
Safety of toys —
Part 2:
Flammability

Sécurité des jouets —
Partie 2: Inflammabilité

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8124-2 was prepared by Technical Committee ISO/TC 181, *Safety of toys*.

This second edition cancels and replaces the first edition (ISO 8124-2:1994) which has been technically revised.

ISO 8124 consists of the following parts, under the general title *Safety of toys*:

- *Part 1: Safety aspects related to mechanical and physical properties*
- *Part 2: Flammability*
- *Part 3: Migration of certain elements*

Safety of toys —

Part 2: Flammability

1 Scope

(See A.2)

This part of ISO 8124 specifies the categories of flammable materials that are prohibited in all toys, and requirements concerning *flammability* of certain toys when they are subjected to a minor 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 of ISO 8124 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: beards, moustaches, wigs, etc., made from *hair*, pile or material with similar features; molded and fabric masks; hoods, head-dresses, etc.; flowing elements of toys to be worn on the head, 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 a play;
- toys intended to be entered by a child;
- *soft-filled* toys (animals and dolls, etc.) with a piled surface or textile surface.

NOTE 1 Additional requirements for *flammability* of electric toys are specified in IEC 62115, *Electric toys — Safety*.

NOTE 2 There are very few accident data concerning the hazards associated with the *flammability* of toys.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2431:1993, *Paints and varnishes — Determination of flow time by use of flow cups*

ISO 6941:2003, *Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens*

ISO 8124-1:2000, *Safety of toys — Part 1: Safety aspects related to mechanical and physical properties*

ISO 8124-1/Amd.1, *Safety of toys — Part 1: Safety aspects related to mechanical and physical properties — Amendment 1*

ISO 8124-1/Amd.2, *Safety of toys — Part 1: Safety aspects related to mechanical and physical properties — Amendment 2*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms defined in this clause appear in *italics* throughout this part of ISO 8124.

- 3.1**
flammability
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 primarily soft body surfaces and filled with soft substance(s), allowing compression of the main part of the toy readily with the hand
- See ISO 8124-1.
- NOTE Toys with part of their body surfaces made from hard materials, e.g. plastic face, hands or feet, are included.
- 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 1103:2005]
- 3.6**
molten drips
falling droplets of molten material
- 3.7**
flammable gases
any substance that is gaseous and flammable at room temperature
- 3.8**
flammable liquids
preparations having a flash point equal to or greater than 21 °C and less than or equal to 55 °C
- 3.9**
highly flammable liquids
preparations having a flash point below 21 °C
- 3.10**
highly flammable solids
solids that readily catch fire after brief contact with a source of ignition and that continue to burn or to be consumed after removal of the ignition source

4 Requirements

4.1 General (see A.3)

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*, *highly 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 ISO 2431:1993 using cup No. 6.
- *Highly flammable liquids* contained in toys covered in EN 71-5.

4.2 Toys to be worn on the head (see A.4)

4.2.1 General

The requirements of 4.2 apply to:

- beards, moustaches, wigs, etc., made from *hair*, pile or material with similar features;
- molded and fabric masks;
- hoods, head-dresses, etc.;
- flowing elements of toys to be worn on the head;

but not to paper novelty hats of the type usually supplied in party crackers (see A.4).

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 sub-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.

4.2.2 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 determining whether materials are required to be tested under 4.2.2, 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.

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 material with similar features 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

4.2.3 Beards, moustaches, wigs, etc., made from *hair*, pile or material with similar features (e.g. free-hanging ribbons, paper or cloth strands), 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.

4.2.4 Full or partial molded head masks

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.

4.2.5 Flowing elements of toys to be worn on the head

These include hoods, head-dresses, etc., and fabric masks which partially or fully cover the head, but exclude 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.

This requirement does not apply if it is not possible to obtain the test sample from a single toy.

