BEDDING COMPONENTS:
IGNITABILITY

Key words: Fire safety, bedding components, ignitability

0. INTRODUCTION

0.1 The test specified in this method deals with a simple presentation of a particular aspect of the potential fire situation typified by an exposure to the product of smouldering cigarettes and a flame similar to a burning match. The test alone cannot provide any direct guidance on behaviour or safety in other types of accidents, like exposure to larger sources of flames. A test of this type may, however, be used for comparisons or to ensure the existence of a certain characteristic considered to have bearing on fire performance in general. No other significance should be attached to the performance in this test.

0.2 The attention of all users of the test is drawn to the following warning:

SAFETY WARNING. IN ORDER THAT SUITABLE PRECAUTIONS MAY BE TAKEN TO SAFEGUARD HEALTH, THE ATTENTION OF ALL ENGAGED WITH FIRE TESTING IS DRAWN TO THE FACT THAT TOXIC OR HARMFUL GASES MAY BE RELEASED DURING COMBUSTION OF TEST SPECIMENS.

4. DEFINITIONS

Mattress: Product in the form of a resilient material (for instance polyurethane-foam or light fibre fill) or of padding materials in combination with steel springs (spring mattress), enveloped by a cover.

Quilt and pillow: Products of padding materials (down/feather or textile-fibre) enveloped by a textile fabric.

Ticking: Fabric enveloping the resilient material in a mattress.

Ignitability: A measure of the ease with which a material or a product can be ignited so as to flame or to smoulder progressively.

Ignition source: Source of energy which is used to ignite combustible materials or products.

Flaming: Undergoing combustion in the gaseous phase, usually with emission of light.

Smouldering: An exothermic reaction taking place in a material without flaming, with or without emission of light.

Progressive smouldering: Smouldering which continues after the ignition source is extinguished or removed.

1. SCOPE

This NORDTEST method specifies a procedure to determine the ignitability of bedding components with small smouldering and flaming sources of ignition.

2. FIELD OF APPLICATION

The method is intended for testing of blankets, quilts, pillows and mattresses, including thin, light mattresses used on top of other mattresses.

3. REFERENCES


ISO/TC 38/SC 19/N 239: Terms and definitions.

5. SAMPLING

The specimens shall be representative of the whole product to be tested. If possible, the specimens shall be taken in such a way that ignition can also be started along seams and their intersections.

The top side is exposed. Where there is doubt as to which side is the top side, the test shall be carried out on both sides. Six additional specimens are then needed.

Mattresses: Sufficient material shall be available for making at least 6 specimens with dimensions 450 mm x 350 mm in full nominal thickness.

The cover shall envelop the mattress completely without wrinkles, and it shall be secured underneath (for instance with steel pins).

For testing of mattresses with removable covers, sufficient...
material shall be available for the making of at least 12 specimens, 6 with and 6 without the mattress cover, with dimensions 450 mm x 350 mm in full nominal thickness.

Pillows: Four samples in full size shall be available.

Other than mattresses and pillows: Six specimens each of size 450 mm x 350 mm are cut from each sample.

If the product contains loose filling material, the edges must be sewn. It is advisable to sew the seams before cutting the specimens in order to avoid loss of filling material.

6. TEST METHOD

6.1 Principle

The test is carried out with the specimen placed in horizontal position on a test rig. The ignition source is placed on top of the specimen.

The determination of the ignitability is carried out using smouldering and flaming ignition sources.

A smouldering cigarette covered with and insulating fabric is used as primary smouldering ignition source.

A smoulderable insulation of cotton wool on a smouldering cigarette is used as secondary smouldering ignition source, which is intended to simulate possible smoulderable materials used in bedding.

The flaming ignition source is a small butane or propane flame.

The ignition of the specimen in progressive smouldering or flaming is observed.

