



#PlayToday

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promoting the value of play

GROUND SURFACING IN OUTDOOR PLAY AREAS

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

Acquired brain injuries as a result of falls from playground equipment can be substantially reduced where an adequate impact absorbing surface is provided. (Note, however, that under surfacing will not prevent many other types of injury, such as broken limbs, cuts and abrasions.)

Where is an impact absorbing surface needed?

Australian Standards state that an impact absorbing surface is needed wherever falls from fixed play equipment are possible from a height of 600mm or more (1000mm where between two decks in the same cluster). Moving equipment is required to have impact absorbing under surfacing within the impact area at any height, including where installed flush with the adjacent ground.

What is the impact area?

The impact area (previously known as the fall zone) is the area under and around equipment in every direction in which it is reasonably foreseeable that a child could fall.

Hard surfaces such as edging, paths, tree trunks or other items of playground equipment must be located outside of the impact area.

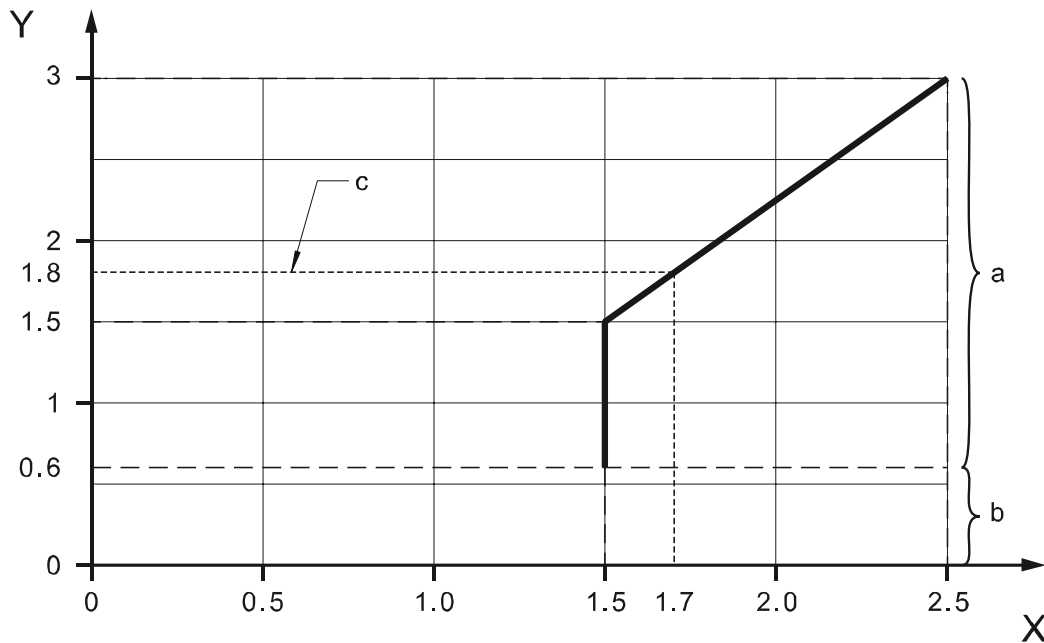
How big is the impact area?

In AS4685 the impact area is generally calculated from the resting height of a child's feet when placed flat on the upper-most part of the equipment that is intended to be accessible.

The impact area allows for the height of most child users, plus the outward momentum they could have as they fall.

The impact area is measured from the outside edge of the equipment, which in the case of moving equipment is taken from the most extreme point in the equipment's arc of movement in every direction.

Impact area requirements for fixed equipment are described in the table below. Note that different (usually larger) impact areas are required for slides and for motion equipment such as swings, carousels and track glides.



