



Safety of toys —

Part 2: Flammability

The European Standard EN 71-2:2003 has the status of a British Standard

ICS 13.220.40; 97.200.50

National foreword

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The UK participation in its preparation was entrusted to Technical Committee CW/15, Safety of toys, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 17 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 15 September 2003

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ISBN 0 580 42612 2

English version

Safety of toys - Part 2: Flammability

Sécurité des jouets - Partie 2: Inflammabilité

Sicherheit von Spielzeug - Teil 2: Entflammbarkeit

This European Standard was approved by CEN on 28 February 2003.

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Foreword

This document (EN 71-2:2003) has been prepared by Technical Committee CEN/TC 52 "Safety of Toys", the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2003, and conflicting national standards shall be withdrawn at the latest by December 2003.

This document supersedes EN 71-2:1993.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard for the safety of toys consists of the following parts:

Part 1: *Mechanical and physical properties*

Part 2: *Flammability*

Part 3: *Migration of certain elements*

Part 4: *Experimental sets for chemistry and related activities*

Part 5: *Chemical toys (sets) other than experimental sets*

Part 6: *Graphical symbol for age warning labelling*

Part 7: *Finger paints – Requirements and test methods*

This standard is Part 2 of the European Standard for safety of toys, EN 71, and should be read in conjunction with Part 1.

There are very few accident data concerning the hazards associated with the *flammability* of toys.

Toys must not constitute a dangerous flammable element in the child's environment.

1 Scope (see A.1)

This part of EN 71 specifies the categories of flammable materials which are prohibited in all toys, and requirements concerning *flammability* of certain toys when they are subjected to a small source of ignition.

The test methods described in clause 5 are used for the purposes of determining the *flammability* of toys under the particular test conditions specified. The test results thus obtained cannot be considered as providing an overall indication of the potential fire hazard of toys or materials when subjected to other sources of ignition.

This part includes general requirements relating to all toys and specific requirements and methods of test relating to the following toys, which are considered as being those presenting the greatest hazard:

- toys to be worn on the head which include beards, moustaches, wigs, etc, made from *hair*, pile or material with similar features, moulded and fabric masks and flowing material attached to hats, masks, etc. but excluding paper novelty hats of the type usually supplied in party crackers;
- toy disguise costumes and toys intended to be worn by a child in play
- toys intended to be entered by a child
- *soft filled* toys (animals and dolls, etc.) with a piled surface or textile surface.

NOTE Additional requirements for flammability of electric toys are specified in EN 50088 Safety of Electric Toys.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 71-5:1993 - *Safety of Toys - Part 5: Chemical toys (sets) other than experimental sets*

EN ISO 2431:1991 - *Methods for the determination of flow time of paints by use of flow cups*

EN ISO 6941:1995 – *Textile fabrics – Burning behaviour – Measurement of flame spread properties of vertically oriented specimens*

EN 1103:1995 - *Textiles - Burning behaviour. Fabrics for apparel. Details procedure to determine the burning behaviour of fabrics for apparel*

EN 50088 - *Safety of electric toys*

3 Terms and definitions

For the purposes of this part of EN 71 the following definitions apply, and appear in italics throughout the standard.

3.1 **flammability**

the ability of a material or a product to burn with a flame under specified test conditions.

3.2 **flaming debris**

material that becomes detached from the sample during the test procedure and continues to flame as it falls.

3.3**hair**

slender flexible fibres intended to represent *hair* (see 4.2).

3.4**soft filled toys**

toy, clothed or unclothed, with soft body surfaces and filled with soft material, allowing compression of the main part of the toy readily with the hand (see EN 71-1).

3.5**surface flash**

rapid spread of flame over the surface of a material, without ignition of its base structure at the same time (EN 1103:1995).

3.6**molten drips**

falling droplets of molten material.

3.7**flammable liquids**

preparations having a flash point equal or greater than 21°C and less than or equal to 55 °C.

3.8**highly flammable liquids**

preparations having a flash point below 21 °C.

4 Requirements**4.1 General (see A.2)**

The following materials shall not be used in the manufacture of toys:

- celluloid (cellulose nitrate), except when used in varnish, paint or glue, or in balls of the type used for table tennis or similar games, and materials with the same behaviour in fire as celluloid. Specific materials to which the test flame is applied in order to check compliance of the toy with requirements in 4.2 to 4.5 are considered to comply with this requirement if the toy meets its appropriate requirements in 4.2 to 4.5.
- materials with a piled surface which produce *surface flash* on the approach of a flame. Piled surfaces showing no momentary area of flame over the area of the piled surface remote from the test flame are considered to meet this requirement.
- highly flammable solids.

