



Stuart Brown
AMF Ceilings

Fire-rated ceilings

1 Types of product



AMF Ceilings



There are various types of fire-rated ceiling and it is essential that the building owner or designer is clear about exactly what he requires or, if the ceiling is in place, exactly what fire rating the ceiling has. Essentially there are four basic types:

- **Class 0 or Class 1 designation:** The simplest form is a ceiling that has obtained a reaction-to-fire rating. All ceiling tiles must obtain a Class 0 or Class 1 designation under BS 476: Part 7: *Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products.* In areas such as escape routes, all surfaces must demonstrate a fire propagation index of less than 12 according to BS 476: Part 6: *Fire tests on building materials and structures. Method of test for fire propagation for products,* resulting in a Class 0 designation, as stipulated in Approved Document B of the Building Regulations in England and Wales
- **BS 476: Part 23 compliant:** The more normal fire-rated ceiling systems refer to fire-resistant materials that can provide fire protection to a specific structure. BS 476: Parts 20 to 23 detail tests to gauge the contribution a suspended ceiling can make to the fire performance of steel beams. The test detailed in BS 476: Part 23 is generally perceived to be the least onerous of the BS 476: Parts 20 to 23 tests and is limited solely to evaluating the protection a suspended ceiling can provide. Success in this test for, say, 60 minutes would certainly not guarantee a similar achievement under the test detailed in Parts 20 or 21, which consider tests for loadbearing elements of construction.
- **BS 476: Part 21 compliant:** Suspended ceiling systems comprising infill units, such as mineral wool tiles, calcium silicate and gypsum boards, can achieve structural fire protection to BS 476: Parts

21 and 23. In the Part 21 test, a complete flooring system, including the suspended ceiling, is tested for integrity, insulation and loadbearing capacity. All parts of the construction contribute to this – suspended ceiling, steel or timber beams and the flooring. With the test carried out under a defined design load and with a positive pressure below the suspended ceiling of 18Pa, the Part 21 test is much more severe than that in Part 23.

Typically, such systems achieve up to 60 minutes' fire resistance, although more specialist manufacturers have achieved times considerably in excess of this benchmark. For certain types of tile and grid systems that offer structural fire protection, the very latest developments have provided benefits to both contractors and end-users. Main runners can be installed at 1,200mm centres, rather than the traditional 600mm, resulting in quicker installation times. Tests have demonstrated that ceiling panels no longer need to be clipped down to achieve the necessary fire resistance, since higher density, closer tolerance products will withstand both furnace temperature rises and positive pressures.

- **BS 476: Part 22 compliant:** The least tested part of the British Standard is Part 22, where the ceiling element is non-loadbearing and is required to provide an integrity and insulation performance independent from the supporting floor construction. The ceiling may act as a horizontal partition either suspended from a secondary structure or spanning a corridor to provide fire protection. In some instances, there are recommendations for protection in both directions. The ceiling should protect services in the ceiling void from fire in the room or corridor; equally, fire resistance may be needed to safeguard the corridor from burning electrical cables and other services located behind the suspended ceiling.

2 Design and installation issues

Suspended ceilings are sold as a complete system of suspension grid components for fixing to the structural ceiling. It is absolutely essential that the installation is done in accordance with the test evidence and only the manufacturer of the system will have full details of this. Under no circumstances should component parts from different manufacturers be used, unless there is a clear indication that full compatibility has been proven by fire tests.

Several manufacturers offer an installation service, either through their own labour or through dedicated contractors, which may be accredited to a third-party certification scheme such as FIRAS. Where specialist ceiling contractors are used, they must be able to verify the performance of the components and materials used.

Many of the latest systems do not use hold-down clips for the tiles. In these cases, care should be taken to ensure that the fit of the tiles is correct and complies with the tolerances used in the original fire test. The installer should be able to produce test evidence to this effect.

