

Testing the performance of novelty slippers

Novelty and character slippers enjoy a year-round demand. MARK SOUTHAM and EMMA NORRIS explain how SATRA tests them.

Novelty slippers are not only made for young children – people of all ages now wear them. However, the availability of such footwear has raised concerns about safety. For example, some styles could present a tripping hazard, causing injury and possibly litigation.

Slip and trip

Slip resistance is an important safety feature for all footwear. SATRA TM144:2011 – ‘Friction (slip resistance) of footwear and floorings’ is well established as the best method for assessing slip resistance, and uses a reference clay tile surface to measure

the friction characteristics of solings. However, assessment against vinyl, wood and carpet (the most common indoor flooring surfaces) is also requested by some retailers.

Slippers are generally not designed for wet outdoor environments. Of course, they may be worn on kitchen or bathroom floors which can become wet from time to time. For this reason, some retailers specify testing for slip resistance on wet surfaces.

Many novelty slippers have external attachments, such as noses, floppy ears, antennae, heads and arms and legs, which can overhang the edge of

the slipper. These may pose a tripping hazard when walking, but particularly when the wearer is climbing or descending stairs. We have already seen product recalls of novelty slippers with pom-poms on the end of cords – there were instances of the cords on the two slippers getting tangled together and causing a child to trip over.

Novelty slippers sometimes have unusually wide soles – for example, in the shape of animal feet. These can be difficult to walk in, with the wearer treading on the opposite slipper with each step. This increases the risk of the



There are a number of safety factors that must be considered when designing and producing novelty slippers

wearer tripping or stumbling, and is particularly hazardous on stairs.

A SATRA wearer assessment will assess the risk of impairment of safe walking. The assessment involves wearer trials on both flat ground and stairs. Sole attachment failure could also result in a trip, so either peel strength of adhesive bonds or measurement of the strength of the seam attaching the sole to the upper should be routinely carried out.

Novelty slippers as toys?

Novelty slippers come in a huge variety of designs, such as animal and cartoon characters. They share many characteristics with plush, soft-filled toys, and may be played with in a similar way by young children. As with many consumer goods, footwear does not have specific requirements, standards or legislation with which it must comply. However, in the European Union (EU), the General Product Safety Directive 2001/95 EC (GPSD) is applicable for consumer products that are not covered by specific legislation. The aim of the GPSD is to ensure that only ‘safe’ consumer products are sold within the EU. The definition of a safe product is ‘one which, under normal or reasonably foreseeable conditions of use presents no risk – or minimal risk – to the consumer’.

In addition to the basic requirement to place only safe products on the market, producers must inform consumers of the risks associated with their products. They must also take appropriate measures to prevent such risks and be able to trace dangerous products. The safety requirements for toys detailed in the EN 71 series of standards are often seen as good practice, as they take into account the instinctive behaviour of children. To show due diligence with the GPSD for children’s novelty slippers as well as adult sizes, they may be considered as appealing to children.

There are three key parts to the EN 71 Toy Safety Standard which can be considered relevant to novelty slippers, as we will now detail. **EN 71-1:2014 – ‘Mechanical and physical properties’.** Children less than 36 months of age will instinctively place almost anything in their mouth to suck or chew on, so novelty slippers should be assessed for the associated



Figure 1: Using the small parts cylinder

risks. Clause 5.1 of EN 71-1 includes a range of tests to determine if the item incorporates any parts which would fit entirely in the small parts cylinder (figure 1), and would therefore be classed as a choking hazard. Many novelty slippers have uppers with fur or long fibre pile. If detached, these would not be considered as a ‘small part’ under EN 71-1, as they are classified as ‘fabric or fuzz’. However, these fibres might be considered as a

choking hazard if they are pulled out in clumps. SATRA has developed the SATRA TM227:2016 – ‘Assessment of fibre shedding or pile loss’ test method especially to determine the likelihood of pile loss.

Clause 5.1 of EN 71-1 also includes drop and impacts tests, as well as a tension test where either a 50N or 90N force is applied, and torque tests where a component is twisted, to see if it can be removed (see table 1). Testing

Table 1: Clause 5.1 – torque, tension, seams, drop and impact requirements		
Test	Test method	Requirements
Torque test	EN 71-1 Clause 8.3	A component that can be gripped between thumb and forefinger. Torque is applied until either a rotation of 180° is attained or a torque of 0.34Nm is reached
Tension test	EN 71-1 Clause 8.4.2.1	A tensile force of 90N for ten seconds when the largest accessible dimension of the component is greater than 6mm, or 50N where the largest accessible dimension is less than 6mm
Seams and materials	EN 71-1 Clause 8.4.2.2	A tensile force of 70N for ten seconds is applied to a seam
Drop test	EN 71-1 Clause 8.5	A product is dropped five times through a height of 850mm onto a drop plate
Impact test	EN 71-1 Clause 8.7	A metal weight with a mass of 1kg is dropped from a height of 100mm onto the product.