In addition, toys shall not contain flammable gases, extremely flammable liquids, flammable liquids, flammable gels except as provided for below:

- flammable liquids, flammable gels and preparations supplied in sealed containers having a maximum volume of 15 ml per container;
- highly flammable liquids and flammable liquids being entirely retained within a porous material in capillary channels of writing instruments;
- flammable liquids with a viscosity greater than $260 \times 10^{-6} \text{ m}^2/\text{s}$ corresponding to a flow time of more than 38 s when determined in accordance with EN ISO 2431 using cup No. 6;
- highly flammable liquids contained in toys covered in EN 71-5.

NOTE Different legal requirements may exist in non-EU countries.

4.2 Toys to be worn on the head which include beards, moustaches, wigs, etc made from hair, pile or material with similar features, moulded and fabric masks, and flowing material attached to hats, masks etc. (see A.3)

When a product incorporates several features, for example a hat with an attached mask and hair, each part shall be tested separately to the applicable clause relevant to that particular part of the toy.

Attachments made from elastic or string which are used for the purpose of securing a mask, hat etc. on the head shall not be tested.

4.2.1 Beards, moustaches, wigs, etc, made from *hair*, pile or material with similar features (e.g. free-hanging ribbons, paper or cloth strands), which protrude more than or equal to 50 mm from the surface of the toy

These materials may or may not be attached to masks, hats or other products worn on the head.

When tested in accordance with 5.2, the duration of flaming shall not be more than 2 s after the removal of the test flame.

In addition, if ignition occurs, the maximum burnt length of *hair*, pile, or other attachments shall be:

- a) not more than 50 % of the greatest initial length, when the initial length was 150 mm or more;
- b) not more than 75 % of the greatest initial length, when the initial length was less than 150 mm

When determining whether materials are required to be tested under this clause, the distance by which the material protrudes shall be measured without applying tension to the protruding part, e.g. curly *hair* is not straightened. Plaits or braided *hair* shall be fully released and combed, where possible, before testing.

4.2.2 Beards, moustaches, wigs etc. made from *hair*, pile or material with similar features (e.g. free-hanging ribbons, paper or cloth strands etc.), which protrude less than 50 mm from the surface of the toy

These materials may or may not be attached to masks, hats or other products worn on the head.

When tested in accordance with 5.3, the duration of flaming shall not be more than 2 s after the removal of the test flame and the maximum distance between the upper edge of the burnt area, and the point of application of the test flame shall not be more than 70 mm.

4.2.3 Full or partial moulded head masks including those which cover the head

When tested in accordance with 5.3, the duration of flaming shall not be more than 2 s after the removal of the test flame. The maximum distance between the upper edge of the burnt area and the point of application of the test flame shall not be more than 70 mm. Cardboard partial masks with no hair, pile or other attachments (other than those for securing the toys) are excluded.

4.2.4 Flowing shrouds, hoods, head-dresses, etc. which are attached to products worn on the head and fabric masks which partially or fully cover the head, but excluding those items covered by 4.3

When tested in accordance with 5.4, the rate of spread of flame of the material shall not exceed 10 mm/s or shall self-extinguish before the second marker thread is severed.

4.3 Toy disguise costumes and toys intended to be worn by a child in play (see A.4)

These include e.g. cowboy suits, nurses outfits, etc and long flowing capes, etc not attached to headwear covered by 4.2.4.

When carrying out the tests, if there is insufficient material to obtain a test sample of at least 610 mm x 100 mm, it is permissible to use a test sample made up of two separate pieces of material measuring 310 mm x 100 mm which - when fitted together with an overlap of 10 mm (see 5.4.2) - will constitute a test sample of 610 mm x 100 mm.

When tested in accordance with 5.4, the rate of spread of flame shall not exceed 30 mm/s or shall self-extinguish before the second marker thread is severed.

If the rate of spread of flame is between 10 mm/s and 30 mm/s, both the toy and the packaging shall be permanently marked with the following warning: **“Warning! Keep away from fire”**.

