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FIRE TESTS ON BUILDING MATERIALS AND STRUCTURES

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BRITISH STANDARD SPECIFICATION

FIRE TESTS
ON BUILDING MATERIALS
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B.S. 476 : 1953

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THIS BRITISH STANDARD, having been approved by the Building Divisional Council, was published under the authority of the General Council on 20th July, 1953.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

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The Committee responsible for the preparation of this British Standard consists of representatives from the following Government departments and scientific and industrial organizations:—

British Constructional Steelwork Association
British Electrical and Allied Industries Research Association
British Fire Services' Association
Building Industries National Council
D.S.I.R.—Building Research Station
D.S.I.R.—Forest Products Research Laboratory
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Joint Fire Research Organization of the Department of Scientific and Industrial Research and Fire Offices Committee
London County Council
London Fire Brigade
Ministry of Works
National Federation of Building Trades Employers
Reinforced Concrete Association
Royal Institute of British Architects

BRITISH STANDARD SPECIFICATION FOR FIRE TESTS ON BUILDING MATERIALS AND STRUCTURES

FOREWORD

The purpose of this British Standard is to specify a series of tests for determining those properties of building materials and structures which are relevant when considering the fire protection of buildings in which they are to be used, and by which such materials and structures may be accepted or rejected.

Combustibility. It is desirable that the materials used in building construction should not contribute to the intensity of a fire. Materials for building purposes may be classified as non-combustible or combustible according to how they behave when subjected to the combustibility test specified in Section One.

Surface spread of flame. To require non-combustibility in all circumstances would be unreasonably severe and unnecessarily restrictive. It is often sufficient to require that materials should not be readily ignitable and, if ignited, that their tendency to spread flame be limited. The surface spread of flame test in Section Two may be used to classify combustible wall and ceiling lining materials according to the fire hazard they are likely to present in becoming ignited and spreading flame over their surfaces from one part of a building to another. This test may also be used to show the effectiveness of flame-retardant treatments in reducing the surface spread of flame on lining materials.

Fire-resistance of structures. Where a fire occurs in a compartment of a building, the structure of the compartment should be required to contain the fire by continuing to perform those of its normal functions which contribute to the integrity and insulation of the compartment. The fire-resistance test of Section Three grades elements of building structures in accordance with the time for which they are capable of fulfilling these functions while subjected to heating conditions representative of an actual fire in a compartment. Although the term 'fire-resistance' has often been used indiscriminately in the past to denote the resistance of materials to ignition or spread of flame, the use of the term in this standard is restricted to the performance of complete elements of building structure without individual regard to the performance of the materials of which they are composed. Materials which perform well in the combustibility or surface spread of flame tests may not necessarily do so when built into an element of structure and subjected to the fire-resistance test.

Consideration is being given to the substitution of the term 'fire endurance' for the term 'fire resistance' as used in this British Standard, as it is felt in some quarters that the former term is more appropriate for the purposes of the tests.

Alterations to the standard. In the present revision of the standard some major alterations have been made, as follows:—

The non-inflammability test has been deleted. This test was sometimes found to give anomalous results. It was mostly applied to fabrics and decorative materials, for which purpose it was considered that a test similar to that given in B.S. 1547, 'Flameproof industrial clothing', would be more satisfactory.

In the combustibility test, the specimen is not introduced into the furnace until the temperature of the latter has been stabilized at 750°C., to ensure that the rate of efflux of any combustible gases given off is sufficiently rapid to give the optimum chance of ignition at the pilot flame.

The method of classification of materials in the surface spread of flame test has been amended. In the last edition of B.S. 476, the classification of a material rested on the mean spread of a certain number of specimens. While mean spread gives a measure of the general standard of performance of a material, it does not take account of the variability which is known to occur in the performance of different samples of most materials. The present method is intended to do this by classifying materials in such a way that not more than 1 per cent of a material is likely to have a performance below the standard of the class in which the material is placed, this proportion being chosen as acceptably small for safety reasons. The calculation of the performance of the material is such that credit is given to materials of uniform standard, since variability is penalized by requiring a correspondingly higher standard of general performance if any particular classification is to be attained. The values of the limits are derived from all available testing experience to date, and show an improved balance between 1½-minute and final or 10-minute values, the former having been made considerably more rigorous. The final limit of Class 2 is the equivalent of that used hitherto, while the 10-minute limit of Class 3 is more rigorous.

In the fire-resistance test it has been considered desirable to standardize the method of control of the furnace temperature for all types of specimen to that of the standard time-temperature curve (Fig. 1a), although the tolerance on the curve has had to be increased for conducting specimens in tests of longer than ½-hour duration.

For load-bearing structures, the loading has been reduced to the design load, as it has long been felt that the reasons advanced for imposing one and a half times the design load were not necessarily valid in every instance. It is also in keeping with American test practice. The water test has been deleted as it could not be applied to all types of structure nor