



Fire-resistance tests — Contribution made by suspended ceilings to the protection of steel beams in floor and roof assemblies

Essais de résistance au feu — Contribution apportée par les plafonds suspendus à la protection des poutrelles en acier dans les ouvrages de plancher et de toiture

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0 Introduction

The tests specified in this Technical Report provide a means of determining the contribution made by suspended ceilings to the fire-resistance of load-bearing unventilated floor or roof assemblies on the basis of the length of time for which the test specimens satisfy the defined criteria when submitted to the test. In most cases these floor and roof assemblies are represented in the tests by a slab of reinforced concrete but provision is also made for some tests to be carried out using slabs of aerated concrete (see A.1.1). For information on the testing of ventilated assemblies, see A.1.2.

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The tests are based on the assumption that the fire will attack the underside of the suspended ceiling and will not attack from within the void between the ceiling and the supporting construction.

Before performing a test specified in this Technical Report, all concerned should read the commentary given in the annex. This commentary explains some of the problems of suspended ceilings in fires, explains why the tests are needed, how they were developed and how their results can be put to use.

Safety warning : So that suitable precautions may be taken to safeguard health, the attention of all concerned in fire tests is drawn to the possibility that toxic or harmful gases may be evolved during combustion of test specimens.

1 Scope and field of application

This Technical Report specifies methods of test for assessing the contribution made by suspended ceilings to the protection of steel beams forming part of horizontal unventilated floor and roof assemblies.

These tests are not intended to provide a separate fire-resistance classification for the ceiling alone. Results from these tests may be used as data for extrapolation techniques where appropriate (see the annex). These tests are not applicable to ceilings serving solely as horizontal partitions or as suspended false ceilings of the open cell or louvered types.

These test methods, which are referred to in an amendment to ISO 834, should be read in close conjunction with ISO 834. The annex explains some of the problems associated with suspended ceilings in fires and gives recommendations to assist in carrying out the tests : they are not mandatory as far as this Technical Report is concerned.

The test methods are not applicable to :

- a) ceilings which form a part of a complete floor assembly (which should be tested in accordance with ISO 834);
- b) ceilings which are required to act as horizontal partitions by themselves¹⁾;
- c) suspended false ceilings of the open cell or louvered types;
- d) ventilated roof assemblies (which should be tested in accordance with ISO 834).

2 References

ISO 834, *Fire-resistance tests — Elements of building construction*.

EURONORM 19, *Beams with parallel flanges — Dimensions*.²⁾

EURONORM 53, *Broad flanged beams with parallel sides — Dimensions*.²⁾

3 Definitions

For the purposes of this Technical Report the following definitions shall apply :

3.1 suspended ceiling : A horizontal membrane which is located at a clear distance of not less than 5 mm from the floor or roof construction beneath which it is suspended and, amongst its other functions, is intended to contribute to the fire-resistance of the floor and roof constructions beneath which it is suspended, and which does not incorporate any load-bearing member of the structure.

3.2 cavity : The whole void between the suspended ceiling and the underside of the top covering (see figure 1).

3.3 unventilated floor and roof assembly : An assembly in which the cavity between the floor or roof soffit and the suspended ceiling is entirely surrounded by barriers which have the effect of restricting the transfer of hot gases.

1) A separate test procedure for testing such structures is under consideration.

2) These Euronorms are obtainable from the Office for Official Publications of the European Communities, BP 1003, Luxembourg.

3.4 supporting construction : The horizontal load-bearing construction (steel beams and covering slabs) to which the suspended ceiling is attached during the test.

3.5 test specimen : All parts of a suspended ceiling submitted for test including hangers, fittings and insulating material.

3.6 test assembly : An assembly comprising the suspended ceiling under test (the test specimen) and a supporting construction defined according to the type of test chosen.

4 Apparatus and equipment

Except as otherwise stated, the apparatus shall be as specified in ISO 834, with the exception that for all tests of suspended ceilings the walls of the cavity shall be sealed as specified in figure 1, in order to restrict the transfer of hot gases.

5 Standard heating and pressure conditions

Suspended ceilings shall be tested according to the requirements specified in ISO 834 respectively for heating and for pressure conditions.

6 Preparation of test specimen

6.1 Size of specimen

Where it is not possible to test suspended ceilings of the full size at which they will be installed in a building, the following shall be the minimum dimensions of the part of the test assembly exposed in the furnace :

- span of supporting construction : 4 m
- width of suspended ceiling : 3 m

Suspended ceilings of a minimum width of 2 m may be tested under special conditions, but in which case the test conditions and dimensions shall be clearly stated in the test report.

6.2 Choice of form of construction and method of fixing

6.2.1 The suspended ceiling shall be tested in conjunction with one of the supporting constructions specified in clause 7. If any uncertainty exists as to which supporting construction to use for the test, the test sponsor shall decide on advice given by the testing laboratory. (See A.6.)

6.2.2 Each test specimen shall reproduce the boundary conditions (including all edge members, joints and seals) and incorporate the method of fixing and of support as well as the expansion joints of the same type and frequency as used in practice.

6.2.3 The supporting construction (beams and topping) shall be built as far as possible before the suspended ceiling is installed.

6.3 Allowance for ducts, insulation fittings and combustible materials in the cavity

6.3.1 When preparing the test specimen, account shall be taken of any features such as ducts, insulation materials (see A.2.2) and recessed light fittings which are known to be incorporated in the suspended ceiling or be present in the ceiling cavity when the whole assembly is installed in service.

6.3.2 All combustible material and fittings known to be present in the cavity in practice shall be included in the test assembly. (See A.2.3.)

6.4 Conditioning of test specimen

The test specimen shall be conditioned as specified in ISO 834. The covering (topping) shall be conditioned to moisture equilibrium or may be drier.