Play Equipment Standards Overview

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Contents of Presentation

Play Equipment Standards Overview

Part 1 – Playgrounds Standards

Current Playgrounds Standards

- AS 4685, Part 0 (2017) Supersedes AS/NZS4486.1 (1997)
  Playground equipment and surfacing: Development, installation, inspection, maintenance and operation.
- AS 4685, Parts 1-6 (2014) & 11 (2012)
  Playground equipment: Safety requirements and test methods.
- AS4422 (2016)
  Playground surfacing - specifications, requirements and test method.
- AS 3533.4.2 (2013)
  Contained Play Facilities (i.e. enclosed units within commercial premises)
- NZS 5828 (2015)
  Playground equipment and surfacing: Safety requirements and test methods. This also includes a part on Fully Enclosed Play Equipment.

Not legislated so no legal requirement to conform to AS but playgrounds should conform to at least the “Safety Requirements”. If an issue falls into a grey area of AS but has been deemed acceptable then put reason in writing, usually based on a risk/benefit assessment.

Playgrounds Standards

- AS 4685, Parts 1-6 (2014) and NZS 5828, Parts 1-6 (2015) are simply an adoption of the European Standard EN1176, Parts to 1 to 6 (2008); Page for page, word for word, figure for figure.
- As such, discussion on Parts 1 to 6 of the Standards are applicable to both the Australian and new NZ Standards.
- AS 4685.11 (Spatial Networks) is based on EN1176.11 (2008); whereas the NZ version will be based on the EN1176.11 (2014). However there is little difference between the 2 versions.
- There are Appendices that list specific variations for Australia (App ZZ) and New Zealand (A to C – relatively very few variations).
- NZS5828 also includes Parts 7 (guidance) and 10 (enclosed play) of the EN, and EN1177 (impact surfacing). The equivalents in Australia are, respectively: AS4685.0, AS3533.4.2 and AS4422.

Playgrounds Standards

- Both the Australian and NZ Standards are now adopted from European Standards to allow play equipment manufacturers in Australia, NZ and overseas to trade with reduced barriers.
- As such equipment certified to EN1176 should generally also meet AS4685 and/or NZS5828.
- However there are variations for Australian and New Zealand that need to be checked for imported equipment, and sometimes auditors may not agree with the outcome of an assessment done overseas – just like auditors in the same office sometimes don't agree on Standards interpretations! **The Standards have many subjective clauses in them.**

Play Equipment Standards Overview

Part 2 – Scope and Risk

Scope of AS4685 / NZS5828

- To specify safety requirements for playgrounds.
- It has been prepared with full recognition of the need for supervision of young children and of less able or less competent children.
- To ensure a proper level of safety in, on or around playground equipment, and at the same time to promote activities and features known to benefit children.
- To protect the child from hazards that they may be unable to foresee when using equipment as intended, or in manner that could be reasonably anticipated.

Risk and AS4685 / NZS5828

Notes relating to risk listed in the Introduction of AS4685 / NZS5828

- Risk-taking is an essential feature of play provision.
- Play provision aims to offer children the chance to encounter acceptable risk.
- Exposure to some degree of risk may be of benefit because it satisfies a basic human need and gives children the chance to learn about risk and consequences in a controlled environment.
- Aim at managing the balance between the need to offer risk and need to keep children safe from serious harm.

Other notes on risk

- Similar statements are made in the Forward of AS3353.4.2.
- Play should be as safe as necessary not as safe as possible. (Royal Society for the Prevention of Accidents)
- Play opportunities should not be limited by an over-emphasis on the provision of a 'safe' playspace.

Risk Statement

Given children's appetite for risk-taking, one of the factors that should be considered is the likelihood that children will seek out risks elsewhere, in environments that are not controlled or designed for them, if play provision is not challenging enough. Another factor is the learning that can take place when children are exposed to, and have to learn to deal with, environmental hazards. Play provision is uniquely placed to offer children the chance to learn about risk in an environment designed for that purpose, and thus to help children equip themselves to deal with similar hazards in the wider world.

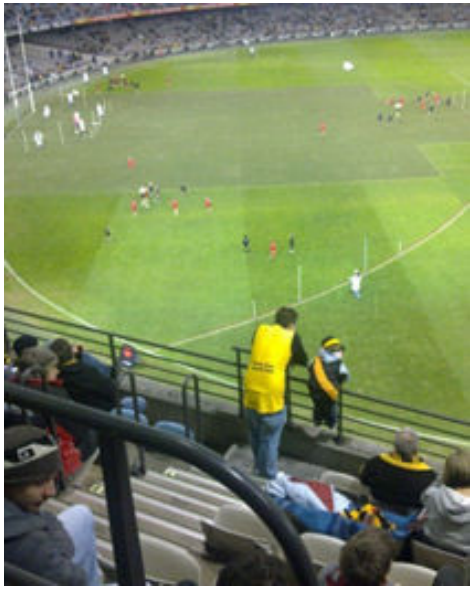
(Ball, Gill and Spiegal (2008), *Managing Risk in Play Provision: Implementation Guide*, Play England)

Kids Will Take Risks Anywhere

Risk in play provision can help children deal with hazards elsewhere





Risk Matrix used by Play DMC

This is based on the International Standard for Risk Management: ISO31000
Organisations may have their own matrix with slightly different risk levels

For each hazard and defect identified in a playground a risk assessment should be undertaken to assist with prioritising works. The following needs to be determined:

- The likelihood of an accident occurring (ie. no chance to highly probable).
- The expected consequences of the accident (eg. minor to permanent injury).

This is then used to determine the **Level of Risk** of the hazard using the matrix shown below.

