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Sistemi za nadzor dima in toplote - 1. del: Določila za ovire proti širjenju dima

Smoke and heat control systems - Part 1: Specification for smoke barriers

Rauch- und Wärmefreihaltung - Teil 1: Bestimmungen für Rauchschürzen

Systèmes pour le contrôle des fumées et de la chaleur - Partie 1: Spécifications relatives aux écrans de cantonnement de fumée

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Smoke and heat control systems - Part 1: Specification for smoke barriers

Systèmes pour le contrôle des fumées et de la chaleur - Partie 1: Spécifications relatives aux écrans de cantonnement de fumée

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 191.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 12101-1:2018) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This document is currently submitted to the Enquiry.

This document will supersede EN 12101-1:2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports basic work requirements of Regulation (EU) 305/2011.

For relationship with EU Regulation(s), see informative Annex ZA, which is an integral part of this document.

This European Standard is one part of the European Standard EN 12101, which has the general title “Smoke and heat control systems” and consists of the following separate 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: Fire and smoke control installations – Kits.

— Part 5: Guidelines on functional recommendations and calculation methods for smoke and heat exhaust ventilation systems (published as CR 12101-5).

— Part 6: Specification for pressure differential systems – Kits.

— Part 7: Smoke control ducts.

— Part 8: Specification for smoke control dampers.

— Part 9: Control panels.

— Part 10: Specification for power supplies.

— Part 11: Design, installation and commissioning requirements for enclosed car parks.

— Part 12: SHEVS – Time dependent fires.

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

Introduction

In a fire situation, smoke and heat exhaust ventilation systems create and maintain a smoke free layer above the floor by removing smoke. They also serve simultaneously to exhaust hot gases released by a fire in the developing stages. The use of such systems to create smoke-free areas beneath a buoyant smoke layer has become widespread. Their value in assisting in the evacuation of people from buildings and other construction works, reducing fire damage and financial loss by preventing smoke damage, facilitating access for firefighting by improving visibility, 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 ventilation systems (referred in this standard as SHEV) operate fully and reliably whenever called upon to do so during their installed life. A smoke and heat exhaust ventilation systems (referred in this standard as a SHEVS) is a system of safety equipment intended to perform a positive role in a fire emergency.

The system design parameters will dictate the minimum classification and performance of smoke barriers which can be used in any particular application. It is essential that the criteria for the correct choice of smoke barrier take into account the total system, function and location requirements without hindering the means of escape or endangering the occupants.

Smoke barriers control the movement of fire effluent within a construction works in the event of fire. Smoke barriers, when used within a smoke and heat control system, become a critical element of that system. If smoke barriers are not in their fire operational position, the system will not perform as designed. However, even in the event that other elements of the SHEVS do not function, smoke barriers in the fire operational position will provide essential smoke containment and channelling.

NOTE Function of smoke barriers are described in Annex G.

1 Scope

This European Standard specifies product characteristics, and test/assessment methods and compliance criteria of the test results for smoke barriers which comprise the barrier itself, with or without associated activation and drive devices. It does not cover barriers made of part of the building's structure. Smoke barriers are intended to be installed in smoke control systems in construction works.

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

EN 1363-1, *Fire resistance tests — Part 1: General Requirements*

EN 1363-2, *Fire resistance tests — Part 2: Alternative and additional procedures*

EN 1634-3, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware — Part 3: Smoke control test for door and shutter assemblies*

CEN/TR 12101-4, *Smoke and heat control systems — Part 4: Installed SHEVS systems for smoke and heat ventilation*

EN 13501-1, *Fire classification of construction products and building elements — 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 13501-4, *Fire classification of construction products and building elements — Part 4: Classification using data from fire resistance tests on components of smoke control systems*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 45545-2, *Railway applications — Fire protection on railway vehicles — Requirements for fire behaviour of materials and components*

EN ISO 1182, *Reaction to fire tests for products — Non-combustibility test (ISO 1182)*

EN ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

EN ISO 13943, *Fire safety — Vocabulary (ISO 13943)*

EN ISO 14184-1, *Textiles — Determination of formaldehyde — Part 1: Free and hydrolysed formaldehyde (water extraction method) (ISO 14184-1)*