If $0 \leq y < 0.6$ then $x \leq 1.5$ (in metres)
 If $0.6 \leq y \leq 1.5$ then $x = 1.5$ (in metres)
 If $y > 1.5$, then $x = \frac{2}{3} y + 0.5$
 If $y = 1.8$ then $x = 1.7$

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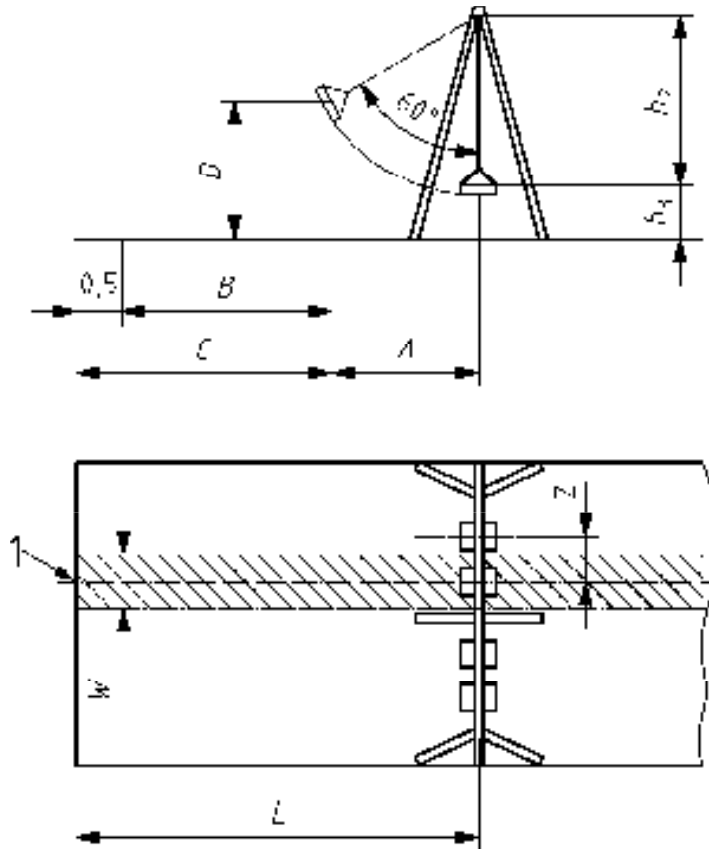
y = free height of fall
 x = minimum dimension of impact area
 a = impact attenuating surface with requirements (4.2.8.5.2)
 b = surface provided in accordance with 4.2.8.5.3
 c = maximum free height of fall and impact area for SECS

Swings

The free height of fall of a swing is determined from the middle of the seat vertically to the ground when the swing seat is raised by 60° . Alternatively, the free height of fall can be determined by the formula:

Free height of fall (D) = (length of the suspension member (h2) \div 2) + height of swing seat at rest (h3)
 (see diagram).

AS4685 does not require a fall zone at the side of swing structures.



Key

A $0,867 \times h$

B 1,75 m for level impact absorbing surface (normally synthetic)

C 2,25 m for contained impact absorbing surfaces (normally loose fill)

D maximum free height of fall

L $A + B$ or $A + C$

W width of the falling space

Z distance from swing axis to swing axis

h_2 length of swing suspension member

h_3 height of seat

1 area to be covered by impact absorbing surface under each swing position

Slides

Although technically complex, in practice the impact area for slides is taken from the height of the starting section, with a runout section at the end 2000mm clear in the direction of motion and 1000mm clear either side. The runout section requires impact absorbing material equivalent to a critical fall height of at least 1000mm.

Motion Equipment

Motion equipment generally has more complex requirements due to the momentum generated by the equipment. For the exact requirements refer to the original manufacturer or seek the advice of an experienced playground safety auditor or playspace designer.

Who is responsible for determining the size of the impact area?

The equipment designer or play equipment supplier must provide details of the required impact areas at the time the equipment is supplied. Nonetheless, mistakes can happen and not all equipment installers are equally experienced. Consequently, if you don't feel confident confirming impact areas, Play Australia recommends that you seek a second opinion from an experienced playground safety auditor or playspace designer.

