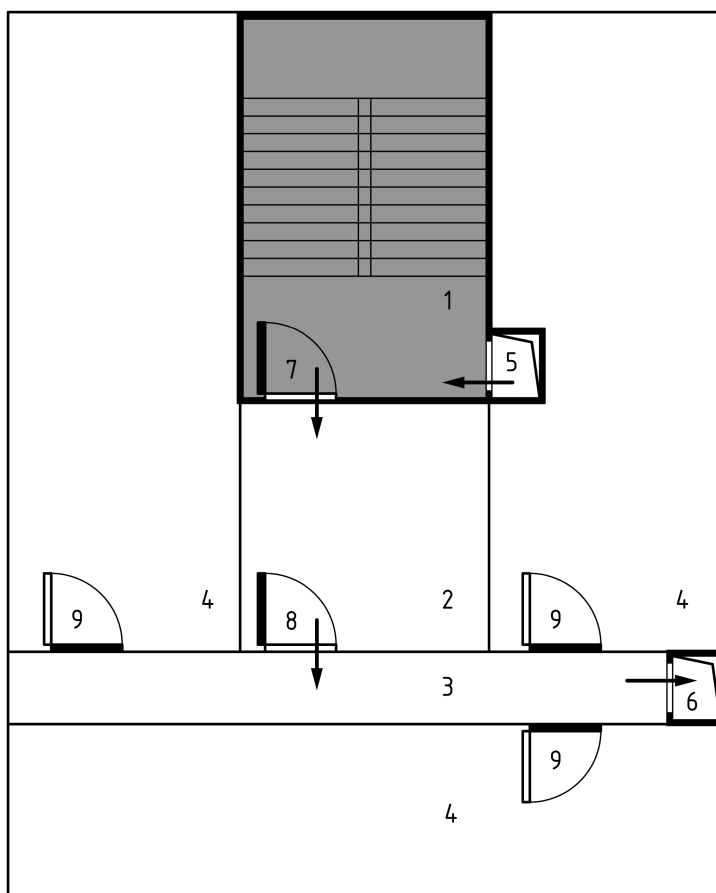


Figure 6 — Pressurization system for staircase and firefighters lift shaft with air release in the lobby

Preconditions

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) an Air Transfer Damper (ATD) may be installed (in accordance with national requirements);
- door (7) shall be equipped with a door closer;
- in the absence of national requirements door(s) (9) may be equipped with door closers.

5.6.3.4 Example 3: Staircase protection (pressurization system)

**Key**

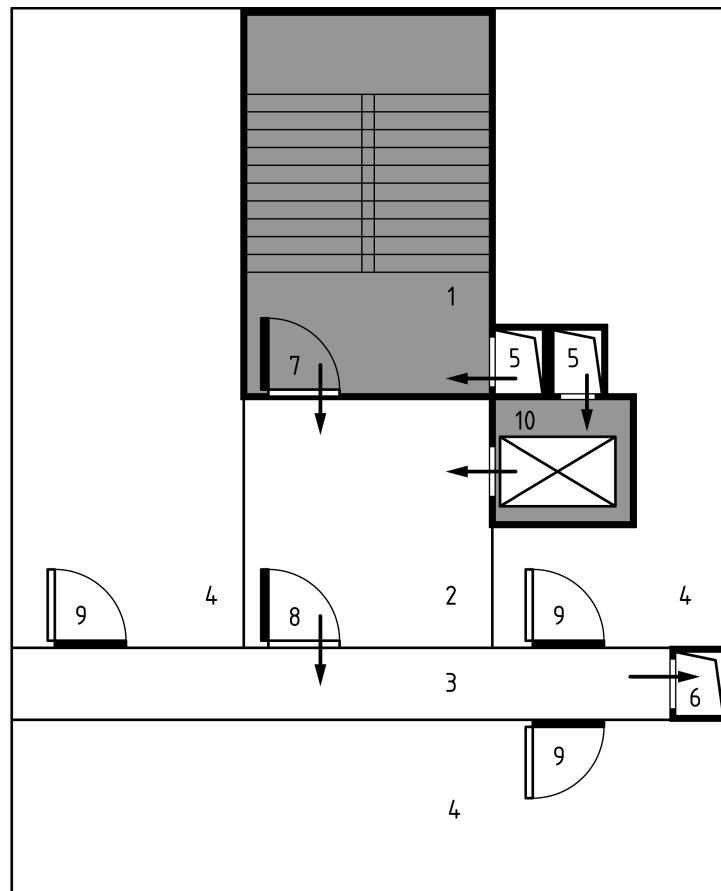
1	staircase	6	air release
2	lobby	7	door to staircase
3	corridor	8	door to lobby
4	accommodation	9	door to accommodation
5	air supply	10	—

← airflow direction
 protected space

Figure 7 — Pressurization system for staircase with air release in the corridor**Preconditions**

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) and between lobby (2) and corridor (3) Air Transfer Damper (ATD)s may be installed (in accordance with national requirements) to allow pressurization of the lobby (2) and ventilation of the corridor (3);
- doors (7, 8) shall be equipped with door closers;
- in the absence of national requirements door(s) (9) may be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause in 5.6.7.