4.4 Toys intended to be entered by a child (see A.5)

These include e.g. toy tents, puppet theatres, wigwams, play tunnels.

When tested in accordance with 5.4, the rate of spread of flame shall not exceed 30 mm/s or shall self-extinguish before the second marker thread is severed.

When tested in accordance with 5.4, if the sample has a rate of spread of flame greater than 20 mm/s, there shall be no *flaming debris* or *molten drips*.

If the material has non-identical surfaces, both sides shall be tested.

If the rate of spread of flame is between 10 mm/s and 30 mm/s, both the toy and the packaging shall be permanently marked with the following warning: **'Warning! Keep away from fire'**.

Where there is insufficient material to give a test sample of at least 610 mm x100 mm, it is permissible to use a test sample made up of two separate pieces of material measuring 310 mm x 100 mm which - when fitted together with an overlap of 10 mm (see 5.4.2) - will constitute a test sample of 610 mm x100 mm.

4.5 Soft filled toys (animals and dolls, etc) with a piled or textile surface

The requirements of this clause do not apply to toys with a maximum dimension of 150 mm or less. A toy shall be tested as supplied, including any clothing present with the toy and, if considered to be more onerous, with the clothes removed if removal can be accomplished without damage to the clothes or toy.

4.5.1 Soft filled toys with a total length 520 mm or less

When tested in accordance with 5.7, the rate of spread of flame on the surface shall not be more than 30 mm/s.

4.5.2 Soft filled toys with a maximum dimension greater than 520 mm

When tested in accordance with 5.8, the rate of spread of flame on the surface shall not be more than 30 mm/s.

5 Methods of test

5.1 General

5.1.1 Test burner

The test flame shall be obtained from a burner as described in EN ISO 6941:1995 Annex A and shall be operated with butane or propane gas.

5.1.2 Conditioning and test chamber

Before each test, the toys or samples shall be conditioned for at least 7 h in an atmosphere having a temperature of (20 ± 5) °C and a relative humidity of (65 ± 5) %.

Carry out the tests in a test chamber in which the movement of air is less than 0,2 m/s at the start of the test and is not affected by operation of mechanical apparatus during the test. It is essential that the volume of air in the test chamber is not affected by a reduction in the level of oxygen concentration. When an open fronted chamber is used for the test, ensure that the test sample is at least 300 mm from the walls of the chamber. Maintain the chamber at 10 °C to 30 °C and at a relative humidity of 15 % to 80 % prior to the test being carried out.

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The samples shall be tested within 5 min of removal from the conditioning atmosphere.

5.1.3 Test flame

Light the burner described in 5.1.1 and pre-heat for a minimum of 2 min.

The required height of the flame shall be measured with the burner in the vertical position from the end of the burner tube to the top of the flame.

5.2 Test relating to beards, moustaches, wigs, etc. made of *hair*, pile or material with similar features (e.g. free-hanging ribbons, paper or cloth strands) protruding 50 mm or more from the surface of the toy

5.2.1 Test flame

Adjust the flame height to (20 ± 2) mm.

5.2.2 Test burner position

Vertical.

5.2.3 Test performance

Measure the length of the *hair*, pile or similar material and position the toy so that the largest dimension hangs vertically or as near vertically as possible.

Apply the test flame for $(2 \pm 0,5)$ s to the lower edge or ends of the sample material so that the flame penetrates the element by approximately 10 mm.

If ignition occurs, measure the duration of flaming and the maximum length of the hair, pile or similar material that has been burnt.

5.3 Test relating to beards, moustaches, wigs, etc. made of *hair*, pile or material with similar features (e.g. free-hanging ribbons, paper or cloth strands), protruding less than 50 mm from the surface of the product and full or partial moulded head masks including those which cover the head and which do not have hair, pile or similar materials

5.3.1 Test flame

Adjust the flame height to (20 ± 2) mm.

5.3.2 Test burner position

Move the burner to an angle of 45°.

5.3.3 Test performance

Position the toy vertically.

Apply the test flame to the toy for $(5 \pm 0,5)$ s, so that the test flame makes contact at least 20 mm above the lower edge of the toy and/or attachment and distance measured from the closest point of the burner tube, horizontally to the surface of the toy is approximately 5 mm.

If ignition occurs, measure the duration of flaming and the maximum distance between the upper edge of the burnt area and the point of application of the flame.

