

Testing and classification
for
reaction to fire properties on material related level

Preface

This method is a DBI guidance document dealing with testing and classification for reaction to fire properties on material related level in relation to the SBI test and the small flame test, i.e. by a characterization testing and classification procedure giving results, which are independent of the concept "end use application".

This method is not legal interpretation of regulations, including Danish building regulations.

It is not judicially binding and it does not modify or amend the Danish rules in "Collection of examples for fire protection of buildings" in any way.

It may be further elaborated, amended or withdrawn by DBI without notice.

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This document supersedes DBI Method No. FIRE01:2007.

It is identical to the previous version with addition of preface on the front page.

Introduction

The essential requirements on construction products constitute both the general and the specific criteria with which construction works must comply – whereas such requirements are to be understood as requiring that the said works conform with an appropriate degree of reliability with one, some or all of these requirements when and where this is laid down in regulations.

In some cases the desired/regulated fire safety in buildings is obtained via reaction to fire requirements not only for each of the construction products in its end use application but also for the materials incorporated in the products and for the materials incorporated in the building elements.

NOTE Examples (from the Danish rules) on reaction to fire requirements on material related level are given in Annex A.

The European system for reaction to fire classification of products (excluding floorings and excluding linear pipe thermal insulation products) provides for the application of the following test methods:

- the non-combustibility test, EN ISO 1182
- the calorific potential test, EN ISO 1716
- the single burning item test, the SBI test, EN 13823
- the ignitability test, the small flame test, EN ISO 11925-2.

The non-combustibility test and the calorific potential test are by their nature tests on a material level, i.e. tests for product characteristics that are independent of the end use of the product.

The SBI test and the small flame test are originally designed for products in their end use application.

This document give specifications for testing and classification for the reaction to fire properties on material related level in relation to the SBI test and the small flame test, i.e. by a characterization testing and classification procedure giving results, which are independent of the concept "end use application".

1. Scope

This document specifies the testing and classification procedures for reaction to fire properties on material related level.

2. References

The latest edition of each of the documents stated below applies.

EN ISO 1182	Reaction to fire tests for building products – Non-combustibility test
EN ISO 1716	Reaction to fire tests for building products – Determination of the heat of combustion
EN ISO 11925-2	Reaction to fire tests – Ignitability of building products subjected to direct impingement of flame – Part 2: Single-flame source test
EN 13238	Reaction to fire tests for building products – Conditioning procedures and general rules for selection of substrates
EN 13501-1	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN 13823	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item.

3. Terms and definitions

(In accordance with the Commission Decision 2000/147/EC and the European Standard EN 13501-1).

product

material, element or component about which information is required.

material

single basic substance or uniformly dispersed mixture of substances, e.g. metal, stone, timber, concrete, mineral wool with uniformly dispersed binder or polymers.

homogeneous product

product consisting of a single material, having uniform density and composition throughout the product.

non-homogeneous product

product that does not satisfy the requirements of a homogeneous product. It is a product composed of one or more components, substantial and/or non-substantial.

substantial component

material that constitutes a significant part of a non-homogeneous product. A layer with a mass/unit area $\geq 1,0 \text{ kg/m}^2$ or a thickness $\geq 1,0 \text{ mm}$ is considered to be a substantial component.

non-substantial component

material that does not constitute a significant part of a non-homogeneous product. A layer with a mass/unit area $< 1,0 \text{ kg/m}^2$ and a thickness $< 1,0 \text{ mm}$ is considered to be a non-substantial component.

Two or more non-substantial layers that are adjacent to each other (i.e. with no substantial component(s) in between the layers) are regarded as one non-substantial component when they collectively comply with the requirements for a layer being a non-substantial component.

internal non-substantial component

non-substantial component that is covered on both sides by at least one substantial component.

external non-substantial component

non-substantial component that is not covered at one side by a substantial component.

4. Testing on material related level

(SBI test and small flame test)

In this clause 4 the word "product" stand both for the product as a whole and for each substantial component of the product.

When the purpose of testing in the SBI test and in the small flame test is classification on material related level, then the test specimen shall involve the product in question with the surface of the product directly exposed to the flames.

A symmetrical product shall be tested with exposure towards one surface only. An asymmetrical product shall be tested in the direction corresponding to the worst case, i.e. the worst test result.

The product shall be mounted directly against a calcium silicate board with density $870 \pm 50 \text{ kg/m}^3$ and thickness $11 \pm 2 \text{ mm}$ (this is one of the standard substrates according to EN 13238), i.e. without an air gap between the calcium silicate board and the product. (This implies, that only the product in question – and not the substrate – will contribute to the generation of heat and smoke).

The product shall cover the entire test specimen surface of the SBI test/the small flame test, and it shall be mounted without the joints prescribed in the test method.