5.6.3.5 Example 4: Staircase, firefighters lift and/or other lift shaft(s), protection (pressurization system)



Key

- | | |
|-----------------|---|
| 1 staircase | 6 air release |
| 2 lobby | 7 door to staircase |
| 3 corridor | 8 door to lobby |
| 4 accommodation | 9 door to accommodation |
| 5 air supply | 10 firefighters' lifts, or other lift shaft(s), that require protection |

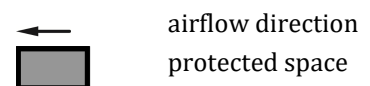
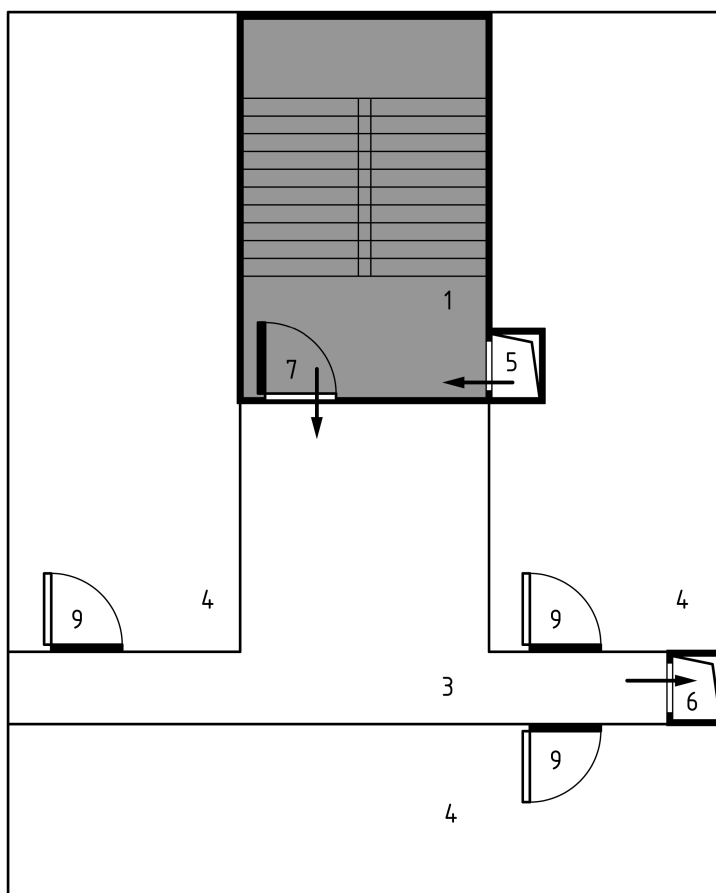


Figure 8 — Pressurization system for staircase and firefighters lift shaft with air release in the corridor

Preconditions

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2), between lift shaft (10) and lobby (2), and between lobby (2) and corridor (3) Air Transfer Damper (ATD)s may be installed (in accordance with national requirements) to allow pressurization of the lobby (2) and ventilation of the corridor (3);
- doors (7, 8) shall be equipped with door closers;
- in the absence of national requirements door(s) (9) may be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause 5.6.7.

5.6.3.6 Example 5: Staircase protection (pressurization system)

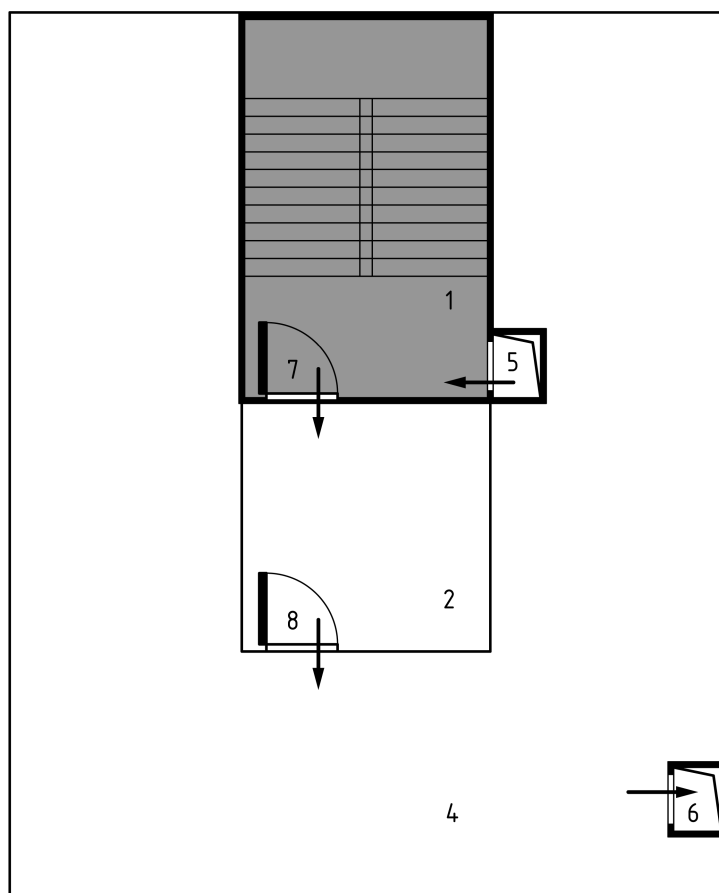
**Key**

1	staircase	6	air release	 airflow direction  protected space
2	—	7	door to staircase	
3	corridor/lobby	8	—	
4	accommodation	9	door to accommodation	
5	air supply	10	—	

Figure 9 — Pressurization system for staircase and air release in the corridor/lobby**Preconditions**

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and corridor/lobby (3) an Air Transfer Damper (ATD) may be installed (in accordance with national requirements);
- door (7) shall be equipped with a door closer;
- in the absence of national requirements door(s) (9) may be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause 5.6.7.