5.4 Test relating to flowing hoods, head-dresses, etc. which are attached to products worn on the head, disguise costumes and toys intended to be entered by a child

5.4.1 Preparation of sample

Each test shall be carried out on a new toy. If advice to the consumer, for example a care label on the toys or its packaging

- indicates that the toy is not intended to be washed, it shall not be washed or soaked before testing;
- recommends a method of washing or cleaning, the article shall be treated in accordance with these recommendations which are regarded as instructions from the manufacturer;
- gives no information relating to washing or cleaning, disguise costumes and toys intended to be entered by a child shall be treated, before test, in accordance with the following instructions.

Immerse the toy in tap water (approximately 20 °C) at a ratio of at least 1:20 mass of toy to volume of water, and allow it to stand for 10 min. Drain and repeat twice. Rinse by immersing the toy in demineralized water for 2 min. Drain and dry by a method appropriate to the toy and, where appropriate, restore the pile as near as possible to its original condition.

Cut test samples with dimensions of at least 610 mm x 100 mm from each material available on the toy. Each test sample shall be made of one material. Where possible, the sample should not include seamed edges or edges decorated with lace trimmings. As seams modify the rate of spread of flame, they shall be placed in the upper part of the sample holder.

If there is insufficient material to make a full sample as described above, two equal pieces of the same material with dimensions of 310 mm x 100 mm may be used so that when they overlap, a full sample of at least 610 mm x 100 mm is obtained. In order to ensure that there is not gap at the overlap, staples may be used to secure the join.

As the rate of spread of flame can be different with the direction of the fabric, where there is enough material, cut the test sample with the length corresponding to the vertical direction of the toy when in use.

5.4.2 Holding the sample (see A.6)

Place the sample on the sample holder as shown in Figure 1, slightly tensioned to avoid creases, waving or curling.

Dimensions in millimetres

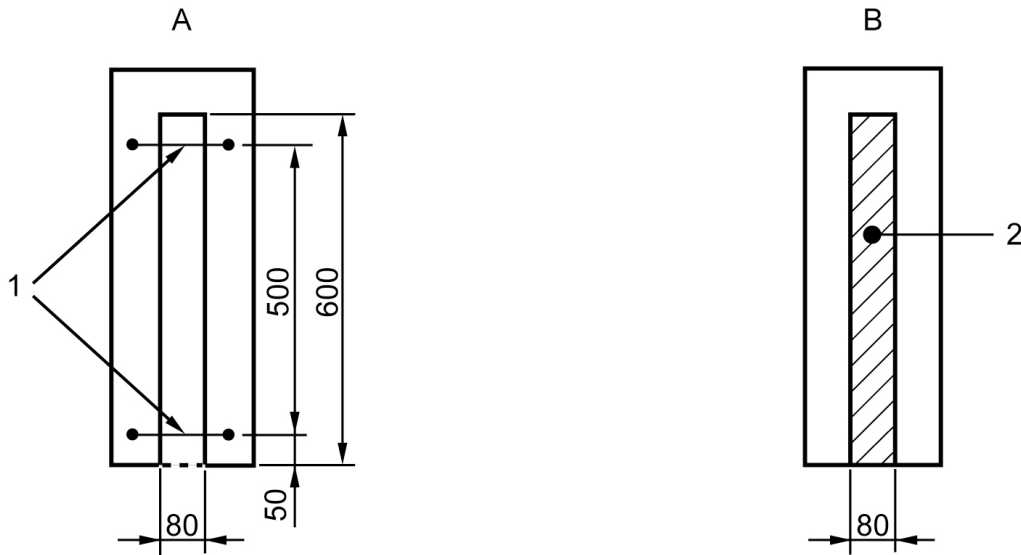


Figure 1 - Test relating to disguise costumes and to toys intended to be entered by a child

Key

- A Top side
- B Underside
- 1 100 % mercerised white cotton marker threads
- 2 Sample

For toys corresponding to 4.2.4 and 4.3, the outside surface of the material when in use, shall be positioned face up.

If the material of toys corresponding to 4.4 has non-identical surfaces, both sides shall be tested.

Attach the marker threads at points A and B across the sample at no more than 2 mm from the surface of the sample, with a device to indicate when the thread is severed.

Position the sample holder at $(45 \pm 1)^\circ$ to the horizontal.