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

The critical fall height 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 the equipment beneath. It is measured from the upper standing surface (usually a platform) to the surface below upon which a child might fall.

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 maximum free height of fall in Supervised Early Childhood Services is 1800mm.

In other playspaces the maximum free height of fall is 3000mm. Note, however, that standing points higher than 2000mm should in most cases not be 'easily accessible'. (An activity will generally be considered to be easily accessible if reachable by stairs, ramps, fixed-rung ladders and tiered platforms.)

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 will generally not prevent injury to other parts of the body.

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

No, and experience suggests that loose materials if well maintained can have significantly better impact absorbing qualities.

What types of impact absorbing material are suitable?

There are many kinds of materials suitable for use in outdoor play areas. Note, however, that many of these will require a particular formulation designed and tested to achieve particular impact absorbing qualities.

Loose fill materials need to be prepared by the supplier so that they have a consistent particle size free of fines (such as clay) and of sharp or pointy edges, and must drain freely.

Materials commonly used for impact absorbing under surfacing include

- Loose natural materials
 - pea gravel (2mm to 8mm grain size)
 - woodchip (5mm to 30mm grain size)
 - sand (0.2 to 2mm grain size)
 - bark (20mm to 80mm grain size)
- Synthetic fixed materials (tested to comply with AS4422)
 - rubber matting
 - mesh tiles
 - rubber poured on site ('wet pour')

What are the impact absorbing surface material requirements?

For loose fill materials, standards require a minimum 200mm thickness for critical fall heights under 2000mm, and 300mm for critical fall heights of 2000mm or greater.

Note, however, that these thicknesses are minimums and an allowance should be made for both compaction and displacement due to weathering and the normal movement of users over the surfacing.

Play Australia recommends that at the time of initial installation, and also when topping up under surfacing, playspace owners and managers should aim for a thickness 50% greater than the required minimums. (That is, 300mm for equipment up to 2000mm high, and 450mm for equipment between 2000mm and 3000mm high.)

For synthetic fixed materials, the surface must be tested and certified as complying with the requirements detailed in AS/NZS 4422. (Note, however, that many common synthetic materials have been known to harden over time due to age, weathering or exposure to sunlight – surfaces that feel too hard probably are too hard and should be retested or replaced.)

There are strengths and weaknesses of all surfaces and playspace managers are advised to consider the following issues and/or seek advice from Play Australia prior to making a large investment in under surfacing:

- appearance of the material
- vandal proofing
- fire resistance
- slip resistance
- accessibility for all children
- drainage
- site topography and vegetation
- weather conditions
- cleaning and maintenance requirements
- costs, initial plus on going
- durability, and
- demolition and replacement costs

Which is more cost-effective, rubber or loose fill materials?

Loose fill materials typically have a relatively low upfront cost, however will require frequent top ups as material breaks down and/or is displaced. Costs can therefore add up over time.

Synthetic materials typically have a large upfront cost and a large end of life cost (demolition and disposal), while the interim/maintenance cost of synthetic materials can also add up over time. For example, synthetic surfaces need to be swept regularly to remove sticks, rubbish and other particles which may damage and prematurely age the surfacing.

Rubber under surfacing is also susceptible to inadvertent damage (such as from dropped tools or furniture) and failure due to 'excessive' wear (such as at the base of ladders or the run out of slides) both of which may require patching or similar repairs to be undertaken well before the end of the material's nominal expected lifespan.

What are the responsibilities of undersurfacing suppliers?

Standards require playground equipment suppliers to provide information on their products' impact absorbing performance according to the test methods detailed in Australian standard AS4422.

Under surfacing suppliers should provide a copy of the certified test results, confirming what impact absorbing surface material depth (for loose fill materials) or structure (for fixed or 'unitary' products) is necessary to comply with the impact absorbing requirements of Australian standards at different critical fall heights.