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**Fire hazard testing -**
**Part 1-12: Guidance for assessing the fire hazard of electrotechnical products - Fire safety engineering**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# Fire hazard testing - Part 1-12: Guidance for assessing the fire hazard of electrotechnical products - Fire safety engineering

## FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60695-1-12:2015. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60695-1-12 has been prepared by IEC technical committee 89: Fire hazard testing. It is an International Standard.

This document has been given the status of a horizontal document in accordance with the ISO/IEC Directives, Part 1. It has the status of a basic safety publication in accordance with IEC Guide 104 and ISO/IEC Guide 51.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) whole text is renewed to contain the most recent technologies of fire safety engineering mainly developed by ISO/TC92 Fire safety SC4 Fire safety engineering.

b) Annex A is changed to show example of application of FSE in an international standard.

The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---|---|
| 89/1631/CDV | 89/1670/RVC |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/reference. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts in the 60695 series, under the general title *Fire hazard testing*, can be found on the IEC web site.

IEC 60695-1 consists of the following parts:

Part 1-10: Guidance for assessing the fire hazard of electrotechnical products - General guidelines

Part 1-11: Guidance for assessing the fire hazard of electrotechnical products - Fire hazard assessment

Part 1-12: Guidance for assessing the fire hazard of electrotechnical products - Fire safety engineering

Part 1-30: Guidance for assessing the fire hazard of electrotechnical products - Preselection testing process - General guidelines

Part 1-40: Guidance for assessing the fire hazard of electrotechnical products - Insulating liquids.

This document is to be used in conjunction with IEC 60695-1-10 and IEC 60695-1-11.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

# INTRODUCTION

## Fire safety engineering

Fire safety engineering (FSE) is the application of engineering methods based on scientific principles to the development or assessment of designs in the built environment through the analysis of specific fire scenarios or through the quantification of risk for a group of fire scenarios.

Typical objectives of FSE are:

a) to protect life safety,

b) to protect property,

c) to maintain the continuity of operations,

d) to protect the natural environment, and

e) to preserve heritage.

The analysis of FSE is usually based on calculations that use input data obtained principally from quantitative fire tests as described in IEC 60695-1-11.

Fire safety engineering (FSE) is a discipline increasingly being used in support of performance-based national fire safety regulations in many states and regional jurisdictions throughout the world. ~~The eight parts of ISO/TR 13387 (see Clause 2 and [1] to [6]) and ISO 23932 outline the fundamental methodologies and uses of FSE. Further detailed aspects of FSE are covered in ISO 16730 [7], ISO/TS 16732 [8], ISO/TS 16733, ISO 16734 [9], ISO 16735 [10], ISO 16736 [11], ISO 16737 [12] and ISO/TR 16738.~~ ISO 23932-1 [1][1], developed by ISO TC 92/SC 4, outlines the fundamental methodologies and uses of FSE. Further detailed aspects of FSE are covered in ISO 16730-1 [2], ISO 16732-1 [3], ISO 16733-1 [4], ISO 24678-2 [5], ISO 24678-3 [6], ISO 24678-4 [7] and ISO/TR 16738 [8].

In addition to performance-based regulations, many nations are also using FSE to supplement prescriptive regulations by applying FSE principles to specific design aspects, where reduced costs, alternative practices, improved performance and improved safety are the objectives.

The International Maritime Organization (IMO) is using FSE and the ISO standards mentioned above to develop fire safety designs for ships as described in IMO MSC/Circ.1002[27]. These are considered to bring an improvement in the design ~~based on prescriptive fire safety requirements~~ of electrotechnical products.

There are handbooks, guides and literatures which give information with regards to FSE. See Bibliography [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38].

## Qualitative and quantitative fire tests

Many standardized qualitative fire test methods give information on the performance of a material or end product as measured in the test~~, which may or may~~. Such information usually is not ~~be~~ related to a real fire scenario or real installation practices. These qualitative fire test methods result in a "pass" or "fail" and/or a product or material ranking. They play an important role in prescriptive regulations, and the results of a qualitative test can be used indirectly in fire hazard assessment of electrotechnical products, but they are not suitable for directly supporting performance-based design.

Most standardized test methods developed by IEC TC 89 for electrotechnical products are of the qualitative type. It is agreed within ISO TC 92 and IEC TC 89 that this type of fire test will

[1] Numbers in square brackets refer to the Bibliography.

continue to be maintained and, where necessary, developed. It is recognized that, even if the use of these standards is in prescriptive codes, product data from many of these standards ~~may~~ can be potentially adaptable for fire safety engineering purposes.

In contrast, quantitative fire tests are increasingly being developed and used, and these provide data that can be inputs to fire safety engineering calculations.