5.4.3 Test flame

Adjust the flame height to (40 ± 3) mm.

5.4.4 Test burner position

Position the burner vertically in order to have a distance between the edge and the top of the burner of

(30 ± 2) mm (see Figure 2).

Dimensions in millimetres

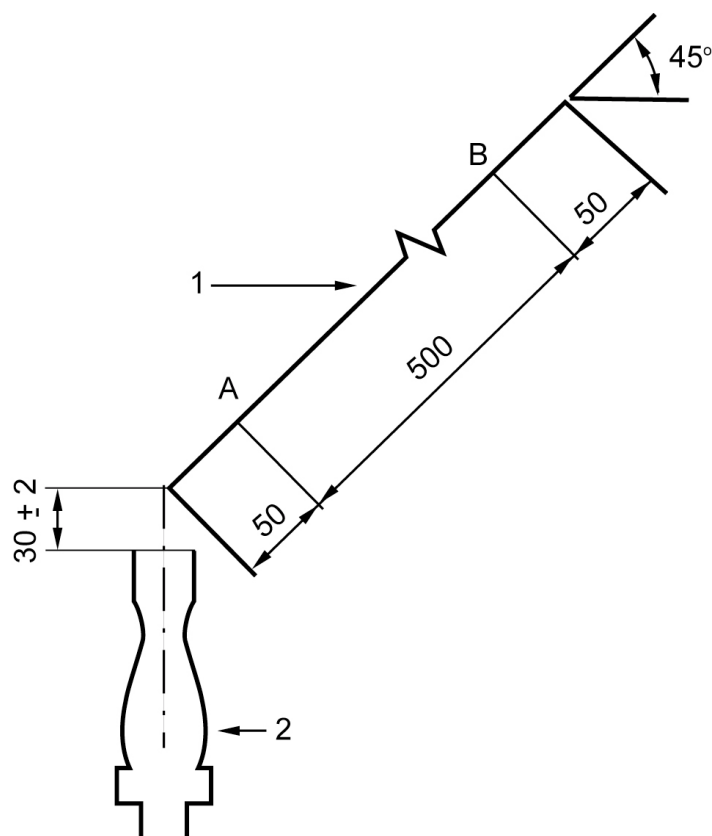


Figure 2 - Gas burner

Key

A and B Location of 100 % mercerised white cotton marker threads

- 1 Sample
- 2 Burner

5.4.5 Test performance

Maintain the burner with the flame as indicated above for (10 ± 1) s.

If flaming occurs, start the timing device when the first thread is severed by the flame and stop it when the second thread is severed.

5.4.6 Results

If, after applying the flame, the sample fails to ignite and if the first thread is not severed, the rate of spread of flame is equal to 0.

If flaming occurs and the first marker thread is severed and the flame extinguishes before severing the second thread, the material tested is considered as self-extinguishing.

If the second marker thread is severed, note the time and calculate the rate of spread of flame in mm/s. Round the resulting value to the nearest mm/s.

5.5 Test for soft filled toys with a maximum dimension of 520 mm or less

5.5.1 Test flame

Adjust the flame height to (20 ± 2) mm.

5.5.2 Test burner position

Move the burner to an angle of 45° .

5.5.3 Test performance

Position the toy vertically, i.e. with the head uppermost, if it has one, or otherwise so that the toy presents the maximum unhindered vertical area of its surface to the spread of flame.

Apply the test flame to the toy for $(3 \pm 0,5)$ s so that the distance between the edge of the burner tube, and the toy is approximately 5 mm and the test flame makes contact between 20 mm and 50 mm above the lower edge of the toy.

After removal of the test flame, measure the time taken for the flame to spread on the surface of the toy until the top of the flames first reach the height of the uppermost toy surface.

5.6 Test for soft filled toys with a maximum dimension greater than 520 mm

5.6.1 Test flame

Adjust the flame height to (20 ± 2) mm.

5.6.2 Test burner position

Move the burner to an angle of 45° .

5.6.3 Test performance

Position the toy vertically, i.e. with the head uppermost, if it has one, or otherwise so that the toy presents the maximum unhindered vertical area of its surface to the spread of flame, supported at least by two vertical metal supports as shown in Figure 3. The metal supports shall be equipped with attachment points to which a horizontal 100 % cotton mercerized thread can be affixed (white mercerized threads having a maximum linear density of 50 tex). One of the fixing points shall be equipped with a device for indicating the moment that the thread is severed by the flame.

