TECHNICAL SPECIFICATION

ISO/TS 17431

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Fire tests — Reduced-scale model box test

Essais au feu — Essai à échelle réduite utilisant une boîte

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 17431 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*.

Introduction

This Technical Specification is intended to provide a test method for describing the fire behaviour of a product under fire conditions by simulating such fire conditions in a reduced scale under controlled laboratory conditions.

The test method can be used as part of a fire hazard assessment that takes into account all of the factors that are pertinent to an assessment of a particular type of fire hazard.

Fire tests — Reduced-scale model box 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 combustion of test specimens.

The test procedures involve high temperatures and combustion processes from ignition to a fully developed fire. Therefore, hazards can exist for burns, ignition of extraneous objects or clothing. It is important that the operators use protective clothing, e.g. helmet, face-shield and equipment for avoiding exposure to toxic gases.

Means for extinguishing a fully developed fire should be available.

1 Scope

This Technical Specification specifies an intermediate-scale test method that simulates a fire that under well-ventilated conditions starts in a corner of a small room with a single doorway and can develop until the room is fully involved in the fire.

The method is primarily intended to evaluate the contribution to toxic hazard in, and potential for fire spread to, evacuation routes connected to the room of origin in which surface products are installed.

The method is especially suitable for products with which a full-scale room test has to be terminated before the full involvement of the room with fire because of the occurrence of flashover or any other safety reasons.

2 Normative references

The following referenced documents are indispensable for the application 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 9705:1993, *Fire tests — Full-scale room test for surface products*

ISO 13943:2000, *Fire safety — Vocabulary*

3 Definitions

For the purpose of this document, the definitions given in ISO 13943 and the following shall apply.

3.1
exposed surface
surface of the product subjected to the heating conditions of the test

3.2
surface product
any part of a compartment that constitutes an exposed surface on the interior wall, ceiling and/or floor such as panels, tiles, boards, wall papers or coatings

4 Principle

The potential for fire spread to objects outside the room of fire origin is evaluated by the heat release rate and total heat release from the model box.

An indication of the toxic hazard in an evacuation route connected to the room of fire origin is provided by the measurement of specific gases at the doorway of the model box.

5 Combustion chamber

5.1 Dimensions

The combustion chamber (see Figure 1) shall consist of three walls, a ceiling and a floor connected at right angles. The inside dimension of the combustion chamber shall have the following dimensions:

a) length: (1,8 ± 0,01) m;

b) width: (1,1 ± 0,01) m;

c) height: (1,0 ± 0,01) m.

5.2 Front panel

A front wall panel with an opening of the following dimensions (see Figure 1) shall be attached to the opening of the combustion chamber prior to each test. The opening shall be at the centre of the front wall panel and touch the floor.

a) width of the front panel: (1,1 ± 0,01) m;

b) height of the front panel: (1,0 ± 0,01) m;

c) width of the opening: (0,3 ± 0,01) m;

d) height of the opening: (0,67 ± 0,01) m.

