
**Fire resistance tests — Elements
of building construction —
Requirements for active fire curtains**

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols	4
5 Requirements	5
5.1 General	5
5.2 Side retention	6
5.3 Additional requirements for multiple active fire curtains	7
5.3.1 Multiple active fire curtains	7
5.3.2 Required overlap	9
5.3.3 Larger than tested	9
5.4 Horizontal or angled	9
5.5 Pass door(s)	11
5.6 Vision panels	12
6 Sampling	13
6.1 Test samples, testing and conformance criteria	13
7 Test methods	14
7.1 General	14
7.2 Durability and force gauge	15
7.3 Reliability and durability	15
7.4 Deployment	15
7.4.1 Response time and velocity	15
7.4.2 Delayed and/or multi-positional deployment	16
7.4.3 Emergency egress control	16
7.4.4 Emergency access control	16
7.5 Smoke leakage	16
7.5.1 General	16
7.5.2 Total smoke leakage of active fire curtains with smoke-resistance	16
7.6 Fire resistance	16
7.6.1 General	16
7.6.2 Integrity	17
7.6.3 Insulation	17
7.6.4 Radiation (heat flux)	17
7.6.5 Deflection zone	18
7.6.6 Initial deployment	18
7.6.7 Operation following initial deployment — emergency egress	18
7.6.8 Operation following initial deployment — emergency access	18
7.6.9 Delayed and/or multi-positional deployment	18
7.7 Reaction to fire	18
7.8 Ancillary devices	19
7.8.1 General	19
7.8.2 Ancillary devices activation	19
7.8.3 Hold-open devices	19
7.8.4 Fire detection and alarm systems	19
7.8.5 Sensory equipment for obstruction warning	19
7.8.6 Pressure-sensitive protective equipment (PSPE)	19
7.8.7 Self-test facility for dwellings	19
8 Marking, labelling and packaging	20
Annex A (normative) General requirements for testing	21

Annex B (normative) Order of testing	24
Annex C (normative) Fire-resistance test method	26
Annex D (normative) Overlapping multiple active fire curtains	41
Annex E (normative) Test method for active fire curtains reliability and response time and the durability of materials	43
Annex F (normative) Test method for reliability of motor operation at elevated temperatures	46
Annex G (normative) Calculation of ambient temperature smoke leakage	52
Annex H (normative) Test method for the durability and reliability of alternative or additional motors	55
Annex I (normative) Test method for ancillary and optional equipment	58
Annex J (normative) Test method for durability and force gauge	62
Annex K (informative) Typical product performance summary	65
Annex L (normative) System design	67
Annex M (informative) Installation	79
Annex N (informative) Commissioning	83
Annex O (informative) Inspection, testing and maintenance	86
Annex P (informative) Typical approving authority pre-installation checklist	88
Annex Q (informative) An engineered approach to using radiative heat flux for tenable conditions for single-level horizontal routes	89
Annex R (informative) Yarns and fabric materials	99
Annex S (informative) Typical installation checklist	100
Annex T (informative) Model installation certificate	103
Annex U (informative) Typical inspection checklist	105
Annex V (informative) Model commissioning certificate	107
Annex W (informative) Model completion certificate	109
Annex X (informative) Model servicing certificate	111
Bibliography	113

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 2, *Fire containment*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

As fire-separating elements, active fire curtains are intended to provide two main functions:

- a) to maintain any compartmentation of buildings needed to limit the spread of fire and smoke; and
- b) to allow access to protected escape routes, both vertical and horizontal, without any loss of fire resistance, and to limit smoke entry into these routes, i.e. protected corridors and protected shafts.

They can also be partially deployed to control the deployment of fire effluent within buildings in the event of fire, prior to being fully deployed as active fire curtains.

Recommended positions and ratings for fire-separating elements for means of escape purposes are given in national codes providing either prescriptive or risk-based approaches using the principles of fire safety engineering.