Various ISO standards [14] to [23] for quantitative fire tests have been developed by ISO TC 92/SC 1, *Fire safety - Initiation and growth of fire*, some of which can be used to assess the performance of electrotechnical products ~~(see 9.4)~~, and referred to in the series of IEC 60695, e.g. IEC TS 60695-5-2 [9], IEC 60695-6-2 [10], IEC 60695-7-2 [11], IEC 60695-8-2 [12] and IEC 60695-9-2 [13].

## 1 Scope

This part of IEC 60695 ~~is intended as a general guideline for IEC Product Committees and provides~~ specifies methodologies of fire safety engineering for electrotechnical products by providing:

– an explanation of the principles and uses of fire safety engineering;

– guidance on the use of fire safety engineering in the design of electrotechnical products;

– fire safety engineering terminology, and concepts;

– an indication of properties, data and tests needed for input into fire safety engineering assessment; and

– informative references.

This document ~~is not intended to be a detailed technical design guide, but~~ is intended to provide guidance for product committees on fire safety engineering methods and performance-based tests for use in performance-based designs and fire hazard assessments of electrotechnical materials, assemblies, products and systems. More detailed information on fire safety engineering is contained ~~in the ISO/TR 13387 series of documents (see Clause 2 and [1] to [6]) and in ISO 23932~~ in ISO 23932-1 [1].

NOTE Further detailed aspects of FSE are covered in ~~ISO 16730 [7], ISO/TS 16732 [8], ISO/TS 16733, ISO 16734 [9], ISO 16735 [10], ISO 16736 [11], ISO 16737 [12] and ISO/TR 16738~~ ISO 16730-1 [2], ISO 16732-1 [3], ISO 16733-1 [4], ISO 24678-2 [5], ISO 24678-3 [6], ISO 24678-4 [7] and ISO/TR 16738 [8].

This basic safety publication focusing on safety guidance is primarily intended for use by ~~technical~~ committees in the preparation of ~~standards~~ safety publications in accordance with the principles laid down in IEC Guide 104 [39] and ISO/IEC Guide 51 [40].

One of the responsibilities of a ~~technical~~ committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications. ~~The requirements, test methods or test conditions of this basic safety publication will not apply unless specifically referred to or included in the relevant publications.~~

This document has the status of a horizontal publication in accordance with IEC Guide 108 [43].

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60695-1-10:2016, *Fire hazard testing - Part 1-10: Guidance for assessing the fire hazard of electrotechnical products - General guidelines*

IEC 60695-1-11, *Fire hazard testing - Part 1-11: Guidance for assessing the fire hazard of electrotechnical products - Fire hazard assessment*

IEC 60695-4:2021, *Fire hazard testing - Part 4: Terminology concerning fire tests for electrotechnical products*

~~IEC Guide 104, *The preparation of safety publications and the use of basic safety publications and group safety publications*~~

~~ISO/IEC Guide 51, *Safety aspects – Guidelines for inclusion in standards*~~

ISO 13943:~~2008~~2017, *Fire safety - Vocabulary*

~~ISO/TR 13387-2: *Fire safety engineering – Part 2: Design fire scenarios and design fires*~~

~~ISO/TR 13387-8, *Fire safety engineering – Part 8: Life safety: Occupant behaviour, location and condition*~~

~~ISO/TS 16733, *Fire safety engineering – Selection of design fire scenarios and design fires*~~

~~ISO/TR 16738, *Fire safety engineering – Technical information on methods for evaluating behaviour and movement of people*~~

~~ISO/TR 17252:2008, *Fire tests – Applicability of reaction to fire tests to fire modelling and fire safety engineering*~~

~~ISO 23932:2009, *Fire safety engineering – General principles*~~

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60695-4:2021 and ISO 13943:2017 apply.

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

– IEC Electropedia: available at http://www.electropedia.org/

– ISO Online browsing platform: available at http://www.iso.org/obp

~~For the purposes of this document, the terms and definitions given in ISO 13943:2008 and IEC 60695-4:2012, some of which are reproduced below for the user's convenience, as well as the following apply.~~

~~**3.1**~~
~~**absorptivity**~~
~~fraction of the incident radiation that is absorbed by a surface on which it falls~~

~~Note 1 to entry: Absorptivity is dimensionless.~~

~~**3.2**~~
~~**active fire protection**~~
~~action taken to reduce or prevent the spread and effects of fire in response to the detection of the fire~~

~~Note 1 to entry: Examples include the application of agents (e.g. halon gas or water spray) to the fire, or the control of ventilation.~~

~~**3.3**~~
~~available safe escape time~~

~~**ASET**~~
~~time available for escape~~
~~for an individual occupant, the calculated time interval between the time of ignition and the time at which conditions become such that the occupant is estimated to be incapacitated, i.e. unable to take effective action to escape to a safe refuge or place of safety~~

~~see also **required safe escape time** (3.40).~~

~~Note 1 to entry: The time of ignition can be known, e.g. in the case of a fire model or a fire test, or it may be assumed, e.g. it may be based upon an estimate working back from the time of detection. The basis on which the time of ignition is determined is always stated.~~