4.3 Toy disguise costumes and toys intended to be worn by a child in a play (see A.5)

These include e.g. cowboy suits, nurses' outfits, etc., and long flowing capes, etc., not attached to headwear covered by 4.2.5.

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**". (See ISO 8124-1:2000, C.2.1, for guidance).

The requirements of this clause do not apply if it is not possible to obtain the test sample from a single toy.

If the costume is intended to be reversible and the material has non-identical surfaces, both sides shall be tested.

4.4 Toys intended to be entered by a child (see A.6)

These are toys that at least partially enclose a child and include e.g. toy tents, wigwams and play tunnels, but do not include open canopies. The requirements apply to toys made of flexible materials such as fabric and vinyl. They do not apply to rigid materials.

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

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 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**". (See ISO 8124-1:2000, C.2.1, for guidance).

The requirements of this clause do not apply if it is not possible to obtain the test sample from a single toy.

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

4.5.1 General

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.

4.5.2 Soft-filled toys with a maximum dimension of 520 mm or less

When tested in accordance with 5.5, the rate of spread of flame on the surface shall not be more than 30 mm/s.

4.5.3 Soft-filled toys with a maximum dimension greater than 520 mm

When tested in accordance with 5.6, the rate of spread of flame on the surface shall not be more than 30 mm/s.

5 Test methods

5.1 General

5.1.1 Precautionary information

It is the responsibility of those using these test methods to do so in a safe manner. Burning materials can produce smoke and toxic gases and therefore protective measures are required for the safety of operators. Fire extinguishers should be readily to hand.

5.1.2 Test burner

The test flame shall be obtained from a burner as described in ISO 6941:2003, Annex A, and shall be operated with butane or propane gas.

The type of gas used shall be specified in the results, for the sake of consistency.

5.1.3 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 $(20 \pm 5) ^\circ\text{C}$ and a relative humidity of $(65 \pm 5) \%$.

Carry out the tests in a draught-free test chamber in which the movement of air 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 $10 ^\circ\text{C}$ to $30 ^\circ\text{C}$ and at a relative humidity of 15 % to 80 % prior to the test being carried out.

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

5.1.4 Test flame

Light the burner described in 5.1.2 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 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

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 material with similar features and position the toy so that the largest dimension of the *hair*, pile or material with similar features 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 material with similar features that has been burnt.

5.3 Test relating to beards, moustaches, wigs, etc., made from *hair*, pile or material with similar features (e.g. free-hanging ribbons, paper or cloth strands), which protrude less than 50 mm from the surface of the toy, and full or partial molded head masks

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 with a distance measured from the closest point of the burner tube, horizontally to the surface of the toy of 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 elements of toys to be worn on the head (except those covered by 4.2.2 and 4.2.3), hoods, head-dresses, etc., fabric masks which partially or fully cover the head, toy disguise costumes, toys intended to be worn by a child in a play and toys intended to be entered by a child

5.4.1 Preparation of sample

Each test shall be carried out on a single new toy. If advice to the consumer (e.g. a care label on the toy 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, articles likely to be washed or exposed to rain shall be treated, before testing, in accordance with the following instructions.

Immerse the toy in tap water (at approximately 20°C) at a ratio of at least 1:20 mass of toy: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 $610\text{ mm} \times 100\text{ mm}$ from each material available on the toy. Each test sample shall be made from 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 the material dimensions are such that it is not possible to obtain a test sample of at least $610\text{ mm} \times 100\text{ mm}$, it is permissible to use a test sample made up of two separate pieces of material from the same toy, each measuring $310\text{ mm} \times 100\text{ mm}$, which – when fitted together with an overlap of 10 mm – will constitute a test sample of $610\text{ mm} \times 100\text{ mm}$. Staples may be used to secure the join in order to ensure that there is no gap at the overlap.

