



GROUND SURFACING IN OUTDOOR PLAY AREAS

Why is the ground surface in an outdoor playspace so important?

A significant body of scientific research indicates that the frequency and severity of playground injuries, resulting from falls from playground equipment, are substantially reduced where an adequate impact absorbing surface is provided.

Where is an impact absorbing surface needed?

The Australian Standard states that an impact absorbing surface is needed wherever falls from play equipment, fixed or movable, are possible - ie. in the 'fall zone'.

Impact absorbing surfaces are required in outdoor playspaces to reduce potential head injury to children as a result of normal play activity.

Impact absorbing surfaces which have been tested are required in any area under and around playground equipment where falling is possible from a height of 500mm or above.

An impact absorbing surface is not necessary where falls **are prevented** by engineering means. This **does not** mean that fall zones can be reduced arbitrarily.

What is the fall zone?

The fall zone is the area under and around a piece of playground equipment onto which a child could fall. It extends under and around equipment in every direction in which it is reasonably foreseeable that a child could fall. It is the minimum distance from any part of equipment to any hard surface (borders, paths, tree trunks or adjacent equipment)

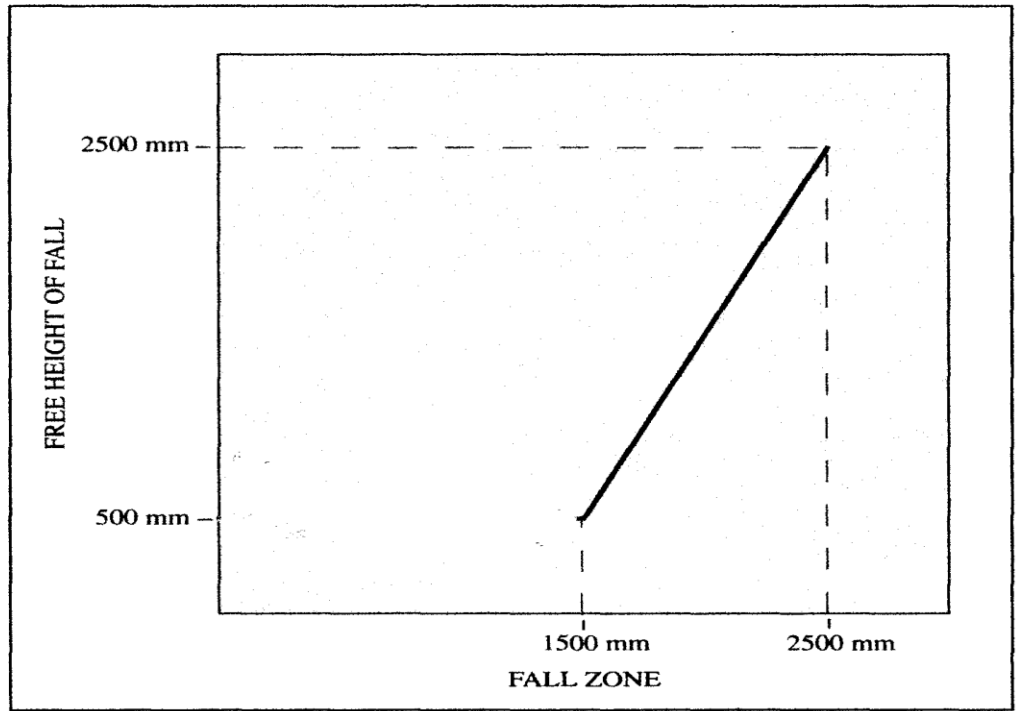
How big is the fall zone?

The 2004 AS 4685 allows the fall zone to be determined according to the exact measurement of the free height of fall which will be documented in table form in the Standard. This allows for the height of most users, plus the outward momentum they could have as they fall. The minimum fall zone shall increase from 1500 mm to 1900 mm depending on the free height of fall from 500 mm to 1500 mm. . Where the dimensions of the fall zone are not specified in the appropriate part of the AS 4685 series for the particular type of equipment, the minimum dimensions as detailed in AS 4685 Part 1 will apply.