The product shall be fixed to the calcium silicate board with screws and also with glue when necessary for the fixation of the product to the calcium silicate board (the fixation shall hold the product in position against the calcium silicate board – also during the testing).

The type and the amount of glue shall be selected in such a way, that the glue has no or very little influence on the generation of heat and smoke during the test.

5. Classification on material related level

For any homogeneous product and for a non-homogeneous product of classes A1 and A2 the reaction to fire classification on material related level shall – beyond the testing rules stated above – follow the procedure and classification criteria for construction products (excluding floorings and excluding linear pipe thermal insulation products) given in EN 13501-1.

For a non-homogeneous product of classes B, C, D and E the reaction to fire classification on material related level shall – beyond the testing rules stated above – follow the procedure and classification criteria for construction products (excluding floorings and excluding linear pipe thermal insulation products) given in EN 13501-1

- both for the product as a whole
- and for each substantial component of the product when tested by itself (i.e. with no component in front of the substantial component in question).

Test results obtained with the product/the substantial component directly exposed to the flames and mounted against another substrate are considered also to be valid (as basis for the classification on material related level) if the substrate has a density of not more than 870 kg/m³.

NOTE This includes also the case with air as substrate.

Class designation

A product (homogeneous or non-homogeneous) which fulfils the requirements stated above related to testing and classification on material related level can be designated "material class X" (e.g. material class A2-s1,d0 or material class D-s2,d2).

6. Remarks

It is noted, that the obtained classification on material related level only applies to the tested thickness of the product in question – including the tested thickness of each substantial component of a non-homogeneous product, which belong to the classes B, C, D and E.

If testing is performed with both the thickest and the thinnest version of the product (or of the substantial component as described above), then the worst performance decides the classification on material related level for the entire thickness range. However, this does not exclude, that the reaction to fire class on material related level is determined as function of the thickness.

The thickness of a classified product (or the thickness range) should be stated together with the obtained classification (the class designation) on material related level for the product.

It is summarized, that the specifications stated above for testing and classification for a product's reaction to fire properties on material related level as a matter of principle imply:

- testing in the SBI test and in the small flame test with the calcium silicate board substrate and without an air gap between the substrate and the product
- reaction to fire requirements for the product as a whole
- reaction to fire requirements for each substantial component of the product
- reaction to fire requirements for each non-substantial component, if it is a non-homogeneous product of classes A1 and A2.

The reaction to fire properties on material related level can be characterized by the fact that they are independent of the end use application for the product – contrary to the normal testing and classification system in which the product is classified in its different end use applications.

It is noted, that the specifications stated above (for testing and classification for reaction to fire on material related level) do not exclude, that a product can be classified for different end use applications (presumably giving different classes of reaction to fire performance).

Annex A

(informative)

Reaction to fire requirements on material related level in the Danish rules

The Danish rules in "Collection of examples for fire protection of buildings" imply reaction to fire requirements on material related level for materials, coverings and building elements.

Materials

When the Danish rules prescribe

- material class A2-s1,d0
- material class B-s1,d0
- material class D-s2,d2

then this implies that each of the products in question shall fulfil the in pursuance of the stated class designation prevailing reaction to fire requirements on material related level.

Coverings

When the Danish rules prescribe

- covering class K₁ 10 B-s1,d0
- covering class K₁ 10 D-s2,d2
- covering class K₂ 30 A2-s1,d0
- covering class K₂ 60 A2-s1,d0

then this implies that the covering shall give the prescribed fire protection ability (for 10 or 30 or 60 minutes) and that each of the products from which the covering consist shall fulfil the in pursuance of the stated class designation prevailing reaction to fire requirements on material related level.

It is noted, that fire protection ability (K₁ 10 or K₂ 30 or K₂ 60) for coverings always is combined with reaction to fire requirements on material related level for each of the products in the covering.

Building elements

When the Danish rules prescribe

- building element class REI 120 A2-s1,d0
- building element class R 120 A2-s1,d0
- building element class REI 60 A2-s1,d0
- building element class EI 60 A2-s1,d0
- building element class R 60 A2-s1,d0
- building element class REI 30 A2-s1,d0
- building element class EI 30 A2-s1,d0
- building element class R 30 A2-s1,d0
- building element class R 60 D-s2,d2
- building element class EI 60 D-s2,d2

- building element class R 30 D-s2,d2
- door class EI₂ 60-C A2-s1,d0

then this implies that the building element/the door shall give the prescribed fire resistance (for 30 or 60 or 120 minutes) and that each of the products from which the building element/the door consist shall fulfil the in pursuance of the stated class designation prevailing reaction to fire requirements on material related level.

It is noted, that fire resistance for building elements/doors often (as shown above) – but not nearly always – are combined with reaction to fire requirements on material related level for each of the products in the building element/the door.