TECHNICAL REPORT

ISO/TR 11696-1

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Uses of reaction to fire test results —

Part 1:

Application of test results to predict fire performance of internal linings and other building products

Utilisation des résultats des essais de réaction au feu —

Partie 1: Application des résultats à la prédiction de la performance au feu des revêtements intérieurs et d'autres produits de bâtiment

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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 3.

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In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this part of ISO/TR 11696 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 11696-1, was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*.

ISO/TR 11696 consists of the following parts, under the general title *Uses of reaction to fire test results*:

— *Part 1: Application of test results to predict fire performance of internal linings and other building products*

— *Part 2: Fire hazard assessment of construction products*

Introduction

This Technical Report deals with a methodology for describing fire development from building products in fire rooms under real life conditions by the use of results from small-scale tests, mostly those described in ISO/TR 3814, as input for different types of fire models.

Fire is a complex phenomenon. Its behaviour depends upon a number of inter-related factors. The behaviour of materials and products depends upon the characteristics of the fire, the end-use application and the environment in which they are exposed. The tests described in ISO/TR 3814 provide the basis for obtaining important physical data describing ignition, flame spread, rate of heat release and smoke. Each single test explained in this Technical Report deals only with a simple representation of a particular aspect of the potential fire situation and cannot alone provide any direct guidance on behaviour or safety in fire.

Uses of reaction to fire test results —

Part 1: Application of test results to predict fire performance of internal linings and other building products

1 Scope

This Technical Report describes how information on basic values for ignition, spread of flame, rate of heat release and smoke can be used in fire growth models for internal linings and other building products to describe the fire hazard in a limited number of scenarios starting with fire development in a small room. Other scenarios include fire spread in a large compartment and fire propagation down a corridor.

The types of models to be used are:

a) mathematical models based on fire growth physics, which calculate fire room variables, the results of which may be used for fire safety engineering purposes; and

b) generalized engineering calculations.

Sub-models can be included within the above models, provided the consistency of the whole is not prejudiced.

The models in general are not limited to one fire scenario.

The models should be used to calculate and describe the fire properties of building products in their end-use conditions. The use of models should not be limited by difficult materials, but it is recognized that some products may not be capable of being modelled (for example due to their complex assembly or to their thermoplastic properties).

Input parameters for models are based on ISO tests, mainly those in ISO/TR 3814.

The quality of a fire model for wall and ceiling linings is assessed by comparison with test results from a full-scale small room test for surface products and by sensitivity analysis on the model itself.

2 References

ISO/IEC Guide 52, *Glossary of fire terms and definitions*.

ISO 3261, *Fire tests — Vocabulary*.

ISO/TR 3814, *Tests for measuring "reaction-to-fire" of building materials — Their development and application*.

ISO 5657, *Reaction to fire tests — Ignitability of building products using a radiant heat source*.

ISO/TR 5658-1, *Reaction to fire tests — Spread of flame — Part 1: Guidance on flame spread.*

ISO 5658-2, *Reaction to fire tests — Spread of flame — Part 2: Lateral spread on building products in vertical configuration.*

ISO 5660-1, *Reaction to fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (Cone calorimeter method).*

ISO 5660-2, *Reaction to fire tests — Heat release, smoke production and mass loss rate from building products — Part 2: Smoke production rate (dynamic measurement).*

ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions.*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method.*

ISO/TR 5924, *Fire tests — Reaction to fire — Smoke generated by building products (dual-chamber test).*

ISO/TR 9122-1, *Toxicity testing of fire effluents — Part 1: General.*

ISO/TR 9122-2, *Toxicity testing of fire effluents — Part 2: Guidelines for biological assays to determine the acute inhalation toxicity of fire effluents (basic principles, criteria and methodology).*

ISO/TR 9122-3, *Toxicity testing of fire effluents — Part 3: Methods for the analysis of gases and vapours in fire effluents.*

ISO/TR 9122-4, *Toxicity testing of fire effluents — Part 4: The fire model (furnaces and combustion apparatus used in small-scale testing).*

ISO/TR 9122-5, *Toxicity testing of fire effluents — Part 5: Prediction of toxic effects of fire effluents.*

ISO/TR 9122-6, *Toxicity testing of fire effluents — Part 6: Guidance for regulators and specifiers on the assessment of toxic hazards in fires in buildings and transport.*

ISO 9239-1, *Reaction to fire tests — Part 1: Determination of the burning behaviour with a radiant heat source.*

ISO 9239-2, *Reaction to fire tests — Horizontal surface spread of flame on floor coverings — Part 2: Flame spread at higher heat flux levels.*

ISO 9705, *Fire tests — Full-scale room test for surface products.*

ISO/TR 11925-1, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 1: Guidance on ignitability.*

ISO/TR 14696, *Reaction to fire tests — Determination of fire parameters of materials, products and assemblies using an intermediate-scale heat release calorimeter (ICAL).*

3 Terms and definitions

For the purposes of this part of ISO TR 11696, the terms and definitions given in ISO/IEC Guide 52 and ISO 3261 apply.