When used as part of a fire-engineered design solution, active fire curtains can become a critical element of design. If active fire curtains do not deploy to their operational position, the fire-engineered design solution is compromised. However, in the event that other fire protection systems or elements do not function (e.g. due to total power failure), active fire curtains in their fire-operational position provide fire separation.

Active fire curtains used in life safety and property protection applications can be vertical, horizontal or angled. Depending on the application, they are at times used to replace fire doors, roller shutters, non-loadbearing walls, non-loadbearing ceilings, glazed elements, etc. At times, they are also used to form fire separation, e.g. forming protected routes or lobbies. They provide some of the functionalities of a fire door, but when used only for fire and smoke leakage, as a fire door, then different requirements apply. These requirements are given in ISO 3008-1 and ISO 5925-1, and further information is given in ISO/TR 5925-2. Active fire curtains enable greater widths and deployments using less space than other traditional methods.

It is essential that any proposed use of active fire curtains be assessed in the context of the building use and perceived occupancy to ensure that it is ultimately suitable and fit for purpose, taking into consideration such factors as:

- a) fire resistance;
- b) reaction to fire;
- c) smoke leakage;
- d) occupancy type and risk profile;
- e) occupancy load;
- f) means of escape for egress;
- g) ingress for fire and rescue service;
- h) life safety and property protection objectives.

Some examples of how active fire curtains are deployed are:

- a) deploy fully upon receipt of a signal from the fire alarm system;
- b) remain retracted when the fire alarm system is activated and only deploy upon receipt of a signal from a local smoke/heat detector. In these circumstances, the only active fire curtains to deploy are those where fire or smoke are in the vicinity;
- c) remain retracted when the fire alarm system is activated for a predetermined time to allow for evacuation before deploying fully;

- d) for vertical installations, move to a given height above finished floor level when the fire alarm system is activated to contain smoke for a predetermined time before closing fully for fire separation;
- e) for vertical installations, move to a given height above finished floor level when a specific fire alarm system signal is provided to contain smoke when the fire location is such that active fire curtains are not required to deploy fully;
- f) deploy upon loss of primary and auxiliary power supply.

In fire safety situations, it is often important to establish the heat transfer from one side of the separating element to the other in order to calculate escape route sizes and safe operating distances. Traditionally this has been established using insulation and radiation measurements.

NOTE National codes apply to life safety. Higher performance levels are sometimes necessary for certain applications if property protection is required.

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Fire resistance tests — Elements of building construction — Requirements for active fire curtains

1 Scope

This document specifies requirements for the design, testing and classification of active fire curtains, applicable to any material, that are designed to provide fire and smoke resistance.

This document gives recommendations for the application, installation and maintenance of active fire curtains. It is also intended to provide guidance and recommendations for designers, specifiers (e.g. architects, fire engineers), authorities having jurisdiction (AHJs), installers and maintainers for the following:

- a) creating compartmentation;
- b) creating protected routes for the purpose of means of escape;
- c) providing protection at the location of non-fire resisting elements (e.g. in front of non-fire-resisting glazing and doorsets) where required for compartmentation or protecting means of escape;
- d) providing fire- and smoke-resistant active fire curtains in conjunction with non-smoke rated products protecting openings to reduce leakage of smoke.

This document does not apply to the following, which are intended for a different use:

- barriers made of part of the building's structure;
- theatre/proscenium textile curtains;
- smoke barriers according to ISO 21927-1;
- door and shutter assemblies according to ISO 3008-1.

NOTE 1 Smoke barriers used solely for smoke control are covered by ISO 21927-1. Such smoke barriers are not considered to be active fire curtains.

NOTE 2 Requirements of fire doors are given in ISO 3008-1. Requirements for leakage are given in ISO 5925-1 and further information is given in ISO/TR 5925-2.

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.

ISO 834-1, *Fire-resistance tests — Elements of building construction — Part 1: General requirements*

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

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

ISO 3009, *Fire-resistance tests — Elements of building construction — Glazed elements*

ISO 5925-1, *Fire tests — Smoke-control door and shutter assemblies — Part 1: Ambient- and medium-temperature leakage tests*

ISO 9705-1, *Reaction to fire tests — Room corner test for wall and ceiling lining products — Part 1: Test method for a small room configuration*

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

ISO 13943, *Fire safety — Vocabulary*

ISO 21927-10, *Smoke and heat control systems — Part 10: Specification for power output devices*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 834-1 and ISO 13943 and the following apply.

