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Furniture — Assessment of the ignitability of mattresses and upholstered bed bases —

Part 2: Ignition source: match flame equivalent

Ameublement — Évaluation de l'allumabilité des matelas et des sommiers rembourrés —

Partie 2: Source d'allumage: flamme équivalente à celle d'une allumette

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Contents

Page

Foreword

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This document was prepared by ISO/TC 136, *Furniture*.

A list of all parts in the ISO 16502 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a part of the ISO 16502 series concerned with the ignitability of mattresses and upholstered bed bases using different ignition sources. The ignition source used in this document is a gas flame equivalent to a match flame.

When mattresses or bed bases are used or stored on their own, it is desirable to know their ignitability in their own right.

It cannot be assumed that protection against flaming sources automatically gives protection against smouldering ignition. Users of this document should therefore recognize the need to submit test specimens to both a gas flame equivalent to a match flame and cigarette ignition tests.

WARNING — Attention is drawn to the fact that the tests given in the test report (see Clause 11) are not intended to reproduce the full fire hazards that may be encountered.

Furniture — Assessment of the ignitability of mattresses and upholstered bed bases —

Part 2:
Ignition source: match flame equivalent

1 Scope

This document specifies a test method to assess the ignitability of mattresses, upholstered bed bases or mattress pads when subjected to a gas flame as an ignition source.

This document does not apply to air mattresses and water beds.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
progressive smouldering
exothermic oxidation, not accompanied by *flaming* (3.2), that is self-propagating, i.e. independent of the *ignition source* (3.4), which may or may not be accompanied by incandescence

3.2
flaming
undergoing combustion in the gaseous phase with the emission of light

3.3
ignitability
measure of the ease with which a material, product or component can be ignited so as to flame or progressively smoulder

3.4
ignition source
source of energy used to ignite combustible materials or products

3.5
mattress pad
upholstered product that is used in conjunction with, and to complement, a *mattress* (3.6) or upholstered *bed base* (3.7)

3.6
mattress
upholstered product intended for sleeping upon

3.7
bed base
structure that supports a *mattress* (3.6) or the surface(s) of a mattress that support(s) a user

3.8
upper surface
surface of a *bed base* (3.7) that supports a *mattress* (3.6) or the surface(s) of a mattress that support(s) a user

4 Criteria of ignition

4.1 Progressive smouldering ignition

For the purposes of this document, all the following types of behaviour are considered to be progressive smouldering ignitions:

a) any test assembly that displays escalating combustion behaviour so that it is unsafe to continue the test and active extinction is necessary;

b) any test assembly that smoulders until it is largely consumed within the test duration;

c) any test assembly that smoulders to its full thickness, within the test duration;

d) any test assembly that smoulders after 1 h from the application of the ignition source;

e) any test assembly that, on final examination (see 10.3), shows evidence of progressive smouldering.

NOTE In practice it has been found that there is usually a clear distinction between materials which can char under the influence of the ignition source but which do not propagate further (non-progressive combustion) and those where smouldering develops in extent and spreads (progressive combustion).

4.2 Flaming ignition

For the purposes of this document, all the following types of behaviour are considered to be flaming ignitions:

a) any test assembly that displays escalating combustion behaviour so that it is unsafe to continue the test and active extinction is necessary;

b) any test assembly that burns until it is essentially consumed within the test duration;

c) any test assembly on which any flame front reaches the lower margin, either side or passes through its full thickness within the duration of the test;

d) any flaming which continues for more than 120 s after removal of the burner tube.

5 Principle

To subject a full upper surface or upper surface characteristic features of a mattress, the bed base or the mattress pad to the contact of a gas flame which is equivalent to a match flame by placing the gas flame so that all the zones having different characteristics are tested.

6 Instructions for use

6.1 General

The test method specified in this document presents a considerable hazard; suitable precautions shall be taken, which may include the provision of breathing apparatus and protective clothing.

6.2 Enclosure

For safety, the test should be conducted in a non-combustible fume cupboard. If such a cupboard is not available, a test enclosure should be constructed (see 7.2) so that the operator is protected from the fumes.

6.3 Extinguishers

Adequate means of extinguishing the assembly should be provided bearing in mind that some combinations may produce severe flaming during the test. A hand and/or fixed water spray which can be directed over the burning area can be useful. Other means such as suitable fire extinguishers, fire blankets and a bucket of water can assist.

In some cases smouldering may be difficult to extinguish completely and complete immersion in water may be necessary.

