



**Playground surfacing – Specifications,
requirements and test method**

STANDARDS
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This Australian Standard® was prepared by Committee CS-005, Playground Equipment. It was approved on behalf of the Council of Standards Australia on 7 November 2016. This Standard was published on 23 November 2016.

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 - Early Childhood Australia
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 - Engineers Australia
 - Kidsafe
 - Institute of Public Works Engineering Australasia
 - National Association of Testing Authorities, Australia
 - NSW Fair Trading
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-

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Australian Standard[®]

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PREFACE

This Standard was prepared by the Standards Australia Committee CS-005, Playground Equipment, to supersede AS/NZS 4422:1996.

The objective of this Standard is to provide a test method to measure compliance with thresholds that if exceeded are more likely to lead to death associated with brain injury resulting from a fall or impact onto surfaces. The thresholds contained within this Standard only relate to acute brain injuries.

This Standard will apply from the date of publication.

The term 'informative' has been used in this Standard to define the application of the appendices to which it applies. An informative appendix is only for information and guidance.

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FOREWORD

Designers, operators, installers, and maintainers of playgrounds need to take reasonable care to identify and address foreseeable hazards in the play facilities that they are responsible. The most common cause of serious playground injury is a fall from a height onto the playground surface. Therefore, appropriately impact-attenuated playground surfaces are a key safety strategy and injury prevention intervention. This Standard sets out the methods for testing the impact-attenuation performance of playground surfaces. Such testing is required in the development of prototype surfacing products, at the commissioning of newly installed surfaces, and during the periodic field-testing of the impact attenuating surface to confirm continuing minimum acceptable performance.

The performance requirements contained within this Standard are minimum threshold values that designers, installers and operators are strongly encouraged to exceed. The better the impact-attenuating properties of a surface, the lower the frequency and severity of injuries, particularly brain injuries. Long-bone fractures involving the growth plate can also lead to permanent disability, but unfortunately impact attenuation of playground surfaces is not a particularly effective countermeasure for these. Playground surfaces that pass the minimum threshold values that also have an inherent bounce property are known to increase the likelihood of long-bone fractures. Playground surfaces that bring the child to rest over a short period of time or over a short distance (penetration) are also associated with a higher likelihood of injury associated with falls.

The test described in this Standard uses an instrumented hemispherical missile. The performance of an impact-attenuating surfacing system is specified in terms of its critical fall height (h_c), that is, the maximum fall height at which the impact test scores do not exceed any of three limits established by this Standard. Currently, these limits are peak acceleration during impact (g_{max}) less than 200g; a head injury criterion (HIC) value less than 1000; and a HIC duration greater than 3 ms.

The committee considered the use of other injury predicting indicators, including the maximum jerk (j_{max}), bounce, penetration, and energy. The members concluded that specifying any of these would create an additional reporting requirement that would pose an unnecessary financial burden on the playground industry. The committee considered increasing the HIC duration from 3 ms to 5 ms. The committee agreed to retain the 3 ms HIC duration pass/fail performance criteria and monitor and review if other jurisdictions or evidence supported increasing the HIC duration.

The HIC value of 1000 is merely one data point on a risk severity curve, where a HIC of 1000 is equivalent to a 3% probability of a critical brain injury (equivalent to an Abbreviated Injury Score (AIS) of 5), an 18% probability of severe brain injury (AIS 4), a 55% probability of serious brain injury (AIS 3), a 89% probability of moderate brain injury (AIS 2), and a 99.5% chance of minor brain injury (AIS 1), to an average male adult. In setting the impact limits the CS-005 committee did not take into consideration recent research into the long-term effects of traumatic brain injury (TBI) associated with non-concussive impacts. It is the committee's intention to consider research in this area in any future revision of this Standard.

The committee is aware that impact-attenuating playground surfaces may, depending on the type of product, introduce inadvertent risks to children. For example, some products can become too hot for barefoot play in un-shaded areas on days of extreme high temperature. Other products, particularly those that are recycled, may contain hazardous sharps. In selecting an appropriately impact-attenuating surface for a particular site, playground designers, installers and operators are cautioned against selecting excessively dusty, sharp, ingestible, contaminated, or otherwise hazardous materials.

Children discover and learn about the world in which they live through play, which is essential for children's healthy growth and development. A child's perception of successful negotiation of risky situations is important for confidence building and competent risk assessment which leads to children learning how to manage their own safety. The minimum threshold impact-attenuation performance values of playground surfaces do not detract from this perception. Playground surfacing should prevent permanent injury and death while contributing positively to a child's ability to learn autonomous risk assessment skills.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE AND OBJECTIVE

This Standard specifies test methods by which the performance of impact-attenuating surfaces can be determined in the laboratory and on-site, such as in playgrounds, sports surfaces and other sites.

The objective of this Standard is to provide a test method to measure compliance with thresholds that if exceeded are more likely to lead to death associated with brain injury resulting from a fall or impact onto surfaces. The thresholds contained within this Standard only relate to traumatic brain injuries.

1.2 APPLICATION

This Standard is intended to be used in conjunction with the AS 4685 series.

This Standard is also intended to be used as an impact-attenuating surface test method where no specific Standard exists.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
4685	Playground equipment and surfacing
4685.0	Part 0: Development, installation, inspection, maintenance and operation
4685.1	Part 1: General safety requirements and test methods (EN 1176-1:2008, MCD)
1141	Methods for sampling and testing aggregates
1141.3.1	Method 3.1: Sampling—Aggregates
AS ISO/IEC	
17025	General requirements for the competence of testing and calibration laboratories
ISO	
6487	Road vehicles—Measurement techniques in impact tests—Instrumentation

1.4 DEFINITIONS

For the purpose of this Standard, the following definitions apply.

1.4.1 Competent person

A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform a specified task.

1.4.2 Critical fall height (h_c)

The maximum free height of fall for which a surface will provide an acceptable level of impact attenuation.