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

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

3.1

active fire curtain

curtain, manufactured from flexible materials, not hinged or pivoted, provided for the passage of persons, air and objects, which, together with its frame as installed in a building, is intended (when closed) to resist the passage of fire

3.2

compartmentation

process of separating a building or part of a building into one or more rooms, spaces or storeys, with the intention of preventing the spread of fire to or from another part of the same building or adjoining building

Note 1 to entry: Compartmentation is mainly implemented to assist the fire and rescue services by confining the fire within a fire-resisting enclosure. In some instances, it is employed to assist means of escape in buildings where evacuation might be delayed (e.g. where phased evacuation policy has been applied in premises such as hospitals and care homes) or where a policy of non-evacuation (e.g. “defend in place” or “stay put strategy”) is employed, as in blocks of flats.

Note 2 to entry: Fire enclosures specifically for the purpose of means of escape, such as lobby protection to stairways and enclosure of special risks, are not regarded as compartments and may employ passive smoke separation measures.

3.3

competent person

individual suitably trained and qualified by knowledge and practical experience and provided with the necessary instructions to enable the required task(s) to be carried out correctly

3.4

deployment

movement of an active fire curtain from its retracted position to its fire-operational position

3.5

dwelling

unit of residential accommodation occupied (whether or not as a sole or main residence):

- a) by a single person or by people living together as a family; or
- b) by not more than six residents living together as a single household, including a household where care is provided for residents

3.6**fire effluent**

all gases and aerosols, including suspended particles, created by combustion or pyrolysis and emitted to the environment

[SOURCE: ISO 26367-1:2019, 3.6, modified — Notes to entry removed.]

3.7**fire-operational position**

final configuration of an active fire curtain specified by its designer to achieve and be sustained in the ultimate fire condition of the design

3.8**fire separation**

method of providing an element that is intended for use in maintaining separation between two adjacent areas of a building in the event of a fire to form protected routes and/or compartmentation

3.9**fire strategy**

safety design for a particular building determined by prescriptive codes, fire safety engineering or fire risk assessment

3.10**fit for purpose**

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

3.11**gravity fail safe**

ability of an active fire curtain to move to its fire-operational position in a safe and controlled manner to facilitate fire separation when all consumable primary and auxiliary power supplies are removed, in the event of wiring or system corruption, open or short circuit, or any combination thereof

3.12**integrity**

ability of a separating element, when exposed to fire on one side, to prevent the passage of flames and hot gases or occurrence of flames on the unexposed side, for a stated period of time in a standard fire resistance test

[SOURCE: ISO 22899-1:2007, 3.9]

3.13**hold-open device**

element of the hold-open system that allows a gravity fail safe active fire curtain to remain open either at a pre-set or chosen position until released

3.14**life safety**

application of the active fire curtain in its fire-operational position assisting in the protection of the means of escape and access for the fire and rescue service

3.15**material****fabric**

product made from fibres

Note 1 to entry: Within the context of this document, "material" is understood to conform to one of the following tests:

Note 2 to entry: a) Non-combustible test (ISO 1182).

Note 3 to entry: b) Limited combustibility test (ISO 1716).

Note 4 to entry: Within the context of this document, "material" is understood to require the following tests:

Note 5 to entry: a) Room corner test for wall and ceiling linings (ISO/TR 9705-2).

Note 6 to entry: b) Ignitability of products when subjected to direct impingement of flame test (ISO 11925-2).