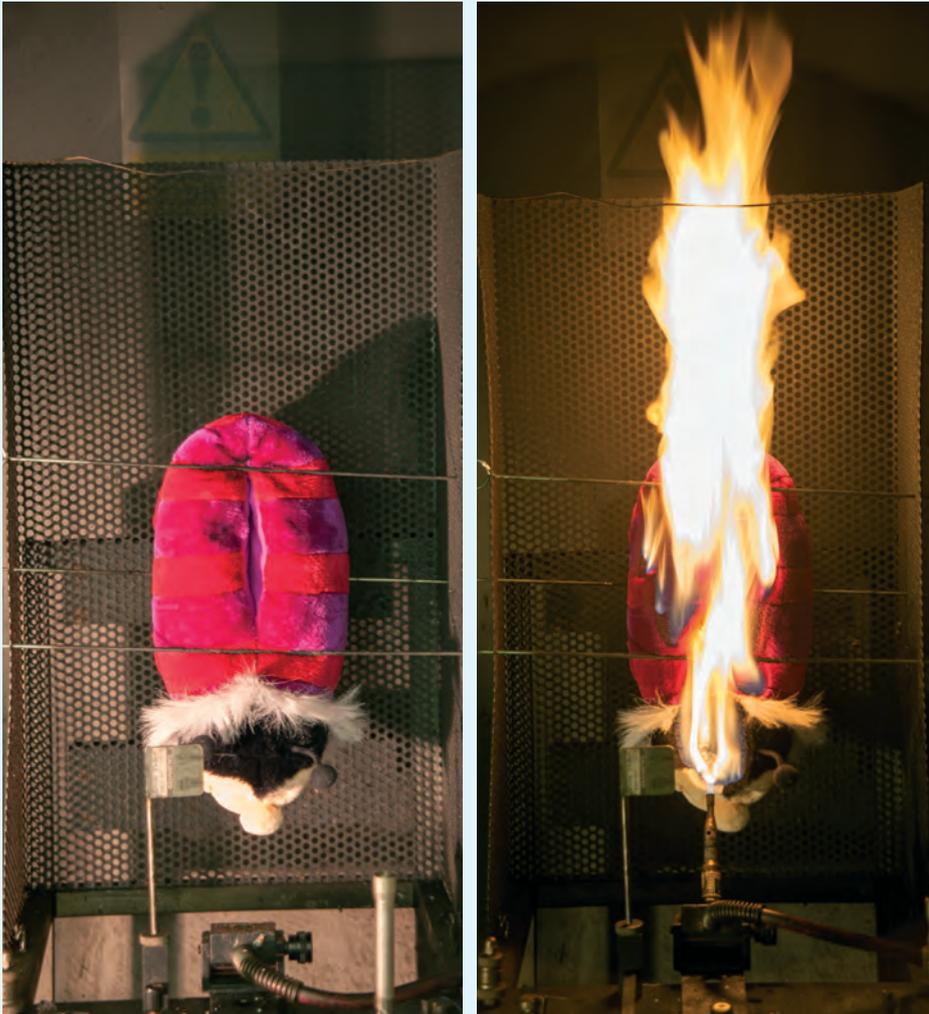


Figure 2: An example of a novelty slipper which proved to be very flammable



Extractable metals being measured by inductively coupled plasma (ICP) spectrometry in line with EN 71-3

Element	Category III migration limit (mg/kg)
Aluminium	70,000
Antimony	560
Arsenic	47
Barium	18,750
Boron	15,000
Cadmium	17
Chromium	460 (Cr III) 0.2 (Cr VI)
Cobalt	130
Copper	7,700
Lead	160
Manganese	15,000
Mercury	94
Nickel	930
Selenium	460
Strontium	56,000
Tin and Organic tin	180,000 12 (organic)
Zinc	46,000

seams is also required to prevent potential exposure to small parts such as rattles or bells, or fibrous/foam filling materials. Other hazards may be the presence of sharp edges or sharp points, which are covered under clause 4 of EN 71-1.