5.6.3.7 Example 6: Staircase protection (pressurization system)

**Key**

- 1 staircase
- 2 lobby
- 3 —
- 4 accommodation
- 5 air supply

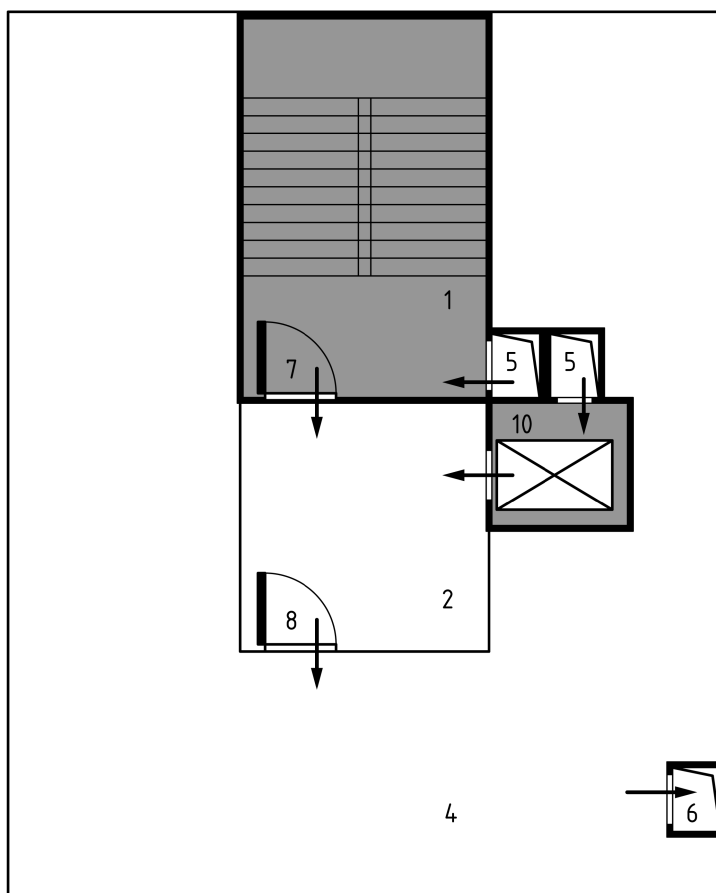
- 6 air release
- 7 door to staircase
- 8 door to lobby
- 9 —
- 10 —

← airflow direction
 protected space

Figure 10 — Pressurization system for staircase and air release in the accommodation**Preconditions**

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) and between lobby and accommodation (4) Air Transfer Damper (ATD)s may be installed (in accordance with national requirements);
- all doors (7, 8) shall be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause 5.6.7.

5.6.3.8 Example 7: Staircase, firefighters lift and/or other lift shaft(s), protection (pressurization system)



Key

1	staircase	6	air release
2	lobby	7	door to staircase
3	—	8	door to lobby
4	accommodation	9	—
5	air supply	10	firefighters' lifts, or other lift shaft(s), that require protection

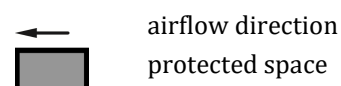
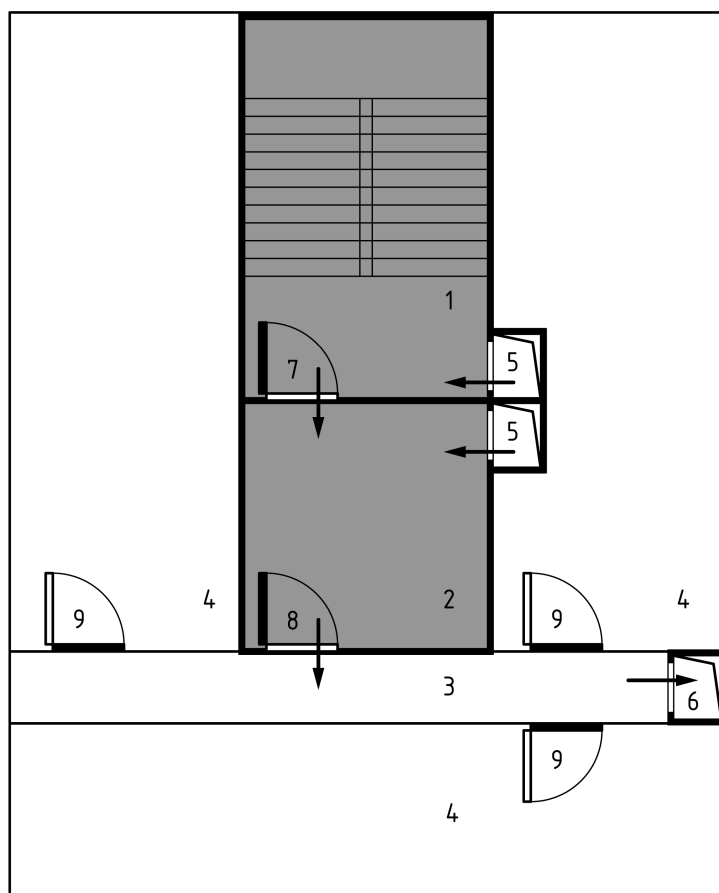


Figure 11 — Pressurization system for staircase and firefighters lift shaft with air release in the accommodation

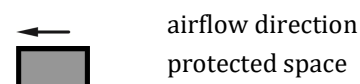
Preconditions

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) Air Transfer Damper (ATD)s may be installed (in accordance with national requirements) to allow pressurization of the lobby (2);
- all doors (7, 8) shall be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause 5.6.7.