3 Terms, definitions and symbols

3.1 General 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 http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
actuation
to make a device operate by moving or controlling a mechanism or system

3.1.2
active smoke barrier
smoke barrier which moves from its retracted position into its fire operational position automatically when called upon to do so

3.1.3
barrier movement
travel distance (e.g. height, drop) of an active barrier from its retracted position to its fire operational position

3.1.4
channelling screen
smoke barrier installed beneath a balcony or projecting canopy to direct the flow of smoke and hot gases from a room opening to the spill edge

3.1.5
consumable power supplies
any form of power that when not available will prevent an active smoke barrier moving to the required fire operational position

3.1.6
deflection
movement of a smoke barrier when subjected to the buoyant force of the hot smoke, the movement of air, air pressure, or any combination thereof

3.1.7
fail-safe
designed to return to a safe condition in the event of a failure or malfunction etc. without internal or external power supply

3.1.8
fire operational position
final configuration of a device

EXAMPLE A smoke barrier, specified by its designer to achieve and be sustained in the ultimate fire condition of the design

3.1.9
fitness for purpose
ability of a product, process or service to serve a defined purpose under specific conditions

3.1.10
free area
total area of all designed openings and clearance gaps in and/or around the perimeter of a smoke barrier

3.1.11
integrity
ability of a barrier to maintain its soundness for the purpose for which it is intended without the transmission of significant quantities of flames or hot gases to the non-exposed side

3.1.12
initiation
action of beginning by moving the smoke barrier

3.1.13
life safety application
application of the smoke and heat control system in its fire operational condition for the period of time required for the occupants of the premises to be alerted, and to be able to exit the premises, with the smoke and heat control system assisting in the protection of the means of escape

3.1.14
smoke and heat exhaust ventilation system (SHEVS)
set of components jointly selected to exhaust smoke and heat in order to establish a buoyant layer of warm smoke above cooler, cleaner air

3.1.15
smoke and heat control system
arrangement of components installed in a construction works to limit the effects of smoke and heat from a fire

3.1.16
reaction to fire
response of a product in contributing by its own decomposition to a fire to which it is exposed, under specified conditions

3.1.17
smoke barrier
device to channel, contain and/or prevent the migration of smoke (fire effluent)

Note 1 to entry: Smoke Barriers can also be referred to as, e.g. smoke curtains, smoke blinds, smoke screens

3.1.18
smoke reservoir
region within a construction works limited or bordered by smoke barriers or structural elements so as to retain a thermally buoyant smoke layer in the event of a fire

3.1.19
triggering device
device such as a fire detector system, smoke detector or pushbutton, which sends an activating signal to the initiation device(s)

3.1.20
spill edge
edge of a soffit beneath which a smoke layer is flowing and adjacent to a void

EXAMPLE The edge of a balcony or canopy, or the top edge of a window through which the smoke is flowing out of a room

3.1.21
static smoke barrier
smoke barrier permanently fixed in its fire operational position

3.1.22
void edge screen
smoke barrier deployed beneath the edge of a balcony or projecting canopy

Note 1 to entry: Void edge screens can either be used to create a smoke reservoir beneath the balcony or canopy or to restrict the length of spill edge in order to create a more compact spill plum

3.1.23
void sealing screen
smoke barrier deployed across a void to create a smoke reservoir beneath the smoke barrier

3.2 Symbols

A_g	Area of the gaps between smoke barriers, or between barrier and structure (m^2)
d_C	Horizontal deflection of a smoke barrier, measured at its bottom bar (m)
d_0	Height of opening
D	Distance of movement (drop) of smoke barrier (mm)
D_1	Design depth of a smoke layer in a reservoir (m)
G	Acceleration due to gravity (m/s^2)
h_b	Height of rise of a thermal line plume from an opening or balcony edge to the smoke layer (m)
h_p	Height of rise of leakage gases from the base of the hot gas layer in the smoke reservoir to the ceiling in the adjacent protected area (m)
L_C	Length of the smoke barrier from top to bottom bar, measured along the fabric (m)
M_b	Mass per metre length of the barrier's bottom bar (kg/m)
M_c	Mass per m^2 of the barrier fabric (kg/m^2)
M_B	Mass flow rate under a balcony (kg/s)
M_p	Mass of gas flowing into the gas layer in a protected area, having leaked through gaps in smoke barriers (kg/s)
$N_{1...3}$	Number of each type of gap in smoke barrier
t	Time in minutes
T	Absolute temperature of gases (K)
T_I	Absolute temperature of gas layer in a reservoir (K)