6.2 Apparatus and material

The following equipment and material are necessary for the test:

a. A test rig for support of the specimen. (Shown in Fig. 1). The stand is made of angle iron with nominal dimensions 25 mm x 25 mm x 3 mm. On top of the stand is a platform of wire mesh with openings of nominal dimensions 100 mm x 50 mm.

b. Mineral wool with a nominal density of 60 kg/m³ and with dimensions 450 mm x 350 mm x 50 mm.

c. Stop clock.

d. Test enclosure, being either a room with a volume greater than 20 m³ (which contains adequate oxygen for testing), or a smaller enclosure with a through flow of air.

Inlet and extraction systems providing air flow rates of 0.02 m/s to 0.2 m/s in the locality of the rig to provide adequate oxygen without disturbing the burning behaviour.

e. Ignition sources

The sequent ignition sources used are a smouldering cigarette covered with a piece of cotton fabric, a smouldering cigarette covered with a cotton wool pad and an open flame.

f. Cigarette

Cigarettes with the following specifications shall be used for the test:

Length: 70 ± 4 mm
Diameter: 8 ± 0.5 mm
Weight: 1 ± 0.1 g
Smouldering rate: 12 ± 3 minutes/50 mm

The smouldering rate shall be verified for every collection of 200 cigarettes as follows:

The cigarettes are conditioned as described under 6.4. One cigarette is marked at distances 5 mm and 55 mm from one end. The cigarette is ignited at the end with the 5 mm distance marking, and air is drawn through the cigarette until a clear glow is observed, but not further than on to the 5 mm marking, whereafter the cigarette is impaled horizontally on a wire spike inserted not more than 13 mm into the unlit end. The time for the smouldering from the 5 mm to the 55 mm marks is recorded.
g. Cotton fabric
The cigarette shall be covered with a piece of cotton fabric plain weave of weight 150 ± 20 g/m², with dimensions 150 mm x 150 mm.

h. Cotton wool pad
The cigarette shall be covered with a pad of cotton wool of nominal dimensions 150 mm x 150 mm x 25 mm and of weight 20 ± 6.5 g. The piece shall be unwrapped from the roll as a single layer 25 to 30 mm thick, cut to size, then reduced to the correct mass and thickness by removal of loose fibres from the top.

i. Flame
The burner is a tube of stainless steel with internal diameter 6.5 ± 0.1 mm, outside diameter 8 ± 0.1 mm and length 200 mm.

The fuel may be butane or propane gas. Fuel supply rate: 6.38 g ± 0.25 g/hour at 20 °C.

6.3 Preparation of specimens
If the blankets, quilts, pillows, thin, light mattresses or removable covers are sold as flame retarded, they shall be tested after three cleansing treatments carried out according to instructions given by the manufacturer or in accordance with a procedure described in International Standard ISO 6330.

6.4 Conditioning
The materials to be tested, the cigarettes used as ignition sources, the insulating cotton fabric and cotton wool pads, shall be conditioned immediately before testing for 72 hours in indoor ambient conditions and then for at least 16 hours in an atmosphere having a temperature of 23 ± 2 °C and 50 ± 5% relative humidity.

6.5 Test procedure
The test is carried out indoors in an environment essentially free of air currents. The room temperature shall be 20 ± 5 °C.

The mattress specimen is placed directly on the test rig. The blanket, pillow, quilt and thin, light mattress specimen one at a time, is placed on the mineral wool which is laid on the test rig. The ignition source is placed on top of the specimen. The time is measured from the moment the ignition source is placed on the specimen.

The test duration is 1 hour from the moment the ignition source is placed on the specimen.

6.5.1. Testing with smouldering ignition sources
The cigarette is lighted and air is drawn through the cigarette until it glows brightly. Not less than 5 mm and not more than 8 mm of the cigarette shall be consumed in this operation.

The cigarette is placed on the specimen at a distance of at least 100 mm from the nearest edge of the specimen or from marks left by any previous test. The cotton fabric or the cotton wool pad is placed centrally on the cigarette, and the clock is started.

The progress of combustion is observed and any evidence of progressive smouldering ignition (see 7.1) or of flaming ignition (see 7.2) of the specimen is recorded.

2 separate tests are carried out with the cigarette covered with cotton fabric and cotton wool pad respectively.