The height of the control thread above the bench top shall be adjusted to be within 500 mm to 520 mm where this will provide surface contact with the toy.

Apply the test flame to the toy for $(3 \pm 0,5)$ s so that the distance between the edge of the burner tube and the toy is approximately 5 mm and the test flame makes contact between 20 mm and 50 mm above the lower edge of the toy.

Calculate the rate of the spread of flame as follows:

$$(h - a) / t$$

where:

h is the height in mm of the control thread above the bench top;

a is the height in mm at which the test flame was applied to the toy above the bench top;

t is the time in seconds that elapsed between removal of the test flame and the severing of the control thread.

Dimensions in millimetres

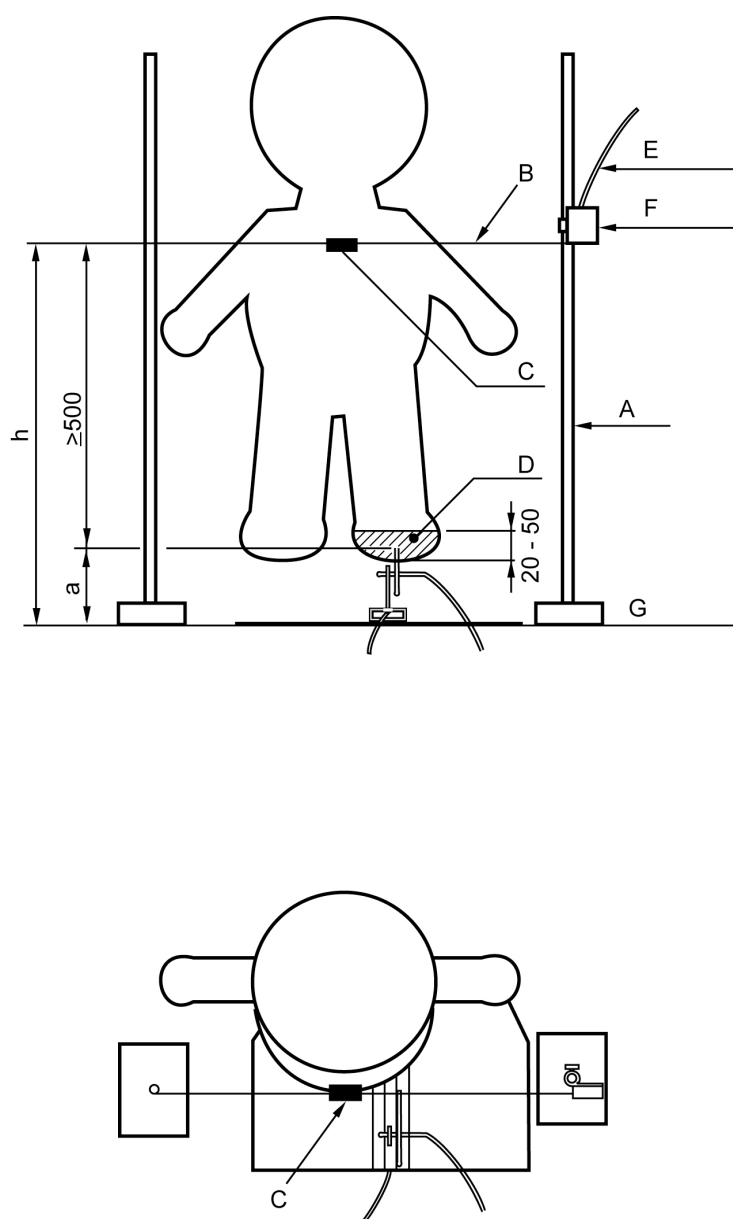


Figure 3 – Test arrangement for soft filled toys with a maximum dimension greater than 520 mm

Key

- h* Height in mm above bench top of control thread
- a* Height in mm above bench top at which test flame was applied
- A Vertical metal support
- B Tight marker thread
- C Contact area of marker thread
- D Area contact flame
- E At the chronometer
- F Microswitch
- G Test bench

5.7 Test report

A test report shall be provided and shall contain at least the following information:

- c) Description and identification of the product.
- d) A reference to this European standard (EN 71-2:200X).
- e) Clauses deemed applicable.
- f) The results and conclusions of the tests.
- g) Any departure by agreement or otherwise from the test procedures specified, particularly with regard to washing of samples.
- h) Details of any washing instructions supplied with a disguise costume or toy intended to be entered by a child.

