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Reaction-to-fire tests for sandwich panel building systems —

Part 2: Test method for large rooms

Essais de réaction au feu des systèmes de fabrication de panneaux de type sandwich —

Partie 2: Méthode d'essai pour des chambres de grande taille

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth.*

This second edition cancels and replaces the first edition (ISO 13784-2:2002), which has been technically revised.

The main changes compared to the previous edition are as follows:

— All drawings have been updated, as some were unclear and views were incorrect.

— In the Introduction, the reference to ISO/TR 3814 has been updated to ISO/TS 3814.

— In the Introduction, clarification has been added that this document deals with thermal insulating sandwich panels as well as a widening of the use of products to reflect the current field of applications of sandwich panels.

— In Clause 3, the term "constant mass" has been removed, as it is not used in this document, and the term "thermal" in terms of the sandwich panel has been introduced. Terms have been renumbered.

— In Clause 8, Ignition source, the wording and locations have been altered to bring them in line with the ISO 19075 series and cross-references to a figure have been introduced for clarity (no technical consequences).

A list of all parts in the ISO 13784 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Fire is a complex phenomenon, its behaviour and effects dependent upon a number of interrelated factors. The behaviour of materials and products depends upon the characteristics of the fire, the method of use of the materials and the environment in which they are exposed (for the philosophy of reaction-to-fire tests, see ISO/TS 3814).

The need for improved insulation of buildings has led to the increased use of thermal insulating sandwich panel systems in different parts of the building industry. Thermal insulating sandwich panel systems are applied as external cladding on factory buildings, in internal envelopes with controlled atmospheres and in cold stores, varying from small rooms to large, coolhouses and warehouses. Other applications are in modular building rooms and retail premises. These systems can also be used for roof applications in traditional constructions. Multi-layered panels with other facings (e.g. plasterboard) or sandwich panel systems can also be applied to walls as internal linings or insulation; however, this is not within the scope of the ISO 13784 series.

There exist three primary fire-related threats to the walls and ceilings or roofs of a building insulated with freestanding or frame-supported types of thermal insulating sandwich panel systems:

a) an interior compartment fire impinging directly onto the joints of the wall, typical ignition sources being welding torches, burning items near the wall and fire in an adjacent room;

b) an external fire or combustibles (rubbish, vegetation, vehicles, etc.) accumulated near the wall;

c) fire spread to outside spaces.

Moreover, such a fire can spread in several ways:

— over a combustible exterior surface;

— by travelling vertically and horizontally through the combustible cores of cavities within the external wall or ceiling/roof;

— through combustible gases which have developed due to the pyrolysis of the combustible components and which will ignite on the surface;

— as burning debris or flaming droplets.

This document deals with a simple representation of a fire scenario involving a thermal insulating sandwich panel system, such as that typified by a local fire impinging directly on the internal face of a thermal insulating sandwich panel building construction. The test method specified can be used to provide a large-room scale, end-use evaluation of all aspects of thermal insulating sandwich panel systems, including constructional techniques (supporting frameworks, jointing detail, etc.).

The test method is intended for evaluating products which, by their nature, are not normally used as internal linings and are unsuitable for assessment using ISO/TR 9705-2 which evaluates fire growth from a surface product or ISO 9705-1 (test method). Nevertheless, this document provides a means by which a freestanding or frame-supported thermal insulating sandwich panel building construction can be built and evaluated.

Testing of this type can be used for comparative purposes or to ensure the existence of a certain quality of performance considered to have a bearing on fire performance generally.

The ISO 13784 series consists of the following parts, under the general title "Reaction-to-fire tests for sandwich panel building systems":

— Part 1: Test method for small rooms;

— Part 2 (this document): Test method for large rooms.

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Reaction-to-fire tests for sandwich panel building systems —

Part 2:
Test method for large rooms

SAFETY PRECAUTIONS — In order that suitable precautions can be taken to safeguard health, the attention of all concerned in fire tests is drawn to the possibility that toxic or harmful gases can evolve during combustion of test specimens.

The test procedures concerned involve high temperatures and combustion processes, from ignition to a fully developed room fire. Therefore, hazards can exist for burns, ignition of extraneous objects or clothing. Operators should use protective clothing, helmet, face-shield and equipment for avoiding exposure to toxic gases.

Laboratory safety procedures shall be set up which ensure the safe termination of tests on sandwich panel products. Specimens with combustible content burning inside metallic facings can be difficult to extinguish with standard laboratory fire fighting equipment. Adequate means of extinguishing such a fire shall be provided.

When tests are conducted using freestanding or frame-supported constructions, specimens could emit combustion products from their external faces, especially if joints open up. Specimen collapse can also occur. Laboratory safety procedures shall be set up to ensure the safety of personnel with due consideration to such situations.

For construction of the test enclosure using a freestanding structure without structural framework, because of the size and weight of the individual panels it is strongly recommended that construction be accomplished within an additional external support framework (e.g. scaffolding). If the test enclosure is erected in an outside environment, it is further recommended that the external framework remain in place during the test. The purpose of this framework is only to avoid collapse of the test room caused by wind action. This additional framework shall not be used to fix and support the sandwich panels.

1 Scope

This document specifies a test method for evaluating the reaction-to-fire performance of thermal insulating sandwich panel building systems for large rooms and the resulting flame spread on or within the thermal insulating sandwich panel building construction when it is exposed to heat from a simulated internal fire with flames impinging directly on its internal corner. The test method is not intended for evaluating a product's fire resistance.

This document is applicable to both freestanding and self-supporting and frame-supported thermal insulating sandwich panel systems, but only to wall and ceiling or roof constructions.

2 Normative references

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

ISO 13943, *Fire safety — Vocabulary*

IEC 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13943 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
composite
combination of materials generally recognized in building construction as discrete entities

EXAMPLE Coated or laminated materials.

3.2
exposed surface
surface of the *product* (3.2) subjected to the heating conditions of the test

3.3
product
material, *composite* (3.1) or assembly

3.4
surface product
any part of a building constituting an exposed surface on the walls or ceiling/roof, or on both

EXAMPLE Panel or board.

3.5
thermal insulating sandwich panel
sandwich panel
building *product* (3.2) consisting of two metal faces positioned on either side of a core that is a thermally insulating material, which is firmly bonded to both faces so that the three components act compositely when under load

Note 1 to entry: One layer is an insulating material, such as mineral or glass wool, cellular plastics or a natural material (e.g. corkboard), protected by facings on both sides. Facings can be selected from a variety of materials and can be either flat or profiled. The most widely used facing is coated steel. The composite varies from a simple construction to a complex composite system with specific fixing joints and supports, depending on the application and on the performance requirements.

3.6
specimen
assembly representing the end-use construction

4 Principle

The reaction to fire performance of a sandwich panel assembly is assessed when it is exposed to flames impinging directly on the internal corner of a sandwich panel assembly. The different kinds of flame spread that can occur are flame spread within the internal core, on the surface or through joints, by ignited combustible gases and by falling debris or melting droplets of the sandwich panel assembly. The assessment allows determination of the following possible fire hazards:

— the contribution of the system to fire development up to flashover;

— the potential for transmitting an interior fire to outside spaces or other compartments or adjacent buildings;

— the possibility of the structure's collapse;

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