INTERNATIONAL STANDARD

ISO 13784-1

Second edition
2014-02-01

Reaction to fire test for sandwich panel building systems —

Part 1: Small room test

Essais de réaction au feu des systèmes de fabrication de panneaux de type sandwich —
Partie 1: Essais pour des chambres de petite taille

Reference number
ISO 13784-1:2014(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*.

This second edition cancels and replaces the first edition (ISO 13784-1:2002), which has been technically revised.

ISO 13784 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: Test method for large rooms*

Introduction

Fire is a complex phenomenon; its behaviour and effects depend 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. The philosophy of reaction to fire tests is explained in ISO/TR 3814.

The need for improved insulation of buildings has led to the increased use of insulating sandwich panel systems in different parts of the building industry.

Sandwich panel systems are applied as external cladding of factory buildings, in internal envelopes with controlled atmospheres, and in cold stores which can vary from small rooms to large cool houses. Another application is the use for modular building rooms and sometimes for retail premises. They can also be used for roof applications in a traditional construction. Multi-layered panels with other facings (for example, plasterboard) or sandwich panel systems can be applied to walls as internal linings or insulation but this is not within the scope of this part of ISO 13784.

With free-standing or frame supported types of sandwich panel systems, there are three primary fire threats to the insulated walls and ceilings/roofs of the building:

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

b) an external fire of combustibles accumulated near the wall, i.e. rubbish, vegetation, vehicles, etc.;

c) fire spread to outside spaces.

Fire can spread in several ways:

— over a combustible exterior surface;

— fire 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;

— burning debris or flaming droplets.

This part of ISo 13784 deals with a simple representation of one fire scenario with this type of product, such as that typified by a local fire impinging directly on the internal face of a sandwich panel building construction.

This part of ISO 13784 provides a test method which should be used to provide a small-room scale, end-use evaluation of all aspects of sandwich panel systems, which include constructional techniques such as supporting frameworks, jointing detail etc.

This method is intended to evaluate products which, due to their nature, are not normally used as internal linings and are not suitable to be assessed using ISO 9705, which evaluates fire growth from a surface product. This part of ISO 13784, however, provides a method by which a free-standing or frame supported sandwich panel building construction may be built and evaluated within the room.

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

These tests do not rely on the use of asbestos-based materials.

Reaction to fire test for sandwich panel building systems —

Part 1:
Small room test

WARNING — So 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 be evolved during the combustion of test specimen. The test procedures 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. The 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. Specimen with combustible content burning inside metallic facings may 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 the free-standing room construction, specimens can emit combustion products from their back face, especially if joints open up. Specimen collapse can also occur into the laboratory space. Laboratory safety procedures shall be set up to ensure safety of personnel with due consideration to such situations.

1 Scope

This part of ISO 13784 specifies a method of test for determining the reaction to fire behaviour of sandwich panel building systems, and the resulting flame spread on or within the sandwich panel building construction, when exposed to heat from a simulated internal fire with flames impinging directly on the internal corner of the sandwich panel building construction.

The test method described is applicable to free-standing, self-supporting, and frame-supported sandwich panel systems. This part of ISO 13784 is not intended to apply to sandwich panel products which are glued, nailed, bonded, or similarly supported by an underlying wall or ceiling construction. For products used as internal linings, the ISO 9705 test method should be used.

This part of ISO 13784 provides for small room testing of sandwich panel building systems. For large-room testing of sandwich panel building systems, ISO 13784-2 should be used.

This method is not intended to evaluate the fire resistance of a product, which should be tested by other means.

