

Components for smoke and heat control systems —

Part 1: Specification for natural smoke and heat exhaust ventilators

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Fire Standards Policy Committee (FSM/-) to Technical Committee FSM/14, upon which the following bodies were represented:

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British Fire Services' Association	Fire Brigades Union
British Gas plc	Health and Safety Executive
British Retailers' Association	Home Office
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The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Access Committee for England	Building Services Research and Information Association
Association of Consulting Engineers	Flat Glass Manufacturers' Association
Association of Rooflights	Intumescent Fire Seals Association
Manufacturers (Arms)	London District Surveyors Association
British Automatic Sprinkler Association	Smoke Ventilation Association
British Council of Shopping Centres	Society of Fire Safety Engineers
British Fire Protection Systems Association Ltd.	Warrington Fire Research Centre
British Property Federation	

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Definitions	1
3 Construction	1
4 Heat and coefficient of performance testing of smoke and heat exhaust ventilators	2
5 Climatic performance and testing of smoke and heat exhaust ventilators	3
6 Certification of performance data	3
7 Servicing	3
Appendix A Coefficient of discharge test	4
Appendix B Temperature rise and expansion test	5
Appendix C Fire/heat test	6
Appendix D Rain testing of natural ventilators	7
Appendix E Service schedule	8
Figure 1 — Wind tunnel	4
Figure 2 — Apparatus for rain testing	8
Publications referred to	Inside back cover

Foreword

This Part of BS 7346 has been prepared under the direction of the Fire Standards Policy Committee and is based on a draft prepared by the Smoke Ventilation Association. It is one of a series of specifications for components of smoke and heat control systems. The other Parts are as follows:

- *Part 2: Specification for powered heat and smoke exhaust ventilators;*
- *Part 3: Specification for smoke curtains.*

The use of smoke and heat exhaust ventilators has become widespread and their value in assisting in the evacuation of people from buildings, 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 ventilation installation is intended to perform a positive role in a fire emergency. Smoke and heat exhaust ventilators should be installed as part of a properly designed smoke and heat exhaust scheme.

Assessed capability. Users of this British Standard are advised to consider the desirability of assessment and registration of a supplier's quality systems against the appropriate Part of BS 5750 by a third party certification body.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 7346 specifies performance requirements for natural smoke and heat exhaust ventilators that are intended to be installed in buildings to release the products of combustion in the event of a fire.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this standard the following definitions apply.

2.1

automatic smoke and heat exhaust ventilator

a ventilator that is installed into a building and is designed to open automatically after the outbreak of fire if called upon to do so, to allow smoke and hot gases to escape

NOTE Such ventilators are sometimes referred to as fire vents.

2.2

dual purpose ventilator

a smoke and heat exhaust ventilator which has provision to allow its use for comfort ventilation

2.3

natural ventilation

ventilation that is caused by buoyancy forces due to difference in density of the air because of the effects of temperature differences

2.4

measured free area

the actual measured throat area of the natural heat and smoke exhaust ventilator

NOTE This is normally the smallest clear opening between the drainage channels; no reduction is made for controls, louvres or other obstructions.

2.5

aerodynamic free area

the measured free area (2.4) above multiplied by the coefficient of discharge

2.6

coefficient of discharge (C_D)

the ratio of actual flow rate to theoretical flow rate through the ventilator

NOTE The theoretical flow rate (see Appendix A) is calculated for an opening with the same area. The actual flow rate is measured over a range of pressure differences across the ventilator in a suitable wind tunnel. The coefficient is normally constant over the range of pressure differences, and takes into account any obstructions in the ventilator such as controls, louvres, dampers, or other obstructions.

2.7

thermal link

a heat sensitive mechanical linkage which parts when its temperature exceeds a specified limit

NOTE Thermal links can also be specified by time constant, so that they operate in a predetermined period.

3 Construction

3.1 General

3.1.1 The smoke and heat exhaust ventilator shall be constructed so that when correctly installed and in use there is no possibility of flames or hot gases emerging from the ventilator being deflected directly onto an adjacent structure.

3.1.2 The design of the ventilator shall ensure that when in use none of the component parts reduce the ventilation opening if the ventilator disintegrates or collapses due to the effects of fire.

3.1.3 The materials used shall have a class 1 surface spread of flame rating when tested in accordance with BS 476-7.

NOTE The materials used in the construction of the heat and smoke ventilator should not add to the fire risk of the building, nor contribute significantly to a fire during use.

3.1.4 The design of all moving parts, bearings, sliding surfaces, fastenings and other components of the operating mechanisms and the materials from which they are constructed, shall ensure satisfactory operation of the heat and smoke exhaust ventilator during its expected lifetime, which shall be not less than 10 years.