Likelihood \ Injury Type		Little/None 1	Minor 2	Moderate 3	Serious 4	Permanent 5
Highly unlikely	E (1)	Very Low (1)	Very Low (2)	Low (3)	Low (4)	Moderate (5)
Unlikely	D (2)	Very Low (2)	Low (4)	Moderate (6)	Moderate (8)	High (10)
Possible	C (3)	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
Likely	B (4)	Low (4)	Moderate (8)	High (12)	High (16)	Extreme (20)
Very likely	A (5)	Moderate (5)	High (10)	High (15)	Extreme (20)	Extreme (25)

As assessments of likelihood and consequence are subjective and likely to differ over time and between individuals, some hazards and defects are listed on the next page to provide consistency.

Expected Injury Type <u>Examples</u>:

1 (Little/None) - scratches, pinching, minor bruising
2 (Minor) - surface cuts, major bruising
3 (Moderate) - deep cuts (stitches), hairline fracture
4 (Serious) - full fracture, digital amputation/crush
5 (Permanent) - amputation/crush (non-digital), spinal damage, brain damage, death

Remember: Many risks may be deemed acceptable subject to benefits of play assessment.
In the proposed AS4685.0 there is currently even a statement that “A playground may be opened if it contains non-conformances that do not present hazards to users” subject to risk / benefits assessment.

Play Equipment Standards Overview

Part 3a – AS4685.1 / NZS5828.1

Fall Height and Impact Areas

Falling & Free Space

- Impact Area (Cl.3.3) (Previously this was called the Fall Zone)
  Area that can be hit by a user after falling through the falling space.
- Falling Space (Cl.3.7)
  Space in, on or around the equipment that can be passed through by a user falling from the equipment.
- Free Space (Cl.3.5)
  Space in, on or around the equipment that can be occupied by a user undergoing a movement forced by the equipment (e.g. sliding, swinging, rocking). Generally 1m for sitting and standing; and 0.5m for hanging.
  Important when determining how much impact areas can overlap, and when considering entrapments.

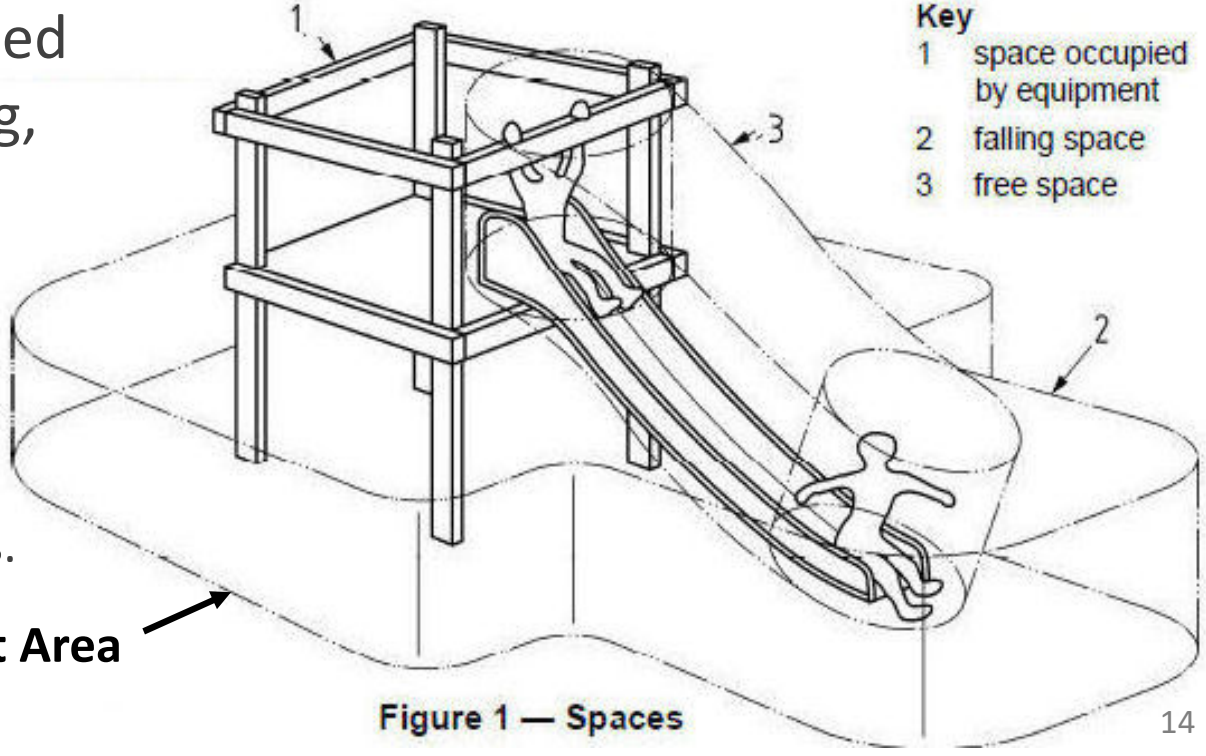


Figure 1 — Spaces

Falling Space Protection

- The falling space shall not contain any obstacles onto which a user could fall and cause injuries.
  (although minor knocks and bumps could be possible)

However the following may be in the falling space:

- Adjacent parts of play structures with a Free Height of Fall difference <600mm.
- Parts bearing or containing the user, or helping the user to keep balance.
- Parts with an inclination of 60^{o} or more from the horizontal (as only glancing contact). (Cl.4.2.8.4)
- Clusters can still be used. That is, where separate pieces are designed to be installed in close proximity for continuity in a sequence of play. (Cl.3.19)

Easily Accessible

This is a *new concept* not previously used in Australian or NZ Standards. It can affect the maximum allowable Free Height of Fall for Steep Play Elements (see next slide).

- Requires only basic skills to access equipment, users can move freely and quickly. (Cl.3.6)

- Ladders where the first rung is <=400mm high.
- Stairs and ramps.
- Tiered platforms with a height difference <600mm between platforms.
- There are other forms that can make access more difficult and give time for supervisors to intervene. (Cl.4.2.9.5)

Steep Play Elements

Another *new concept* not previously used in AS or NZS.
It is probably the main change where things are stricter.