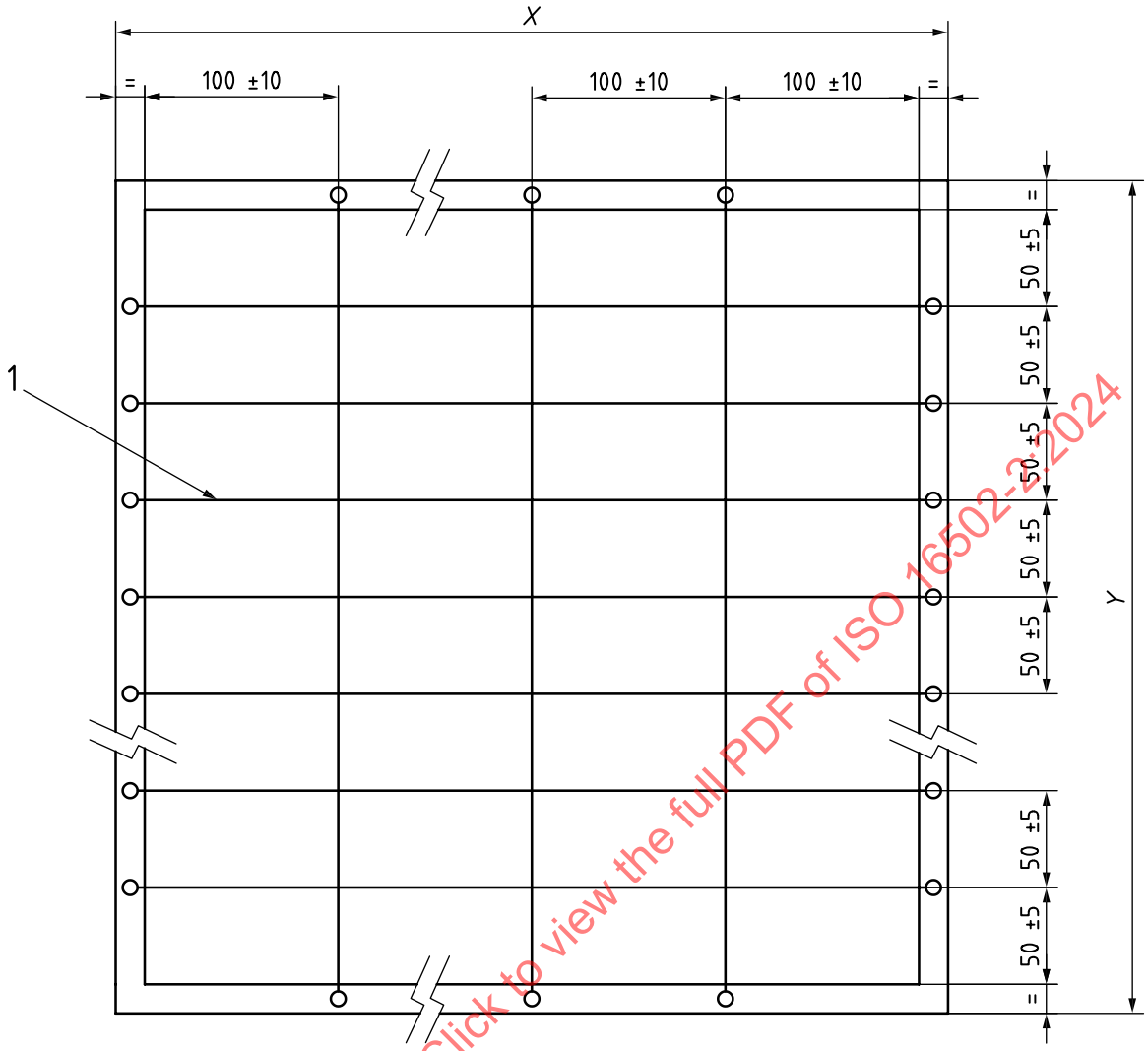
7 Apparatus

7.1 Test rig

The test rig consists of a platform of expanded steel or open mesh at least 450 mm × 450 mm supported at least 75 mm above a solid base (a suitable test rig mesh is illustrated in Figure 1). The size of the mesh is not critical.

For the tests, the rigs shall be sited within the enclosure (see 7.2) and the testing shall be performed in a basically draught-free environment permitting an adequate supply of air and removal of smoke from the area of the apparatus.

Dimensions in millimetres



Key

X test rig width at least test specimen width

Y test rig length at least test specimen length

1 mesh made from wire approximately 2 mm in diameter

Figure 1 — Test rig assembly

7.2 Test enclosure

The test enclosure shall consist of either a room with a volume greater than 20 m^3 (which contains adequate oxygen for testing) or a smaller enclosure with a through flow of air. Inlet and extraction systems providing an air speed rate of less than 0,2 m/s in the locality of the rig provide adequate oxygen without disturbing the burning behaviour.

7.3 Clock

The clock shall be capable of measuring to at least 1 h with an accuracy of 1 s.

7.4 Ignition source: gas flame ignition source, match-flame equivalent

NOTE 1 This source has been designed to give a calorific output approximating to that of a burning match.

