

Methods of test for

Impact absorbing playground surfaces

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- Association of Metropolitan Authorities
- Association of Play Industries
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- Department of the Environment (Property Services Agency)
- Design Council
- Independent Engineering Insurers' Committee
- Institution of Civil Engineers
- Landscape Institute
- National Playing Fields Association
- Royal Society for the Prevention of Accidents
- Timber Research and Development Association

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Foreword

This British Standard was prepared under the direction of the General Mechanical Engineering Standards Policy Committee.

In the British Standard for play equipment for permanent installation outdoors, BS 5696, it is strongly recommended that the organizations responsible for the purchase of such equipment also ensure that impact absorbing surfacing is provided around those items of equipment from which children are most likely to fall. This standard describes methods of determining the more important properties of playground surfacing materials and the manner in which their performance is to be expressed.

By making reference to this standard it will be possible for BS 5696 to make more detailed recommendations for playground surfacing appropriate to particular equipment and activities.

Studies of accidents to children in playgrounds have shown¹⁾ that the majority of the more serious cases involve head injuries caused through striking hard ground. Section two of this standard describes a method by which the ability of a surfacing material to absorb the energy of a child falling on to it is measured. It uses the concept of severity index (see appendix A) developed by Gadd et al²⁾ in which the severity of a blow to the head is estimated by mathematical integration of the area under a plot of deceleration versus time for the entire impact event. Severity index is considered a more meaningful parameter of the pathogenicity of a blow to the head under these conditions than other concepts such as peak acceleration or rate of change of acceleration.

The third section of this standard describes the testing of materials for their resistance to wear. It is considered important that any surface installed in a childrens' playground should be sufficiently hard wearing that it continues to function for many years. There are many different aspects of wear that will contribute to the overall durability of a surface but one of the most important is abrasion resistance.

It is also important that any pattern or profile imparted to the wearing surface to improve its slip resistance should be retained even in areas of heaviest wear such as beneath a swing or roundabout.

Section four of this standard describes a method by which the slip-resistance of a surfacing material is to be measured. Good surface traction is particularly important in order to reduce accidents when children climb on or off moving equipment. Many impact absorbing materials are manufactured from rubber formulations which may not have adequate slip-resistance for this situation, unless they are carefully designed with this property in mind.

Section five of this standard describes a method by which the resistance of a surfacing material to indentation by point loading is to be measured. Good resistance to such forces is particularly important in order to reduce accidental damage to resilient surfaces by high-heeled shoes and also by deliberate vandalism.

Many impact absorbing materials are manufactured from resilient rubber formulations which, to remain effective, must not only be compliant and able to absorb the impact of a falling child, but must also have adequate resistance to damage.

Section six of this standard describes a method by which one aspect of the flammability of a surfacing material may be determined.

¹⁾ In "Two hundred injuries caused by playground equipment" British Medical Journal (1975) 4, 332-334.

²⁾ In "Use of a weighted impulse criterion for estimating injury hazard" Proceedings 10th Stapp Car Crash Conference (December 1966).

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1.1 Scope

This standard describes five methods of testing impact absorbing playground surfacing.

It covers methods of assessing manufactured products in the form of resilient tiles, mats, slabs or other continuous surfacing which can be either pre-fabricated or formed in situ. The first method described, that for the measurement of the ability to absorb energy, may also be used to assess materials of a particulate nature such as pea gravel, sand, wood chips and bark.

The five methods of test are as follows.

- a) The measurement of the ability of the surface to absorb energy.
- b) The measurement of the ability of the surface to resist abrasive wear.
- c) The measurement of the slip resistance of the material.
- d) The measurement of the ability of the material to resist indentation by point loading and to recover from sustained loading.
- e) The assessment of the response of the material to one particular source of ignition. It does not give an indication of what contribution the product would make to an established fire or its response to a larger ignition source.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

1.2 Definitions

For the purposes of this British Standard, the definitions given in BS 5696-2 apply together with the following.

1.2.1

accelerometer

a piezoelectric drive, capable of generating an electric charge proportional to the acceleration to which the device is subjected

1.2.2

effective drop height

for a free falling headform, the distance, in metres, between the lowest point of the headform at the moment of release and the top surface of the specimen. For a guided headform the height from which it would need to fall to impart to it the same velocity on impact as that measured in the test

1.2.3

critical height

the lowest value for the effective drop height giving a severity index value of 1 000, obtained in any of the series of tests described in this standard

NOTE Critical height represents the greatest height of head-first fall from which a child, landing on a surface, could be expected to avoid sustaining a critical head injury.

1.2.4

headform

a missile, designed to simulate the size and shape of a human head, used as a striker in an impact test

1.2.5

playground

an area set aside for childrens' play containing play equipment

NOTE The term playground does not extend to areas intended for general ball games or areas set aside for children to assemble freely for pedestrian activities.

1.2.6

impact absorbing surfacing

a material, applied as a final covering to a playground surface having a resilient or compliant elastomeric composition, designed to dissipate part of the energy of an impact

1.2.7

severity index (SI)

the integral of the acceleration experienced by a headform throughout an impact, raised to the power 2.5

NOTE The severity index value is a measure of the severity of a blow in human injury terms.

1.2.8

slip resistance

the force which resists the relative movement of a shod foot, when in contact with a floor surface

1.2.9

wear index

a numerical expression of the resistance to wear, in terms of the rate of weight loss by a specimen in the test procedure described

1.2.10

wear ratio (ρ)

a numerical expression of the ratio of the wear index at the beginning of the test procedure to that at the end of the test

1.2.11

afterglow

persistence of glowing of a material, under specified test conditions, after cessation of flaming or, if no flaming occurs, after removal of the ignition source