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**External exposure of roofs to fire —  
Part 1:  
Test method**

*Exposition des toitures à un feu extérieur —*

*Partie 1: Méthode d'essais*

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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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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.

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 12468-1 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 2, *Fire containment*.

ISO 12468 consists of the following parts, under the general title *External exposure of roofs to fire*

— *Part 1: Test method*

— *Part 2: Classification*

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## Introduction

This part of ISO 12468 specifies a test method that relates to the effects of fires on roofs. The test method described in this part of ISO 12468 represents the effect of two levels of fire exposure.

- Level A: A large burning brand coming from a nearby building and falling onto the roof. Level A considers the effects of wind and additional radiant heat.
- Level B: A small burning brand transported by the wind from a remote fire and falling onto the roof. Level B considers the effect of wind but without additional radiant heat.

Any national regulation may refer to only one or both of the two levels of fire exposure.

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# External exposure of roofs to fire —

## Part 1: Test method

**CAUTION** — The attention of all persons concerned with managing and carrying out this fire test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may also arise during the construction of the test elements or structures, their testing and disposal of test residues.

An assessment of all potential hazards and risks to health shall be made and safety precautions shall be identified and provided. Written safety instructions shall be issued. Appropriate training shall be given to relevant personnel. Laboratory personnel shall ensure that they follow written safety instructions at all times.

### 1 Scope

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This part of ISO 12468 specifies a test method to determine the resistance of roofs to external exposure to fire. This method evaluates the behaviour of the roof when exposed to two types of burning brands combined with wind and with or without heat radiation, concerning:

- a) the fire spread across the external surface of the roof;
- b) the fire spread within the roof;
- c) the fire penetration;
- d) the production of flaming droplets or debris falling through the roof, from the underside of the roof or from the exposed surface.

### 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 13943, *Fire safety — Vocabulary*

### 3 Terms and definitions

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

#### 3.1

##### assembly

fabrication of materials and/or composites

EXAMPLE Sandwich panels.

**3.2**

**burned material**

material that has been destroyed by combustion or pyrolysis

**3.3**

**composite**

combination of materials which are generally recognized in building construction as discrete entities

EXAMPLE Coated or laminated product such as roofing felt.

**3.4**

**continuous deck**

deck supporting the roof covering in which the gap between adjacent elements is not greater than 0,5 mm (5,0 mm in the case of wooden planks with plain edges)

**3.5**

**damaged material**

material that has been burned, melted or otherwise visually changed by heat but does not include discoloration and soot deposits

**3.6**

**exposed surface**

external surface of the calibration element or of the specimen which is subject to the heat conditions

**3.7**

**external fire spread**

progression and extent of sustained flaming across the exposed surface of the specimen

**3.8**

**fire penetration**

any opening, sustained flaming or glowing due to combustion on the underside that appears during the test and/or the occurrence of any flaming droplets or debris falling through the specimen or from the underside

NOTE Charring or discoloration is not be regarded as fire penetration.

**3.9**

**fire spread within the roof**

extent of burned material in each functional layer inside the specimen

**3.10**

**flaming droplets or debris**

burning material falling from or through the specimen that continues to burn on the floor for at least 5 s

**3.11**

**internal damage**

extent of damaged material in each functional layer inside the specimen

**3.12**

**material**

basic single substance or a uniformly dispersed mixture of substances

EXAMPLE Metal, stone, wood, bitumen, concrete or mineral wool.

**3.13**

**measuring zone**

area of the specimen within which measurements are made



**3.14****opening**

any hole greater than 10 mm × 10 mm that appears during the test which penetrates completely through the specimen

**3.15****product**

material (3.12), composite (3.3) or assembly (3.1) about which information is required

**3.16****profile pitch**

repeating length between sections of a uniformly corrugated or undulating roof deck

**3.17****roof**

covering and sealing systems including any insulating layers or vapour barriers with their supporting elements and roof lights or other closures for roof apertures that are intended to provide a weatherproof surface

NOTE Elements with a slope greater than 70° are not considered as roofs in this part of ISO 12468.