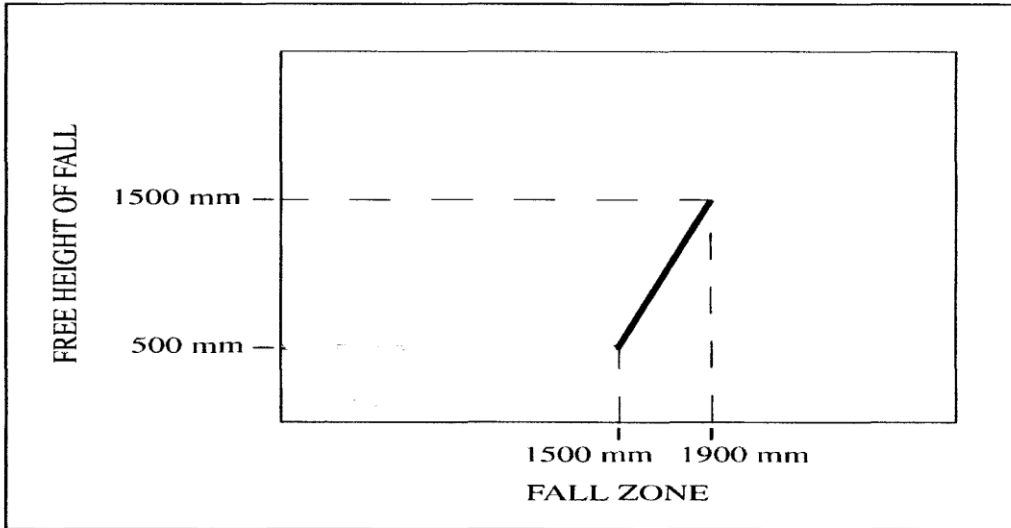
For moving equipment this distance is measured from the extremity of the movement. Children falling, jumping or being pushed off equipment should land within the fall zone onto an impact absorbing surface. Under certain circumstances fall zones may be reduced (i.e. when equipment will not permit falling).

There are also particular requirements re the fall zone applicable for swings. It should be noted that AS 4685 does not require a fall zone at the side of swing structures.

The fall zone is measured from the outer perimeter of the equipment.



MINIMUM EXTENT OF FALL ZONE - SUPERVISED EARLY CHILDHOOD SETTINGS



Who is responsible to determine the size of the fall zone?

The designer/play equipment supplier.

If the free height of fall is less than 500 mm, the impact absorbing material does not need to be **tested**. The standard outlines examples of surfaces that provide some impact absorption, and so would be acceptable with fall heights of less than 500 mm (e.g. well-maintained turf). It also gives examples of other surfaces that do not absorb impacts and that would not be acceptable (e.g. concrete, or timber).

In all situations where the free height of fall is less than or equal to 500 mm, the minimum surface requirements as detailed in the Table below shall apply.

MINIMUM SURFACE REQUIREMENTS IN FALL ZONE FOR FREE HEIGHT OF FALL LESS THAN OR EQUAL TO 500 MM

Non-moving equipment

Moving equipment

Use	Not used for Climbing	Used for climbing	Not used for climbing	Used for climbing
Surface requirement	Any surface	Impact attenuating surface required-testing not required	Impact attenuating surface required-testing not required	Impact attenuating surface required-testing not required

Concrete footings should be buried underground. Industry practice is that the top of the concrete be 50-100mm below natural ground level, and then covered with the required depth of impact absorbing material.

What is the maximum free height of fall (fall height) permitted in an outdoor playspace?

This is the greatest distance between a part of the equipment to which a child has reasonably foreseeable access and the playing surface or part of equipment beneath. It is measured from the standing surface (usually a platform) to the surface underneath the equipment.

