

English Version

Smoke and heat control systems - Part 4: Installed SHEVS systems for smoke and heat ventilation

Systèmes pour le contrôle des fumées et de la chaleur -
Partie 4 : Systèmes SEFCV installés pour l'évacuation de
fumées et de chaleur par ventilation

Rauch- und Wärmefreihaltung - Teil 4: Anlagen zur Rauch-
und Wärmefreihaltung im eingebauten Zustand

This Technical Report was approved by CEN on 9 September 2008. It has been drawn up by the Technical Committee CEN/TC 191.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....	5
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Description of the principles of operation for smoke and heat control systems	11
4.1 Smoke and heat control systems which rely on the principle of the creation of a smoke layer.....	11
4.1.1 Smoke layers exhausted by natural vents	11
4.1.2 Layers of smoke exhausted by powered vents	11
4.2 Smoke free areas by differential pressure systems.....	11
4.3 Air renewal of the room with fresh air by dilution of smoke	11
5 Description of the combination of products for construction of SHEVS	12
5.1 General.....	12
5.2 General requirements.....	12
5.3 Requirements for smoke layer systems with natural ventilators	13
5.4 Requirements for smoke layer systems with powered ventilators	13
5.4.1 Requirements for power supplies for powered smoke and heat exhaust ventilation systems.....	13
5.4.2 Requirements for powered smoke and heat exhaust systems.....	14
5.5 Requirements for smoke free area systems by differential pressure	14
5.6 Requirements for smoke control by air renewal of the room with fresh air by dilution of smoke.....	14
6 Air Inlet.....	14
6.1 General requirements.....	14
6.2 Fire behaviour requirements	15
6.2.1 Performance parameters under fire conditions	15
6.2.2 Reaction to fire.....	15
6.2.3 Resistance to fire	15
6.3 Geometric areas for natural air inlets	15
7 Tubes, cables and accessories	16
7.1 General requirements.....	16
7.2 Fire behaviour requirements	16
7.2.1 Performance parameters under fire conditions	16
7.2.2 Reaction to fire of cables and tubes	17
7.2.3 Resistance to fire of cables and tubes	17
7.3.2 Requirements for electrical supplies.....	17
7.3.3 Isolators and switches on power lines.....	17
7.3.4 Enclosures for electrical components.....	17
7.3.5 Extra low voltage operated components	17
7.3.6 Sizing of electrical cables and related equipment	17
7.4 Requirements for pneumatic supplies	18
7.4.1 Requirements for pneumatic supplies using compressors	18
7.4.2 Requirements for pneumatic lines.....	18
7.4.3 Mechanical cables	18
8 Requirements for installation.....	18
8.1 General requirements for installation.....	18

8.2	Requirements for installation of a SHEVS	18
8.3	Requirements for installation of power supplies	19
8.4	Requirements for installation of controls	19
8.5	Access to components	19
8.6	Requirements for installation of powered SHEVS	20
8.7	Requirements for installation of air inlets	20
8.8	General requirements for installation of smoke barriers	20
8.8.1	Fastenings and adjacent surfaces	20
8.8.2	Maximum gaps	20
8.8.3	Response time	21
8.9	Functional test	21
9	Handing-over and commissioning	21
9.1	Requirements for commissioning of the system	21
9.2	Requirements for acceptance report of the system	22
9.3	Technical information report	22
9.4	Specific requirements for powered smoke ventilation systems	22
10	Routine checking	23
11	Maintenance	23
11.1	General	23
11.2	Scope of maintenance	23
11.3	Functional test	23
11.4	Maintenance operations	23
11.5	Availability	23
Annex A	(normative) Pneumatic system leakage testing	25
Annex B	(normative) Air flow measurements	26
B.1	Air flow requirements in powered ventilation systems	26
B.2	Measurement of air flow for ducted systems	26
B.2.1	Selection of measurement method	26
B.2.2	Selection of cross section	26
B.2.3	Measurement of air flow	26
Annex C	(informative) Drawings of example systems	27
Annex D	(informative) Detailed engineering plan	38
D.1	Detailed engineering plan for smoke flow and pressure control within the premises	38
D.1.1	General	38
D.1.2	Requirements for SHEVS intended to form a smoke layer	38
D.1.3	Requirements for natural smoke and heat exhaust ventilation systems	38
D.1.4	Requirements for powered smoke exhaust systems	39
D.1.5	Functioning and requirements for differential pressure systems	39
D.1.6	Requirements for differential pressure systems	39
D.2	Requirements for assembly, commissioning, inspection, testing and maintenance of natural smoke exhaust systems	40
Annex E	(informative) Requirements specific to powered smoke exhaust systems (powered fans, dampers, ducts etc) – Mounting and testing	41
E.1	Requirements for mounting and commissioning	41
E.1.1	General	41
E.1.2	Mounting of powered smoke and heat exhaust systems	41
E.1.3	Mounting of the operating devices	43
E.1.4	Mounting of control devices and circuits	43
E.1.5	Mounting of components of powered smoke exhaust systems	45
E.2	Requirements for acceptance and testing	46
E.2.1	General	46
E.2.2	Acceptance and testing of powered smoke and heat exhaust system	47
E.3	Requirements for routine checking	49
E.4	Requirements for maintenance	50
E.4.1	General	50

E.4.2 Scope of maintenance..... 50

E.4.3 Functional test 50

E.4.4 Maintenance operations..... 50

E.4.5 Availability 50

Bibliography 51

Foreword

This document (CEN/TR 12101-4:2009) has been prepared by Technical Committee CEN/TC 191 "Fixed firefighting systems", the secretariat of which is held by BSI.

