

Resolution A.688(17)
Adopted on 6 November 1991
(Agenda item 10)

**FIRE TEST PROCEDURES FOR IGNITABILITY
OF BEDDING COMPONENTS**

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

RECOGNIZING the fact that many accommodation fires on board ships have been initiated from ignition of bedding components,

RECOGNIZING ALSO the need to develop an internationally acceptable fire test procedure for ignitability of bedding components,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its fifty-ninth session,

1. ADOPTS the Recommendation on Fire Test Procedures for Ignitability of Bedding Components set out in the annex to the present resolution;
2. INVITES Governments to apply the Recommendation to ensure compliance with the criteria specified therein;
3. REQUESTS the Maritime Safety Committee to continue its work on the development of further test procedures, as may be appropriate.

Annex

**RECOMMENDATION ON FIRE TEST PROCEDURES
FOR IGNITABILITY OF BEDDING COMPONENTS**

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 smouldering cigarettes and a match equivalent flame exposure to the product. 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 to make comparisons or to ensure the existence of a certain characteristic considered to have a bearing on fire performance in general. No other significance should be attached to 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.

1 SCOPE

The 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 bedding components such as blankets, quilts, bedspreads, pillows and mattresses, including thin, light mattresses used on top of other mattresses.

3 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 progressively smoulder.

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.

4 SAMPLING

The specimens should be representative of the whole product to be tested. If possible, the specimens should 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 should be carried out on both sides. Four additional specimens are then needed.

Mattresses: Sufficient material should be available for making at least four specimens with dimensions 450 mm × 350 mm in full nominal thickness. The cover should envelop the mattress completely without wrinkles and should be secured underneath (for instance with steel pins).

For testing of mattresses with removable covers, sufficient material should be available for the making of at least eight specimens, four with and four without the mattress cover, with dimensions 450 mm × 350 mm in full nominal thickness.

Pillows: four samples in full size should be available.

Other than mattresses and pillows: four specimens each of size 450 mm x 350 mm should be cut from each sample.

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

5 TEST METHOD

5.1 Principle

The test is carried out with the specimen placed in a 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 smoulderable insulation of cotton wool pad on a smouldering cigarette is used as a 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.

5.2 Apparatus and material

The following equipment and material are necessary for the test:

- .1 The test rig for support of the specimen is shown in figure 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.
- .2 Mineral wool with a nominal density of 60 kg/m³ and with dimensions 450 mm x 350 mm x 50 mm.
- .3 Stop clock.
- .4 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 speed of 0.02 m/s to 0.2 m/s in the locality of the rig provide adequate oxygen without disturbing the burning behaviour.
- .5 Ignition sources. The sequent ignition sources used are a smouldering cigarette covered with a cotton wool pad and an open flame.
- .6 Cigarettes. For the tests, cigarettes with the following specifications should be used:

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

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

The cigarettes are conditioned as described below 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 the 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 is recorded for the smouldering from the 5 mm to the 55 mm marks.

- .7 Cotton wool pad. The cigarette should 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 cotton wool should consist of new, undyed and soft fibres without any admixtures or artificial fibres, and it should be free from thread, leaf and shell fibre dusts. A suitable material for this purpose

is packaged in the form of rolls for surgical use. The piece should be unwrapped from the roll as a single layer 25 mm to 30 mm thick, cut to plan size, then reduced to the correct mass and thickness by removal of loose fibres from the top.

- .8 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 ± 0.25 g/h at 20°C .

5.3 Preparation of specimens

If the blankets, quilts, pillows, thin light mattresses or removable covers are sold as flame retardant, they should 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.

5.4 Conditioning

The materials to be tested, the cigarettes used as ignition sources, the insulating cotton wool pads should be conditioned immediately before testing for 72 h in indoor ambient conditions and then for at least 16 h in an atmosphere having a temperature of $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity.

5.5 Test procedure

The test is carried out indoors, in an environment essentially free of air currents. The room temperature should be $20 \pm 5^\circ\text{C}$.

The mattress specimen is placed directly on the test rig. The blanket, pillow, quilt and thin light mattress specimen 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 one hour from the moment the ignition source is placed on the specimen.

5.5.1 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 should 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 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 6.1) or of flaming ignition (see 6.2) of the specimen is recorded.

Two separate tests are carried out with the cigarette covered with cotton wool pad. On specimens with stitchings, one test is carried out with the cigarette placed along a stitching, and one test is carried out with the cigarette placed on a smooth surface if possible.

