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Fire safety engineering — Requirements governing algebraic formulae —

Part 7: Radiation heat flux received from an open pool fire

Ingénierie de la sécurité incendie — Exigences régissant les formules algébriques —

Partie 7: Flux de chaleur rayonné reçu d'un feu en nappe ouvert

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Foreword

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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 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.

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

A list of all parts in the ISO 24678 series can be found on the ISO website.

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.

This corrected version of ISO 24678-7:2019 incorporates the following corrections:

Figure 1: "ISO 23932" has been corrected to "ISO 23932-1:2018". The box titled "selection of engineering methods" has been highlighted.

Figure A.2: The symbol *m*&, estimation of mass burning rate, has been corrected to $\dot{m}''$.

B.3.1.2, Formula B.2: first parenthesis, under the squared root, "x+1/x−1" has been corrected to read "x−1/x+1".

B.3.1.2, Formula B.5: second denominator "*r*" has been corrected to "r^2".

B.3.3.2.1, Figure B.11 a): The black triangles have been removed.

B.3.3.3.1, Figure B.12: The black rectangle has been removed.

B.3.3.3.1, Figure B.13: "1" has been removed from inside the figure.

B.3.3.3.1, Figure B.14: The horizontal line has been removed.

Introduction

This document is intended to be used by fire safety practitioners involved with fire safety engineering calculation methods. It is expected that the users of this document are appropriately qualified and competent in the field of fire safety engineering. It is particularly important that the users understand the parameters within which particular methodologies can be used.

Algebraic formulae conforming to the requirements of this document are used with other engineering calculation methods during fire safety design. Such a design is preceded by the establishment of a context, including the fire safety goals and objectives to be met, as well as performance criteria when a trial fire safety design is subject to specified design fire scenarios. Engineering calculation methods are used to determine if these performance criteria are met by a particular design and if not, how the design needs to be modified.

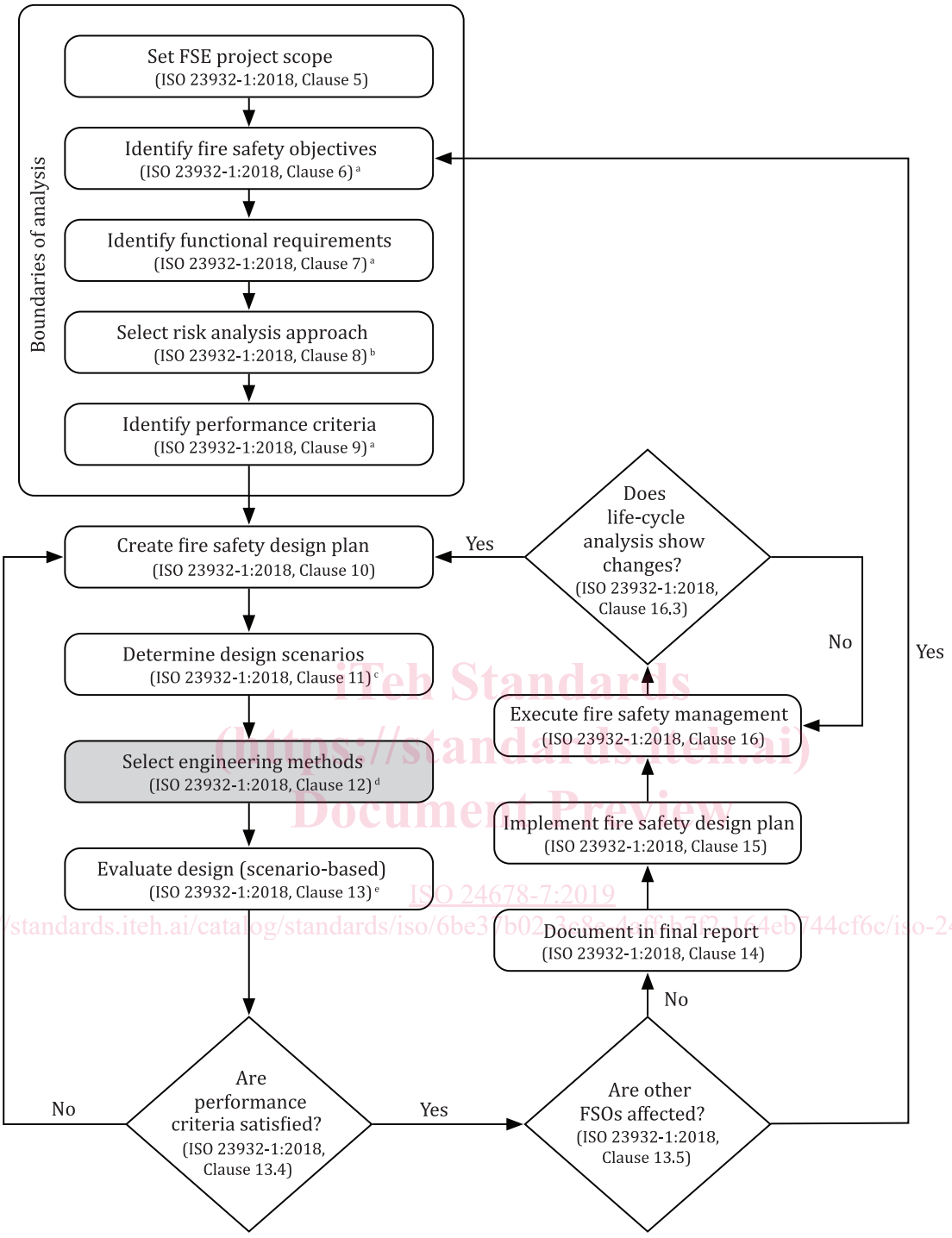
The subjects of engineering calculations include the fire safety design of entirely new built environments, such as buildings, ships or vehicles as well as the assessment of the fire safety of existing built environments.