- Access/egress play element of a gradient greater than 45 degrees from the horizontal. (Cl.3.28)

- Where there is a Steep Play Element on an Easily Accessible part of the equipment, the free height of fall shall be <=2.0m (or <=1.8m for Aus SECS, 1.5m for NZ SECS)
  (under previous AS this could be up to 2.5m, or 1.5m for SECS)
  In addition any barrier opening shall be <=800mm wide (Aus), or <=500mm wide (NZ). (Cl.4.2.9.4)
  (under previous AS this could be as wide as the element)

SECS – Supervised Early Childhood Settings (eg. kinders, preschools, childcare)

Easily Accessible & Steep Play Elements Example

There is easy access provided by the stairs and the ladder hence the steep play elements (fire pole, scramble net, rock climbing wall and ladder) can only have a maximum FHOF=2.0m. The openings at the top of these must be <=800mm wide (Aus) or <=500mm wide (NZ). Note: non-easily accessible steep play elements can be up to 3m high and have openings up to 1200mm wide with a guardrail over the top.

Free Height of Fall (FHOF)

Greatest vertical distance from the clearly intended body support to the impact area below. (Cl.3.6)

- Standing foot support to surface below
- Sitting seat to surface below (Cl.4.2.8.1)
- Hanging hand support to surface below
  (where support is by hands only and whole body can be lifted up)
- Climbing foot support, or hand support -1m. (which ever is higher) (new concept)
  (when body support is combination of feet/legs and hands)

Unintended Access: Cl.3.6 indicates that intended body support includes those surfaces to which access is encouraged. The AS4685.1 Australian Preface indicates that unintended access should be discouraged through the elimination of unnecessary handholds and footholds, the inclusion of physical barriers, and the use of dimensions and profiles that are intrinsically difficult for children to climb.

Free Height of Fall (FHOF)

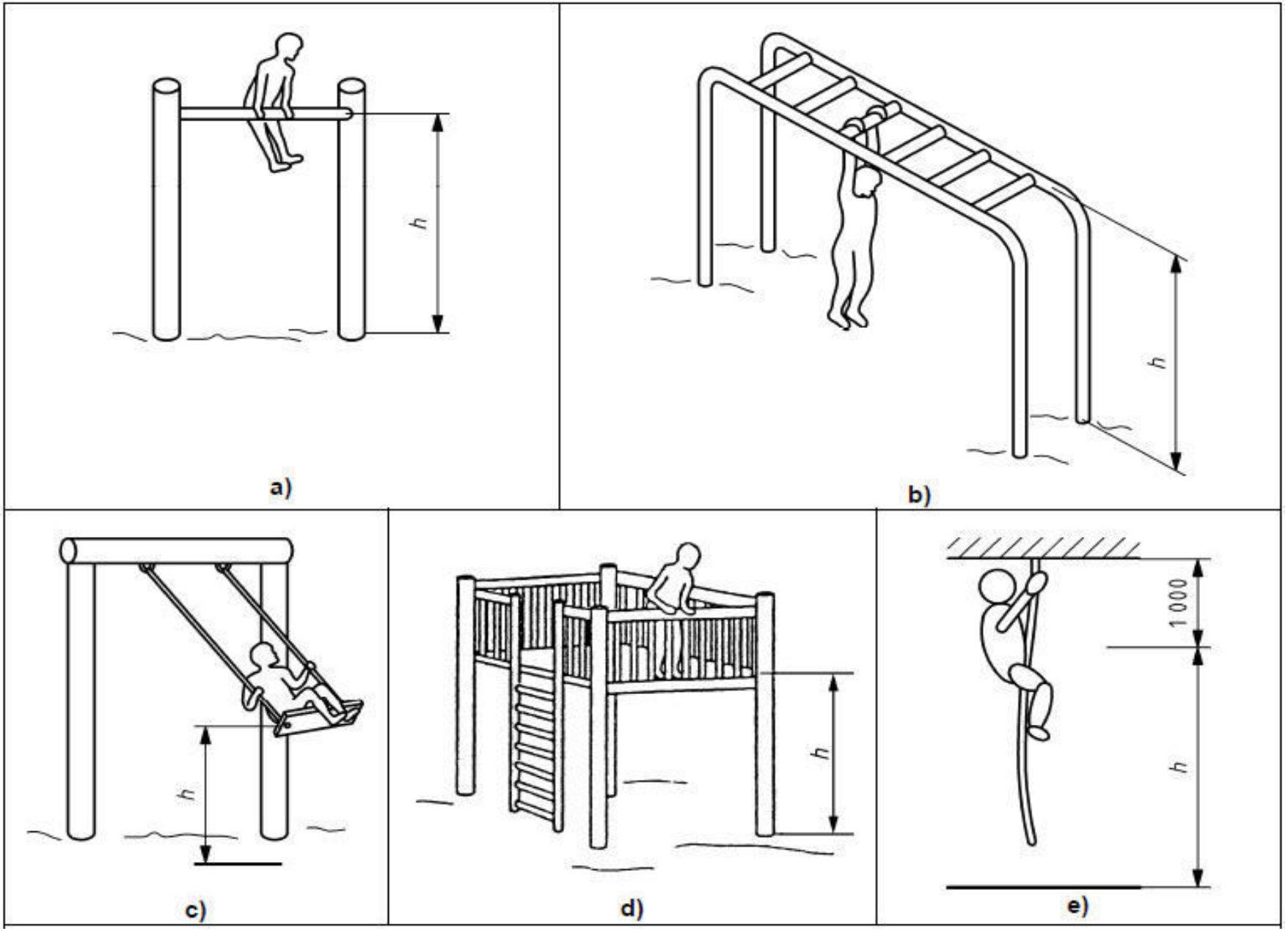
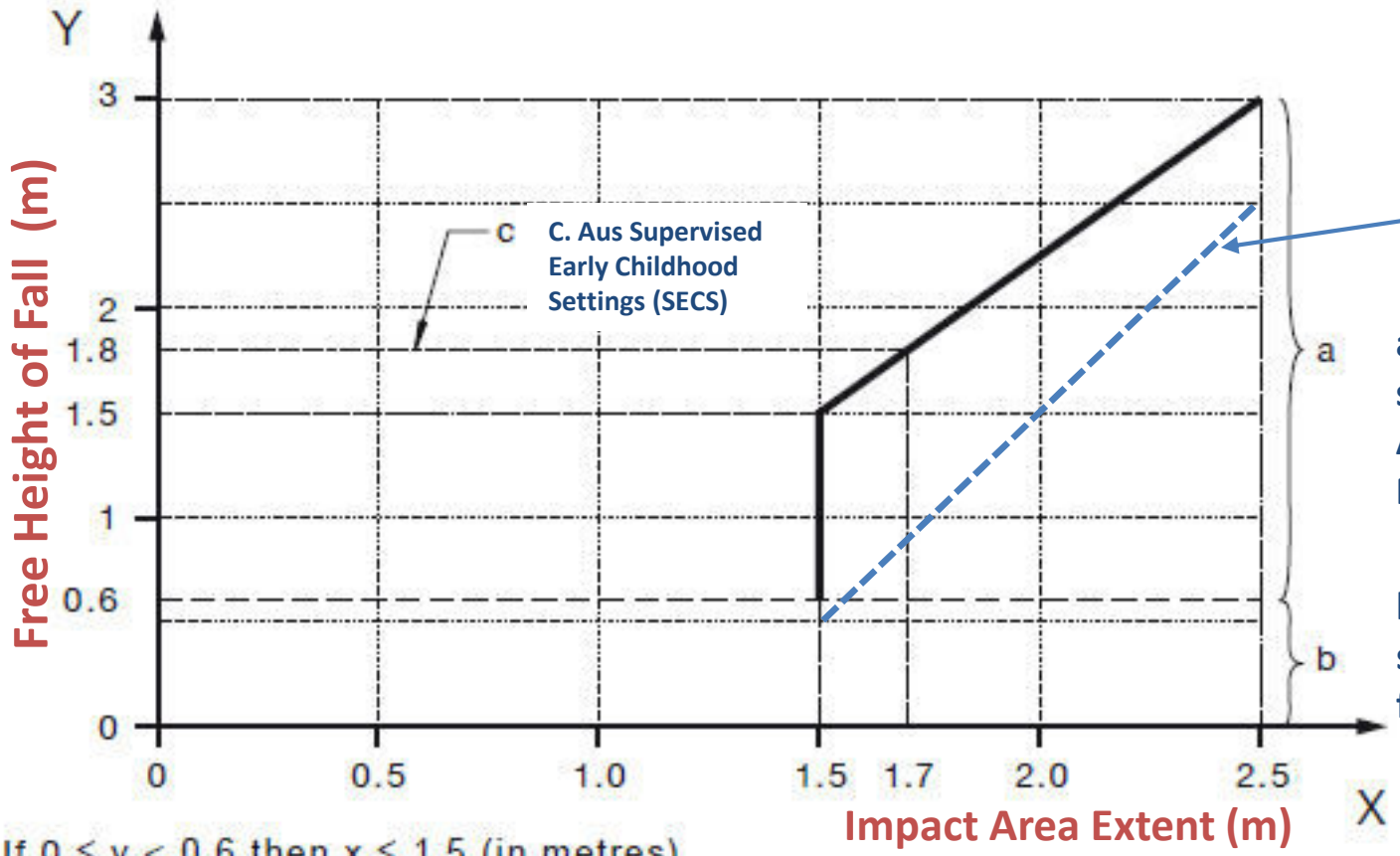