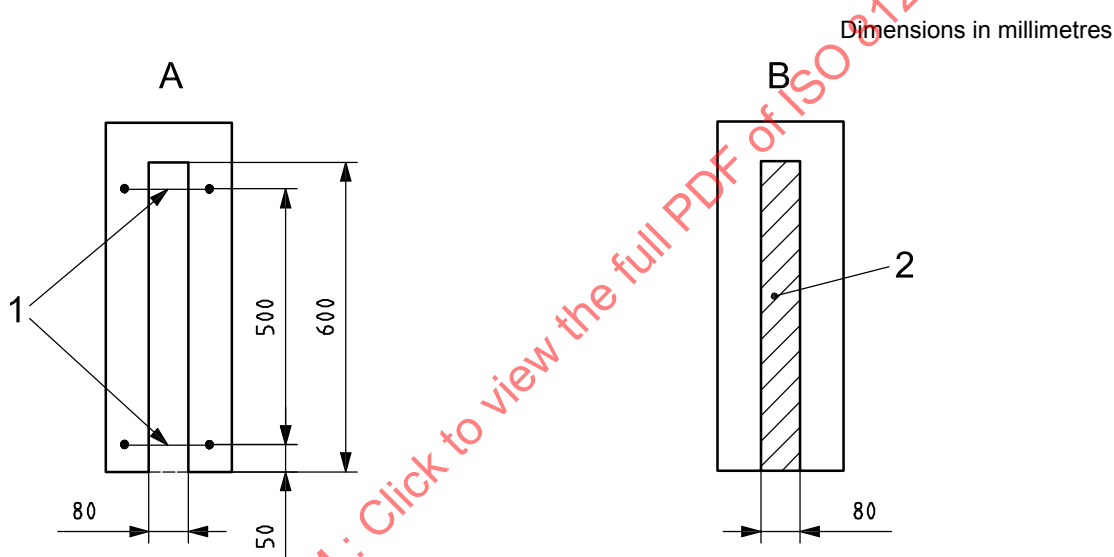
As the rate of spread of flame can be different with the direction of the fabric, where there is enough material, cut the test sample with the length corresponding to the vertical direction of the toy when in use.

For toys corresponding to 4.3 (toy disguise costumes and toys intended to be worn by a child in a play), if the costume is intended to be reversible and the material has non-identical surfaces, both sides of the material shall be tested. In this case a second sample is prepared and may be from a second toy if there is insufficient material to obtain two samples from the same toy.

For toys corresponding to 4.4 (toys intended to be entered by a child), if the material has non-identical surfaces, both sides of the material shall be tested. In this case a second sample is prepared and may be from a second toy if there is insufficient material to obtain two samples from the same toy.

5.4.2 Holding the sample (see A.7)

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



Key

- A top side
- B underside
- 1 100 % mercerized white cotton marker threads
- 2 sample

Figure 1 — Test relating to flowing elements of toys to be worn on the head (except those covered by 4.2.2 and 4.2.3), hoods, head-dresses, fabric masks which partially or fully cover the head, toy disguise costumes, toys intended to be worn by a child in a play and toys intended to be entered by a child

For toys corresponding to 4.2.5 (flowing elements of toys to be worn on the head) and 4.3 (toy disguise costumes and toys intended to be worn by a child in a play), the outside surface of the material when in use, shall be positioned face up.

Attach 100 % cotton mercerized threads, (white mercerized threads having a maximum linear density of 50 tex), at points A and B of Figure 2 across the sample at no more than 2 mm from the surface of the sample, with a device to indicate when the marker thread is severed.