This European document (Technical Report) has the general title "*Smoke and heat control systems*" and consists of the following separate parts:

- *Part 1: Specifications 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*
- *Part 5: Guidelines on functional recommendations and calculation methods for smoke and heat exhaust ventilation systems (published as CEN/TR 12101-5)*
- *Part 6: Specification for pressure differential systems - Kits*
- *Part 7: Smoke control ducts*
- *Part 8: Smoke control dampers*
- *Part 9: Control panels*
- *Part 10: Power supplies*

Introduction

Smoke and heat exhaust ventilation systems (SHEVS) create a smoke free layer above the floor by removing smoke and thus improve the conditions for the safe escape and/or rescue of people and animals. It contributes to the protection of property and permits the fire to be fought while still in its early stages. They also exhaust hot gases released by a fire in the developing stage.

The use of smoke and heat exhaust ventilation systems to create smoke free areas beneath a buoyant smoke layer has become widespread. Their value in assisting in the evacuation of people from construction works, reducing fire damage and financial loss by preventing smoke logging, facilitating fire fighting, reducing roof temperatures and retarding the lateral spread of fire is firmly established. For these benefits to be obtained it is essential that smoke and heat exhaust ventilators operate fully and reliably whenever called upon to do so during their installed life. A heat and smoke exhaust ventilation system is a scheme of safety equipment intended to perform a positive role in a fire emergency.

Components for smoke and heat exhaust ventilation systems should be installed as part of a properly designed smoke and heat exhaust ventilation system.

Smoke and heat exhaust ventilation systems help to:

- keep the escape and access routes free from smoke;
- facilitate fire fighting operations by creating a smoke free layer;
- delay and/or prevent flashover and thus full development of the fire;
- protect equipment and furnishings;
- reduce thermal effects on structural components during a fire;
- reduce damages caused by thermal decomposition products and hot gases.

A powered smoke exhaust system can also be used for the realisation of the following purposes:

- creation of a negative pressure differential facing the direction of escape for the prevention of the spread of smoke;
- local dilution of smoke within occupied zones.

Natural smoke and heat exhaust ventilators are devices fitted into the roof and/or upper walls of a construction works to allow smoke and fire gases to be exhausted from the construction works when driven by thermal buoyancy inherent in those gases. It is essential that they are able to open, and/or to remain open in the event of a fire and to fulfil their function even when climatic and weather conditions are unfavourable.

Depending on the building geometry and siting of the building with regard to neighbouring buildings, and design criteria, natural smoke and heat exhaust ventilators can be used instead of powered smoke and heat ventilators.

This Technical Report sets down the testing requirements for the system when installed to ensure that it operates in a safe and reliable manner. Commissioning, periodic maintenance and servicing requirements are stated as well as the users' responsibilities for ensuring that the system is always for use in case of fire.

Components of the SHEVS should be designed or chosen to meet the specific performance requirement of the system.

Without proper installation of all of its components, the SHEVS could not operate correctly nor meet the performance targets for which it has been designed.

Commissioning is necessary to check the SHEVS operates in accordance with its design. The system has to be permanently available for operation. This can only be achieved when checked and maintained.

1 Scope

This Technical Report applies to SHEVS when installed in a building. This Technical Report specifies the ability of the system to meet the required performances of the SHEVS as specified by the design of the system. This Technical Report is to help to translate the detailed engineering plan into an installed system, but it does not state how the design is made. This Technical Report also covers requirements for components and compatibility between components to ensure that the requirements on the installed system will be met. This Technical report includes requirements for the assembly, installation, commissioning, function testing, maintenance, periodic servicing and routine testing of SHEVS.

2 Normative references

The following referenced documents are indispensable for the application 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 1366-8, *Fire resistance tests for service installations — Part 8: Smoke extraction ducts*

EN 1366-9, *Fire resistance tests for service installations — Part 9: Single compartment smoke extraction ducts*

prEN 1366-10, *Fire resistance tests for service installations — Part 10: Smoke control dampers*

EN 12101-1, *Smoke and heat control systems — Part 1: Specification for smoke barriers*

EN 12101-2, *Smoke and heat control systems — Part 2: Specification for natural smoke and heat exhaust ventilators*

EN 12101-3, *Smoke and heat control systems — Part 3: Specification for powered smoke and heat exhaust ventilators*

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

prEN 12101-9, *Smoke and heat control systems — Part 9: Control panels*

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

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13501-3, *Fire classification of construction products and building elements — Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers*

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*

EN 60529, *Degrees of protection provided by enclosures (IP code)* (IEC 60529:1989)

EN ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements* (ISO 5167-1:2003)

ISO 2408, *Steel wire ropes for general purposes — Minimum requirements*