Figure 14 (part) – Examples showing Free Heights of Fall

FHOF Typical Height Limits

- Generally — 3.0m (up from 2.5m under the previous AS)
- Steep Elements — 2.0m (or 3.0m if not Easily Accessible)
- Upper Body Equip — 2.2m (e.g. monkey bars, trackrides) **(not in EN)**
- Early Childhood (this is **not in the EN**) — 1.8 or 1.5m for moveable equipment (Aus)
  - 1.2 – 1.7m depending on equip't type (NZ)
- Swing Seats — 3.0m (when seat is raised by 60 degrees)
- Cableways — 2.0m (sitting type cableway)
  - 1.5m (hanging, measured 1.5m below grip)
- Carousels — 1.0m (hanging is measured 1.5m below grip)
- Rockers — 1.0m (or 1.5m for axial seesaws)
  - 2.0m (for sweeping & overhead seesaws)
- Spatial Networks — 3.0m (highest foot position giving unimpeded fall)

Fall Heights & Impact Area Graph



Previous AS4685 (2004) Fall Zone

a. Impact attenuating surfacing required as per AS/NZS4422 (AUS) or NZS5828 / EN1177 (NZ)

b. Impact attenuating surfacing only required if forced movement item

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 $x = 2/3\ y + 0.5$
If $y = 1.8$ then $x = 1.7$

Exception: if the height difference between adjacent platforms is <=1m then the lower platform does not require impact attenuation. (Cl.4.2.8.5.4)

LEGEND
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 **(Aus: 1.5-1.8m. NZ: 1.2-1.7m)**

FIGURE 17 MINIMUM EXTENT OF IMPACT AREA—OTHER CASES

Fall Heights & Impact Area
General requirements

- FHOF 1.5-3.0m: 1.5 to 2.5m impact area range depending on height.
- FHOF 0.6-1.5m: 1.5m impact area.
- FHOF <0.6m: can be <1.5m impact area if non-moving equipment.

It is also specifically stated that if no forced movement then it is not necessary to provide impact attenuating surfacing.(Cl. 4.2.8.5.3)
(in some cases requiring significant balance or climbing skills, impact attenuation could be warranted based on item intention & risk assessment)

- Overlapping: Generally falling spaces (and impact areas) can overlap, except Cl.4.2.8.2.5 states that "overlapping of the falling space where forced movement exists should not occur". Note that this is a should not a shall requirement. Generally, I work on the falling space of one item cannot overlap free space of other items (as per Cl.4.2.8.3). Nothing shall overlap swing and carousel falling spaces.

