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Fire safety engineering — Design of evacuation experiments

National foreword

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Foreword

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This document was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 4, *Fire safety engineering.*

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.

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Introduction

Performance-based engineering requires analyses of building design. Such analyses require a great deal of data on occupant response, movement and behaviour. Data is also collected for the development and validation of model calculations. Empirical data sets are rare and those that exist can be difficult to use in combination.

This document provides guidance in the conduct of evacuation experiments and the collection and coding of data, so that users can understand the context under which the data was collected, and in order to facilitate the use of data sets in combination with each other. Although the development of a repository of data is not part of the scope of this document, the use of a consistent process for collecting and distilling peer-reviewed reaction, response and movement data will allow the development of such a repository.

This document specifies the techniques used in the collection of evacuation data. It also provides guidance for documenting experiments, so as to provide context and background for the use of the data, as well as a methodology for the coding of those data.

The main criterion suggested in this document for evaluating an evacuation is total evacuation time (a parameter of "escape time" as defined in ISO/TR 16738). Evacuation time includes pre-travel activity time (often called "pre-movement time") and travel time. Escape time depends on a range of qualitative and quantitative parameters (see ISO/TR 16738). Other possible performance measurands include walking speeds on horizontal surfaces, stairs and ramps, occupant densities, flows through openings, delays before and during evacuation, exit choice, affiliation, altruism, scepticism, courtesy range, herding behaviour, space occupancy, risk perception, etc. Information on the influence of these parameters on total evacuation time and on understanding human behaviours is available in ISO/TR 16738, ISO/TS 29761 and SFPE Guide[1]).

Instrumentation for measuring walking speeds, densities, delays, etc. is discussed in this document, along with suggested locations for instrumentation. A minimum level of instrumentation is also suggested.

The safety of participants is strongly emphasized in this document.

The evacuation experiments carried out in accordance with this document will allow the comparison of the results of other experiments also realized with this document and thus, will contribute to increased epistemological knowledge. This will be useful for the development or modification of building regulatory requirements and could provide useful information for assisting in the development or testing of evacuation models.

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Technical Specification **ISO/TS 17886:2024(en)**

Fire safety engineering — Design of evacuation experiments

1 Scope

This document specifies a methodology for the design of experiments conducted in the built environment to collect data on evacuation for the following purposes:

— for use in fire safety engineering;

— for comparing different evacuation experiments realized in different jurisdictions and conditions;

— for studying one or more variables;

— for achieving a general overview of an evacuation or for testing one or more parameters;

— for design safety procedures and training;

— for assessing evacuation plan(s);

— for reducing uncertainty on the results;

— for verifying the relevance of preventive measures implemented before and after building design;

— for refining software input parameters and making them more realistic;

— for comparing the results obtained with different software;

— for verifying and validating evacuation models (for example ISO 16730-1).

This document provides guidance in several main areas: initial planning, preparation, the evacuation experiment itself, coding the collected data, data analysis and interpretation and documentation of results.

This document sets out the considerations for an evacuation experiment, including geometry of the space, lighting and environmental conditions, occupant characteristics, cue or alarm used, instrumentation and safety considerations. It discusses performance measurements for the evacuation experiment. The results of any experiment depend on all these factors and their interactions, if any. This document does not define a standard evacuation experiment.

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.

ISO 13943, *Fire safety — Vocabulary*

ISO 23932-1, *Fire safety engineering — General principles — Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13943, ISO 23932 and the following 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

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