TECHNICAL REPORT

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External exposure of roofs to fire —

Part 3: Commentary

Exposition des toitures à un feu extérieur —

Partie 3: Commentaire

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 ISO 12468-1, test method **1**
4 Fire scenarios **1**
5 Evaluation parameters **5**
6 ISO 12468-2, classification of roofs **6**
Bibliography **7**

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).

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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 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 of roofs*

— *Part 3: Commentary*

Introduction

This part of ISO 12468 describes the background used in the development and ongoing revision of ISO 12468-1:2013 and ISO 12468-2. Guidance is provided on the use of the test method and classification methods.

External exposure of roofs to fire —

Part 3:
Commentary

1 Scope

This part of ISO 12468 provides background and guidance on the use and limitations of the external fire exposure to roofs test method, the classification system, and the application of the data obtained. This part of ISO 12468 is designed to be of assistance to code officials, fire safety engineers, designers of buildings, and other persons responsible for the safety of persons in and around buildings.

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 12468-1:2013, *External exposure of roofs to fire — Part 1: Test method*

3 ISO 12468-1, test method

In the development of the test method, an attempt was made to evaluate as many of the potential sources of external fire exposure a roof system could be subjected to as possible. Once identified, the test method attempted to define tests that simulated the identified possible exposure conditions, while at the same time, utilizing tests that already exist and are described in national test methods.

The ultimate goal of the test method development was to create an international test procedure which incorporated the most desirable elements of the existing test methods that could be used in national regulations and replace the wide variety of test methods that exist in national regulations.

The following are the three levels of fire exposure for roofs defined in ISO 12468–1:2013:

— Level A: A large burning brand falling onto the roof from an adjacent building. Level A considers the effect of wind and radiant heat.

— Level B: A medium burning brand coming from a fire in a neighbourhood and falling onto the roof. Level B considers the effect of wind but without additional radiant heat.

— Level C: A small burning brand transported by the wind from a remote fire and falling onto the roof. Level C considers the effect of the wind but without additional radiant heat.

The following presentation starts with a summary background description of some fire scenarios, relevant for test methods regarding external fire exposure to roofs. Then the decisive evaluation parameters for different classification systems, based on test measurements and observations, are identified.

4 Fire scenarios

Figures 1 to 6 show different types of external fire exposure to a roof.