5.5.2 Testing with flame as ignition source

The gas is ignited and the gas flow adjusted to the rate indicated in 5.2.8. The flow is allowed to stabilize for at least 120 s. 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 should be exposed to the ignition flame for 20 s. 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 6.1) or of flaming ignition (see 6.2) of the specimen is recorded.

Two separate tests are carried out: On specimens with stitchings, one test is carried out with the burner placed along a stitching, and one test is carried out with the burner placed on a smooth surface if possible.

5.6 Expression of test results

5.6.1 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 millimetres.

5.6.2 The results obtained from each individual test should be reported separately.

5.7 Test report

The test report should contain the following information:

- .1 name and address of the testing laboratory;
- .2 date and identification number of the report;
- .3 name and address of the client;
- .4 purpose of the test;
- .5 method of sampling;
- .6 name of the manufacturer or supplier of the product;
- .7 name or other identification marks and description of the product;
- .8 density and thickness of the product;
- .9 date of supply of the product;
- .10 description of the specimens and preparation technique;
- .11 date of test;
- .12 test method;
- .13 conditioning of the specimens;
- .14 deviations from the test method, if any;
- .15 test results;
- .16 designation of the product according to criteria expressed in official standards or regulations.

6 CRITERIA FOR IGNITABILITY

6.1 Progressive smouldering

For the purpose of this test method, all the types of behaviour described below in .1 to .5 are considered to be progressive smouldering ignition:

- .1 any test specimen that produces externally detectable amounts of smoke, heat or glowing after a period of one hour following the application of the ignition source;
- .2 any test specimen that displays escalating combustion behaviour so that it is unsafe to continue the test and requires forcible extinction;

- .3 any test specimen that smoulders until it is essentially consumed within the duration of the test;
- .4 any test specimen that smoulders to the extremities of the specimen, viz. to either side or to the full thickness of the specimen, within the duration of the test. However, all materials having a thickness of 25 mm or less, such as light mattresses, quilts and blankets are allowed to smoulder to the full thickness of the specimen;
- .5 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 edge of cotton wool pad and open flame ignition source.

6.2 Flaming ignition

6.2.1 Mattresses

For the purpose of this test method, all the types of behaviour described below in .1 to .5 are considered to be flaming ignition;

- .1 the occurrence of any flames initiated by a smouldering ignition source;
- .2 any test specimen that continues to flame for more than 150 s after removal of the igniting flame;
- .3 any test specimen that displays escalating combustion behaviour, so that it is unsafe to continue the test and requires forcible extinction;
- .4 any test specimen that burns until more than 66% consumed within 150 s after removal of the igniting flame;
- .5 any test specimen that burns to the extremities of the specimen, viz. to either side or to the full thickness of the specimen, within the duration of the test.

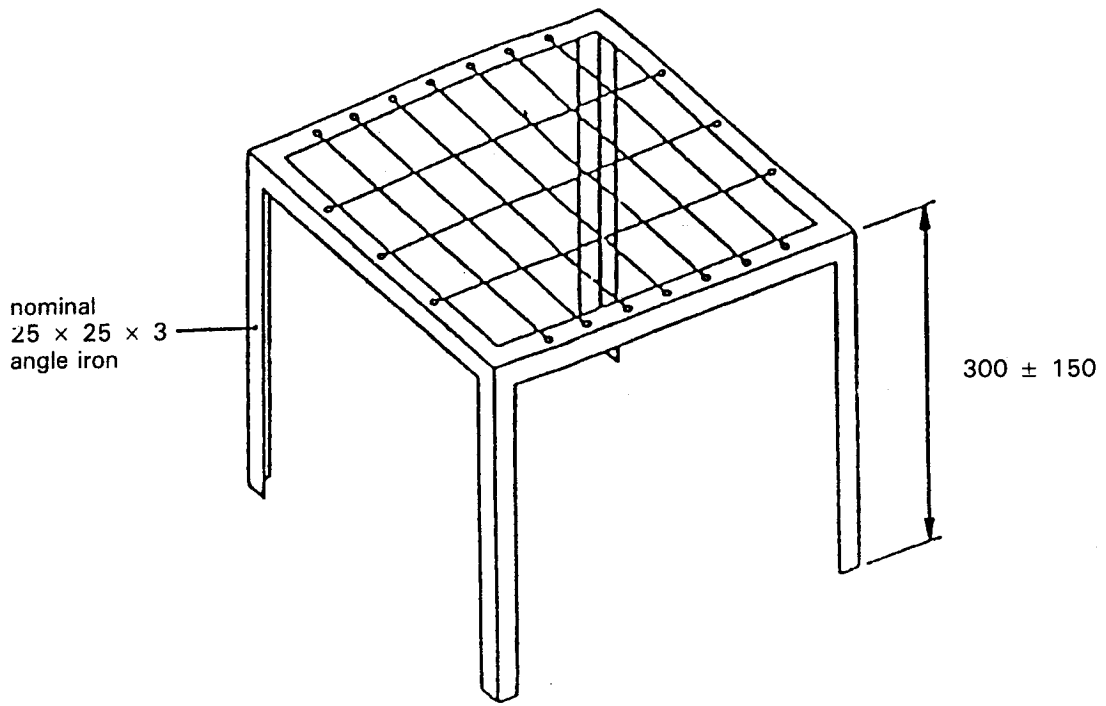
6.2.2 Blankets, quilts, pillows and thin light mattresses