Impact Areas

Specific equipment type requirements

(further details on these items are also provided later)

- **Swings** (where "L" is the swing seat suspension length)

  Swing Direction Impact Area (m) = 0.867*L + 2.25m
  or pull the seat out 60 degrees and add 2.25m.
  Width = 1.75m (or Seat Width+1.25m if seat >500mm wide)

  or +1.75m if impact area level with adjacent surface,
  or +1.75m if at a SECS (Aus),
  or +1.5m if at a SECS (NZ).

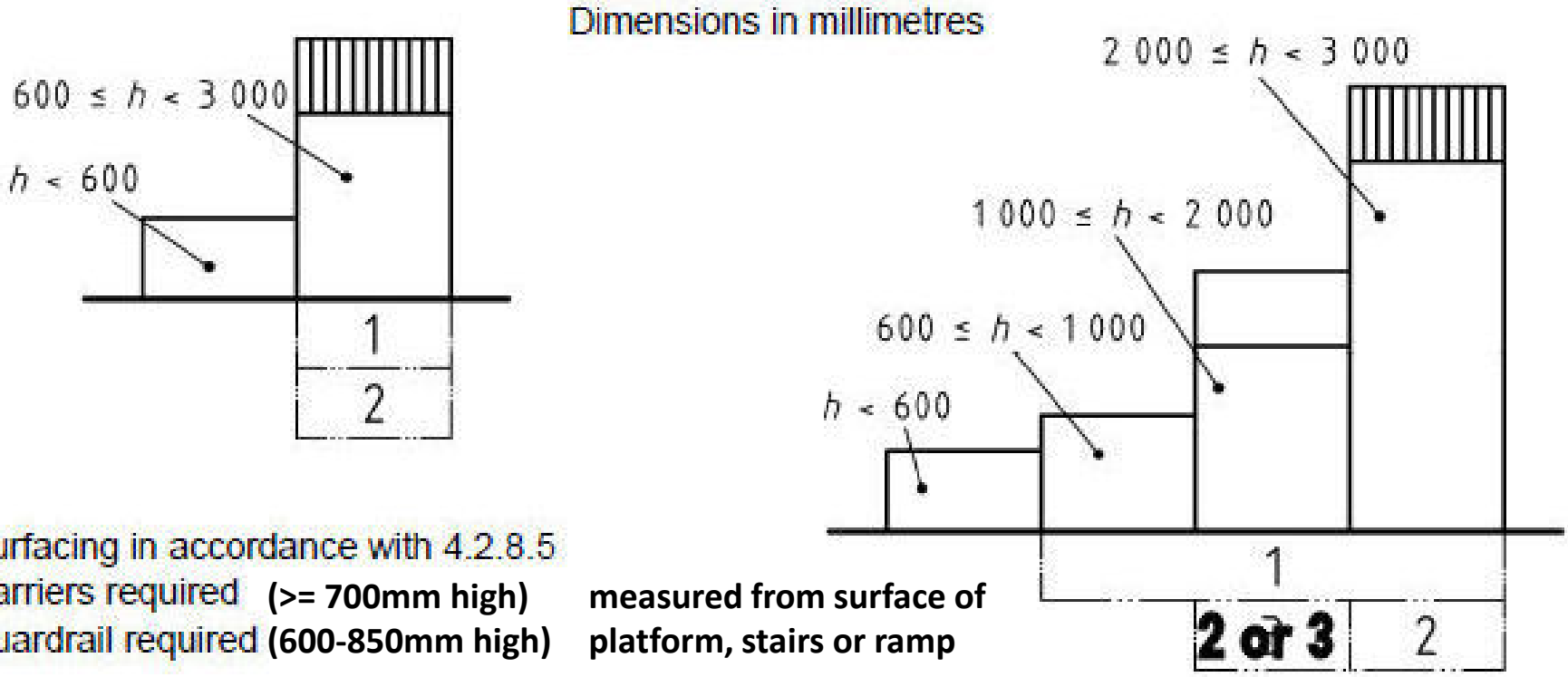
- **Slides:** The impact area extents relate to the heights as per AS4685.1, apart from the runout which is 1m to the sides, and 1 or 2m beyond the end. (See diagram in slide section - it looks tricky but it's not really)
- **Cableways:** 2m to the sides and 2m beyond the end swing (at 45^{o})
- **Carousels:** 2m with surfacing rated to a 1.5m height
  3m for giant revolving disks
- **Rockers:** 1m (under the previous AS this was 1.5m)
  As per graph for sweeping & overhead seesaws

Play Equipment Standards Overview

Part 3a – AS4685.1 / NZS5828.1

Barriers, Guardrails, Handrails

Barriers / Guardrails



Key

1 surfacing in accordance with 4.2.8.5
2 barriers required **(>= 700mm high)**
3 guardrail required **(600-850mm high)**

measured from surface of platform, stairs or ramp

a) Equipment easily accessible to all ages **b) Equipment not easily accessible**

Figure 8 — Protection against falling

Supervised Early Childhood Settings (SECS) **Australia: Guardrails (600-700mm high) or barriers (>=700mm high) can be used for 0.6-1.2m high decks; barriers must be used for 1.2-1.8m high decks. Australia and NZ: Moveable play equipment items do not require handrails, guardrails or barriers.**

The above figures have significant differences from the previous Australian Standard:
- Barrier heights are now 700mm minimum - previously 900mm was required for platforms above 1.2m high.
- For equipment not easily accessible: there are no requirements for platforms up to 1m high (previously 0.5m); and guardrails can be used for platforms between 1 - 2m high (previously barriers had to be used).