On specimens with seams one test is carried out with the cigarette placed on a seam, and one test is carried out with the cigarette placed on a smooth surface if possible.

6.5.2 Testing with flame as ignition source
The gas is ignited and the gas flow adjusted to appropriate rate (Ref. 6.2.i). The flow is allowed to stabilize for at least 120 seconds.

The burner is placed horizontally on the specimen at a distance of at least 100 mm from any edge of the specimen and not less than 50 mm from any marks left from previous tests. The specimen shall be exposed to the ignition flame for 20 seconds. The exposure is terminated by carefully removing the burner from the specimen.

The progress of combustion is observed and any evidence of progressive smouldering ignition (see 7.1) or of flaming ignition (see 7.2) of the specimen is recorded.

2 separate tests are carried out.

On specimens with seams, one test is carried out with the burner placed along a seam, and one test is carried out with the burner placed on a smooth surface if possible.

6.6 Expression of test results
6.6.1 All time observations are expressed in minutes and seconds elapsed from the start of the test. The test results include
- the behaviour of the specimen during and immediately after the specified test period.
- flames or detectable amounts of smoke, heat or glowing during and immediately after the specified test period.
- damages to the specimen after the test is finished, measured in mm.

6.6.2 The results obtained from each individual test shall be reported separately.

6.7 Test report
The test report shall contain the following information:
a) Name and address of the testing laboratory
b) Date and identification number of the report
c) Name and address of the client
d) Purpose of the test
e) Method of sampling
f) Name of manufacturer or supplier of the product
g) Name or other identification marks and description of the product
h) Density and thickness of the product
i) Date of supply of the product
j) Description of the specimens and preparation technique
k) Date of test
l) Test method
m) Conditioning of the specimens
n) Deviations from the test method, if any
o) Test results
p) Designation of the product according to criteria expressed in official standards or regulations.

7. CRITERIA FOR IGNITABILITY

7.1 Progressive smouldering
For the purpose of this test method all the types of behaviour described below in a) to e) are considered to be progressive smouldering ignition:

a. Any test specimen that produces externally detectable amounts of smoke, heat or glowing after a period of 1 hour following the application of the ignition source.
b. Any test specimen that displays escalating combustion behaviour so that it is unsafe to continue the test and requires forcible extinction.
c. Any test specimen that smoulders until it is essentially consumed within the duration of the test.
d. Any test specimen that smoulders to the edges of the specimen, viz. to either side or to the full thickness of the specimen, within the duration of the test. However, all thin materials, like thin, light mattresses, quilts and blankets are allowed to smoulder to the full thickness of the specimen.
e. Any test specimen that, on final examination, shows evidence of smouldering other than discoloration more than 25 mm in any horizontal direction from the nearest part of the original position of the ignition source.

7.2 Flaming ignition

7.2.1 Mattresses:
For the purpose of this test method all the types of behaviour described below in a) to e) are considered to be flaming ignition.

a. The occurrence of any flames initiated by smouldering cigarette.
b. Any test specimen that continues to flame for more than 150 seconds after removal of the igniting flame.
c. Any test specimen that displays escalating combustion behaviour, so that it is unsafe to continue the test and requires forcible extinction.
d. Any test specimen that burns until it is essentially consumed within 150 seconds after removal of the igniting flame.
e. Any test specimen that burns to the edges of the specimen, viz. to either side or to the full thickness of the specimen, within the duration of the test.

7.2.2 Blankets, quilts, pillows and thin, light mattresses:
For the purpose of this test method all the types of behaviour described below in a) to e) are considered to be flaming ignition.

a. The occurrence of any flames initiated by smouldering cigarette.
b. Any test specimen that continues to flame for more than 150 seconds after removal of the igniting flame.
c. Any test specimen that displays escalating combustion behaviour, so that it is unsafe to continue the test and requires forcible extinction.
d. Any test specimen that burns until it is essentially consumed within 150 seconds after removal of the igniting flame.
e. Any test specimen that burns to either side of the specimen within the duration of the test.