TIMBER DEVELOPMENT UK

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Timber and Fire Building Regulations

All new buildings, and existing multi-occupied buildings, must comply with the fire performance requirements set out by relevant national building regulations. The requirements are only met if a structure is correctly designed and its components manufactured and built to required standards.

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Timber and Fire Building Regulations

The legislative system underpinning fire safety intends to protect life through each stage of the design, construction, and occupation of a building. This results in a reasonable level of protection for the building's occupants and firefighters in the event of a fire.

Building regulations, guidance documents, and their associated requirements differ slightly around the UK and are often subject to change. The building designer is responsible for checking current regulations in their area.

Current Legislation

In England, the overarching legislation for construction, material alteration, and change of use of buildings is the **Building Act 1984**, under which the Building Regulations are published periodically. The main functional requirements for fire safety are found in **Schedule 1, Part B**, and detailed guidance on achieving compliance is in the supporting statutory guidance documents **Approved Document B Volume 1,** and **Volume 2**. Although **Approved Document B** only applies to England, there are similar provisions in the devolved regions of the UK, such as **Technical Handbooks** in Scotland, **Technical Booklet E** in Northern Ireland, and Wales has its own **Approved Document B**.

These are translated via statutory fire safety guidance (the **Approved Documents** in England, Wales and Northern Ireland, and **Technical Handbooks** in Scotland) into performance requirements or intentions, accompanied by technical guidance or provisions which set out in detail how to achieve that performance requirement or intention. These requirements are divided into five sections:

- Means of escape and warning
- Internal fire spread (linings)
- Internal fire spread (structure)
- External fire spread
- Fire service access and facilities

Approved Document B makes clear that *"Compliance with the guidance set out in the approved documents does not provide a guarantee of compliance with the requirements of the regulations because the approved documents cannot cater for all circumstances, variations and innovations."*

There may be other ways to comply with the requirements and designers should refer to appropriate standards or other documents to find further useful guidance.

Similarly, **BS 9991 Fire Safety in the Design, Management and Use of Residential Buildings Code of Practice** states *"There might be circumstances where it is necessary to use one publication to supplement another, but care needs to be taken when using a "pick-and-mix" approach as it is essential to ensure that an integrated approach is used in any one building. As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification, and particular care should be taken to ensure that claims of compliance are not misleading."*

In some cases, principal solutions are derived to meet performance requirements and intentions described in statutory guidance documents with the process in **BS 7974 Application of Fire Safety Engineering Principles to the Design of Buildings Code of Practice**. Different regulations and guidance apply in Scotland and Northern Ireland, so it is important to identify the relevant requirements early in a project.

Approved Document B sets out routes to compliance in **Appendix B Performance of Materials, Products, and Structures**, which include:

a. They should be in accordance with a specification or design that has been shown by a specific test to be capable of meeting that performance classification.

b. They should have been designed by using relevant design standards to meet that performance classification.

c. They should have been assessed by applying relevant test evidence, in lieu of carrying out a specific test, as being capable of meeting that performance classification.

Following the UK's departure from the EU, new UKCA (UK Conformity Assessed) construction product marking came into force in the UK (England, Wales, Scotland). At time of writing, the UKCA mark and the CE mark are both accepted in the UK.

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European and British Test Standards

Building Regulations often refer to British Standards and / or Harmonised European Standards associated with fire safety in buildings. In most cases, these standards contain test methods for assessment of fire performance of materials and products used in construction.

The European system, introduced in 1988 by the **Construction Products Directive (CPD)**, includes performance classes, testing, and calculation standards for fire performance. The **CPD** was replaced by the **Construction Products Regulation (CPR)** in 2013. The main change is that the **CPR** is mandatory in all European countries.

Six essential requirements were introduced in the **CPD** and remain in the **CPR**. Fire safety is one of these six essential requirements, stipulating that structures must be designed and built such that, in the case of fire:

- Load-bearing capacity can be assumed to be maintained for a specific period
- The generation and spread of fire and smoke is limited
- The spread of fire to neighbouring structures is limited
- Occupants can leave the building or be rescued by other means
- The safety of rescue teams is taken into consideration.

Reaction to Fire Testing

Reaction to fire is defined as the response of materials to an initial fire attack, including: time to ignition; flame spread; heat release rate; and smoke production. These properties are relevant in early fire development when combustible construction products may contribute to the fire.