NOTE Because of their design, some systems may be unsuitable for testing with this part of ISO 13784. These systems may be suitable for testing with ISO 13784-2 and the latter test method should be considered. In this case application area of the test report is restricted.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9705:1993, *Fire tests — Full-scale room test for surface products*

ISO 13943:2008, *Fire safety — Vocabulary*

ISO 14934-3:2012, *Fire tests — Calibration and use of heat flux meters — Part 3: Secondary calibration method*

IEC 60584-2:1982 + A1:1989, *Thermocouples — Part 2: Tolerances*

3 Terms and definitions

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

3.1
composite
combination of materials which are generally recognized in building construction as discrete entities, for example, coated or laminated materials

3.2
exposed surface
surface of the product subjected to the heating conditions of the test

3.3
product
material, composite, or assembly

3.4
constant mass
state of a test specimen when two successive weighing apparatus operations are carried out at an interval of 24 h, and do not differ by more than 0,1 % of the mass of the specimen or 0,1 g, whichever is greater

3.5
surface product
part of a building that constitutes an exposed surface on the walls and/or the ceiling/roof such as panels, boards, etc.

3.6
insulating sandwich panel
multi-layered product consisting of three or more layers bonded together

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. The facing can be selected from a variety of materials and can be either flat or profiled.

Note 2 to entry: The most widely used facing is coated steel. The composite can vary from a simple construction to a complex composite system with specific fixing joints and supports depending on the application and on the performance requirements.

3.7
specimen
assembly representing the end-use construction

3.8
flashover
point in the fire history when the sum of the rate of heat release from the ignition source and the product reaches 1 000 kW for more than 10 s

4 Principle

The reaction to fire performance of a sandwich panel assembly is assessed when exposed to flames impinging directly on the internal corner of a small sandwich panel assembly. The different kinds of flame spread, for example within the internal core, on the surface or through joints, and through ignited combustible gases and falling debris or melting droplets of the sandwich panel assembly, are assessed to allow the following possible fire hazards to be determined:

a) the contribution of the system to fire development up to flashover;

b) the potential to transmit an interior fire to outside spaces or other compartments or adjacent buildings;

c) the possibility of collapse of the structure;

d) the development of smoke and fire gases inside the test room.

If for product development, quality control, or on special request by sponsor or regulatory body the heat release and/or smoke measurement is not included in the test procedure, this shall be clearly stated in the test report.

5 Types of systems

5.1 General

The test method applies to the following two types of structures which are representative of those used in practice, both in construction and materials.

5.1.1 Type A: frame-supported structures

For these types of structures, sandwich panel systems are mechanically fixed to the outside or the inside of a structural framework, normally steel, through the thickness of the panel. The ceiling/roof may be built traditionally or with sandwich panel systems. A widespread construction is an external cladding of industrial buildings. In most cases, this kind of sandwich panel systems is used for the exterior wall and/or the roof of a building.

When using a frame, the deformation of the frame can influence the fire behaviour of the sandwich panels. The test recommends that the frame is protected in practice using fire resistance requirements. Protection can be obtained by means of insulating boards or coatings.

5.1.2 Type B: free-standing structures

Sandwich panel systems are assembled together to provide a room or enclosure which does not depend for its stability on any other structural framework, e.g. cold stores, or food or clean rooms, constructed normally within a weatherproof shell. The ceiling of these constructions may be supported from above. These rooms are normally situated inside a building.

6 Test specimen

The test specimen used shall consist of the requisite number of panels required by the test method to be performed. In all cases, the test specimen shall be representative of that used in practice, both in construction and materials. All constructional details of joints, fixings, etc., shall be reproduced and positioned in the test specimen as in practice. If the investigated type of sandwich panel is used in practice with an inside or outside structural framework, this shall also be used in the test.

It is recommended that the test specimen is built by those suitably qualified in the construction of this type of structure.

NOTE 1 If in practice ceiling panels are different from wall panels, a test can be performed with the correct combination of wall and ceiling panels.

If the sandwich panel building system is intended to be used with decorative paint or film facings, these shall be present on the test specimen.

7 Test method

7.1 This method specifies a procedure by which sandwich panel assemblies may be assessed in their end-use scale and utilizing constructional details, which are incorporated in their end-use. Products are evaluated with end-use joints and fixings and where a supporting steel framework is part of the construction, with this framework also in place. Where the panels are self-supporting, it is recommended that an unconnected external framework be used for safety reasons.