**3.18****roof covering**

material (3.12) attached to the deck

**3.19****specimen**

representative section of the roof prepared for the purpose of test

**3.20****sustained flaming**

flaming arising from an observed location, which persists for 5 s or longer

**3.21****underside**

bottom surface of the specimen

**4 Symbols**

Symbol	Description	Unit
$v_1, v_2, v_3, v_4, v_5, v_6, v_7$	Velocity of the air at the measuring points	metres per second (m/s)
$\alpha$	Pitch (slope)	degrees (°)

**5 Selection of test specimen pitch**

Roof systems designed for only one pitch shall be tested at the actual design pitch.

Roof systems designed for more than one pitch shall be tested as follows:

- for pitch ( $\alpha$ ) less than 5°, test at zero pitch;
- for pitch ( $\alpha$ ) from 5° to 20°, test at 15°;
- for pitch ( $\alpha$ ) greater than 20°, test at 30°.

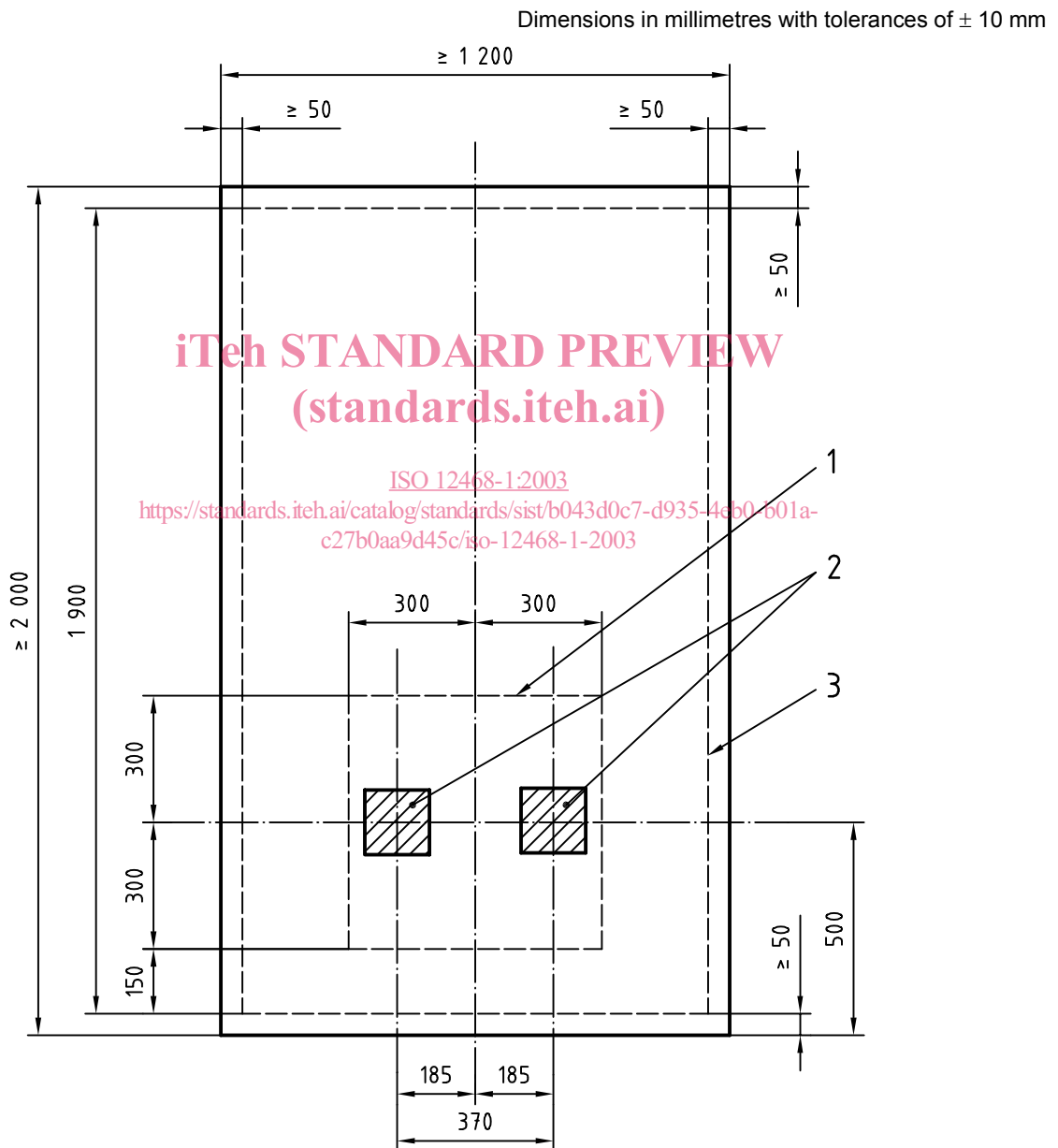
## 6 Test specimens

### 6.1 General requirements

For each level of fire exposure, two specimens shall be tested with dimensions measuring 1 200 mm ± 10 mm in width × 2 000 mm ± 10 mm in length for each test pitch. (See Figures 1 and 2.) When this is not possible due to the size of the roof light or other closure, a larger specimen shall be used.

NOTE Roof lights cause difficulties due to their size, shape, composition and fire behaviour. Further guidance on the testing of roof lights will be presented in the next revision of this part of ISO 12468.

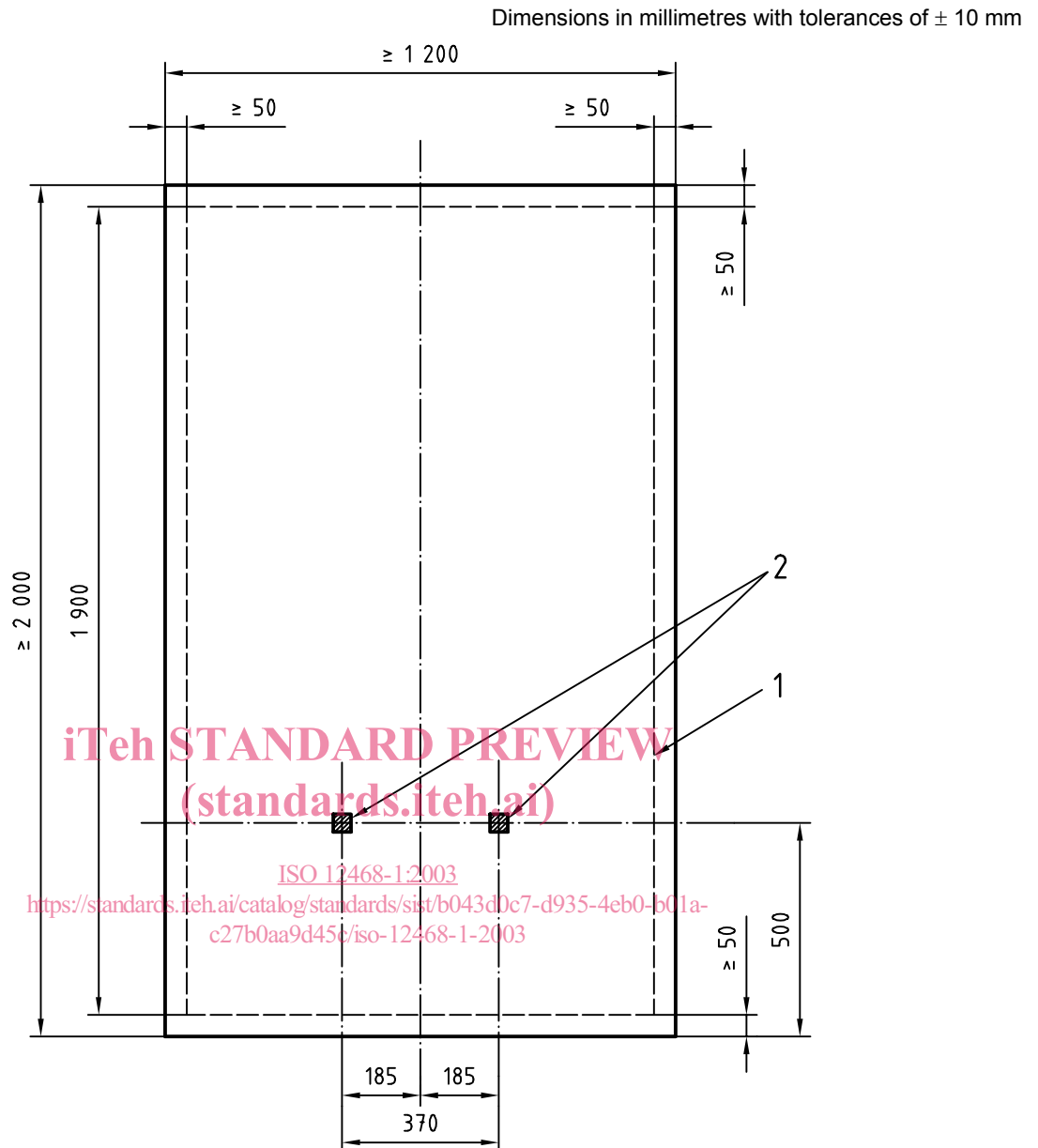
The specimens shall be representative in all details of the roof in practice.