The algebraic formulae discussed in this document can be useful for estimating the consequences of design fire scenarios. Such formulae are valuable for allowing the practitioner to quickly determine how a proposed fire safety design needs to be modified to meet performance criteria and to compare among multiple trial designs. Detailed numerical calculations can be carried out until the final design documentation. Examples of areas where algebraic formulae have been applicable include determination of convective and radiative heat transfer from fire plumes, prediction of ceiling jet flow properties governing detector response times, calculation of smoke transport through vent openings, and analysis of compartment fire hazards such as smoke filling and flashover. However, the simple models often have stringent limitations and are less likely to include the effects of multiple phenomena occurring in the design fire scenarios.

The general principles are described in ISO 23932-1, which provides a performance-based methodology for engineers to assess the level of fire safety for new or existing built environments. Fire safety is evaluated through an engineered approach based on the quantification of the behaviour of fire and based on knowledge of the consequences of such behaviour on life safety, property and the environment. ISO 23932-1 provides the process (i.e. necessary steps) and essential elements to conduct a robust performance-based fire safety design.

ISO 23932-1 is supported by a set of available fire safety engineering International Standards on the methods and data needed for all the steps in a fire safety engineering design as summarized in Figure 1 (taken from ISO 23932-1:2018, Clause 4). The set includes ISO 16730-1, ISO 16733-1, ISO 16732, ISO 16734, ISO 16735, ISO 16736, ISO 16737, ISO/TR 16738, ISO 24678-6, ISO/TS 24679, ISO 23932-1, ISO/TS 29761 and other supporting technical reports that provide examples of and guidance on the application of these standards.

Each International Standard supporting the global fire safety engineering analysis and information system includes language in the introduction to tie the standard to the steps in the fire safety engineering design process outlined in ISO 23932-1. ISO 23932-1 requires that engineering methods be selected properly to predict the fire consequences of specific scenarios and scenario elements (ISO 23932-1:2018, Clause 10). Pursuant to the requirements of ISO 23932-1, this document provides the requirements governing algebraic formulae for fire safety engineering. This step in the fire safety engineering process is shown as a highlighted box in Figure 1 and described in ISO 23932-1.



Key

a See also ISO/TR 16576 (Examples).

b See also ISO 16732-1, ISO 16733-1, ISO/TS 29761.

c See also ISO 16732-1, ISO 16733-1, ISO/TS 29761.

d See also ISO/TS 13447, ISO 16730-1, ISO/TR 16730-2 to 5 (Examples), ISO 16734, ISO 16735, ISO 16736, ISO 16737, ISO/TR 16738, ISO 24678-6.

[e] See also ISO/TR 16738, ISO 16733-1.

NOTE Documents linked to large parts of the FSE process: ISO 16732-1, ISO 16733-1, ISO/TS 24679, ISO/TS 29761, ISO/TR 16732-2 to 3 (Examples), ISO/TR 24679-2 to 4 and 6 (Examples).

Figure 1 — Flow chart illustrating the fire safety engineering design process (from ISO 23932-1:2018)