4 Fire scenarios

4.1 There is a need to improve preventive fire protection because of public demand for more safety against fire hazards which have increased during the last decade.

4.2 To evaluate the fire hazard, technical fire tests have to be used. Since these will provide the basis for safety requirements they must be relevant to the end use of a product.

4.3 Fire growth, smoke production and generation of toxicants or corrosive gas depend on the specific properties of a material, its mass, its form and orientation and its surface area.

4.4 To start a fire and for fire development, three components are necessary: heat, air and combustible material (see Figure 1).

4.5 The development of fire can be split into different phases (see Figure 2, which describes two different fire growth courses).

4.6 Traditionally, fire types in rooms have been subdivided into combustion categories, as is done in ISO/TR 9122 (all parts). This scheme suggests that there are six different fire types, each with a characteristic value of oxygen concentration, CO_2/CO ratio, etc.

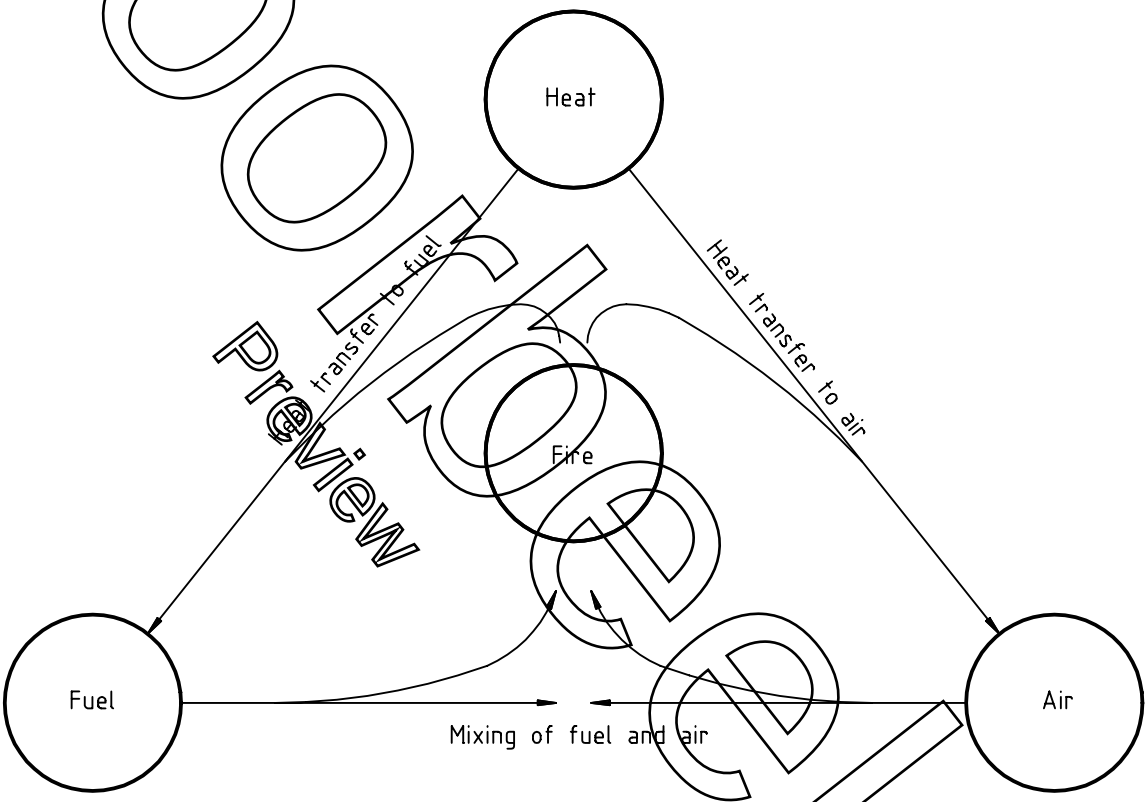

Figure 1 — Components necessary for starting a fire

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