Most, if not all, suspended ceilings will include recessed luminaires that are laid into the grid system. Ceilings rated to BS 476: Part 23, or with a simple reaction-to-fire rating, may use lighting systems that are themselves fire rated, but care must be taken to ensure that suitable light boxes or tents are fitted to prevent the fittings melting or burning. In some cases, this can occur within 20 minutes. It is essential that the installation of luminaires is specified correctly and that the entire system is in accordance with the fire-rating requirement of the ceiling.



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3 Inspection and maintenance

Suspended ceilings are often viewed by building occupiers as simply there for aesthetic reasons and it is essential that the 'responsible person' knows exactly the purpose of the installed system in the fire strategy of the building. This is particularly important now that risk assessments are required for all premises, since it is easy to downgrade a ceiling from the original intended fire rating.

The first essential of inspection, therefore, is to know exactly the intended performance of the ceiling system. Once this is known and drawings or installation data have been obtained, the inspection should show if the original plans have been adhered to.

One of the most common faults found in existing ceilings is that hold-down clips are removed and not replaced when maintenance work has been conducted behind the ceiling. If tiles are a loose fit, the original design should be checked, since pressure increases during a fire condition can remove lightweight tiles.

Damage to tiles is common and replacement with tiles from another manufacturer could lead to a premature failure in a fire. Tiles that are damaged but left in place should be replaced with

complete tiles of the correct type. Work above the ceiling can often be 'out of sight, out of mind' and loose cable runs, debris and damage to light boxes or tents can all cause problems that are outside the design limits of the ceiling and will adversely affect the fire performance.

Maintenance should be done by contractors or staff trained to the same standards as the original installers and only components approved by the system manufacturer should be used. If tiles are replaced over a wide area, it is essential that they conform to the same fire rating as the grid system. If open penetrations above doors or through service ducts are visible behind the ceiling then the rating of the ceiling must be sufficient to maintain the intended compartmentation.

Some specialist fire-protection ceiling systems can also provide a smoke seal. At the panel-to-panel joint, or at the junction with the perimeter wall, intumescent seals ensure that escape routes stay protected and smoke-free. Light fittings and other elements fitted into the ceiling panels must maintain their fire integrity. Fire-resistant light boxes, up to 40mm thick, can provide the necessary two-directional protection.

4 Relevant standards and other documents

The principal recommendations are set down in BS 476: Parts 6 and 7 for reaction-to-fire and Parts 20 to 23 for fire resistance.

BS 476: Parts 6: 1989: *Fire tests on building materials and structures. Method of test for fire propagation for products*

BS 476: Parts 7: 1997: *Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products*

BS 476: Parts 20: 1987: *Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)*

BS 476: Parts 21: 1987: *Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction*

BS 476: Parts 22: 1987: *Fire tests on building materials and structures. Methods*

for determination of the fire resistance of non-loadbearing elements of construction

BS 476: Parts 23: 1987: *Fire tests on building materials and structures. Methods for determination of the contribution of components to the fire resistance of a structure*

The proposed new European standard for non-loadbearing ceilings – EN 1364-2: 1999: *Fire resistance tests for non-loadbearing elements. Ceilings* specifies that testing can be carried out in two ways: with fire from below; or with fire from above, where the fire is contained in a closed cavity. Any fixtures or fittings forming an integral part of the ceiling must be included in the test specimen.

The fire-rating recommendations for systems can be found within Approved Document B of the Building Regulations in England and Wales for the particular element of the building in which they are installed.



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5 Other issues

It is particularly relevant when considering areas of public access, such as retail premises that may be refitted for aesthetic reasons, to understand the original intention of the suspended ceiling. Should a system tested to Part 21 of BS 476, for example, be replaced with one of a lesser fire rating, such as a Part 23 system, the whole fire strategy may be compromised. Similarly, the removal of an old ceiling system without replacement, due to a change in use of the building, may also materially compromise the fire performance. Ceilings are part of the in-built structural fire protection plans in many instances and must be considered as such when refurbishments or changes of use are planned for buildings.