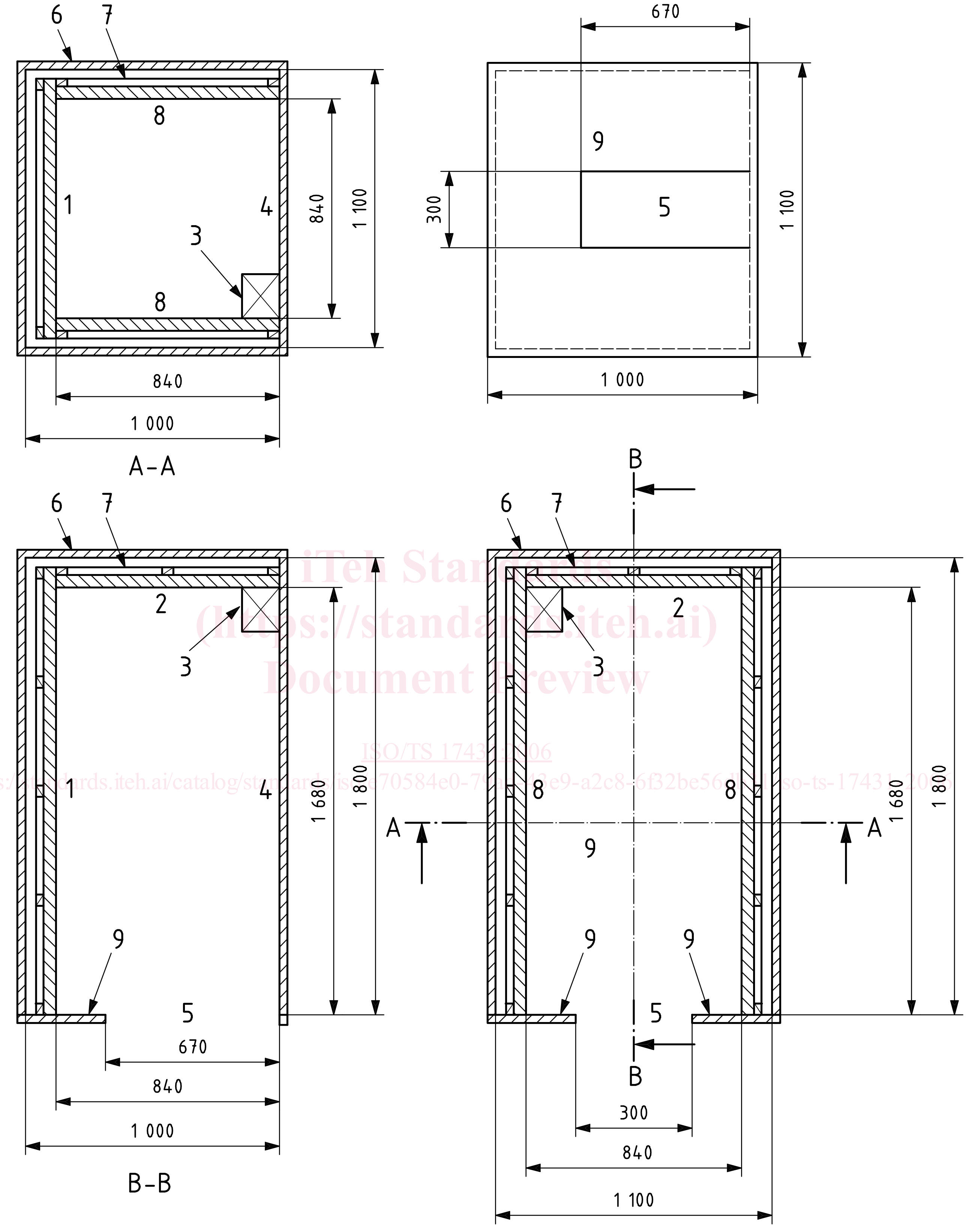
5.3 Material of combustion chamber

The combustion chamber shall be constructed of non-combustible material with a density of (800 ± 100) kg·m^{-3}. The thickness of the construction shall be (20 ± 2) mm.

5.4 Installation

The combustion chamber shall be placed in an essentially draught free space, large enough to ensure that there is no influence on the test fire. Hanging the combustion chamber can assist in the measurement of the mass loss and accurate collection of combustion products. An example of a hanging combustion chamber is given in Annex A.

Dimensions in millimetres



Key

1	top panel	4	floor	7	steel sheet (0,27)
2	inner wall	5	opening	8	side wall
3	ignition source	6	combustion chamber	9	front wall panel

Figure 1 — Combustion chamber with specimen panels, front wall panel and ignition source

6 Ignition source

6.1 Design of ignition source

The ignition source shall be a propane gas burner having a 0,17 m × 0,17 m square top surface layer of a porous, inert material, e.g. sand. The construction shall be such that an even gas flow is achieved over the entire opening area. It is recommended that the gas burner described in Annex B be used.

WARNING — All parts and equipment of the burner system such as tubes, couplings, flow meters, etc. shall be of approved type for propane. The installation shall be performed in accordance with existing safety regulations.

The burner should, for reasons of safety, be equipped with a remote control ignition device, for example a pilot flame, electric spark or a glow wire. There should be a warning system for detection of gas leakage in the case of extinction of the flame.

6.2 Fuel

The fuel for the burner shall be of industrial grade propane (95 % purity). The heat release rate of the burner shall be 40 kW during the test period. The fuel gas flow rate to the burner shall be measured with an accuracy of at least ± 3 % and shall be controlled within ± 5 % of the prescribed value of heat output.

7 Measurement at the opening of the combustion chamber for toxicity assessment

The present Clause specifies minimum requirement for the instrumentation attached to the opening of the combustion chamber. Additional information and designs can be found in Annex A.

7.1 Gas analysis

7.1.1 Sampling

The gas shall be sampled at the opening of the combustion chamber at a position where the combustion products flow out above the neutral plate (see Figure A.1). The sampling line shall be made of an inert material that does not influence the concentration of the gas species to be analysed.

7.1.2 Carbon monoxide

The gas concentration shall be measured using an analyser having an accuracy of at least ± 0,02 % by volume for carbon monoxide. The analyser shall have a t_{10} to t_{90} response time of less than 12 s (using a similar procedure to that defined in ISO 5660-1:2002, 10.1).

7.2 Gas temperature

Gas temperature in the immediate vicinity of the gas-sampling probe shall be measured by a thermocouple with a maximum diameter of 0,25 mm.

8 Hood and exhaust duct

The system for collecting the combustion products shall have a capacity and be designed in such a way that all of the combustion products leaving the combustion chamber through the opening during a test are collected. The system shall not disturb the fire-induced flow in the opening. The exhaust capacity shall be at least 2,0 $m^3 \cdot s^{-1}$ at atmospheric pressure and temperature of 25 °C. An example of hood and exhaust duct is shown in Figure A.2.

