



STEEL INDUSTRY
GUIDANCE NOTES

BS 9999: A New Approach to Design of Fire Precautions in Buildings

Since the mid 1980s, fire precautions in buildings in England and Wales have been designed principally to the provisions of Approved Document B to the Building Regulations, making regular reference to supporting standards. The Approved Document approach has served its purpose well, but the past decades have seen a significant commitment to research into fire behaviour in the UK which has resulted in improvements in knowledge and understanding of fire behaviour and how risk is created in fire. As a consequence, many of the provisions of the Approved Document are now recognised as outdated and/or overly conservative. A new approach was required and the result has been the creation of BS 9999, *Code of practice for fire safety in the design, management and use of buildings*.

Rationale behind the development of BS 9999

Improved knowledge of fire behaviour and building performance in fire has led to the widespread adoption of engineered, or performance based, solutions in the UK. These are usually applied to large and complex buildings and generally require specialised knowledge. It has been clear for some time that there was scope for another approach which would lie between the advanced approach and the prescriptive approach of the Approved Document. The result has been the creation of BS 9999.

Differences between BS 9999 and Approved Document B

The new standard sits between the prescriptive approaches found in the Approved Document and the performance based approaches used predominantly on large and complex buildings. While remaining prescriptive, it seeks to allow the development of solutions based on an understanding of the causes of risk to life and how these can effectively be mitigated. On publication, the BSI said: *"The standard builds on government guidance to legislative requirements, providing an advanced approach to fire safety in the design, management and use of buildings. It promotes a more flexible approach to fire safety design through use of structured risk-based design where designers can take account of varying human factors."*

The future of the Approved Document

BS 9999 does not sit in opposition to Approved Document B. Nevertheless, all references to BS 5588, *Fire precautions in the design, construction and use of buildings*, are being withdrawn from the Approved Document, a development which will probably hasten the widespread adoption of the new standard.

Structural fire precautions in BS 9999

The periods of fire resistance for elements forming part of a structural frame found in the Approved Document have been transferred into BS 9999. However this is complemented by an alternative approach which classifies buildings according to a risk profile based on occupancy, fire growth rate, ventilation conditions and height. There are limitations on the buildings on which this approach can be used but it is expected that few buildings will be excluded. The risk profile of the building, and therefore the fire resistance requirement, can be reduced if sprinklers are installed. Some building types will see their fire ratings rise and some will see a fall.

Examples of increases and decreases in structural fire resistance requirements

A two storey office building with a ground floor area less than 1000m² will see the required period of fire resistance change from 30 minutes to 15 minutes. Most

hot rolled structural sections will achieve 15 minutes fire resistance without protection.

An open plan office building between 30 and 60 metres in height will see a reduction from 120 minutes plus a sprinkler system to 90 minutes without sprinklers and 60 minutes with sprinklers.

A department store without sprinklers, between 11 and 18 metres in height, will see an increase from 60 to 75 minutes

The role of sprinklers in BS 9999

Sprinklers are not mandatory in any building in BS 9999 although two separate statements are made to the effect that, for buildings over 30 metres in height, sprinklers should be installed.

BS 9999 generally allows more attractive trade offs for automatic sprinkler installation and automatic fire detection than are generally available in the Approved Document.

An example of how BS 9999 works

Take a shop with a risk profile requiring 45 minutes fire resistance, a maximum two way travel distance of 40 metres, a ceiling height of 4.5 metres and a minimum door width allowance per person of 6mm.

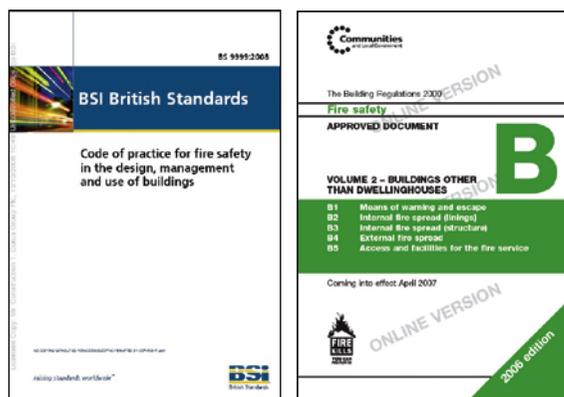
If a shop sales area with this risk profile is fitted with sprinklers its risk profile reduces and the maximum two-way travel distance is increased from 40m to 50m. Similarly the maximum one-way travel distance may be increased from 16m to 20m. The fire rating can be reduced from 45 to 30 minutes.

If a smoke detection system and a voice alarm giving evacuation instructions are also fitted, the maximum

two-way travel distance may be increased by 15% from 50m to 57.5m.

Similarly the maximum one-way travel distance may be increased from 20m to 23m. If the ceiling height is between 4 m and 5 m, an additional 10% may be added, to bring the limits to 63.25 m and 25.3m. The limits are 75m and 24m for two-way and one-way travel distances, so in this example the limits would be 63.25m and 24m. For the same shop with sprinklers, the minimum door width per person can be reduced to 4.1mm. Fitting a smoke detection system and a voice alarm giving evacuation instructions permits the width to be reduced by 15% to 3.4 mm per person. If the ceiling height is between 4m and 5m, the width may be reduced an additional 10% to 3.13mm. This is less than the minimum value of 3.3mm allowed for the risk profile, so in this example the minimum limit of 3.3mm would be used.

The increased travel distances with increased storey height simply reflects what is already known and adopted by fire engineers in that the higher the ceiling the longer it takes for smoke 'fill down' to take place and therefore the lower the risk.



Key Points

1. BS 9999 offers an approach to the problems of fire precautions in buildings which lie between the prescriptive approach of Approved Document B and the performance based approaches common in large and complex buildings.
2. BS 9999 offers flexibility in the design of fire precautions which can be applied to all types of buildings.
3. BS 9999 will probably eventually displace the Approved Document as the main source of information on fire precautions in buildings in England and Wales.

Further sources of Information

1. **BS 9999 Code of practice for fire safety in the design, management and use of buildings. Available from the British Standards Institution**
2. **Approved Document B, available at <http://www.planningportal.gov.uk/england/professionals/en/400000000084.html>**