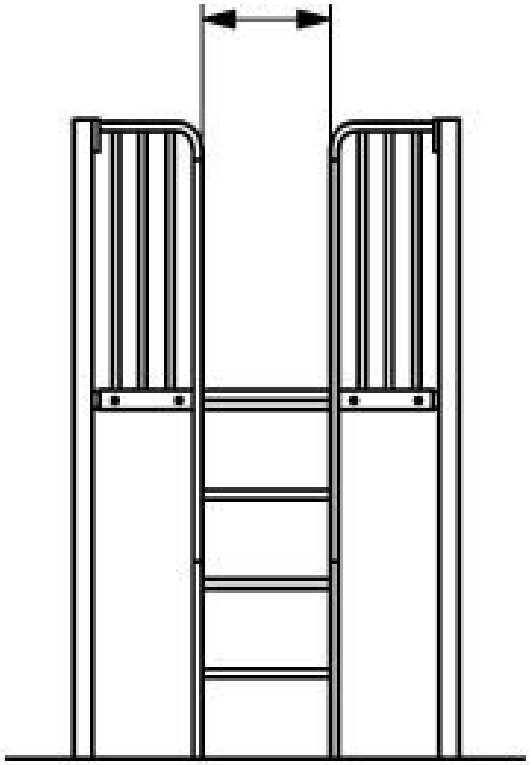
Barriers / Guardrails on Bridges

- Not Easily Accessible Rigid Bridges:
  As per Figure 8 (previous page), a rigid bridge that is not easily accessible can have just guardrails if <2m high.
  If the bridge is >=2m high, barriers are needed.

- Easily Accessible Rigid Bridges
  Australia (App ZZ, Cl.4.2.4.1):
  Guardrails can be used if the rigid bridge height is <1.5m.
  If >1.5m high then barriers must be used.

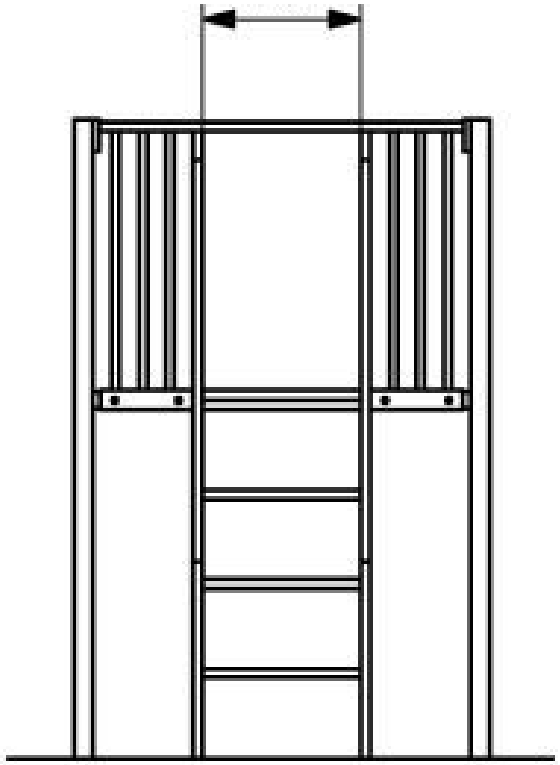
Barrier Openings

must be <=800mm Aus
must be <=500mm NZ



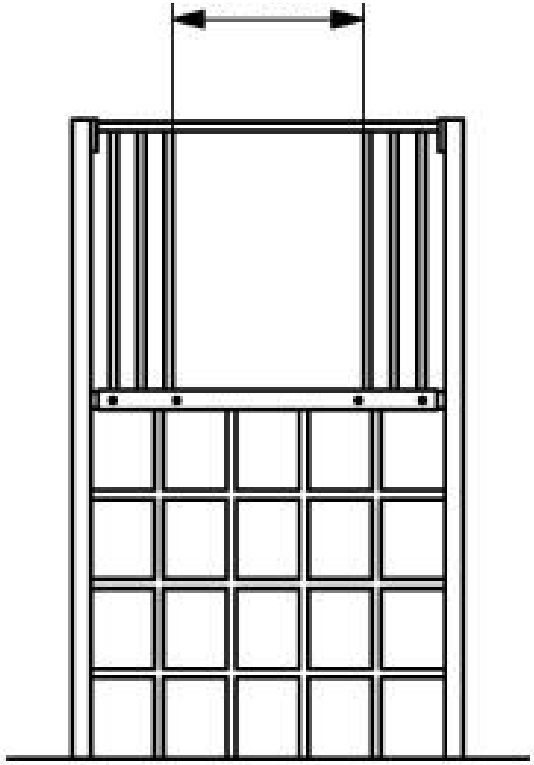
a) no guardrail in opening

can be >800mm Aus
can be >500mm NZ



b) guardrail in opening

<=800mm(Aus) / 500mm(NZ) if easily accessible
<=1200mm if not easily accessible
rail across top not mandatory if <=800mm(Aus) / 500mm(NZ)



c) steep play elements

Figure 10 — Entrance and exit openings in barriers

Openings in guardrails shall be a maximum 800mm(Aus) / 500mm(NZ) wide and have hand supports. For stairs, ramps and bridges the opening in the guardrail or barrier shall be no greater than the width of these elements (eg. if stairs are 2m wide then the opening can be).

Handrails (Cl.4.2.4.2)

- Single Handrail: Height = 600 - 900mm(Aus) / 850mm(NZ)
  Handrail height is measured from the centre of a stair tread.
- AS4685 has an exception for SECS, being 450-700mm.
- AS4685 also specifically indicates that two or more handrails can be used as long as one is at the required height and spacing is such that there are no head entrapments. This could also apply in NZ.

- Stairs / Ramps Handrail Requirements (Cl.4.2.9.2 / 4.2.9.3)
  Guard/handrails **OR** barriers can be used for stairs/ramps to decks up to 1.2m(Aus) / 1.0m(NZ) high.
  If the deck is higher than 1.2m(Aus) / 1.0m(NZ) then barriers shall be used. If a set of stairs is higher than 1m and >45^{o} steep then the barrier shall be graspable (<60mm wide) or a handrail shall be provided.