In 2000 the European classification system **EN 13501-1 Fire Classification of Construction Products and Building Elements Part 1** was introduced. Referred to as the Euroclass system, construction products are considered in relation to their end use application and apply to three categories:

- Construction products, excluding floorings and linear pipe thermal insulation products
- Floorings
- Linear pipe thermal insulation products.

The Euroclass system describes classes A to F, of which classes A1 and A2 are non-combustible; these exclude all wood products. In addition to combustibility classes, the Euroclass system also assesses construction materials in considering smoke and flaming droplets released during fire, assigning them with appropriate ‘s’ and ‘d’ classes, respectively.

The European classification system for reaction to fire performance is based on a set of EN standards for different test methods.

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Overview of the European Reaction to Fire Classes for Building Products and Associated Tests

Class			Test methods				
Reaction to fire	Smoke	Burning droplets	Non-combustibility test[1]	Gross calorific test[2]	Small flame test[3]	Single burning item test[4]	Radiant panel test[5]
A1	-	-	✓·	✓·	·	·	·
A2	s1, s2, s3	d0, d1, d2	✓·	✓·	·	✓·	✓·
B	s1, s2, s3	d0, d1, d2	·	·	✓·	✓·	✓·
C	s1, s2, s3	d0, d1, d2	·	·	✓·	✓·	✓·
D	s1, s2, s3	d0, d1, d2	·	·	✓·	✓·	✓·
E	-	d2	·	·	✓·	·	·
F	-	-	·	·	✓·	·	·

[1] In accordance with EN ISO 1182, fire properties measured:
- temperature rise,
- mass lost,
- duration of sustained flaming

[2] In accordance with EN ISO 1716, fire properties measured:
- gross calorific coefficient (PCS)

[3] In accordance with EN ISO 11925-2, fire properties measured:
- flame spread

[4] In accordance with EN 13823, fire properties measured:
- fire growth rate (FIGRA)
- smoke growth rate (SMOGRA)
- flaming droplets or particles

[5] In accordance with EN ISO 9239-1, fire properties measured (floorings only):
- critical heat flux (CHF)
- smoke production

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Fire Protection Ability

EN 13501-2 Fire Classification of Construction Products and Building Elements Part 2 provides K classes for the fire protection performance of building panels.

K classes are based on full-scale furnace testing in horizontal orientation according to **EN 14135 Coverings – Determination of fire protection ability,** with the main parameter being the temperature behind the panel after different time intervals (10, 30, and 60 minutes). No collapse, burning on substrate, or falling parts are permitted.

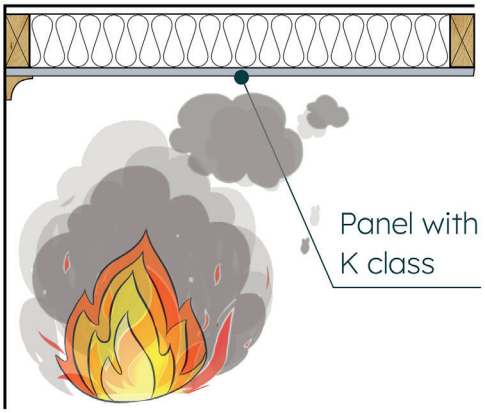
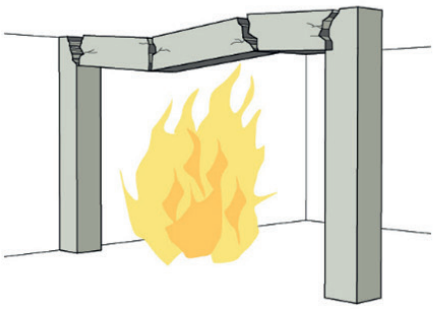
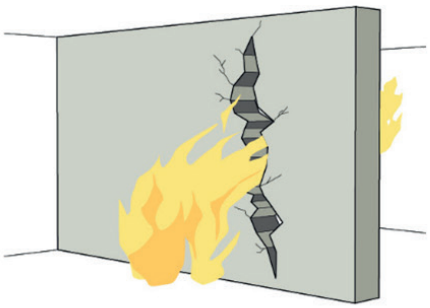