Figure 1 — Flying brand from a remote building or from environmental vegetation

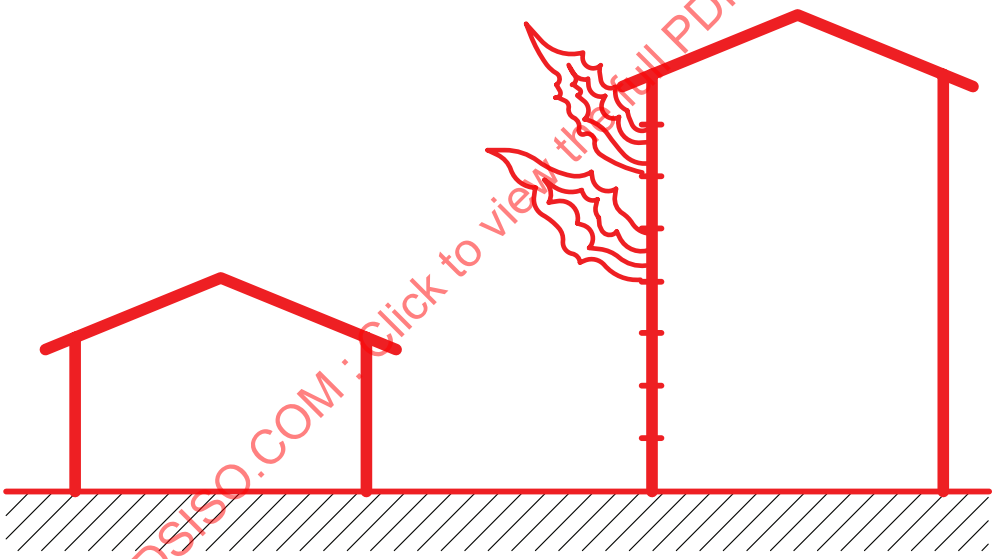


Figure 2 — Radiation exposure from a fire in a nearby building

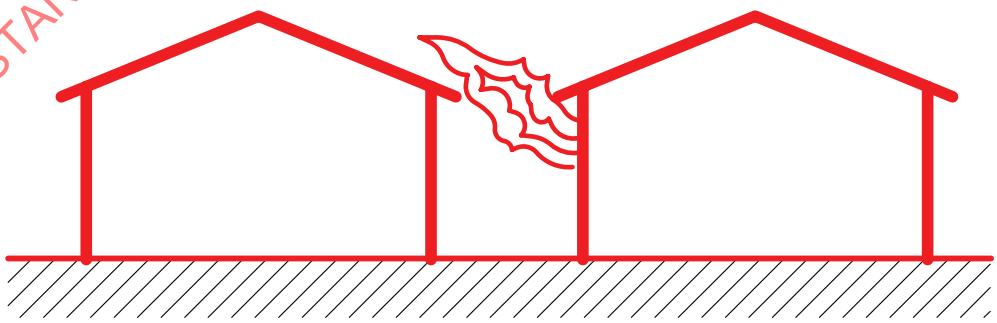


Figure 3 — Direct flame exposure together with radiation exposure from a fire in a nearby building in a dense small house area

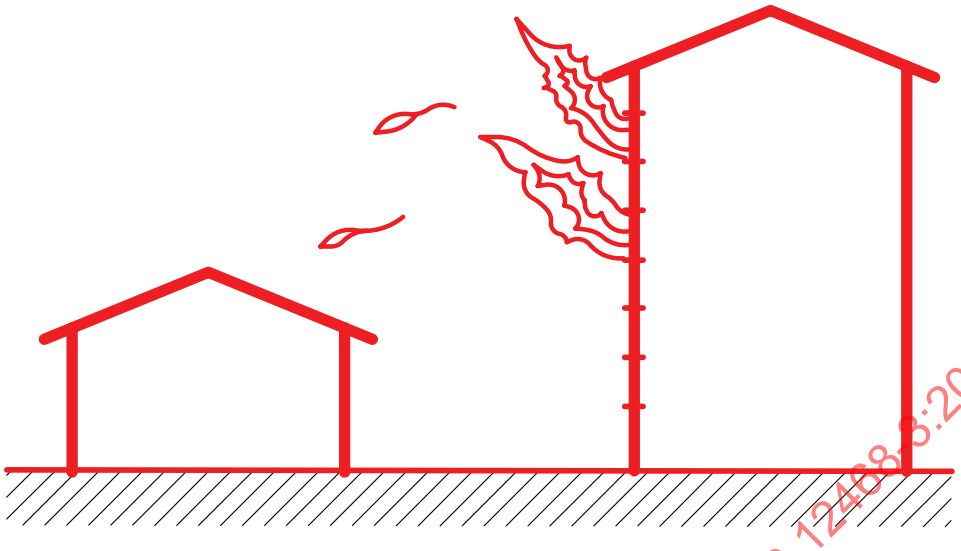


Figure 4 — Combined exposure by flying brand and radiation from a nearby building