Means of Access (Cl.4.2.9)

- **Ladders**

  Equal spacing is required between the rungs only. (NA to rope ladders)
  Rung / step spacing shall conform to head entrapment requirements.
  There shall be unobstructed space >=90mm to rear from the rung centres.
  Rungs and/or styles shall conform to grasp (OR have handrails that conform to grip).

- **Stairs**

  Inclination shall be constant with equally spaced treads.
  Tread Projection >=140mm. Tread depth >=110mm.
  Intermediate landing required for stairs >2m high.

- **Ramps**

  Can be inclined at a constant angle of up to 38°.
  Ramps expected to be used by all children shall include means to improve foot grip.

No Limits of Slope are specified for stairs and ramps but the AS (but not EN / NZS) has a Figure 21A to provide GUIDANCE only on this.

This is from an AS relating to access to places normally used by servicing/works personnel. I think the less / more preferable text should be ignored.

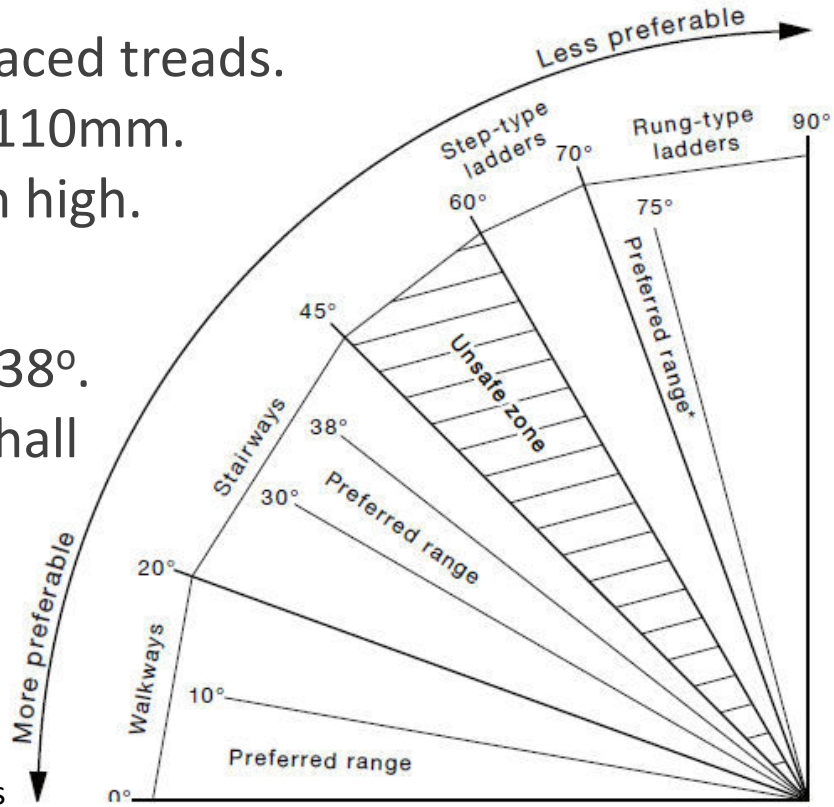


FIGURE 21A GUIDANCE FOR LIMITS TO SLOPE

Play Equipment Standards Overview

Part 3a – AS4685.1 / NZS5828.1

Entrapments

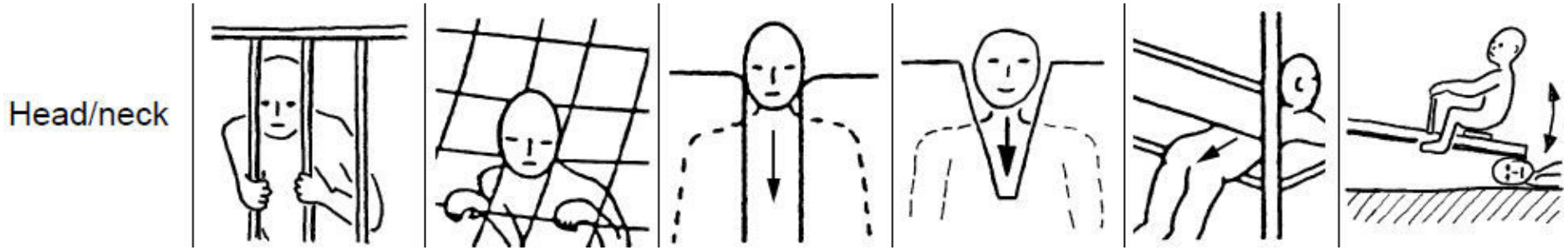
Entrapment Types (Cl.4.2.7)

Listed below are entrapment types specifically discussed in the Standards, with details provided on the following pages.
Distortion of materials that can occur during use should be taken into account when assessing potential for entrapment.

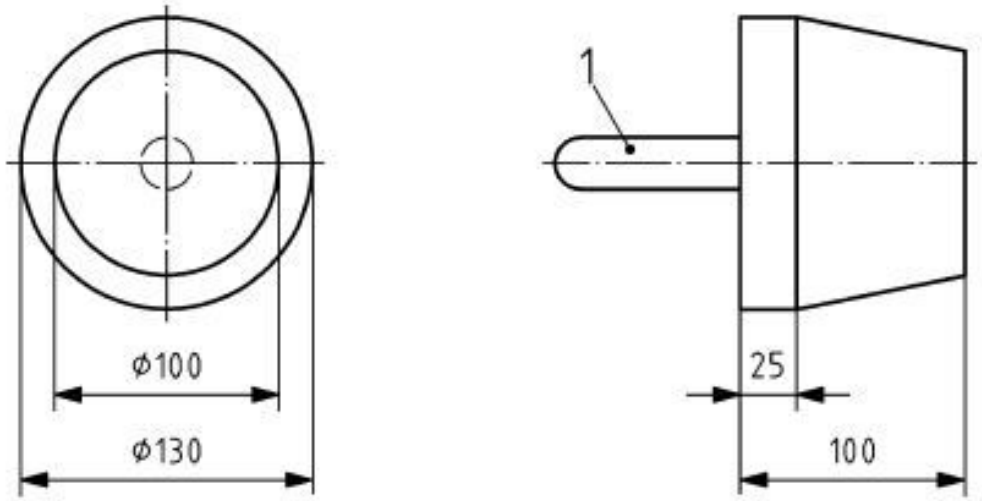
- Head Entrapment (Cl.4.2.7.2)
- Neck Entrapment (Cl.4.2.7.2)
- Clothing / Hair Entrapment (Cl.4.2.7.3)
- Whole Body Entrapment (Cl.4.2.7.4)
- Foot or Leg Entrapment (Cl.4.2.7.5)
- Finger Entrapment & Crush (Cl.4.2.7.6)