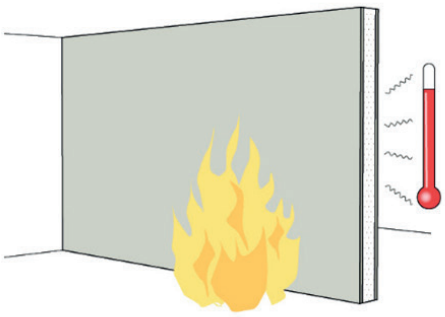
IMAGE: Principle for Testing Fire Protection Ability according to EN 14135



Load bearing R



Integrity E



Insulation I

Fire Resistance of Building Elements

EN 13501-2 also defines fire resistance classes. Fire resistance means that structural elements, e.g., wall elements, shall withstand a fully developed fire and fulfil requirements of insulation (I), integrity (E), and/or load bearing capacity (R).

IMAGE: Performance criteria for fire resistance. These are used together with a time value, e.g., REI 60 for an element that maintains its load-bearing and separating functions for 60 minutes.

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Fire exposure testing is conducted according to the standard time-temperature curve, defined in **ISO 834**, and referred to in all national building codes. The time-temperature curve specifies a fire exposure with ever increasing temperatures, which building elements shall withstand for a specified period, e.g., 60 minutes. In Europe, detailed versions for different applications are published in series **EN 1363, EN 1364, EN 1365** and **EN 1634**.

Timber structures can obtain high fire resistance, e.g., REI 60, REI 90 or even higher. There are no longer any requirements on non-combustibility, which previously limited taller timber structures. The fire resistance of timber elements can also be achieved by calculation according to **Eurocode 5**.

There are special performance characteristics (I1 and I2) for doors and shutter assemblies. There are also additional performance characteristics for mechanical action (M), Radiation (W), self-closing (C), and smoke leakage (S) in **EN 13501-2**. The fire resistance of stairs can be tested according to **EN 1365-6**.

European Classes for the Fire Resistance of Building Elements According to EN 13501-2

Building element	Load bearing (R)	Separating (E)	Insulating (I)	Time (min)	Test method
Walls	✓•	✓•	✓•	15-360	EN 1363-1, EN 1364-1 or EN 1365-1
Floors	✓•	✓•	✓•	15-360	EN 1363-1, EN 1364-2 or EN 1365-2
Beams	✓•			15-360	EN 1363-1, EN 1365-3
Columns	✓•			15-360	EN 1363-1, EN 1365-4
Balconies	✓•			15-360	EN 1363-1, EN 1365-5
Stairs	✓•			15-360	EN 1363-1, EN 1365-6
Doors		✓•	✓•	15-240	EN 1634-1, EN 1634-3

European Harmonization on Structural Design – Eurocodes

Eurocodes are European design standards for structural engineering that standardise design rules across the continent.

The Eurocodes aim to:

- Provide common design criteria and calculation methods to merge necessary requirements
- Establish a common understanding of structural design
- Enable the exchange of construction services within Europe
- Provide a common basis for research and development in the construction industry
- Increase the competitiveness of European civil engineers, architects, and manufacturers
- Contribute significantly to single-market activities within the European Union.

Each of the 10 Eurocodes relating to materials have a Part 1-1, covering the design of civil engineering works and buildings, and a Part 1-2 for fire design. The Eurocodes must be implemented by the national standard committees in all European countries. National annexes with specific rules and values to maintain the prevailing level of safety prevailing in individual states form essential documents enabling the use of Eurocodes. The following information must be included in the annexes:

- Values or classes where alternatives are given in the Eurocode
- Values to be quantified where only a symbol is given in the Eurocode
- Specific data e.g., for material properties, wind, or snow load
- The procedure to be used when alternative procedures are given in the Eurocode
- Decision on the application of informative annexes.

Eurocodes allow the calculation and verification of load-bearing capacity of components and structures for different materials, based on semi-probabilistic design concepts with partial safety coefficients. It is also possible to design fire safety for structures or components using tabular values and simplified or general calculation methods to optimise the design of fire protection.

The present Eurocode 5 for timber, EN 1995, was published in 2004. An extensive revision is underway, with the updated version planned for 2025. New design models have been developed since 2004, and are included under Separating Construction and Load-Bearing Structures.