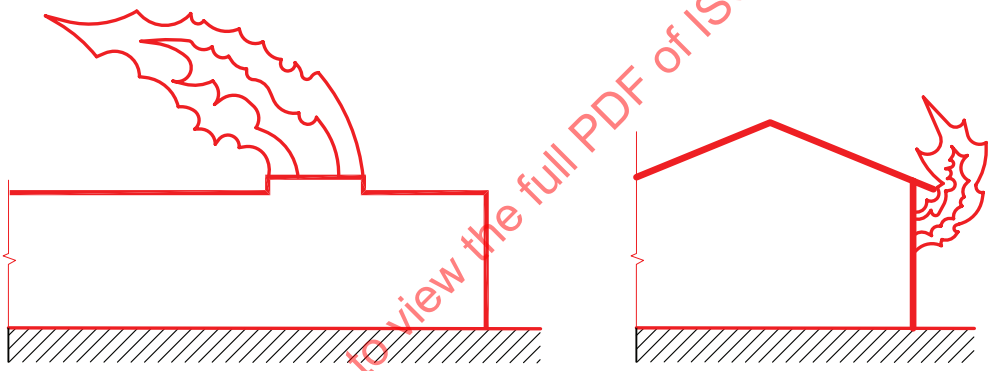


Figure 5 — Radiation exposure, with or without a simultaneous flame contact, from flames emerging through a roof opening for fire venting or through a window opening in a compartment below the roof

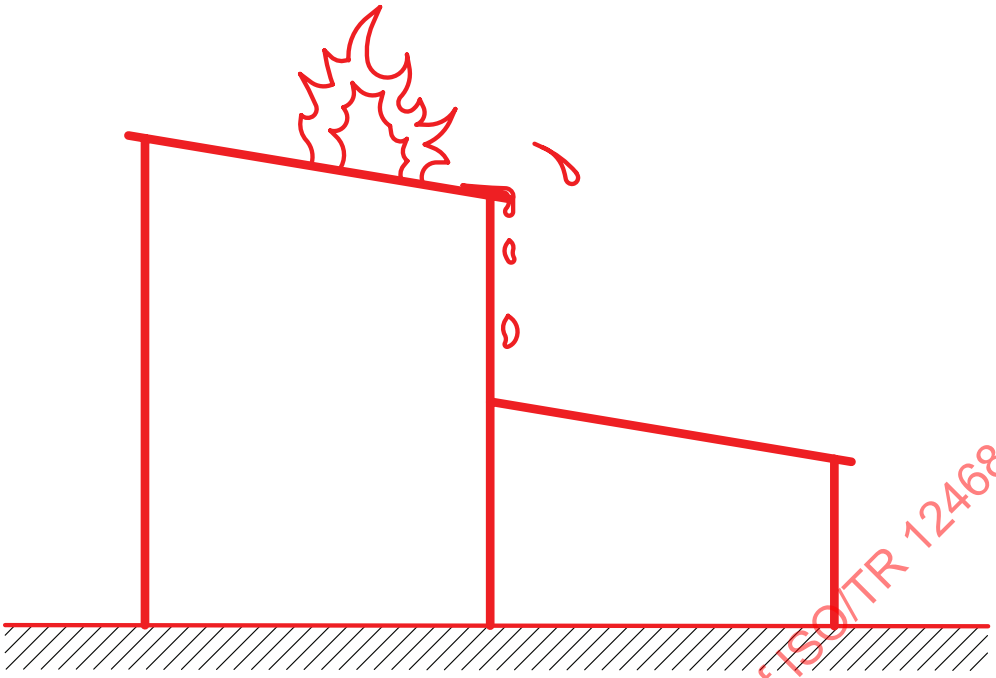


Figure 6 — Exposure by dripping melted material, flaming or not, together with sparks and flying brand, orginating from an external fire on the roof of a higher part of the building