For the purpose of this test method, all the types of behaviour described below in .1 to .5 are considered to be flaming ignition;

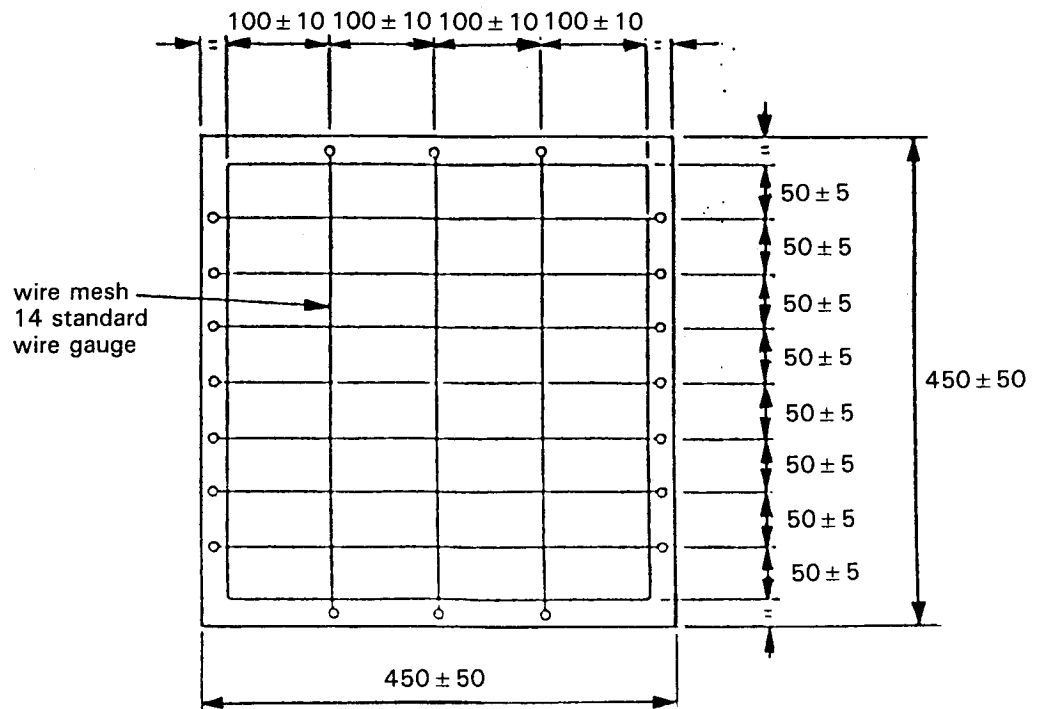
- .1 the occurrence of any flames initiated by a smouldering ignition source;
- .2 any test specimen that continues to flame for more than 150 s after removal of the igniting flame;
- .3 any test specimen that displays escalating combustion behaviour, so that it is unsafe to continue the test and requires forcible extinction;
- .4 any test specimen that burns until more than 66% consumed within 150 s after removal of the igniting flame;
- .5 any test specimen that burns to either side of the specimen within the duration of the test.

6.3 Classification

The bedding component is classified as not readily ignitable if it shows no progressive smouldering ignition or flaming ignition as specified in 6.1 and 6.2.



(a) Platform showing extended legs



(b) Spacing of wire mesh platform

All dimensions are in millimetres

Figure 1 - Test rig