FIS Information

KNOWLEDGE HUB

Fire Performance- Ceilings

There are two performance requirements for fire: “Reaction to Fire” and “Fire Resistance”

Reaction to Fire

Reaction to fire is the measurement of a material or products contribution to the development and spread of fire, generation of smoke and the production of flaming droplets. All are major factors in the rate of development of a fire and thereby the risk to people and property. Except for products classified as A1 (non-combustible) fire resistance classifications are formed using three references points e.g. “B-s3, d0” (see fig 1)

Reaction to fire is classified under BS EN 13501-1. Products are tested using several BS EN standards dependent on their predicted performance.

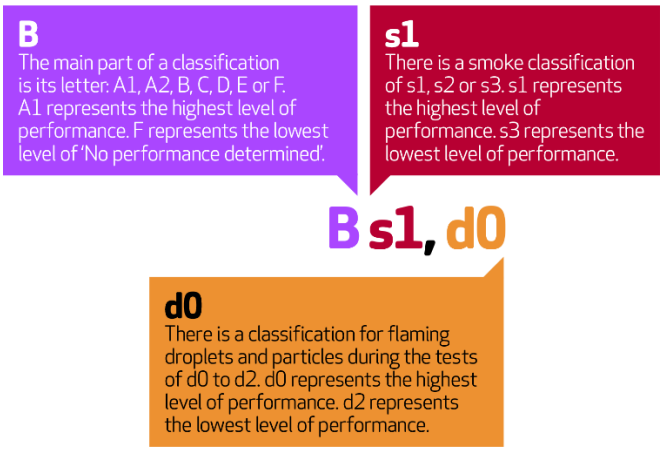

Fig 1.example classification using BS EN 13501-1

The required “Reaction to Fire” classifications for lining materials used in commercial buildings in England are shown in Approved Document B volume 2 - Requirement B2: Internal fire spread (linings). BS EN 13501-1 is now referenced here as the only standard for classifying reaction to fire.

***NOTE**: This is a recent change.*

Background and references:

The change was made in the ADB 2019 Edition as shown below (highlighted):

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***NOTE**: It is somewhat ambiguous what is meant by 'with transposition to a national classification provided in Appendix B' but the general thinking is classification to EN 13501-1 for wall and ceiling lining materials is now required for new projects.*

Fire Resistance

Fire resistance is a systems/construction's ability to resist the passage of fire and excessive heat from one area to another for a given period of time.

The performance tests for most suspended ceilings are specified in BS EN 13964 which as a harmonised European Norm (hEN) requires products and kits to be CE marked to in accordance with the Construction Products Regulation (CPR). There is also a requirement to make a products Declaration of Performance (DoP) readily available.

To be valid, BS EN Reaction to Fire and Fire Resistance tests must be carried out by an accredited "Notified Body", BS tests can be carried out by UKAS approved laboratories.

Whilst the criteria for Fire Resistance tests are very specific, there are many variables that can be included in the structural test construction that can influence the test and installed performance. Variable items such as the type of floor, void depth, hanger centres, load, etc. these will all affect the test result and performance when installed in the project.

The person specifying the product should examine the test report and satisfy themselves that the product meets performance requirements and can be constructed in accordance with the test and or relevant field of application (FOA) report. The specification should include the test report/ FOA reference and require that the system is installed strictly in accordance with the conditions of the relevant test/FOA report.

Where other elements such as lights and services are installed that will perforate the ceiling, the specifier should check that the fire performance of the ceiling can be maintained, and that any test/assessment evidence of performance is to the same standard as the ceiling.

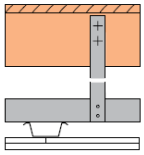
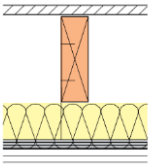
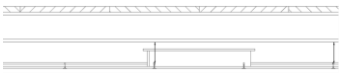
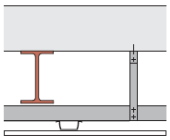
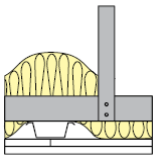
There should be no additional loads applied to the ceiling unless mitigated by installing sufficient additional or independent hangers to support the load. This should be included in the assessment/FOA report.

While the BS and BS EN test standards for loadbearing floors use different types of thermocouples, the three performance criteria for both BS476 part 21 and BS EN 1365-2 show the ability of the test construction to provide loadbearing capacity, integrity and Insulation. The BS test shows the results for each performance criteria in minutes while the results from the BS EN test are classified in accordance with BS EN 13501-2 and shown as REI30 (30 minutes), REI60 (60 minutes), etc., where "R" represents loadbearing capacity, "E" Insulation and "I" Integrity

The whole test construction is generally made up of the floor assembly, suspended ceiling, any services included in the ceiling plane and a specified floor load.

As well as the result, test reports should show the overall construction, details of components used in construction, floor loading, floor load capacity, data from the test and the test officer's observations during the test.

