



# Technical Report

**ISO/TR 24188**

## **Large outdoor fires and the built environment — Global overview of different approaches to standardization**

*Grands incendies extérieurs et environnement bâti —  
Vue d'ensemble des différentes approches en matière de  
normalisation*

**Second edition  
2025-02**

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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 document 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 92, *Fire safety*.

This second edition cancels and replaces the first edition (ISO/TR 24188:2022), which has been technically revised.

The main changes are as follows:

- various term entries in [Clause 3](#) have been modified;
- [Figure 2](#) has been replaced with a new diagram;
- the Bibliography has been updated.

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](http://www.iso.org/members.html).

## Introduction

Large outdoor fires have the potential to negatively impact the built environment.

Examples of such fires are:

- wildland-urban interface (WUI) fires (wildland fires that spread into communities; this type of fire has become a global problem);

NOTE Once a WUI fire reaches a community, a large urban fire can develop.

- post-earthquake fires (large urban fires that potentially occur after an earthquake);
- tsunami-generated fires (fires potentially generated from tsunamis);
- volcano-generated fires (fires potentially generated from volcanic activity); and
- fires that occur in informal settlements.

This document provides an overview of approaches to standardization for lessening the destruction on the built environment caused by such fire exposure. Some of the test methods outlined in this document have been developed in the context of building fires and extrapolated to external fire exposures. Evacuation is not included as there are no known approaches to standardization as the present time.

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# Large outdoor fires and the built environment — Global overview of different approaches to standardization

## 1 Scope

This document provides a review of global testing methodologies related to the vulnerabilities of buildings from large outdoor fire exposures. It also provides information on land use management practices.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1.1

#### **bushfire**

unplanned fire in a vegetated area, as opposed to an urban area

Note 1 to entry: Used primarily, but not exclusively, in Australia, New Zealand and Africa.

Note 2 to entry: For further information, see Reference [42].

### 3.1.2

#### **direct flame contact**

flame impinging on building systems and materials

Note 1 to entry: For further information, see Reference [43].

### 3.1.3

#### **evacuation**

dispersal or removal of people from dangerous areas and their arrival at a place of relative safety

Note 1 to entry: For further information, see Reference [44].

### 3.1.4

#### **post-earthquake fire**

fire which occurs after an earthquake

### 3.1.5

#### **firebrand**

airborne object capable of acting as an ignition source and carried for some distance in an airstream

Note 1 to entry: For further information, see Reference [45].

### 3.1.6

#### **informal settlement**

unplanned settlement or area where housing is not in compliance with current planning and building regulations (unauthorized housing)

[SOURCE: Glossary of Environment Statistics, Studies in Methods, Series F, No. 67, United Nations, New York, 1997]<sup>[46]</sup>

### 3.1.7

#### **large outdoor fire**

urban fire, tsunami-generated fire, volcano-generated fire, WUI fire, wildland fire, or informal settlement fire, where the total burnout area is significant

### 3.1.8

#### **spot fire**

fire caused by flying firebrands at a distance from the original fire

### 3.1.9

#### **tsunami-generated fire**

fire caused by tsunami, typically by burning elements contained in the flood waters

### 3.1.10

#### **urban fire**

fire which occurs in an urbanized area

### 3.1.11

#### **volcano-generated fire**

fire caused by volcanic eruption

### 3.1.12

#### **wildland**

land that either has never suffered human intervention or has been allowed to return to its natural state, or that is managed for forestry or ecological purposes

[SOURCE: ISO/TS 19677:2019, 3.2]

### 3.1.13

#### **wildland fire**

fire occurring in peat, forests, scrublands, grasslands or rangelands, either of natural origin or caused by human intervention

Note 1 to entry: Used primarily, but not exclusively, in North America.

[SOURCE: ISO/TS 19677:2019, 3.3, modified — reference to "peat" added and Note 1 to entry added.]

### 3.1.14

#### **wildland firefighting**

suppressive action involving a fire in forests, scrublands, grasslands or rangelands

### 3.1.15

#### **wildland-urban interface**

#### **WUI**

area where structures and other human development adjoin or overlap with wildland

Note 1 to entry: A community based in such an area, in which humans and their development meet or intermix with wildland fuel, is referred to as a WUI community.<sup>[48]</sup>

Note 2 to entry: A fire that spreads to a WUI is referred to as a WUI fire. Suppressive action in relation to such a fire is referred to as WUI firefighting, and can involve different actions, tactics and equipment compared to those used in urban firefighting.

[SOURCE: ISO/TS 19677:2019, 3.4, modified — Notes to entry have been added.]