5.6.3.9 Example 8: Staircase and lobby protection (pressurization system)

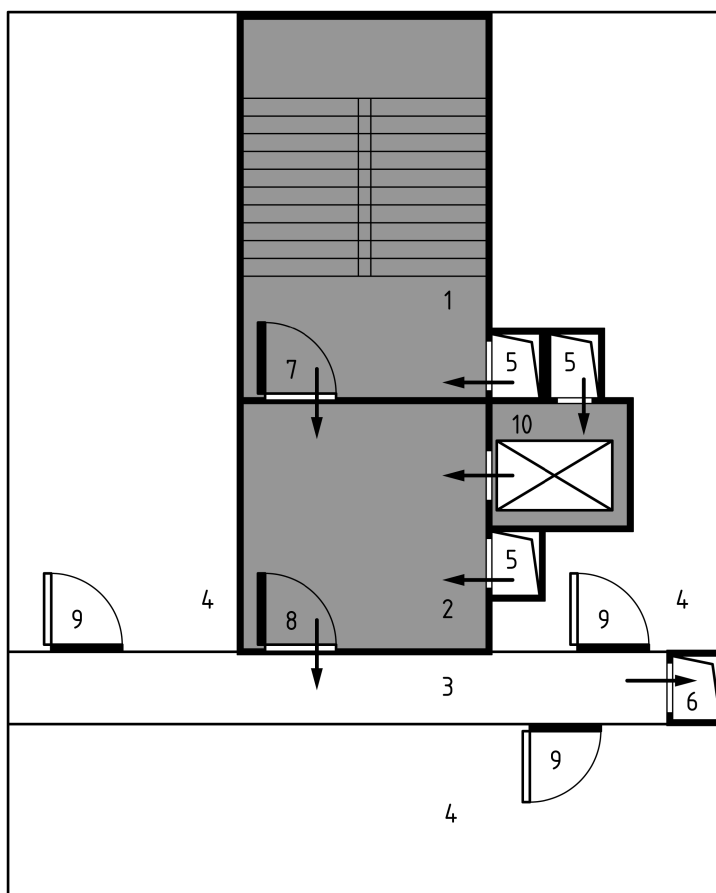
**Key**

- | | |
|-----------------|-------------------------|
| 1 staircase | 6 air release |
| 2 lobby | 7 door to staircase |
| 3 corridor | 8 door to lobby |
| 4 accommodation | 9 door to accommodation |
| 5 air supply | 10 — |

**Figure 12 — Pressurization system for staircase and lobby with air release in the corridor****Preconditions**

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) and between lobby and corridor (3) Air Transfer Dampers (ATD, see 7.5 for more explanation) may be installed (in accordance with national requirements);
- doors (7, 8) shall be equipped with door closers;
- in the absence of national requirements door(s) (9) may be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause 5.6.7.

5.6.3.10 Example 9: Staircase, lobby and firefighters lift shaft protection (pressurization system)

**Key**

- | | |
|-----------------|-------------------------|
| 1 staircase | 6 air release |
| 2 lobby | 7 door to staircase |
| 3 corridor | 8 door to lobby |
| 4 accommodation | 9 door to accommodation |
| 5 air supply | 10 Firefighters' lifts |

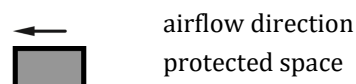


Figure 13 — Pressurization system for staircase, firefighters lift shaft and lobby with air release in the corridor

Preconditions

- PDS is activated and air release (6) is open on the fire floor only;
- between staircase (1) and lobby (2) and between lobby and corridor (3) Air Transfer Dampers (ATD)s may be installed (in accordance with national requirements);
- doors (7, 8) shall be equipped with door closers;
- in the absence of national requirements door(s) (9) may be equipped with door closers;
- if openings in the façade are used for air release, refer to the specific subclause 5.6.7.

NOTE Non-firefighters' lift shafts, connected to a protected lobby, do not have to be pressurized.

5.6.4 Pressure differential criteria

The design shall provide a pressure differential of at least 30 Pa between the protected and unprotected space (with the air release open) on the fire floor. This requirement shall be met when:

- all doors in the protected staircase including the final exit door are closed (exception, see chapter 5.4.2); and
- all doors to the pressurized lift shaft except one access door (generally the door to the lift on the evacuation exit floor) are closed (including the lift door on the fire floor); and
- the air release (active or passive) to the outside from the unprotected space is open and operating.

When the doors between the protected and unprotected spaces are open, the pressure differential criterion is replaced by the velocity criteria (see subclause 5.6.5).

The overpressure within the lift shaft of a firefighting lift shall not adversely affect the operation of the firefighting lift. If necessary, the lift shaft shall be equipped with an appropriate overpressure relief device (e.g. Barometric Relief Damper or Pressure Control Damper).