If the design of your equipment allows children access to higher parts (not necessarily intended for standing) then this should be considered the free height of fall.

The Standard AS 4685 diagrammatically indicates the point from which the free height of fall should be measured.

The 2004 Australian Standard AS4685 indicates that the maximum free height of fall shall be 1500 mm (1.5 m) for Supervised Early Childhood Centres. PRAV recommends that 1000mm (1.0m) is the maximum fall height recommended for 0-3 year olds.

What is adequate impact absorbing material?

The required impact absorbing material depth depends on the material used and the height of the equipment from which falls can occur. The height from which a fall could occur onto a surface that has the capacity to absorb the impact, is the “free height of fall”. Put briefly, falls from above the “free height of fall” onto a surface with an **inadequate** depth, could result in brain injury.

Any impact absorbing material installation should have a “free height of fall” greater than the highest point on the playground equipment to which a user has 'reasonably foreseeable access'.

How effective is undersurfacing?

It is very effective in the prevention of head injury, when installed properly in accord with AS/NZS 4422, however, it does not necessarily prevent injury to other parts of the body.

Are rubber or synthetic surfaces more effective than loose materials in preventing injury?

No, and current data suggests that loose materials if well maintained perform best re impact absorbing qualities.

PRAV believes that there is a need for a wide variety of playing surfaces to be available to children, and that every setting should be assessed according to the needs of the children, the diversity of play experiences available to the children; and, the availability of materials.

What types of impact absorbing material are suitable?

There are many kinds of materials suitable for use in outdoor play areas which include.

Loose natural materials	Synthetic fixed materials
pea gravel	rubber matting
double milled woodchips	tiles
mulch	rubber poured on site, wet pour method.
sand	
pinebark	
pea hulls	
grass	

PRAV advises against use of sand except when the particular sand is of a granulated variety which does not absorb moisture, and thus does not compact. However, it is acknowledged that there are large parts of Australia where sand is the commonly used material. There are many kinds of sand and some sand can form as solid as concrete. Washed river sand is soft sand. If sand is used, it needs to be checked and/or turned over on a daily basis.

What are the impact absorbing surface material requirements?

1. Loose natural material *Below 500mm free height of fall*

The impact absorbing surface material does not need to be tested but it should have some impact absorption.

Above 500 mm free height of fall

- ◆ 200 mm loose material
- ◆ plus 50 mm for deterioration
- ◆ plus 20% for traffic (i.e. under a swing, at the foot of a slide etc.)

i.e. 300mm is recommended to be installed so that the actual depth of the impact absorbing surface once settled on a daily basis is 250 mm.

2. Synthetic fixed materials

As per the playground equipment suppliers test results as detailed in AS/NZS 4422.

There are strengths and weaknesses of all surfaces, and playspace managers are advised to consider the following issues and/or seek advice from PRAV prior to purchasing undersurfacing materials:

- ◆ *appearance of material;*
- ◆ *vandal proofing;*
- ◆ *fire resistance;*
- ◆ *slip resistance;*
- ◆ *accessibility for all children;*
- ◆ *drainage;*
- ◆ *site topography and vegetation;*
- ◆ *weather conditions;*
- ◆ *material type and range used;*
- ◆ *installation requirements;*
- ◆ *length of time installers have been laying the product;*
- ◆ *installer's contractual arrangements: employees or contractors;*
- ◆ *guarantees/warranties for both product, civil works and labour, including an assurance certificate, including an ABN, stating that the systems employed are true and equal to the company's approved method and test results as required as per the AS 4422;*
- ◆ *track record of supplier;*
- ◆ *selling company's length of experience in "the" business and time of the company's operation;*

- ◆ *additional issues relevant to the use of synthetic surfaces such as:*
 - ◆ *desirability for references of 3,5 and 8 years duration;*
 - ◆ *evidence of back up service and/or repairs;*
 - ◆ *cleaning and maintenance requirements;*
 - ◆ *costs, initial plus on going;*
 - ◆ *durability; and,*
 - ◆ *replacement costs.*