EN 71-2:2011+A1:2014 – ‘Flammability’. EN 71-2 assesses the risks and potential injuries associated with flammability. It is used by many suppliers of slippers – especially the novelty type, where the test is conducted as if the products are soft-filled toys (see figure 2). The performance requirements in EN 71-2 for soft-filled toys calls for the rate of flame spread to not be more than 30 mm/second, or the toy should self-extinguish.

However, the requirements for soft-filled toys in EN 71-2 do not address the issue of having to remove a burning slipper from the foot rather than just dropping the item. For this reason, SATRA developed the SATRA TM225:1998 – ‘Burning behaviour of slippers’ test method, which uses the same principle as EN 71-2, but with more stringent recommendations – such as an assessment of holing. SATRA guidelines also include a lower burn rate (of 20mm/second for SATRA TM225 compared to 30mm/second for EN 71-2).



If a slipper is labelled as being 'washable', it should be tested to ensure that no deterioration will take place

A requirement under EN 71-2, clause 4.1, note 2 specifies that toys intended for children under 36 months of age must be designed in such a way that they can be cleaned and still fulfil safety requirements after having been cleaned. SATRA TM225 assesses slippers labelled as 'washable' after a standard domestic wash.

EN 71-3:2013+A1:2014 – 'Safety of toys – Migration of certain elements'

EN 71-3 sets out the maximum limit for 19 extractable substances that might be released from accessible materials if they were to be swallowed (see table 2). The requirements for 'Category III' materials (as outlined in this section of EN 71) are applicable to natural and synthetic textiles and polymeric materials. Soluble elements are extracted from the material in dilute hydrochloric acid – a condition that simulates contact with gastric juices for a period of time after being swallowed.

Common practice requires that toys aimed at children under the age of six years be tested in accordance with EN 71-3, as it is deemed that by the age of six children do not mouth their toys to any significant degree. Therefore, it is appropriate for footwear designed for children under the age of six and adult's novelty footwear that may be appealing to young children to be tested in accordance with EN 71-3. The standard

requires testing to be carried out on all material types and individual colours for accessible components, as defined by clause 8.10 of EN 71-1.

Some chromium-tanned leathers can have difficulty in meeting the chromium III migration limit. However, SATRA has carried out a research project (see the article 'Extractable chromium in children's leather footwear', published in the January 2016 issue of *SATRA Bulletin*), which concluded that 60 per cent of the leathers submitted by children's shoemakers passed the requirements. The extractable chromium limit in EN 71-3 can therefore be usefully applied to children's footwear, where there is a risk of mouthing, to demonstrate that the chromium level has been carefully controlled and presents a low risk.

Minimum quality levels

Novelty slippers should also be assessed for general durability and quality. Slippers are normally considered as light-use footwear so, for example, fairly low levels of abrasion resistance of the upper and lining may be acceptable. Using SATRA TM31:2003 (2014) – 'Abrasion resistance – Martindale method' (Method A), no worse than moderate wear after 12,800 revolutions dry and 3,200 revolutions wet should indicate a satisfactory performance. Many novelty slippers use a textile

soling, often with a rubber dot pattern to increase slip resistance. These too should be assessed for durability – we recommend a minimum performance of 51,200 revolutions dry in the Martindale test.

Colour fastness is also important – we are seeing an ever-increasing number of customer complaints where the footwear has stained an expensive carpet or item of furniture because the colour fastness of the upper or soling has been poor. This illustrates the importance of testing in order to avoid costly compensation claims.

We do not recommend that customers wash any type of footwear, unless it is labelled as being satisfactory to do so. However, if the slipper is claimed to be washable, it should be tested to ensure that washing will not cause any deterioration. SATRA TM158:2016 – 'Washability of footwear' can be used to check this. The method usually involves washing the slippers six times at a temperature of 40°C. A less rigorous test using three washes at a temperature of 30°C can be used for unstructured slippers where the product is likely to have a shorter wear life. After washing, the slippers are examined to see if there is any visible damage, degradation or change in dimensions or shape. The risk of colours running or changing can also be assessed.

SATRA can recommend relevant tests for each construction or material, along with the safety critical tests already mentioned. We can undertake full testing against the Toy Safety Standard, as well as all other tests applicable to novelty slippers.

How can we help?

Please contact SATRA's footwear testing team for assistance with the physical testing of novelty slippers, and the SATRA chemistry team to assess materials for the presence of specific substances.



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