In the event of smoke entering a common unprotected lobby, the pressure differentials between staircase and lobby and between lift shaft and lobby shall not drive smoke into the staircase or into the lift shaft.

5.6.5 Airflow velocity criteria

The design shall provide minimum air velocities through open doors between the protected and unprotected spaces that comply with Table 1.

When more than one door leads from the protected to the unprotected space, it shall be demonstrated that the PDS will work with one door fully open and in the case of differing door sizes, this shall be the door with the largest area.

If a door, including the final exit door, has two leaves, it shall be demonstrated that the PDS will work with only the largest leaf fully open.

NOTE 1 During the escape period many people will obstruct the door opening, such that free cross section of one fully open door, or leaf, without any obstruction is sufficient for the design.

NOTE 2 Where more doors open from the protected to unprotected spaces on any one floor and/or there is more than one exit door that can be used, consideration must be made in the design to perhaps allow for more volume.

Doors with two leaves that need to close in a specific order shall be designed to do so.

Airflow velocity criteria only needs to be met on the fire floor. The respective release path to the outside shall be open.

As an option, if the designer can justify to the authorities having jurisdiction that the final exit door can be designed to be closed, e.g. if the fire brigade does not have to prop it in its open position during their intervention, this is acceptable. The door shall always be openable for people to escape and the firefighters to enter.

However, clear information about the door not being propped open during an incident shall be provided to the responsible person.

5.6.6 Requirements for air supply

5.6.6.1 General

Consideration shall be given to the position and design of the fans and ducts or shafts to ensure that they are not compromised by a fire from the unprotected space.

NOTE Wind and the specific shape of the building can have an influence on air intake positions and it can be necessary to consider this.

5.6.6.2 Air intake

Intake air shall be drawn directly from the outside in such a way that it is not contaminated by smoke from a fire within the building.

The air intake shall be located away from any potential fire hazards or smoke hazards (e.g. waste containers, basements smoke vents). Air intakes shall be located on ground level to avoid contamination by rising smoke.

NOTE It is advisable that no building openings are situated below the air intake point.

Each PDS shall have a separate outside air intake or be fitted via a ducted plenum system. The intake points of individual PDSs shall not interfere with each other. All connections to supply ductwork/plenums shall be equipped with multi-compartment smoke control dampers. The main air intake of the supply air duct/plenum shall be either permanently open or if controlled, each PDS can control the inlet specifically and individually.

The air intake should be located a minimum of 1 m vertically below and 5 m horizontally from any building openings (e.g. air outlets, windows, doors) or be in accordance with national requirements if these differ.

Glazing in these areas shall have fire resistance in accordance with national requirements or E30 in accordance with EN 13501-2 as a minimum.

As an option, where air intakes on ground level are not possible then they can be positioned at roof level or elsewhere in the façade. For this application there shall be at least two air intakes, spaced as far apart as possible and facing different directions in such a manner that they could not be directly downwind of the same source of smoke and/or as defined in national requirements. Each inlet shall be independently capable of providing the full air requirements of the PDS.

Wherever placed, each inlet shall be protected by an independently operated air supply control damper in accordance with 7.5.10 which shall close in response to an individual self-resetting smoke detector mounted in the ductwork just after the damper. If all relevant dampers are closed, the supply fan shall be switched off. Then, if one, or more, of the smoke detectors resets, to indicate a clean air supply, then the relevant damper will re-open and the fan will re-start automatically.

5.6.6.3 Air supply to firefighter lift and other lift shafts

The air supply shall not negatively affect the lift operation (e.g. creating oscillation of travelling cable/belt, opening and closing of the lift doors). This can be achieved by:

- limiting the air supply speed into the lift shaft to max 3 m/s; or
- positioning the air supply inlet on the top of the lift shaft; or
- positioning the air supply inlet positioned at the lowest possible position, but higher than the maximum possible water level in the lift shaft pit and taking the lowest car position into account; or
- a combination of the above.

The piston effect shall be ignored. All measurements for PDS shall be done with lifts inactive.

NOTE If there is a firefighters intercom system the sound pressure level in the firefighter lift shaft and in the staircase, created by PDS in any situation, should be lower than 80 dB (A) measured in the cabin. The sound pressure level is measured approximately half a meter from the microphone of the intercom system.

5.6.6.4 Air supply to staircases

The air supply to the staircase shall be distributed evenly over the height of the staircase using a vertical shaft to ensure that the pressure differential and velocity requirements are fulfilled.

NOTE 1 An air supply point at every third floor, as a minimum, provides the necessary performance. More supply points can make it easier to fulfil the performance requirements. If it can be shown in the design that fewer supply points deliver the required performance, then this will be acceptable.

It is recommended that the air supply points in the staircase should not be placed close to doors, so as not to compromise an even air distribution through the doors.

The air supply velocity from the staircase supply points shall be not more than 5 m/s.

Lower air supply velocities are recommended.

5.6.7 Requirements for air release

5.6.7.1 General

During operation of the PDS, pressurizing air will flow from the pressurized space into the unpressurized space. It is important that provision be made on the fire floor for the air that has flowed into the unpressurized spaces to escape from the building. The air release path may be passive, for example, from windows or active by fan control.