Suppliers are required to have their material tested by an approved testing authority. The impact attenuation related to the depth of material to be installed is a key component of the Test Report. The Test Report is required to contain the following information and potential customers should request a copy of this Report at the quote and/or tender stage:

- ◆ *Identification details of material;*
- ◆ *The location of the test (laboratory or on-site) and, if relevant, the substrate on which the surfacing was tested;*
- ◆ *The method of fixing used to retain the samples, the internal dimensions of the test container used and the layer thickness for loose fill material;*
- ◆ *A diagram showing all the test positions;*
- ◆ *Condition of the surfacing at the time of the test including the temperature in °C, the moisture content if relevant (including the test method used) and the weather conditions if done on site;*
- ◆ *Specification of all fall heights (with effective fall heights), HIC and g values;*
- ◆ *Critical fall height for the surfacing tested, expressed in meters to the first decimal digit with no rounding;*
- ◆ *Curve for the minimum fall heights (effective fall heights) against the HIC and g values;*
- ◆ *Acceleration/time history of an impact (giving HIC values > 1000 and g values > 200, for the curve in (h));*
- ◆ *Statement to the effect that the fall height has been calculated relative to the nominated piece of equipment, and that no assumption has been made about the height of the user above that equipment;*
- ◆ *at least one characteristic and evaluated time/deceleration curve from that test series in order to demonstrate the quality of the signals, and to allow checking of the result;*
- ◆ *for loose fill materials, the uncompacted and compacted depths, and the material allowance; and,*
- ◆ *for loose fill materials, either a HIC 1000 or a g 200 curve, or both, plotted against fall height and material depth.*

For on-site testing, the report should also include the following information:

- ◆ *reference to this test method i.e. AS/NZS 4422, Appendix A;*
- ◆ *identification of the equipment used to determine the maximum drop height for that site; and*
- ◆ *the drop height used.*

The client should be advised that on-site testing from independent testers is available at the discretion and cost of the client.

It should be noted that a Standard is not a specification or a contract document, but provides the information which informs the testing process.

What are the responsibilities of playground equipment and undersurfacing suppliers?

The Standards require *playground equipment suppliers* to provide information on their products' performance and on the "free height of fall" required, as detailed above. They must also provide inspection and maintenance procedures necessary to ensure their product continues to perform at the required level throughout its life.

Undersurfacing suppliers should provide a copy of the certified test results, explaining what impact absorbing surface material depth (for loose fill materials) or structure (for fixed or 'unitary' products) is necessary for the required "free height of fall", as detailed above. It is not the responsibility of the undersurfacing supplier to detail the free height of fall.

Barbara Champion
Executive Director

AUSTRALIAN STANDARDS FOR PLAYGROUNDS SAFETY 2006

AS 4685	2004	<p><i>This Standard has 6 Parts:</i></p> <p><i>Part 1 General safety requirements and test methods</i></p> <p><i>Part 2 Particular safety requirements and test methods for swings</i></p> <p><i>Part 3 Particular safety requirements and test methods for slides</i></p> <p><i>Part 4 Particular safety requirements and test methods for runways</i></p> <p><i>Part 5 Particular safety requirements and test methods for carousels</i></p> <p><i>Part 6 Particular safety requirements and test methods for rocking equipment</i></p>
AS/NZS 4422	1996	<p><i>Playground Surfacing - Specifications , requirements and test method, including amendment No. 1, 5th May 1999</i></p>
AS/NZS 4486	1997	<p><i>Playgrounds and Playground Equipment</i></p> <p><i>Part 1-Development, installation, inspection, maintenance and operation.</i></p>
AS 2555	1982	<p><i>Supervised Adventure Playgrounds</i></p>
AS/NZS 4360	2004	<p><i>Risk Management</i></p>

Please note

For the purposes of risk management no Draft Standard has any status with Standards Australia and should not be referred to in Risk Assessment Reporting.