PD 7974-2:2019

BSI Standards Publication

Application of fire safety engineering principles to the design of buildings –

Part 2: Spread of smoke and toxic gases within and beyond the enclosure of origin (Sub-system 2)

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Contents

Summary of pages
This document comprises a front cover, and inside front cover, pages i to iv, pages 1 to 50, an inside back cover and a back cover.

Foreword

Publishing information

This Published Document is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 March 2019. It was prepared by Technical Committee FSH/24, *Fire safety engineering*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This Published Document supersedes PD 7974-2:2002, which is withdrawn.

Relationship with other publications

This Published Document is one of a series of documents published under the Fire Standards Policy Committee, and is a supporting document to BS 7974, *Application of fire safety engineering principles to the design of buildings — Code of practice*.

Other documents in the series are:

PD 7974-1: *Initiation and development of fire within the enclosure of origin*;

PD 7974-3: *Structural response to fire and fire spread beyond the enclosure of origin* ;

PD 7974-4: *Detection of fire and activation of fire suppression systems*;

PD 7974-5: *Fire service intervention*;

PD 7974-6: *Evacuation*;

PD 7974-7: *Probabilistic risk assessment*;

Where appropriate, references to relevant standards are provided in order to assist the reader in understanding the design methodologies presented and to compare different approaches or sources of data. It is therefore important that PD 7974-2 is not used in isolation and reference is made to the relevant standards, particularly in relation to additional notes and subclauses describing its application.

Information about this document

This is a full revision of the document, and introduces the following principal changes:

- greater clarity regarding smoke control design principles, application and procedures;
- new information on the practical application of natural and mechanical smoke control, and the use of smoke barriers;
- rationalization of guidance on computer simulation modelling principles, as the intent of this guide is smoke control rather than computer fire modelling;
- where practicable, explicit acknowledgements of the inherent assumptions and limitations of underpinning design correlations;
- revised and new correlations with respect to spill plumes and the axisymmetric plume;
- new figures to aid the correct use of design correlations;
- calculation of smoke detection time for activating smoke control;
- greater clarity on design considerations for smoke reservoir size, and the interaction between sprinklers/smoke ventilation; and

- improved reference data for smoke and toxic gas yields.

Use of this document

As a guide, this Published Document takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice and claims of compliance cannot be made to it.

This publication is not to be regarded as a British Standard.

Presentational conventions

The guidance in this Published Document is presented in roman (i.e. upright) type. Any recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a Published Document cannot confer immunity from legal obligations.

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0 Introduction

This Published Document (PD) is one of a series of documents intended to support BS 7974. It provides a framework for developing a rational methodology for design using a fire safety engineering approach through the application of scientific and engineering principles to the protection of people, property and the environment from fire.

This PD contains guidance and information on how to undertake quantitative analysis for smoke control. This PD is a summary of the latest knowledge and techniques and it does not preclude the use of appropriate methods and data from other sources.

When used by suitably qualified persons, experienced in fire safety engineering, this PD provides a means of establishing acceptable levels of fire safety economically and without imposing unsuitable constraints on aspects of building design.

Sub-system 1 (see PD 7974-1) provides information on the rate of production of heat and combustion products from the fire source. The aim of sub-system 2 is to provide design approaches to estimate the spread of the combustion gases within and beyond the room of origin and to evaluate their properties, i.e. temperature, visibility and concentration of toxic products.

This PD forms part of a series of Sub-systems 1 to 6 (see PD 7974-1 to PD 7974-6), but may, in consultation with the appropriate references, be regarded as "stand-alone" guidance.

PD 7974-4 has now been withdrawn; it provided guidance on the detection of fire and activation of fire protection systems. This guidance is now included in the various parts of the PD 7974 series and other standards covering the subject. PD 7974-4 is referred to as part of the PD 7974 series for the sake of completeness but is no longer maintained as a current document.

1 Scope

This Published Document provides guidance on the application of fire safety engineering principles for the treatment of smoke movement, control and management problems. The guidance is intended primarily for professional engineers with a responsibility for the design or assessment of fire safety in buildings.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and symbols

For the purpose of this part of PD 7974, the following terms and definitions apply.

3.1 Terms and definitions

3.1.1 aerodynamic free area

product of the geometric area and the discharge coefficient

[SOURCE: BS 7346-4:2003, **3.1.2**]

3.1.2 air entrainment

mixing of ambient air into a jet or plume