Ceilings can also be tested under both BS EN and BS test standards as an element providing fire resistance in a loadbearing floor construction, as non-load bearing ceiling membrane for compartmentation and to provide fire resistance to structural components (BS test) such as steel beams (see table 1 Below)

Fire resistance separating element type	Example cross sections images (place holders)	Current UK fire resistance test standards		Classification	
1. Loadbearing floor joist systems (typically timber or steel) which use ceilings as part of the system. In terms of resistance to fire this is testing the whole loaded floor system form below ceiling to above floor deck. Testing to BS 476 part 21 (giving a result in minutes for loadbearing capacity, integrity and insulation) or EN 1365-2 (for EN then classified to EN 13501-2 to get the REI classification). The tested imposed UDL should also be stated in the report and or 3rd party approval.	  (Joists could be solid, timber, 'I', web, steel etc.) 	BS 476 part 21	EN 1365-2	BS 476 part 21 will express the test results of the system within the test report in terms of: 1. Loadbearing capacity 2. Integrity 3. Insulation Results are shown in complete minutes.	EN 1365-2 reports must be classified in accordance with EN 13501-2. The EN 13501-2 classification report will classify the system in terms of: • R • E • I (in specific class periods set within EN 13501-2 e.g. 30, 60, 90)
2. Ceilings used to provide fire resistance to structural steel beams prolonging significantly the time before they reach critical failure Tested to BS 476 part 23 (the steel beams can be tested loadbearing or non-loadbearing)	 	BS 476 part 23	No EN test method	BS 476 part 23 will express the test results of the system within the test report in terms of: 1.Loadbearing capacity in accordance with BS 476 part 20 clause 10.2.3 (if loaded during the test) 2.Steel beam temperature maintained below 400°C (if non-loaded during the test) (in complete minutes)	N/A
3. Non-loadbearing ceiling membranes used as a fire resistance element in its own right. This is fire resistance performance from below the ceiling to above the ceiling system.		BS 476 part 22	EN 1364-2	BS 476 part 22 will express the test results of the system within the test report in terms of: 1. Integrity	EN 1364-2 reports must be classified in accordance with EN 13501-2. The EN 13501-2 classification report will classify

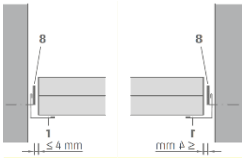
Tested to BS 476 part 22 (test report results state integrity and insulation times) or EN 1364-2 (for EN then classified to EN 13501-2 to get the EI classification).	 Clear span system.			2.Insulation Results are shown in complete minutes	the system in terms of: 1. E 2. I (in specific class periods set within EN 13501-2 e.g. 30, 60, 90, 120)

Table 1 examples of Fire resistance element types with appropriate test standards and classification

Compartmentation

Figure 2 –Compartment walls and floors between dwellings

Compartmentation is a critical element of construction that divides buildings into “fire compartments” using fire resistant walls, doors, floors, ceilings and cavity barriers. Where services penetrate any of the elements fire stopping may be required to ensure the compartmentation is not breached and key performance levels are maintained

The purpose of compartmentation is to:

- Subdivide the building into areas of manageable risk.
- Contain and prevent the spread of fire, smoke and toxic gases.
- Provide adequate time and means of escape to allow the occupants to evacuate the building

Where the ceiling is required to form the compartmentation, it is must be capable of satisfying the insulation and integrity requirements of Building Regulations for the stated period. The ceiling / floor construction may also be considered as fire resistant element of the compartmentation if supported by professional assessment or permitted by Building Control.

To ensure adequate compartmentation, visible and concealed openings or cavities in raised floor, walls and ceilings along with any service penetration must be protected to the required standard to ensure the construction meets the Building Regulations requirement.

When deciding on the ceiling system to be installed areas where compartmentation is required speak to your preferred manufacturer and ensure that a test report is provided showing the systems construction and suitability. Where the installation varies from the test, professional independent assessments should be provided by a competent and qualified person

NOTE: *The ceiling should not be easily demountable. Where access into the void is required lockable, fire rated access traps should be provided. These should be compliant with the ceiling system and have test evidence or professional assessments to support their use. Similarly, any services or penetrations should provide the same level of fire resistance as the ceiling. See Building Regulations Approved Document B for compliance requirements.*

Anchors

Anchors should be specified following guidance in the FIS/CPA Best practice guide, Selection and installation of top fixings for suspended ceilings available here

Cavity barriers

The provision of appropriate vertical or horizontal barriers installed to restrict the spread of smoke and flames through cavities. See Building Regulations Approved Document B

Fire stopping

The provision of seals to restrict the passage of fire and smoke through penetrations in a fire-resistant element. See Building Regulations Approved Document B

Installation

The installation should only be carried out by fully trained and competent people strictly in accordance with the system owners' instructions.

For further guidance on installation see the FIS Best Practice Guide, installation of suspended ceilings here