NOTE 1 The air being released will be a mixture of air and smoke, not clean air.

NOTE 2 For air release paths the means of control can be open-loop control or closed-loop control to suit the specific system/application.

It is advisable that all open windows that are not part of the air release path are closed when the PDS is operating. If the windows cannot be closed automatically, the leakage from these open windows and the additional wind impact shall be considered and covered by the PDS design.

Air release vents e.g. windows, are influenced by wind and thermal effects. This shall be taken into account at the design stage (see chapter 9 and Annex C and D).

Sufficiently sized air release path(s) shall be provided to ensure that the performance parameters specified in Table 1 are delivered.

The pressure loss in the passive air release path between a protected space and the outside shall not exceed the specified overpressure in the protected space.

The air release path shall be designed to achieve the required performance and it shall not be assumed that air release is provided by the breaking of glazing due to the fire or building leakages.

5.6.7.2 Passive air release by openings in the façade

In the case of a smoke incident, the air release vents on the fire floor shall be fully open and shall be closed on all other floors. Appropriate automatic control shall be provided to achieve this.

To provide nearly wind-independent air release the necessary opening area may be provided in at least two sides of the building and preferably on opposite façades.

The openings in each façade shall have the total required area unless it can be demonstrated that the air release is not adversely affected by wind pressure.

Building labels (e.g. LEED Leadership in Energy and Environmental Design) dictate that windows can be opened (manually or automatically) from the building users. The impact to the PDS can be significant (e.g. leakage, wind) and should be considered accordingly.

5.6.7.3 Passive air release by shafts and/or duct systems

There shall be a clear path out of the building for the air release. The general principle will be that vents and dampers shall open or stay open in the fire room and along the release path and shall close or stay closed to maintain compartmentation in all other zones.

Automatic control shall be provided to achieve the positioning of the smoke vents and dampers.

Depending on the design of the PDS some components may be required to operate, modulate and adjust their position whilst being subjected to fire conditions and shall be selected, tested and classified appropriately.

Full details of the specifications for ducts, dampers and vents are given in subclause 7.5.

5.6.7.4 Active air release by shafts and/or duct systems

There shall be a clear path out of the building for air release and the required air movement will be achieved using fans. The active air release shall be automatic in operation under the control of the PDS. The system design shall ensure that the active air release is balanced to release sufficient air flow to achieve the design requirements of the PDS.

It is advisable that all open windows that are not part of the air release path are closed when the PDS is operating. If the windows cannot be closed automatically, the leakage from these open windows and the additional wind impact shall be considered and covered by the PDS design.

The system may include components that will be required to operate, modulate and adjust their position whilst being subject to fire conditions and shall be selected, tested and classified accordingly.

Full details of the specification for ducts, dampers and vents are given in subclause 7.5

NOTE This design may need to take into account that the PDS shall go on operating and keeping smoke out of protected spaces even if the fire is fully evolved. In this instance, if the extract fans are drawing smoke and heat directly from the fire compartment, the gas temperatures may be greater than 600 °C and the components involved like e.g. the fans shall be selected accordingly.

5.6.8 Requirements for pressure control

To fulfil the requirements in Table 1 and to achieve the required response times when doors are opened and closed, devices to control pressure differentials and air volume rates shall be used.

Pressure control shall be realized by:

- Pressure relief devices (which discharge directly or via appropriate duct work from the pressurized space to the outside; or
- Controlling the air volume flow rates (e.g. control of fan speed, damper control, bypass solutions).

5.6.9 Protection device for the controlled opening

Any protection device shall operate in accordance with 5.3.5 and the pressure relief opening shall not be compromised with respect to all weather conditions (e.g. wind loading, snow loading) or loss of the cross-sectional area.

The use of a natural smoke ventilator in accordance with EN 12101-2 will fulfil these requirements.

5.6.10 Requirements for pressure relief, controlled openings and flushing

National requirements may request continuous flushing of the protected space.

NOTE Consideration can be given to the application of flushing in any PDS design.

Where flushing is to be included, the protected space shall be flushed with a minimum airflow in accordance with national requirements, or a minimum of 7 500 m³/h.

This may be achieved by using a simple opening, or an opening with a device fitted (e.g. pressure relief damper, control damper) selected to be capable of allowing the required minimum discharge rate, combined with the selection of the fan to achieve this, whilst maintaining the required design parameters of the PDS.

If the PDS is required to protect other spaces (e.g. lift shaft), the above shall be provided accordingly for those spaces.

6 Interaction

6.1 General

The PDS will require a connection to the fire alarm system, smoke detector(s) or an alternative control unit to allow activation.

The PDS control unit may be required to activate or shut down other additional building systems to allow the correct operation of the PDS (e.g. shut down HVAC systems, close of doors).

If it is necessary, any cause and effect safety matrix for the PDS shall include all these additional control functions.

The pressure differential system, when triggered, may interact with any or all of the following systems:

- Fire detection system, alarms and Public Address and Voice Alarms (see 6.2.1);
- HVAC systems (see 6.2.2);
- Firefighting lifts and other lifts (see 6.2.3);
- Smoke and heat exhaust ventilation systems (SHEVS) (see 6.2.4);
- Spaces being pressurized or depressurized for other reasons than fire (see 6.2.5);
- Automatic water spreading system (e.g. Sprinkler system) (see 6.2.6);

- Window and sun shading systems (see 6.2.7); and
- Windows and other openings (see 6.2.8).