3.1.5 Each heat and smoke exhaust ventilator shall be fitted with a means of automatically opening to vent hot smoke or air. This may take one of the following forms.

a) *Thermal link.* The thermal link shall be mounted within the throat of the ventilator; with flap type ventilators there shall be a single link, so that the parting of the link will release the opening flaps or louvres. It shall be fitted into the ventilator control system in such a way that the load on the thermal link does not exceed the load stamped on the link or the manufacturer's recommendations.

NOTE These links normally fuse at approximately 68 °C to 74 °C.

b) *Multiple control of several ventilators via a frangible bulb activated valve or fusible plug.* The valve or plug shall be positioned at high level and shall release compressed air from pressurized pipework. Unless an alternative temperature is specified, the frangible bulb shall break at 68 °C. Loss of pressure in the pipework shall automatically result in the opening of the ventilators.

c) *Automatic smoke detection system.* The ventilator shall open following an alarm condition initiated by an automatic smoke detection system complying with BS 5839-1.

3.1.6 The ventilator shall be so designed that it will always fail to the fully open position under fire conditions.

3.1.7 When the ventilator has a life safety (i.e. means of escape) application it shall be activated in accordance with **3.1.5 c).**

3.1.8 Manual overriding controls shall be provided as part of the control system.

3.1.9 It shall be possible to test the ventilator, remotely open and closed, from working level in the building.

3.2 Resistance to corrosion

The ventilators and control system shall be constructed from materials resistant to natural atmospheric corrosion and sunlight, and shall be selected so as to prevent the possibility of galvanic corrosion between adjacent components.

3.3 Springs

All springs shall be of stainless steel complying with grade 316S31 of BS 970-1 or equivalent.

NOTE Other types of device, such as gas springs, may also be used in place of tension and compression springs.

3.4 Bearings

All pivot points/bearings shall be designed to ensure free movement at all times.

4 Heat and coefficient of performance testing of smoke and heat exhaust ventilators

4.1 A standard production ventilator with a nominal throat size of 1.5 m wide by 2.5 m long shall be submitted to the test schedule described in **4.2** to **4.7**. If the size range is less than the specified size above, then the largest ventilator in the range shall be tested. Ventilator designs for use in the vertical and horizontal positions shall be tested in both planes.

NOTE A test on one size of ventilator will allow an appraisal of other similar ventilators in the range even with different aspect ratios except for coefficients of performance (see **4.3**). Ventilators of larger area or with unusual aspect ratios may need to be tested on an ad hoc basis.

4.2 The ventilator shall be inspected to ensure that it complies with the published performance data.

4.3 The coefficient of discharge of the ventilator shall be determined in accordance with Appendix A.

4.4 The ventilator shall be mounted either horizontally or vertically on a suitable test rig, depending on whether it is intended for roof or wall application, to check its response to heat and to determine the effects of differential expansion, in accordance with **4.5**, **4.6** and **4.7**.

4.5 The ventilator shall be subjected to a slow rate of temperature rise in accordance with **B.4.1**. The ventilator shall open smoothly to the fully open position, and it shall remain in this position without reduction in the ventilation area. Even if the gas struts fail the ventilator shall be maintained in the open position.

4.6 The ventilator shall be subjected to a fast rate of temperature rise in accordance with **B.4.3**. The ventilator shall open smoothly to the fully open position, and it shall remain in this position without reduction in the ventilation area. Even if the gas struts fail the ventilator shall be maintained in the open position.

4.7 The ventilator shall open as follows:

a) for both slow and rapid rate of rise of temperature tests, smoothly and swiftly to a fully open position so that there is no obstruction of passage of air through the ventilator at any time during test;

NOTE If the ventilator opens prematurely it is not deemed to have failed the tests.

b) for the slow rate of rise of temperature test, within 3 min of the air temperature reaching the stated operating temperature of the heat detector/operating mechanism;

c) for the rapid rate of rise of temperature test, within 90 s of the air temperature reaching the stated operating temperature of the heat detector/operating mechanism.

4.8 The ventilator shall open and close as intended, without failure of any of the components necessary for operation, when the smoke and heat exhaust ventilator is operated 2 000 times, unless it is a dual purpose ventilator, in which case it shall be operated 30 000 times.

4.9 When tested in accordance with Appendix C, the ventilation opening shall remain clear from obstruction throughout the test.

A similar ventilator of a smaller size may be used: the ventilator shall have a minimum measured throat area of 1.2 m × 1.2 m or the largest in the range if smaller than this. If gas struts are used in the ventilator these should be carefully examined for failure.

NOTE 1 If the gas struts fail the ventilator should be maintained in the open position.

NOTE 2 If a range of gas struts is available for the ventilator, it is to be tested with the highest pressure struts fitted.