A burner tube consisting of a length of stainless steel tube [(8 ± 0,1) mm outside diameter, (6,5 ± 0,1) mm internal diameter and (200 ± 5) mm in length] is connected by flexible tubing to a cylinder containing butane via a flowmeter, fine control valve, on-off valve (optional) and cylinder regulator providing outlet pressure of nominal 2,8 kPa.

NOTE 2 Where tubing of these dimensions is not readily available, stainless steel tubing of approximately similar dimensions can be used provided that the 50 mm length at the 'flame' end of the tube is machined to the given size. To facilitate positioning the tube, a suitable handle can be fitted to it at least 100 mm from the flame end of the burner tube.

A calibrated flow meter shall supply butane gas at a flow rate of (45 ± 2) ml/min at (25 ± 3) °C. The flexible tubing connecting the output of the flowmeter to the burner tube shall be 2,5 m to 3 m in length with an internal diameter of (7 ± 1) mm.

NOTE 3 This corresponds to a flame height of approximately 35 mm.

7.5 Gas flow control

It is essential that the rate of supply of gas to the burner tube conform to the flow rate specified. Some difficulties have been reported with the supply and measurement of the gas, particularly where the gas cylinder has, of necessity, to be stored in an environment cooler than the defined test conditions and/or at some distance from the test rig.

In these cases, and other situations where difficulties occur, it is important that there should be sufficient length of tubing inside the controlled environment (10 °C to 30 °C) to ensure that the gas equilibrates to the required temperature (before flow measurement). One way to assist this is to pass the gas (before flow measurement) through a metal tube immersed in water maintained at a constant temperature such that the gas temperature at entry to the flow meter is (25 ± 3) °C, so that flow corrections for temperature variations can be avoided.

Great care also needs to be exercised with the measurement and setting of the flow rate of the gas. Direct reading flowmeters, even those obtained with a direct gas calibration, need to be checked when initially installed and also at regular intervals during testing by a method capable of accurately measuring the absolute gas flow at the burner tube. One way of doing this is to connect the burner tube with a short length of tubing (about 7 mm inside diameter) to a soap bubble flowmeter, such that the upward passage of a soap film meniscus in a glass tube of calibrated volume (e.g. a burette) over a known period of time gives an absolute measurement of the flow.

8 Atmospheres for conditioning and testing

8.1 Conditioning

The materials to be tested shall be conditioned for at least 24 h immediately before the tests in the following atmosphere:

— temperature: (23 ± 2) °C;

— relative humidity: (50 ± 5) %.

8.2 Testing

The test shall be carried out in an atmosphere having a temperature between 10 °C and 30 °C and a relative humidity between 15 % and 80 %.

9 Test specimen

9.1 General

The test assembly materials shall be representative of the components and make-up of the finished mattress, mattress pad or upholstered bed base.

9.2 Small scale

For small scale tests, the test specimen shall be rectangular in shape and have a minimum size of 450 mm × 450 mm × nominal thickness of the finished mattress, mattress pad or upholstered bed base.

The type of proposed edge finishing system shall be incorporated, e.g. plain, piped or taped edge.

Representative tension shall be maintained in the cover. The proposed mattress, mattress pad or upholstered bed base finish shall be represented in the specimen, e.g. tufted or quilted.

NOTE Representative tension can be maintained in the cover by means of suitable clips if the section is produced by cutting.

9.3 Full size

For full size tests 1:1, the actual product shall form the test specimen.

10 Test procedure

10.1 Preparation

10.1.1 The application of the ignition source can be within 2 min of removing the test materials from the conditioning atmosphere (8.1). If there is a significant distance between the conditioning room and the room where testing is carried out, the materials can be protected against de-conditioning during transfer between rooms. If possible, the assembly can be prepared inside the conditioning room.

10.1.2 Ensure that means of extinguishing are close to hand (see 6.3).

10.1.3 For a small scale test, place the test specimen in the test rig (see 7.1).

For full size tests:

— upholstered bed bases are tested on a horizontal surface (feet of the bed bases may have to be fitted if they exist on the actual product);

— mattresses or mattress pads are tested on a horizontal surface.

10.2 Ignition source application

10.2.1 Light the gas emerging from the burner tube, adjust the gas flow to the specified rate (see 7.4) and allow the flame to stabilize for at least 2 min.

10.2.2 Within 20 min of removing the materials from the conditioning room, position the burner tube in position on a flat portion of the upper surface of the test specimen so that the burner tube is not less than 100 mm from the nearest edge or marks left by any previous tests, and simultaneously start the clock. Where the test specimen has a piped or taped-edge finish, or is quilted or tufted, apply the burner tube to additional positions on the taped edge, in the grove of the quilt-line and on the tufts.

The burner tube shall be horizontal and in contact with the test specimen.