After removal of the test flame, measure the time taken for the flame to spread up the toy to sever the control thread.

Annex A (informative)

Background and rationale for this standard

The contents of this standard consider those toys that could pose a significant risk of injury to a child from the hazards presented by the potential to catch fire.

Suppliers of toys in EU Member States are reminded that there are two routes for compliance with Council Directive 88/378/EEC (safety of toys). The more normal route is to satisfy the harmonised standards as laid down in the directive and published in the Official Journal of the European Communities. An alternative route for 'toys which do not conform in whole or in part to the standards' is by way of an EC-type examination which is described in Article 10 of the directive.

Several data-bases were consulted during the preparation of the standard, including those of the United Kingdom's 'Home Accident Surveillance System' and the United States' Consumer Product Safety Commission. There was no indication from these sources that accidents were occurring due to direct contact of children with burning material in toys. It could be argued that the standards/legislation over the years have resulted in safer toy products with respect to *flammability*.

A.1 Scope

This sets out the main categories of toys which are dealt with in this standard, but it must be noted that there are categories of flammable materials which are prohibited in all toys.

A.2 General requirements (see 4.1)

The requirements for flammable solids and gases have in the past led to confusion. Highly flammable solids may be defined as those which readily catch fire after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the ignition source. In this case, only solids that ignite instantaneously and are rapidly consumed should fall into this category. Plastics, paper textiles, etc. will all burn, but should not be considered as flammable solids in the context of these requirements. Any substance that is gaseous and flammable at room temperature must be considered as a flammable gas.

A.3 Toys to be worn on the head which include beards, moustaches, wigs, etc., made from *hair*, pile or with similar features, moulded and fabric masks and flowing material attached to hats, masks, etc (see 4.2)

This clause is intended to cover those articles with protruding attachments that could become ignited without the child's knowledge. The requirement and test methods of 4.2.3 apply also to those masks that fully cover the face or the whole head – whether or not they have the attachments referred to in this clause.

A.4 Toy disguise costumes and toys intended to be worn by a child in play (see 4.3)

These include e.g. cowboy suits, nurses' outfits, etc. and long flowing capes, etc. not attached to headwear covered by 4.2.4. In a change to the previous version of the standard to ensure a wider range of testing (principally, to cover small sizes of costumes etc.), the test sample may be constructed in two equal parts.

A.5 Toys intended to be entered by a child (see 4.4)

These include e.g. toy tents, puppet theatres, wigwams, play tunnels) It is thought unlikely that any such toy would escape testing because of insufficient sample size. The *flaming debris* requirement has been limited to those materials that have a rate of flame spread greater than 20 mm/s. Products produced from nylon and other man-made materials can produce *flaming debris* and yet are extensively used in the production of children's clothing because they have a relatively slow rate of flame spread. This has led to the use of more hazardous materials that meet the *flaming debris* requirement but have a more rapid spread of flame.

A.6 Test relating to disguise costumes and toys intended to be entered by a child (see 5.4.2)

The U-shaped double frame has been designed to ensure that the material is secured throughout the test. When materials are subjected to heating, they react differently depending upon the type. There is a tendency for some materials to shrink away from the flame source. By specifying the sample holder, this effect has been minimised and inconsistencies between the laboratories reduced. The important criterion here is not the speed of ignition but the rate of flame spread. There are practical difficulties in testing toys that have seamed edges and edges decorated with trimmings. When it is possible to prepare a representative sample without their inclusion, this should be done.

Annex ZA (informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive 88/378/EEC.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. In particular the Dangerous Substance Directive 67/548/EEC

The following clause of this standard as detailed in table ZA.1, is likely to support requirements of Directive 88/378/EEC.

Table ZA.1: Correspondence between this European Standard and EU Directives

Essential Requirements of Directive 88/378/EEC as given in its Annex II	Corresponding clause of this Part of EN71.
II.1 j) (Particular)	Clauses 4 and 5
II.2 a) (Particular)	Clauses 4 and 5
Annex IV (General)	Clauses 4.3 and 4.4

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