#### Key

- 1 radiant panel position
- 2 A Brands
- 3 measuring zone

Figure 1 — Measuring zone and position of the brands for Level A

**Key**

- 1 measuring zone
- 2 B Brands

**Figure 2 — Measuring zone and position of the brands for Level B**

## 6.2 Selection of standard supporting elements

### 6.2.1 For continuous decks

#### 6.2.1.1 General

The test deck shall be selected in accordance with the following.

- a) In the case of roof coverings intended to be installed over a continuous deck other than a profiled metal deck, a roof deck in accordance with 6.2.1.2 or 6.2.1.4 shall be used.

- b) If the materials will only be laid over a profiled metal deck, then a trapezoidal profiled metal deck, in accordance with 6.2.1.3, shall be used as the deck.

### 6.2.1.2 Wood particleboard decks

**6.2.1.2.1** The wood particleboard shall consist of wood particles bonded with polymer adhesive (e.g. urea formaldehyde). This particleboard shall have a density of  $680 \text{ kg/m}^3 \pm 50 \text{ kg/m}^3$  and shall not be treated with fire retardants.

**6.2.1.2.2** A wood particleboard deck shall be constructed from planks 250 mm wide  $\times$  13 mm  $\pm$  1 mm thick running parallel to the eaves with plain edges and tightly butt jointed so that the gaps between planks do not exceed 0,5 mm.

**6.2.1.2.3** If it is intended also to cover the case of decks made from wooden planks with plain edges, then these gaps shall be 5 mm  $\pm$  0,5 mm.

### 6.2.1.3 Metal decks

The trapezoidal profiled metal deck shall be made of aluminium or steel (subject to the expected field of application) and have the width of the crown approximately equal to 50 % of the profile pitch and a trough depth of approximately 100 mm. The corrugations shall run parallel to the eaves and be open at the ends.

### 6.2.1.4 Other non-combustible decks

If roofing materials are intended to be laid only on continuous, non-combustible decks with a minimum thickness of 10 mm, then the test roof deck shall consist of 12 mm  $\pm$  2 mm thick reinforced calcium silicate board (oven dry density  $900 \text{ kg/m}^3 \pm 100 \text{ kg/m}^3$ ).

## 6.2 For non-continuous decks

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The spacing of roof supports of any type shall be in accordance with the maximum permissible spans proposed by the manufacturer for the particular application but not exceeding the minimum dimensions specified for the specimen in 6.1.

## 6.3 Positioning of joints

### 6.3.1 General

The joints shall be representative of practical application. In the case of overlapping layers, the position of the joints shall be considered to be the edge of the upper layer.

### 6.3.2 Description of specimen types with respect to joints

Where the dimensions of the elements of any of the layers are such that it requires more than four pieces to cover the specimen, or if any of the layers are without joints, then the specimens shall be fabricated such that those layers are representative (see Figures 3 and 4).

Specimens are categorized by the following types.

- **Type 1:** Single central vertical joint in the top layer. Single horizontal joint in the top layer under position of left brand. Single vertical joint in layer next to top layer under position of right brand. Single vertical joint in insulation under position of left brand [see Figure 4 a), Type 1].
- **Type 2:** Single vertical joint in the top layer under position of right brand. Single vertical joint in layer next to insulation under position of left brand [see Figure 4 b), Type 2].