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Fire performance of external cladding systems – The application of results from BS 8414-1 and BS 8414-2 tests

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 September 2019. It was prepared by Technical Committee FSH/21, *Reaction to fire tests*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

This British Standard is intended to be read in conjunction with BS 8414-1:2015+A1:2017 and BS 8414-2:2015+A1:2017.

Information about this document

The rules and associated guidance in this British Standard have been compiled to reflect the current knowledge base that exists for the series of BS 8414 tests, results and experience from such tests, and insulated non-load bearing facade constructions in general. It is therefore recognized that future experience could lead to changes to the rules and guidance provided by the development of further rules and guidance. Where it is considered that there is insufficient evidence at present to create a rule then the option for change is shown as "not permissible".

It is also intended to widen the scope of this British Standard in future to cover application rules for glazing, infill panels and curtain walling external wall construction systems.

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Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Introduction

There are a number of practical limitations on the size and design of construction elements that can be evaluated by a standard method of test. For example, if these elements are larger or of a modified design or type, it is necessary to be able to confirm that the integrity of the test result would be maintained if such changes to the system were implemented. This can be achieved through the use of standardized rules. This British Standard provides the rules to be applied when assessing the implications of such modifications in relation to systems which have been subjected to tests in accordance with BS 8414-1:2015+A1 or BS 8414-2:2015+A1.

BS 8414-1:2015+A1 and BS 8414-2:2015+A1 provide test methods for determining the fire performance characteristics of non-loadbearing external cladding systems, rain-screen over cladding systems and external wall insulation systems when applied to the face of a building and exposed to an external fire under controlled conditions. The fire exposure is representative of an external fire source or a fully-developed (post-flashover) fire in a room, venting through an opening such as a window aperture that exposes the cladding to the effects of external flames.

This British Standard is concerned with evaluating the scope of the results obtained from the BS 8414-1 and BS 8414-2 tests, defining the parameters which can or cannot be varied and to what extent. It provides direct application (DIAP) rules for a system which has been subjected to a single BS 8414-1 or BS 8414-2 test and interpolation for systems which have been subjected to multiple tests.

This British Standard addresses the nature and extent of any permitted alterations to the system as tested. The number of such changes can vary according to the complexity of the external cladding and the type of construction being considered. However, every component of the external cladding could have an impact on the fire spread performance of the system, and therefore each change needs to be the subject of a separate evaluation when considering extending the scope of the original testing.

This British Standard recognizes that when a construction product is manufactured, the process is controlled to ensure that the properties which categorize the product, such as dimensions, density, thermal performance and mechanical strengths, fall within the bounds of set product manufacturing tolerances. Where a rule is provided for varying such properties, the stated variance is based upon the tested value. If no such rules are provided for a particular characteristic then it is recognized that such properties might vary for the product when placed on the market due to manufacturing tolerances; however, it is expected that the performance for all declared performance characteristics will still be achieved.

Although tests to other standards might not be directly applicable to the evaluation of the fire performance of a BS 8414 test specimen, additional test data may be used to support extended application, for instance, to evaluate the influence of a particular component or aspect of the design, or to establish which design variations affect the performance in the most or least onerous way.

NOTE For reasons of traceability, all supporting documents used for any extension need to be included in the analysis report.

A construction product can be placed on the market with a wide range of variations in properties such as dimensions, density and mechanical strengths. When products are combined into a building system, their fire performance can depend on the underlying substrate or covering, how the products are fixed and what products are used for such fixing. It is not feasible to test all combinations of different products or system characteristics for their reaction to fire or fire resistance performances, although such characteristics can substantially influence a test result.

An external cladding system comprises a number of individual products (cladding, insulation, fixation systems, substrates, cavity barriers, etc.). The external cladding system has a number of different functions and performance requirements, including weather resistance, thermal performance, acoustic performance and aesthetics. The products are combined in such a way that they are effective in resisting the spread of fire when tested as part of a complete system in accordance with BS 8414-1:2015+A1 or BS 8414-2:2015+A1. Each of the products and the way they are assembled could potentially influence how the complete external cladding system performs in such fire tests, and therefore it is necessary to evaluate their individual characteristics and how these interact. Rules for conducting this analysis are given in Clause **5**.

The number of variables which can affect the outcome of such large-scale fire tests on potentially complex structures such as an insulated building facade, with or without a ventilated cavity, is considerable. Changing one of more of these variables might be possible without endangering the integrity of the tested system, but others might require supplementary testing, through either large or smaller scale fire tests. This is to ensure that any changes do not compromise the integrity of the original test result performed in accordance with BS 8414-1:2015+A1 or BS 8414-2:2015+A1.

A result obtained in a fire test is that which is reported. In a separate exercise, it is possible to vary the values of the different product characteristics to extend the field of application of the individual test results. This process of extended application uses rules which are based only on worst-case scenarios and interpolation techniques.

Extended application enables a prediction to be made on the expected fire performance of a system under specified fire conditions if one or more of the components or parameters evaluated as part of the test specimen were to be changed. In the specific case of external cladding systems, such predictions are based upon the need to abide strictly with the fundamental principle that the fire performance of the modified system would be equal or better if it were to be subjected to a BS 8414-1 or BS 8414-2 test.

This British Standard relates only to the extension of results of an external facade system which has previously been tested in some form in accordance with BS 8414-1:2015+A1 or BS 8414-2:2015+A1. It does not provide a means of assessing external facade constructions which incorporate multiple cladding systems.

1 Scope

This British Standard specifies procedures and rules used to evaluate variations and changes to products and systems which have been tested in accordance with BS 8414-1:2015+A1:2017 or BS 8414-2:2015+A1:2017, and, where appropriate, defines options and limits for preparing reports based on the direct and extended application criteria provided.

The following systems are covered:

- rain-screens;
- external thermal insulated composite systems (ETICS);
- self-supporting double skin metal faced insulating (sandwich) panels.

This British Standard covers specific parameters and product characteristics associated with the design of non-loadbearing external cladding systems which have been tested in accordance with BS 8414-1:2015+A1 or BS 8414-2:2015+A1.

This British Standard does not cover the performance of systems that include glazed elements, infill panels or external insulation finishing systems (EIFS).

This British Standard does not cover systems that have been tested in accordance with BS EN 1364.

NOTE Guidance for extending the scope of application for BS EN 1364 tests is given in BS EN 15254-2, BS EN 15254-4, BS EN 15254-5, BS EN 15254-6 and BS EN 15254-7.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document[1)]. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 8414-1:2015+A1:2017, *Fire performance of external cladding systems – Part 1: Test method for non-loadbearing external cladding systems applied to the masonry face of a building*

BS 8414-2:2015+A1:2017, *Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame*

BS EN 1996-1-1, *Eurocode 6 – Design of masonry structures – Part 1-1: General rules for reinforced and unreinforced masonry structures*

BS EN 1996-1-2, *Eurocode 6 – Design of masonry structures – Part 1-2: General rules – Structural fire design*

BS EN 1996-2, *Eurocode 6 – Design of masonry structures – Part 2: Design considerations, selection of materials and execution of masonry*

BS EN 16382, *Thermal insulation products for building applications – Determination of the pull-through resistance of plate anchors through thermal insulation products*

BS EN 13501-1:2018, *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*

BS EN ISO 1716, *Reaction to fire tests for products – Determination of the gross heat of combustion (calorific value)*

1) Documents that are referred to solely in an informative manner are listed in the Bibliography.