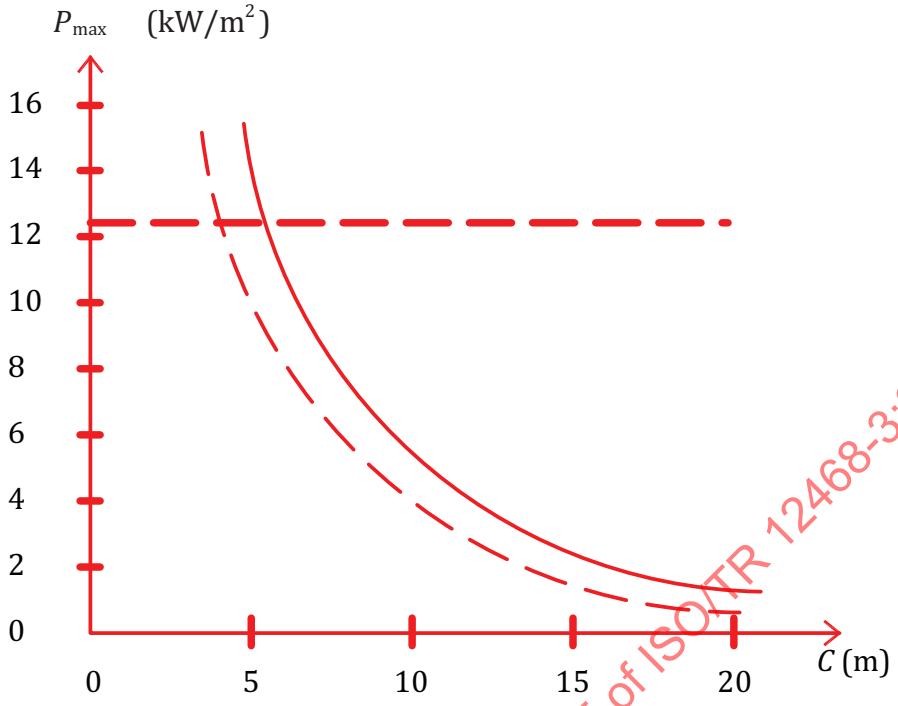
From the different types of external fire exposure shown in Figures 1 to 6, Level A of ISO 12468-1:2013 may relate to Figure 4, and Level B and Level C of ISO 12468-1:2013 may relate to Figure 1. Among the national standard test methods, the German test may simulate external fire exposure represented in Figure 6, the UK and French tests simulate exposure represented in Figure 4, the Scandinavian test and the North American Class C burning brand test simulate exposure represented in Figure 1, and the North American "intermittent flame test" exposure is represented by Figures 3 and 5.

The following brand sizes used in ISO 12468-1:2013 approximate the brands used in the North American roof fire test:

— Level A approximates the Class B brand described in ASTM E108 or ULC S107 (North American tests).

— Level B is a smaller brand than the Class B brand but is larger than the Class C brand described in ASTM E108 or ULC S107 (North American tests). Level B was added to the test standard in 2012 to address the needs of the regulatory requirements in Japan.

— Level C approximates the Class C brand described in ASTM E108 or ULC S107 (North American tests).



Key

a Maximum heat flux exposure (ISO 12468–1, Level A)

Figure 7 — Level of radiation exposure to roof from nearby fire exposure as represented by Figure 4

Figure 7 gives a representative illustration of the level of the radiation exposure to a roof of a building from a fire in a nearby building as represented by Figure 4, relevant for the test method ISO 12468-1, Level A. The curves are showing the calculated maximum radiation at the base of the roof with a specified pitch as a function of the distance between the two buildings. The radiation exposure is caused by a fully developed compartment fire, comprising one compartment (dash-line curve) or two adjacent compartments (full-line curve) and having a size characteristic of fires in a multi-storey office building or dwelling-house. For comparison, the figure also includes the level of the maximum total heat flux to which the test specimen shall be exposed according to the test method ISO 12468-1, Level A.

The calculated maximum radiation (P_{max}) to the base of a roof on a building from a fire in a nearby building as a function of the distance (C) between the two buildings is plotted in Figure 7. The thermal exposure from the nearby building is characterized by a fully developed fire in a compartment with the opening factor $A\sqrt{h}/A_{tot}$ = 0,06 $m^{1/2}$ and surrounding structures of aerated concrete with the density 500 kg · m^{-3}. The fire load density is 170 MJ · m^{-2} surrounding area. The area of the window openings of the compartment facing on to the exposed roof is 5 × 1,5 m^2. The pitch of the roof is 30° and the base of the roof is located at the same level as the lower edge of the window openings of the compartment(s) in fire. The dash-line curve refers to a fire in one compartment and the full-line curve to a fire simultaneously in two adjacent compartments.

5 Evaluation parameters

Measurements and observations, prescribed in the test method ISO 12468-1, enable the following evaluation parameters to be used in the classification systems described in ISO 12468-2:

a) maximum length of external fire spread in any direction related to a defined measuring zone;