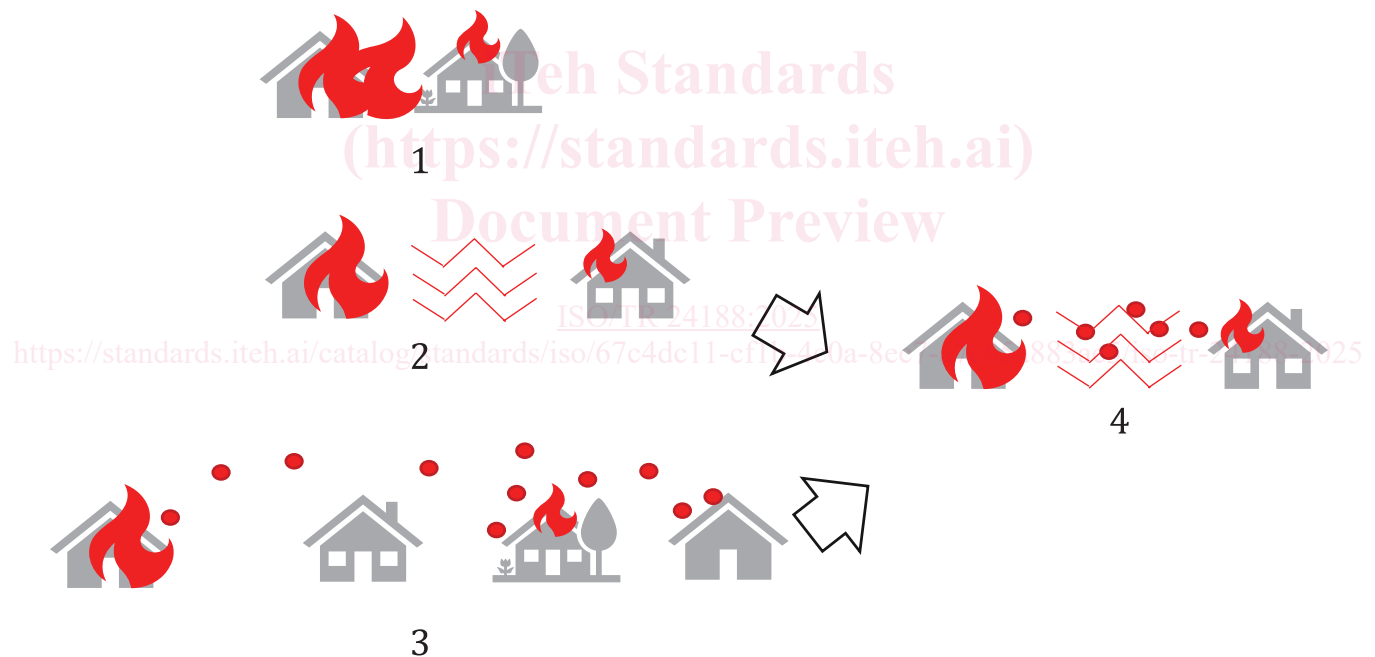
## 4 Ignition scenarios

Large outdoor fires involve the interaction of topography, weather, vegetation and structures. Large outdoor fires differ from enclosure fires in several ways. Most notably, the fire spread processes are not limited to well-defined boundaries, as is the case of traditional building or enclosure fires. Wildland firefighting and WUI firefighting techniques, as well as fire mitigation, also differ in their nature, application and in terms of the distances involved in such situations. At the WUI, the interaction of buildings, construction products used and urbanization rules are also key parameters. Reference [32] provides an overview of these phenomena.

There are three ways in which ignition can occur.

- Direct flame contact — This is the aspect usually managed by fire tests from building regulations.
- Thermal radiation — The probability of ignition depends on the distance and time of exposure. This can occur at distances of tenths of metres.
- Firebrands — The probability of ignition depends on the accumulation. Spot fires can occur at long distances (several hundred metres).

A combination of any of these three points is also possible. Direct flame contact and thermal radiation act in combination as a flame exists and emits thermal radiation. Direct flame contact and firebrands can also act in combination while direct flame contact is likely dominant. Thermal radiation and firebrands can act in combination as shown in [Figure 1](#).



### Key

- 1 direct flame contact
- 2 thermal radiation
- 3 firebrands
- 4 thermal radiation and firebrands

SOURCE Reference [32], reproduced with the permission of the authors.