ΔT Temperature rise above ambient of smoky gases in a reservoir (°C)

ρ_0 Density of ambient air (kg/m^3)

W Width of smoke barrier (mm)

4 Product Characteristics

4.1 Fire resistance

4.1.1 General

All smoke barrier types (See Annex F) shall have a fire resistance stability duration under constant temperature in accordance 4.1.2 or the standard time temperature curve in accordance with 4.1.3.

4.1.2 Stability duration under constant temperature (D)

Smoke barriers of all types shall be tested according to 5.1.1 and maintain their integrity for a set time at 600 °C and classified in accordance EN 13501-4 (See Table 1).

Table 1 — Standard classes

Classes	Temperature (°C)	Time (min)
$D_{600}30$	600	30
$D_{600}60$	600	60
$D_{600}90$	600	90
$D_{600}120$	600	120
$D_{600}A$	600	**any time over 120 min**

4.1.3 Stability duration under the standard time-temperature curve (DH)

Smoke barriers of all types shall be tested according to 5.1.2 and maintain their integrity for a set time temperature and classified in accordance EN 13501-4 (See Table 2)

Table 2 — Classes for smoke barriers operating at higher temperatures

Classes	Temperature (°C)	Time (min)
DH 30	Standard heating curve (EN 1363-1)	30
DH 60	As above	60
DH 90	As above	90
DH 120	As above	120
DHA	As above	**any time over 120 min**

4.2 Reaction to fire

The reaction to fire shall be tested in accordance with 5.2 and classified in accordance with EN 13501-1

4.3 Smoke leakage

4.3.1 Curtain materials

All curtain materials used in the construction of a smoke barrier assembly shall have a smoke leakage classification of S_a or S_{200} in accordance with EN 13501-2 when tested in accordance with 5.2.1 not exceeding 25 $m^3/m^2/h$.

4.3.2 Openings, gaps and/or perimeter spaces

The free area through and around the complete system, materials and joints inherent in the product design shall be stated by the manufacturer.

All gaps in and around all types of smoke barrier shall be minimized to maintain the smoke barrier containment efficiency. See 5.3.2

4.4 Response delay (response time)

4.4.1 General

The smoke barrier shall commence movement to the fire operational position upon receipt of a signal from a trigger device within 10 s when tested in accordance with 5.4. Including both open or short circuit condition by one of the following initiation devices.

a. an initiation device activated an electrical signal from a remote trigger device, e.g. a smoke and/or heat detector system, the interruption of electrical supply or a manually actuated "fire override" switch;

b. an initiation device able to respond to other types of trigger signal.

4.4.2 Closing mechanisms

Gravity fail-safe smoke barriers shall deploy under gravity when tested in accordance with 5.5.2.

4.5 Deployment (response time)

4.5.1 General

Time taken for an active smoke barrier to move to its fire operational position after initiation in accordance with 4.6.1.

4.5.2 Reliability

Active smoke barriers shall commence movement upon initiation or any initiation failure and move to their operational position when tested according to 5.4.1.

4.5.3 Gravity fail-safe

Active smoke barriers shall commence movement upon initiation or any initiation failure and move to their operational position when tested according to 5.5.2.

4.6 Operational reliability

4.6.1 Cycle tests

Active smoke barrier specimens shall be tested in accordance with 5.6.1 and shall complete 1000 cycles. When tested according to 5.6.1. Active smoke barrier specimens shall move to their operational position, in all operating modes, at a velocity range of between 0,06 m/s and 0,30 m/s.