6.2 Requirements

6.2.1 Fire detection systems, alarms, public address and voice alarm systems

An interface is required for the fire detection system if this is the designed means of activation of the PDS.

Alarms, public address and voice alarm systems give information and action messages to occupants within the building in case of fire. The required levels of audibility are determined by national requirements valid in the place of use for the PDS. Generally, there is a requirement for alarms and messages from public address and voice alarm systems to be clearly audible above the sound of any operating pressure differential system. The PDS shall comply with relevant audibility requirements.

6.2.2 Heating, ventilation and air conditioning (HVAC) systems

The HVAC system shall in case of fire:

- be designed so that it does not adversely affect the pressure differential strategy; or
- be shut down to prevent the smoke penetrating other interconnected spaces; or
- comply with the relevant requirements and control functions of this document if used as part of the pressure differential system.

The HVAC system shall generally be controlled by a system independent to the PDS (see also 4.5).

6.2.3 Firefighting lifts, evacuation lifts and other lifts

Design issues are shown in 5.6.3. Any electrical inputs or outputs shall be part of the cause and effect safety matrix and shall meet national requirements.

6.2.4 Smoke and heat exhaust ventilation systems (SHEVS)

If any part of the building is equipped with a SHEVS, the designs of both systems (PDS and SHEVS) shall be demonstrated to not conflict. The design parameters of both systems shall be within their permitted ranges.

SHEVS can produce additional underpressure which may affect the PDS. The combination of the SHEVS' negative pressure and the differential pressure from the PDS may combine to increase the door opening force. Any combination shall not cause the door opening force to exceed 100 N at the door handle.

The smoke vents that are part of the SHEVS can be used as air release for the PDS if they are in compliance with the requirements for air release in this document (see subclause 7.5).

There may be a requirement for staircase ventilation as the PDS will not operate if smoke is detected in the protected space (e.g. staircase).

- There may be a separate SHEVS system associated with the staircase, which will function if smoke is detected in the staircase. The PDS will not function until this system is turned off/closed.
- Alternatively, if the PDS has a SHEVS function for the staircase this will operate automatically or more often from an override button used by the fire brigade. The PDS will not function until this SHEVS function is turned off/closed.

6.2.5 Spaces being pressurized for reasons other than fire

If buildings contain spaces such as computer suites, cleanrooms, or medical facilities that are e.g. pressurized for reasons other than fire, consideration shall be given to the conflicting pressures that may affect the differential pressures and required direction of airflow in the escape routes for smoke control purposes.

The combination of such pressures and the differential pressure from the PDS may also combine to increase the door opening force. Any combination shall not cause the door opening force to exceed 100 N at the door handle.

6.2.6 Automatic water spreading system

No negative influences between the automatic water spreading system (e.g. sprinkler system) and the PDS are expected but shall be considered.

NOTE Influences from PDS to a fog system shall be checked, depending on the position of the air release. If the air release is located in the lobby or corridor (normally not protected by a fog system), no negative interaction to a fog system is expected. If the air release is located in the accommodation, where a fog system is installed, negative interaction to a fog system is possible.

6.2.7 Window and sun shading systems

The windows and sun shading in the building may be controlled by a separate system. When a smoke signal is received the control of these windows shall be overridden by the PDS. All windows will close and the PDS will open the windows required for air supply/release. All shading systems will fully open. Care shall be taken to ensure that any sun shading devices do not obstruct the opening or air flow.

Where retractable shading may interfere with opening of the window or ventilator, the shading shall automatically retract upon receipt of a smoke signal, overriding any other control signal. Opening of the window or ventilator may need a delay to allow this to occur. Any such delay shall comply with the maximum operating time in Table 1 (see subclause 5.3 and Figure 2).

Where shading may affect the pressure drop of the air release system, either the shading shall automatically retract upon receipt of a smoke signal, overriding any other control signal, or the additional pressure drop caused by the shading device shall be determined and included in the system design calculations.

6.2.8 Windows and other openings

In the case of pressurization systems all windows and other openings in the protected space (e.g. staircase) used for ventilation shall be closed before the PDS can function correctly and it is advisable that these windows and openings are under the control of the PDS.

7 Equipment and components – specification and installation

7.1 General

A PDS is designed with a set of components e.g. air supply, pressure control, air release, control panel (see Figure 14 and Figure 15).

All the important components which are necessary to produce and control the required pressure differential are defined as a PDS kit. A kit can be designed using different components such as fans, dampers, controllers, sensors, frequency inverters.

The PDS shall be installed in accordance with the documented design.

All service providers shall demonstrate competencies and the knowledge and skills of their involved staff with regard to planning, design, installation, commissioning, verification, handover or maintenance

of fire safety systems in accordance with EN 16763 regardless of whether these services are provided on site or remotely.