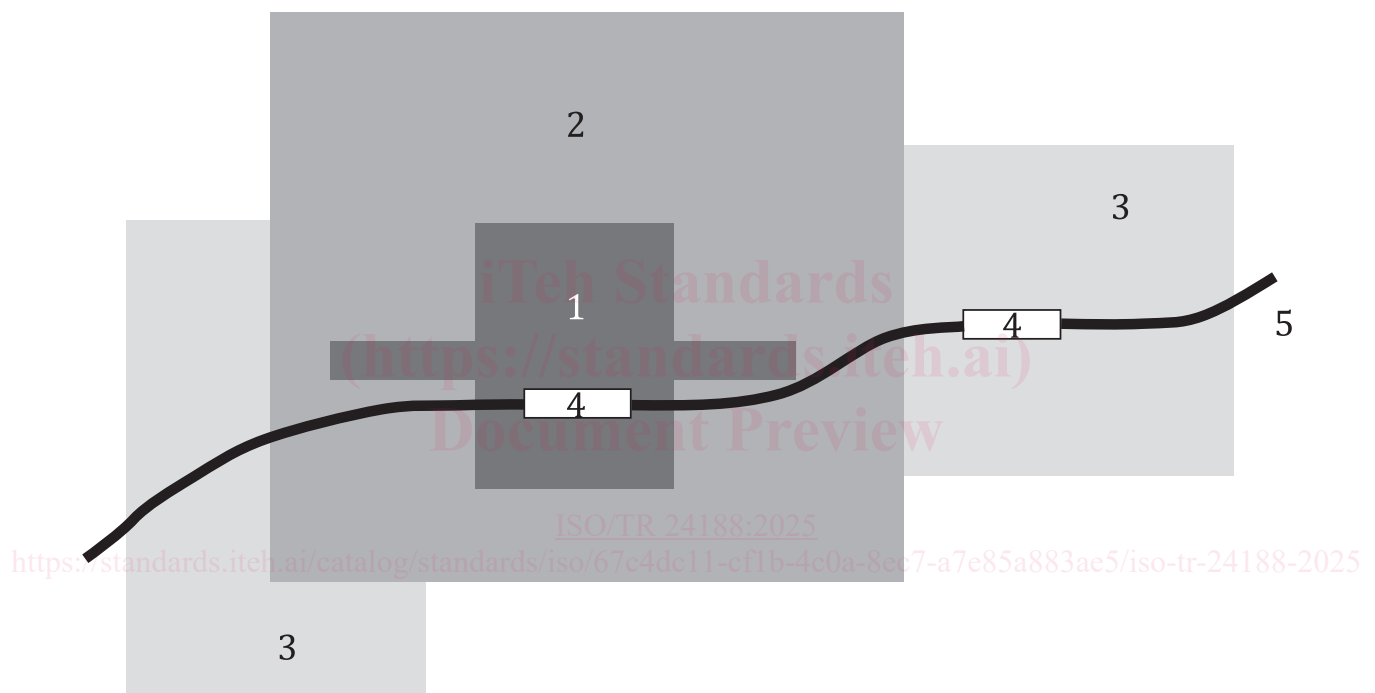
**Figure 1 — Fire propagation modes in large outdoor fires**

## 5 Regulation principle and strategies

### 5.1 Japan

The Building Standard Law (BSL) of Japan<sup>[25],[33]</sup> aims to cover the threat of large urban fires. According to the BSL, there are two major fire tests conducted in Japan in the context of preventing urban fire spread: a roof test and a fire resistance test for exterior walls.

The purpose of the BSL is to safeguard the life, health and property of people by providing minimum standards concerning the site, construction, equipment and use of buildings, and thereby to contribute to the furtherance of the public welfare. To prevent fires from spreading from one building to the next and to minimize the occurrence of urban fires, buildings located in "fire protection zones (FPZs)", "quasi-fire protection zones (QFPZs)", and "cities under Article 22 of BSL" are required to conform to the BSL. [Figure 2](#) illustrates the basic philosophy of zoning. While no scientific research has yet been carried out to determine the efficacy of these regulations, due at least in part to the regulations, large urban fires are a relatively rare occurrence in Japan today, and are most likely to occur under extreme conditions (in themselves rare), such as those following a major earthquake or in extremely high winds.



#### Key

- 1 fire protection zone
- 2 quasi-fire protection zone
- 3 cities under article 22 of BSL
- 4 station
- 5 railway

Figure 2 — Zoning concept according to BSL of Japan

### 5.2 California State Building Code (US)

California refers to the California Building Code, Title 24, Part 1, Chapter 7A Materials and Construction Methods for Exterior Wildfire Exposure, as well as Chapter 49, Requirements for Wildland-Urban Interface Areas. The following California State Fire Marshal (SFM) Test Standards are described: 12-7A-1<sup>[6]</sup>, 12-7A-2<sup>[20]</sup>, 12-7A-3<sup>[18]</sup>, 12-7A-4<sup>[14]</sup>, 12-7A-5<sup>[21]</sup>.