INTERNATIONAL STANDARD

ISO 16734

First edition
2006-07-01

Fire safety engineering — Requirements governing algebraic equations — Fire plumes

Ingénierie de la sécurité incendie — Exigences régissant les équations algébriques — Panaches de feu

Reference number
ISO 16734:2006(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 16734 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 4, *Fire safety engineering*.

Introduction

This International Standard is intended to be used by fire-safety practitioners who employ fire-safety engineering calculation methods. Examples include fire-safety engineers; authorities having jurisdiction, such as territorial authority officials; fire service personnel; code enforcers; and code developers. It is expected that users of this International Standard are appropriately qualified and competent in the field of fire-safety engineering. It is particularly important that users understand the parameters within which particular methodologies can be used.

Algebraic equations conforming to the requirements of this standard are used with other engineering calculation methods during fire safety design. Such 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 tentative fire safety design is subject to specified design fire scenarios. Engineering calculation methods are used to determine if these performance criteria will be met by a particular design and if not, how the design shall be modified.

The subjects of engineering calculations include the fire-safe 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 equations discussed in this standard are very useful for quantifying the consequences of design fire scenarios. Such equations are particularly valuable for allowing the practitioner to determine very quickly how a tentative fire safety design should be modified to meet performance criteria agreed-upon, without having to spend time on detailed numerical calculations until the stage of final design documentation. Examples of areas where algebraic equations have been applicable include determination of heat transfer, both convective and radiant, 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. With respect to fire plumes, algebraic equations are often used to estimate flame dimensions so that the safe separation distance between a potential fire and a vulnerable target can be calculated. Algebraic plume equations are also useful for estimating rates of flame spread, both horizontal and vertical, within a built environment containing combustible materials.

The algebraic equations discussed in this standard are essential for checking the results of comprehensive numerical models that calculate fire growth and its consequences.

Fire safety engineering — Requirements governing algebraic equations — Fire plumes

1 Scope

1.1 The requirements in this International Standard govern the application of explicit algebraic equation sets to the calculation of specific characteristics of fire plumes.

1.2 This International Standard is an implementation of the general requirements provided in ISO/TR 13387-3 for the case of fire dynamics calculations involving sets of explicit algebraic equations.

1.3 This International Standard is arranged in the form of a template, where specific information relevant to algebraic fire plume equations is provided to satisfy the following types of general requirements:

a) description of physical phenomena addressed by the calculation method;

b) documentation of the calculation procedure and its scientific basis;

c) limitations of the calculation method;

d) input parameters for the calculation method;

e) domain of applicability of the calculation method.

1.4 Examples of sets of algebraic equations meeting all the requirements of this International Standard are be provided in separate annexes to this International Standard for each different type of fire plume. Currently, there is one informative annex containing algebraic equations for quasi-steady state, axisymmetric fire plumes.

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/TR 13387-3, *Fire safety engineering — Part 3: Assessment and verification of mathematical fire models*

ISO 13943, *Fire safety — Vocabulary*

3 Terms and definitions

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

NOTE See Annex A for the terms and definitions specific to that annex.