3.16

means of escape

means whereby a safe route (or routes) in the event of fire is (or are) provided for persons to travel from any point in a building to a place of ultimate safety

3.17

multi-positional deployment

staged deployment of active fire curtain to provide initial smoke separation prior to full fire separation

3.18

property protection

application of the active fire curtain in its fire-operational condition to protect a building's contents and structure

3.19

side retention

retention device which links the active fire curtain fabric to the building structure to contain fire and smoke

3.20

smoke barrier

device to channel, control and/or prevent the migration of smoke

Note 1 to entry: Smoke is the visible part of a fire effluent. Smoke barriers can also be referred to as smoke curtains, smoke blinds or smoke screens. These are specified in ISO 21927-1.

4 Symbols

Symbol	Unit	Description
a	m	height of the radiating surface
A	m ²	tested exposed fabric area
A_r	m ²	required exposed fabric area
b	m	width of the radiating surface
c	m	perpendicular distance from the corner of the radiating surface
d_s	m	proximity of the escaping occupants to active fire curtains as the minimum separation distance
δ_a	m	anticipated deflection
H	m	height of the fire tested active fire curtains
H_p	m	proposed height
H_r	m	required height of the exposed fabric
ε	-	emissivity
f	-	factor for scaling the required minimum width of the end curtain and the required minimum width of the overlap
F	-	configuration factor

Symbol	Unit	Description
I	kW/m^2	radiation heat flux (for purposes of TDU)
I_c	m	proposed length/width
L_c	m^3/h	leakage through the complete active fire curtains
L_{fa}	m^3/h	leakage through the fabric only
L_{fb}	$\text{m}^3/\text{m}^2/\text{h}$	leakage per square metre of fabric
L_{fh}	m^3/h	leakage through the fabric and the horizontal edge
L_{ph}	m^3/h	leakage through the perimeter gap at the horizontal edge
L_{phb}	$\text{m}^3/\text{m}/\text{h}$	leakage per metre through the perimeter gap at the horizontal edge
L_{pv}	m^3/h	leakage through the perimeter gap at the two vertical edges
L_{de}	$\text{m}^3/\text{m}^2/\text{h}$	leakage per metre through the perimeter gaps at the vertical edges
L_{lt}	$\text{m}^3/\text{m}/\text{h}$	effective linear perimeter leakage
O	m	width of the tested overlap
O_m	m	required minimum width of the overlap
Q	W/m^2	heat flux
Σ	$\text{W}/(\text{m}^2\text{K}^4)$	Stefan Boltzmann's constant
R_{\max}	kW/m^2	maximum permitted radiation heat flux at the tested size
R_{RSET}	kW/m^2	radiation heat flux from the fire curtain at the tested size at the Required Safe Evacuation/Egress Time
t	s	exposure time
T	K	surface temperature of the radiator
τ	$(\text{kW/m}^2)^{4/3}\text{s}$	thermal dose unit (TDU)
v_o	m/s	speed of escaping occupants
w_c	m	width of the corridor
w_p	m	width of the person
W	m	width of the tested end curtain
W_m	m	required minimum width of the end curtain
W	m	tested width of the exposed fabric
W_r	m	required width of the exposed fabric

5 Requirements

5.1 General

Active fire curtains shall be designed according to [Annex L](#) and manufactured to create a fire-separating element in a horizontal, vertical or angled orientation.

Typical uses of the active fire curtains include:

- a) compartmentation;
- b) creating protected routes for the purpose of means of escape where using standard fire doors/shutters and non-loadbearing walls and ceilings would be prohibitive to the design;
- c) providing protection at the location of non-fire resisting elements, e.g. in front of non-fire resisting glazing and doorsets, where required for compartmentation or protecting means of escape;
- d) meeting the requirements for smoke leakage in conjunction with other non-smoke rated products (e.g. lift door) protecting openings to reduce leakage of smoke.

5.2 Side retention

Where active fire curtains, whether single or multiple units, are reliant on side retention as part of their integral design, there shall be no gaps between the fabric edge and the leading edge of the retention guide that can impede integrity (see [C.3](#)).

[Figure 1](#) illustrates an example of a typical single active fire curtain.

Active fire curtains with side retention (see [3.19](#)) have been found in some circumstances to produce edge gaps in end-use applications. Care should be taken during installation to use side retention that is identical to the tested samples.

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