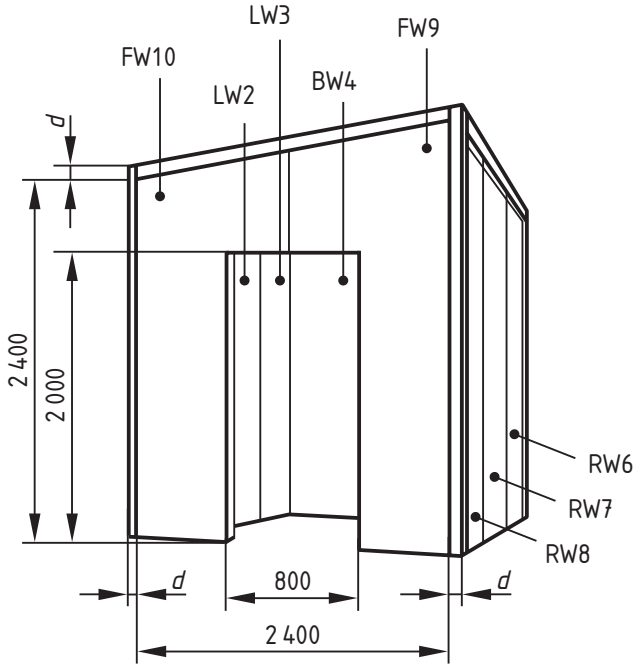
7.2 A room (see Figures 1 to 3) shall be constructed using the components of the sandwich panel systems to be tested. It shall consist of four walls at right angles and a ceiling, and shall be located on a rigid, non-combustible floor surface. The means of securing wall panels together and the means of attaching walls to floor and ceiling to walls shall be representative of end-use. The room shall have the following inner dimensions:

a) length: 3,6 m ± 0,05 m;

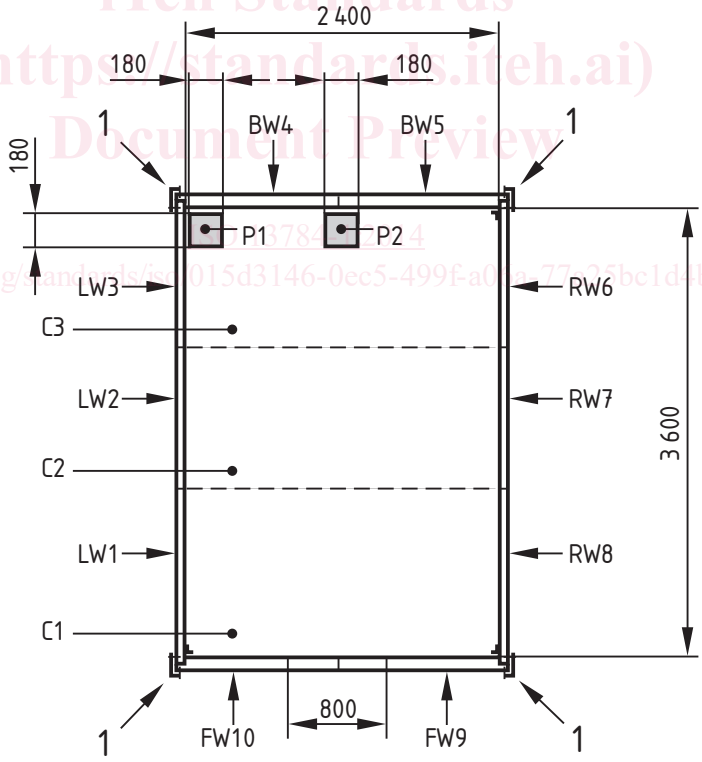
b) width: 2,4 m ± 0,05 m;

c) height: 2,4 m ± 0,05 m.

Dimensions in millimetres



a) Isometric elevation



b) Plan showing alternative burner position

Key

1	supporting frame (if applicable)	LW	left wall panel
C	ceiling panel	BW	back wall panel
D	thickness of panel	RW	right wall panel
P1	burner position 1, at corner (in case of no frame)	FW	front wall panel
P2	burner position 2, at joint (with frame) distance from corner should be ≤ 300 mm		

Figure 1 — Example of test specimen