7.2 Software based fire control systems

If dedicated computerized control systems are used to control the various operating functions of a pressure differential system relying on specific software to carry out the modes of operation, as defined in the cause and effect safety matrix the following requirements shall apply:

- The PDS computerized control panel shall be in accordance with ISO 21927-9.
- To protect the information supplied to and from the PDS computerized control panel, consideration shall be given to the protection of signalling system wiring.
- Where other external control systems (e.g. Building management System (BMS), access control, fire alarm, shading systems) are integrated as part of the operational requirements of a PDS, then any changes to the external control system software shall be demonstrated to not negatively affect the operation of the PDS, or a full functional test (see Clause 8) of the PDS shall be carried out to confirm the continued functioning of the system.
- Wireless communication (e.g. WLAN) shall not be used to control the PDS, but monitoring for visualization/reporting only, is acceptable.
- All operational components of the PDS shall have fault reporting (short-cut, open wire).
- The software-based control systems need to be designed in such a way that faults of individual devices will not affect the rest of the controllers.
- Faults of control units and field devices shall be detected and signalled.

7.3 Automatic control of a PDS

The control panel shall provide the functionality as described in 5.1 and the rest of this document.

There shall be a cause and effect safety matrix showing the automatic control of the system. This cause and effect safety matrix shall also contain details of any manual control as detailed in 7.4 below.

In the absence of national regulations, the automatic control panel shall provide the following indications:

- Ready (green);
- Activated (red);
- Error (yellow – flashing);
- Fan running (white).

7.4 Manual control of a PDS

7.4.1 General

The PDS is generally controlled automatically. If national requirements of local authorities having jurisdiction require an additional manual control, this shall be in accordance with ISO 21927-9 (reliability, functional, environmental, etc), or in accordance with equivalent national requirements, and only used by authorized personnel.

The cause and effect safety matrix shall include the requirements of the manual control of the PDS.

7.4.2 Manual control of a PDS for firefighters

The manual control shall be located at the firefighters' main access, or close to the building entrance.

It is recommended that the location of the manual control should be agreed by the authority having jurisdiction and by the fire brigade.

The manual control shall be designed so that it can only be operated by authorized personnel (e.g. by key holders, using a coded lock, by switches being located behind a frangible panel, in a room only accessible by authorized personnel).

The manual control shall be a switch or switches, or a device such as a "touch-screen". The manual control shall provide three options. Each option shall be selectable such that the other options are then unselected.

The switching options are as follows:

- OFF;
- AUTOMATIC;
- ON.

The "OFF" position stops the fan from running. The yellow Error indication goes on.

The "AUTOMATIC" position is the system ready position. The system is awaiting an activation signal to run automatically (e.g. from a smoke detector, from a fire detection system) or a change from this manual control panel, which will turn off the PDS or allow the system to flush.

NOTE When the manual control panel is not in the "AUTOMATIC" position, the basic function of the PDS is lost and out of scope.

The position "ON" starts the PDS without controlling a specific air release and is intended to only flush the protected space to attempt smoke clearance:

- The supply fan is switched on;
- The pressure relief in the staircase is operational;
- The door opening force shall be in accordance with Table 1;
- If the PDS is designed to provide flushing of the staircase according to clause 5.6.10, the opening for flushing will be open.

The selected option shall be clearly indicated (e.g. rotary switch, lit buttons, screen button colour change).

In the absence of national regulations, the manual control panel shall also provide the following indications:

- Ready (green);
- Activated (red);
- Error (yellow – flashing);
- Fan running (white).

The use and status of the firefighter manual control shall be mirrored on the main control panel.

7.4.3 Manual control for means of escape (operated by the people escaping)

The manual control shall be located close to the building entrance.

It is recommended that the location of the manual control should be agreed by the authority having jurisdiction and by the fire brigade.

The manual control shall be designed so that it cannot be triggered by mistake and shall be located behind a frangible panel or similar.

The manual control starts the PDS without controlling a specific air release (as FLUSH mode above):

- The supply fan is switched on;
- The pressure relief in the staircase is operational;
- The door opening force shall be in accordance with Table 1.

Indication is not required.

This manual control for means of escape has the lowest priority and will be overridden by a smoke detection system signal (including the smoke detector in the air inlet) or from a firefighter's manual control which has a higher priority.

The use and status of the means of escape manual control shall be mirrored on the main control panel.

7.4.4 Manual control for testing and maintenance

Functionality shall be provided for testing and maintenance. This can be built in to the control system and controlled from the main panel by switches or touch screen. As an addition, or an alternative, this may consist of external switches mounted near system components.

The control system shall be designed in such a way that the operator has the option to manually activating/deactivating individual components to check their proper functionality (see Clause 11). Depending on the specific system and component, this will take the form of OFF/AUTO/ON or similar.

This manual control for testing and maintenance has the highest priority and will override all other functions, including smoke inputs and firefighter override – effectively the PDS is turned off and will not work automatically. Therefore, there shall be a system in place when this is being used to watch for smoke signals, so that, in the case of a smoke incident, the testing and maintenance manual control can be stopped/turned off and/or the building occupants evacuated as necessary without the PDS working.

There shall be a mirrored indication at the main panel that the system or part of the system is in testing and maintenance mode. At the same time the error indication shall be turned on at the firefighter manual control panel.

7.5 Description of components and their requirements

7.5.1 General

For a better understanding about the components and the structure of a PDS the following drawings are included. A PDS is a combination of a standardized kit and the design for the specific project. This gives a selection of components. Not all the components referenced may be necessary in any one PDS.

For each component a reference is made to a standard where this document is relevant to smoke control. If no standard is referenced, there is no standard relevant to smoke control available, but other design standards/requirements may apply. Each component of the PDS shall be uniquely identifiable and clearly indelibly labelled.