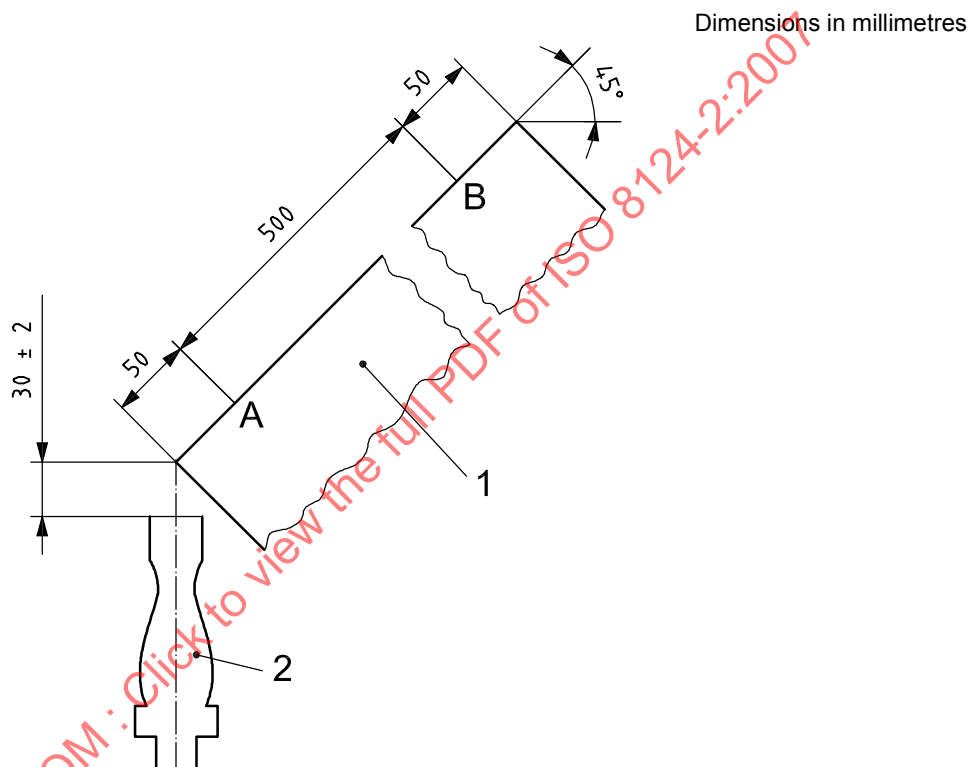
Position the sample holder at $(45 \pm 1)^\circ$ to the horizontal.

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).



Key

- A and B location of 100 % mercerised white cotton marker threads
- 1 sample
- 2 burner

Figure 2 — Gas burner

5.4.5 Test performance

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

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

5.4.6 Results

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

If ignition occurs and the first marker thread is severed and the flame extinguishes before severing the second marker 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

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.

If ignition occurs and the flame extinguishes before reaching the height of the uppermost toy surface, the tested toy is considered as self-extinguishing.

