PD ISO/TS 21602:2022



BSI Standards Publication

Fire safety engineering — Estimating the reduction in movement speed based on visibility and irritant species concentration

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee FSH/24, Fire safety engineering.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Published by BSI Standards Limited 2023

ISBN 978 0 539 12048 6

ICS 13.220.01

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 28 February 2023.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TS 21602:2022

TECHNICAL SPECIFICATION

ISO/TS 21602

First edition
2022-12-21

Fire safety engineering — Estimating the reduction in movement speed based on visibility and irritant species concentration

Ingénierie de la sécurité incendie — Estimation de la réduction de la vitesse de déplacement basée sur la visibilité et la concentration en espèces irritantes

Reference number
ISO/TS 21602:2022(E)

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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*.

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

In performance-based fire safety design, the designer can need to consider that people will move through an environment containing fire smoke. For these types of conditions, the movement speed of occupants is expected to be influenced by the smoke. For example, speed can potentially be reduced due to visibility and the presence of irritant species affecting vision. The precise influence will depend on the smoke characteristics (e.g. soot content and species concentration) as well as on the characteristics of the occupants and the built environment.

This document provides guidance on how visibility, irritant species, occupant characteristics and the built environment influence movement speed in fire smoke. In addition, the document provides correlation between movement speed and selected smoke characteristics, namely visibility and irritant species concentration. Performance criteria related to visibility and irritant species are not specified in this document. Additionally, this document does not consider other sub-incapacitating effects of fire species, (e.g. influence on cognition from asphyxiant or irritant species), nor does is consider the effects of smoke on way-finding or behaviour.

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TECHNICAL SPECIFICATION **ISO/TS 21602:2022**

Fire safety engineering — Estimating the reduction in movement speed based on visibility and irritant species concentration

1 Scope

The aim of this document is to provide designers with correlations that can be used in performance-based fire safety design to represent the reduction of movement speed of building occupants when walking in an environment with low visibility, which also contains irritants. Different correlations are provided for deterministic analysis and probabilistic analysis.

It is recognized that values for visibility and irritant species concentration can be used as performance criteria in performance-based fire safety design. Performance criteria related to visibility and irritant species are not specified in this document. However, it is always necessary to take into account relevant performance criteria when applying this document. For example, an occupant cannot be assumed to continue moving if a performance criterion related to visibility or irritant species concentration is violated in the design calculations.

It is also recognized that fire smoke can have an influence on the cognitive processes of occupants during evacuation. This type of influence on cognition is not covered in this document but can be considered if deemed to have a major impact.

Fire smoke can also influence behaviour (e.g. occupants changing their movement path if moving into worsening smoke conditions). This type of behaviour change is not included in this document but can be considered if deemed to have a major impact.

In some jurisdictions, it is not permitted to include fire smoke in escape routes as part of the fire safety design; this document is not applicable in such situations.

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*

3 Terms and definitions

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

— IEC Electropedia: available at https://www.electropedia.org/

3.1
extinction coefficient
C_s
natural logarithm of the ratio of incident light intensity to transmitted light intensity, per unit light path length

Note 1 to entry: The typical unit is m^{-1}.

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