TECHNICAL REPORT

ISO/TR 11925-1

First edition
1999-03-15

Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame —

Part 1:
Guidance on ignitability

Essais de réaction au feu — Allumabilité des produits de bâtiment soumis à l'incidence directe de la flamme —

Partie 1: Lignes directrices sur l'allumabilité

Reference number
ISO/TR 11925-1:1999(E)

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.

Technical Reports are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances, a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, 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).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 11925-1, which is a Technical Report of type 3, was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Reaction to fire.*

ISO/TR 11925 consists of the following parts, under the general title *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame*:

— *Part 1: Guidance on ignitability*

— *Part 2: Single flame source test*

— *Part 3: Multi-source test*

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

Introduction

Ignitability of materials is of basic importance when fire hazard is analysed because of two reasons: First, at the initiation of a fire some object or local area is ignited, and second, during the fire growth period ignitability is an essential factor in fire spread to the other parts of a room or compartment.

In buildings the structural, lining and furnishing materials are solids, which require external heating to achieve flaming combustion. The ignition condition can be characterized by the minimum surface temperature at which the flow of volatiles is sufficient for sustained flaming. However, the difference in these temperatures between materials is not large. Hence it is usually more important to take into account the time of exposure and the thermal properties of the material when assessing risk of ignition.

When a material is exposed to an external heat flux (radiative, convective, conductive or a combination), its surface temperature starts to rise. The temperature inside the solid also increases with time, but at a slower rate. Provided the net flux into the material is sufficiently high, eventually the surface temperature reaches a level at which pyrolysis begins. The vapours generated emerge through the exposed surface and mix with air in the boundary layer. Under certain conditions this mixture exceeds the lower flammability limit and ignites. The initiation of flaming combustion as described above is termed *flaming ignition*. For some materials or under certain conditions, combustion is not in the gas phase but in the solid phase. In such cases no flame can be observed and the surface is glowing. This quite different phenomenon is termed *smouldering ignition*.

The definition of ignition has been debated in many fora. It is most usually defined as the presence of a flame on a surface, or more simply the persistence of flame. Some documents try to subdivide the ignition process in three ways: flashing (less than 1s of flaming); transient ignition (greater than 1s and less than 4s); and sustained ignition (more than 4s of flame). Other documents define ignition as the persistence of flame for greater than 10s. Many of the definitions have been derived from apparatus-dependent parameters. All definitions have their merits and all have been well discussed.

This Technical Report describes and characterizes the "real fire" ignition sources, the ignition sources used in the testing of materials and products, and any correlation between those and "real fire" sources. Some of the theoretical principles of ignition and ignitability are also addressed.

The majority of ignitability tests used internationally are based on the direct application of a flame. A few tests involve radiative heating of the material but generally also require some form of pilot source whether a flame or a spark. In general the ignition sources used have some relevance to end-use hazard.

ISO/TC 92/SC 1 has concentrated on the development of tests to simulate ignitability by a range of flame sources of increasing size and also a piloted (by flame) radiative ignition source, see ISO 11925-2 and ISO 11925-3 and ISO 5657, respectively.

The guidance given in this Technical Report should enable choice of the appropriate ignition source when related to the end-use application of the material or product being assessed.

A comprehensive review of piloted ignition and ignitability test methods is also given in ISO/TR 11696-1. ISO 11093 also provides a brief description for a number (13) of different types of ignition source and is a reference document for persons seeking descriptions of the standardized source apparatus

Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame —

Part 1:
Guidance on ignitability

1 Scope

This Technical Report provides guidance on "ignitability" tests for building products. It describes the principles of ignitability and characterizes different ignition sources.

The results of small-scale ignitability tests may be used as a component of a total hazard analysis of a specified fire scenario. It is therefore important that the flame or radiative source chosen is fully characterized so that relevant conclusions may be made from the test results.

Guidance given in this Technical Report may also have relevance to other application areas (e.g. building contents, plastics, etc.)

2 References

ISO 5657:1997, *Reaction to fire tests — Ignitability of building products using a radiant heat source.*

ISO 5658-2:1996, *Reaction to fire tests — Spread of flame — Part 2: Lateral spread on building products in vertical configuration*.

ISO 5660-1:1993, *Fire tests — Reaction to fire — Part 1: Rate of heat release from building products (Cone calorimeter method).*

ISO 9239-1:1997, *Reaction to fire tests — Horizontal surface spread of flame on floor-covering systems — Part 1: Flame spread using a radiant heat ignition source.*

ISO 9705:1993, *Fire tests — Full scale room test for surface products*.

ISO 10093:1998, *Plastics — Fire tests — Standard ignition sources*.

ISO/TR 11696-1:—[1)], *Use of reaction to fire tests — Part 1: Application of results to predict fire performance of building products by mathematical modelling*.

ISO 11925-2:1997, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single flame source test.*

ISO 11925-3:1997, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 3: Multisource test.*

---

1) To be published.