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

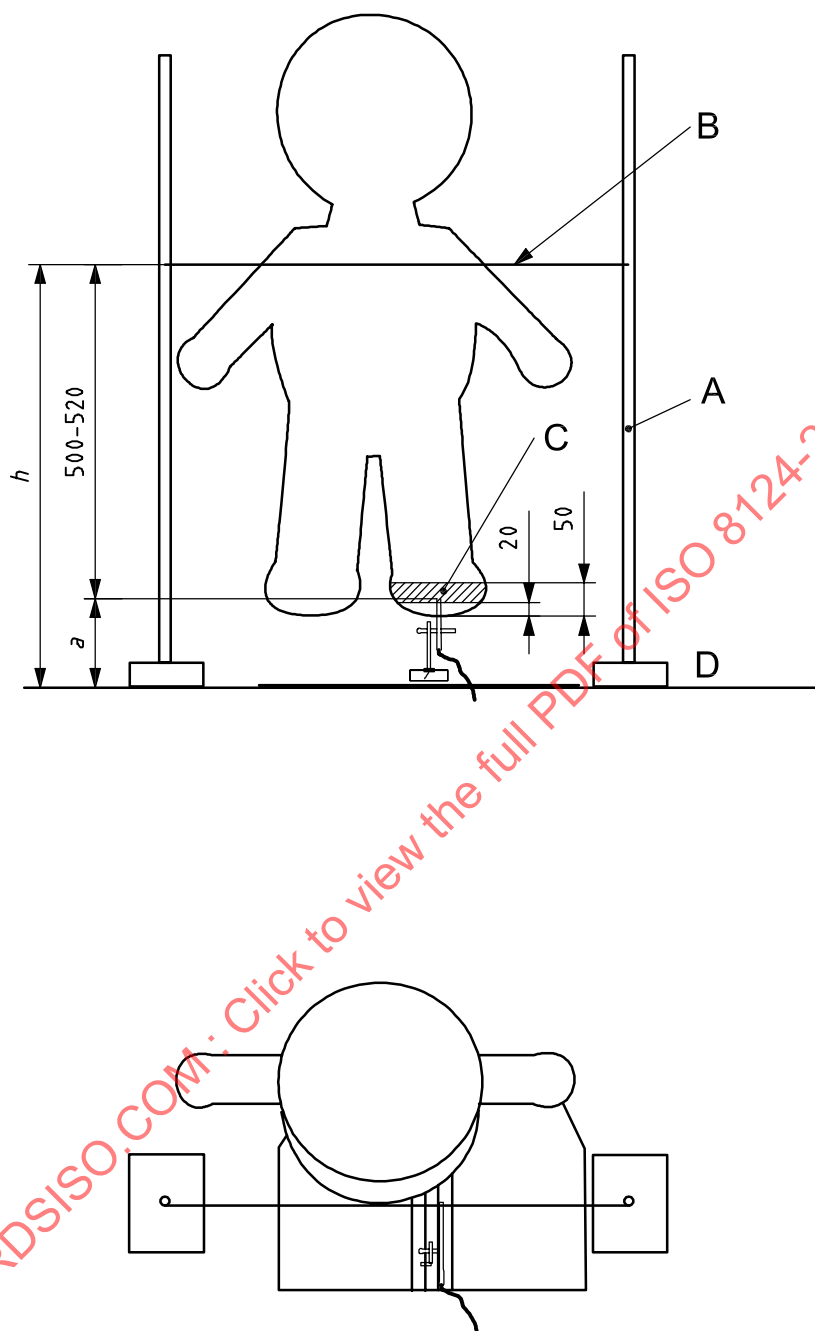
Position the toy vertically, i.e. with the head uppermost, if it has one, or otherwise so that the toy presents the maximum unhindered vertical area of its surface to the spread of flame, supported at least by two vertical metal supports as shown in Figure 3. The metal supports shall be equipped with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

The height of the marker thread shall be adjusted to be within 500 mm to 520 mm above the point where the test flame is to be applied. The marker thread shall be positioned to facilitate visual identification of the time that the flames first reach this height.

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 vertical area to be tested.

If ignition has occurred when the test flame is removed, start the timing device and stop it when flames first reach the height of the marker thread.

Dimensions in millimetres

**Key**

- h height above bench top of marker thread
- a height above bench top at which test flame was applied
- A vertical metal support
- B marker thread
- C area of flame contact
- D test bench

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

If the flame extinguishes before reaching the height of the marker thread, the rate of spread of flame is considered to be less than 30 mm/s.

Note the time and calculate the rate of the spread of flame as follows:

$$\frac{(h-a)}{t}$$

where

h is the height of the marker thread above the bench top, in millimetres;

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

t is the time from removal of the test flame to when the flames first reach the height of the marker thread, in seconds.

6 Test report

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

- a) description and identification of the product;
- b) reference to this part of ISO 8124, i.e, ISO 8124-2:2007;
- c) clauses deemed applicable;
- d) results and conclusions of the tests;
- e) type of gas (butane or propane) used in the test burner;
- f) any departure by agreement or otherwise from the test procedures specified, particularly with regard to washing of samples;
- g) details of any washing instructions supplied with a disguise costume or toy intended to be entered by a child.