
Guidelines for assessing the fire threat to people

*Lignes directrices pour l'évaluation des dangers du feu pour les
personnes*



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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General principles	2
5 Significance and use	3
6 Generation and nature of effluent	3
7 Sources of data on fire effluent	5
8 Effects of fire effluent on people	8
Annex A (informative) Factors affecting fire threat to people	9
Bibliography	10

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 19706 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 3, *Fire threat to people and environment*.

This first edition of ISO 19706 cancels and replaces ISO/TS 19706:2004, which has been technically revised.

Introduction

All fires produce toxic gases, smoke and heat. Whether the fire occurs in a residence, a commercial building, or a transportation vehicle, exposure to this effluent can have serious consequences for the occupants, responding fire safety personnel, and for larger fires, people in the environment surrounding the structure.

It is necessary to anticipate the effects of a possible fire on the safety of the occupants when considering both the design and construction of the enclosure, and also the burning behaviour of the contents. Building codes and similar documents for transportation vehicles generally provide for the egress or refuge of occupants: it is necessary that the time available for escape exceed the time required for escape. Underestimating the effects of fire effluent on the former can result in not providing the intended degree of safety or in overestimating the impact of fire-mitigation tactics, whereas overestimating the threat can inappropriately limit the use of construction, finish and furnishing materials and products, as well as constrain occupancy design options and escalate costs.

Thus, it is important in the fire safety engineering of facilities to include the effects of fire effluent and to include them accurately and in full awareness of available knowledge. From a complementary perspective, it is necessary that information on fire effluent toxic potency be combined with additional consideration of design fire scenarios, the combined effects of ignitability, heat release and mass loss rate, smoke density, the occupancy and the occupants themselves in a fire hazard or risk assessment, rather than selecting, banning or demeaning a construction or furnishing material or product based on its smoke production and toxic potency alone.

All measurements, calculations and assumptions are characterized by a degree of uncertainty. The utility of the outcome of a fire hazard or risk assessment, or the evaluation of the toxic potency of the fire effluent from products and materials, depends on knowing the uncertainties in the assessment methodology and the uncertainties in the input data. This International Standard addresses the uncertainty in the characterization of fire effluent, the measurement of effluent effects and the accuracy of the measurements.

The purpose of this International Standard is to provide general guidelines for estimating the fire threat to people and to the development of quantitative information on effluent potency for use in fire hazard and risk assessment and for the determination of the toxic potency of the fire effluent from burning products and materials.

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Guidelines for assessing the fire threat to people

1 Scope

This International Standard is intended to serve as general guidelines for the assessment of the fire threat to people. It encompasses the development, evaluation and use of relevant quantitative information for use in fire hazard and risk assessment. This information, generally obtained from fire-incidence investigation, fire statistics, real-scale fire tests and from physical fire models, is intended to be used in conjunction with computational models for analysis of the initiation and development of fire, fire spread, smoke formation and movement, chemical species generation, transport and decay, and people movement, as well as fire detection and suppression [ISO/TR 13387 (all parts)]. Aspects of the methodology described here are further amplified in ISO 13571 and ISO 13344.

This International Standard is intended to facilitate addressing the consequences of a single acute human exposure to fire effluent. Other effects of the heat, gases and aerosols (such as effects on electronic equipment and effects of frequent, multiple environmental exposures of people), which are of importance in fire safety design, are addressed elsewhere.

2 Normative references

The following referenced documents are indispensable for the application 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 13571, *Life-threatening components of fire — Guidelines for the estimation of time available for escape using fire data*

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.

3.1

asphyxiant

toxicant causing loss of consciousness and ultimately death resulting from hypoxic effects, particularly on the central nervous and/or cardiovascular systems

3.2

concentration-time curve

plot of the concentration of a gaseous toxicant or fire effluent as a function of time

NOTE The typical units for the concentration of the toxic gas are microlitres per litre and for fire effluent, grams per cubic metre. The units of microlitre per litre are numerically identical to parts per million (ppm), the use of which is discouraged.

3.3

escape

effective action by occupants to accomplish their own arrival at a place of safe refuge