Head / Neck Entrapment (Cl.4.2.7.1 & 2)

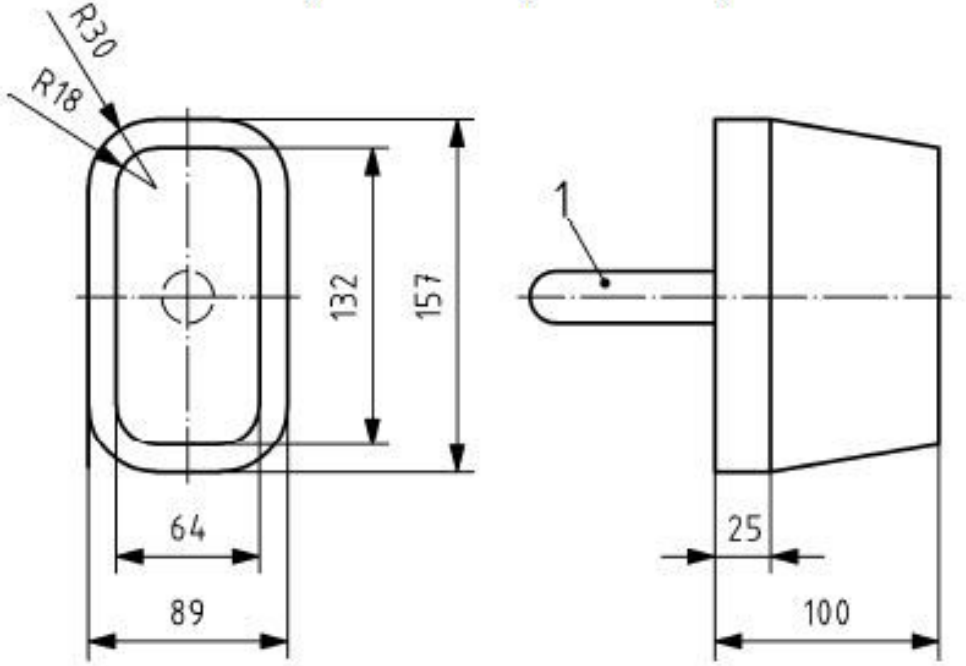
- Openings shall have no parts that converge in a downwards direction at an angle less than 60 degrees.
- Only openings that are greater than 600mm above the ground are required to be tested for head and neck entrapment.
- Hazardous situations could include:
  - Bound openings through which a user could pass feet or head first.
  - partially bound or V-shaped openings.
  - Other openings (e.g. shearing or moving openings)



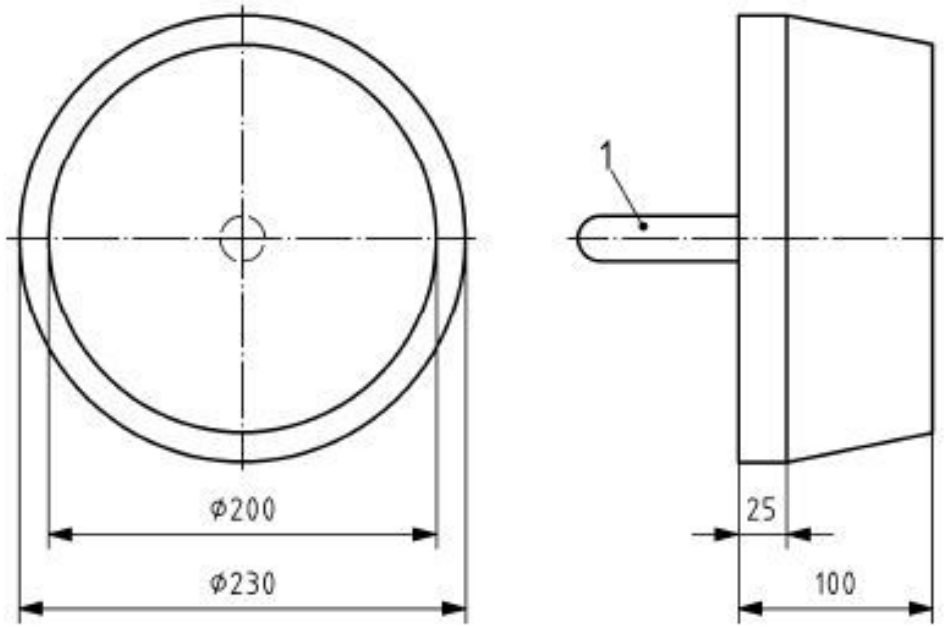
Head Entrapment Test (Cl.4.2.7.2, App D.2)



a) Probe E (small head)



b) Probe C (torso)



c) Probe D (large head)

- **Applicable to bound openings >600mm high.**
- **Three probes now used (Probe E is new)**
- **If Probe E or C passes through an opening then Probe D must also pass.**
- ***Typically openings between 89-230mm wide could be potential head entrapments.***

Head Entrapment (Cl.4.2.7.2)

- Openings between suspended bridges and rigid side members shall be >=230mm. (new to AS)
- If non-rigid members (eg. ropes) overlap then openings shall conform to head trap requirements.
  For example, scramble net openings shall not be 130-230mm square.
- A rope should not be able to be looped around probe C.

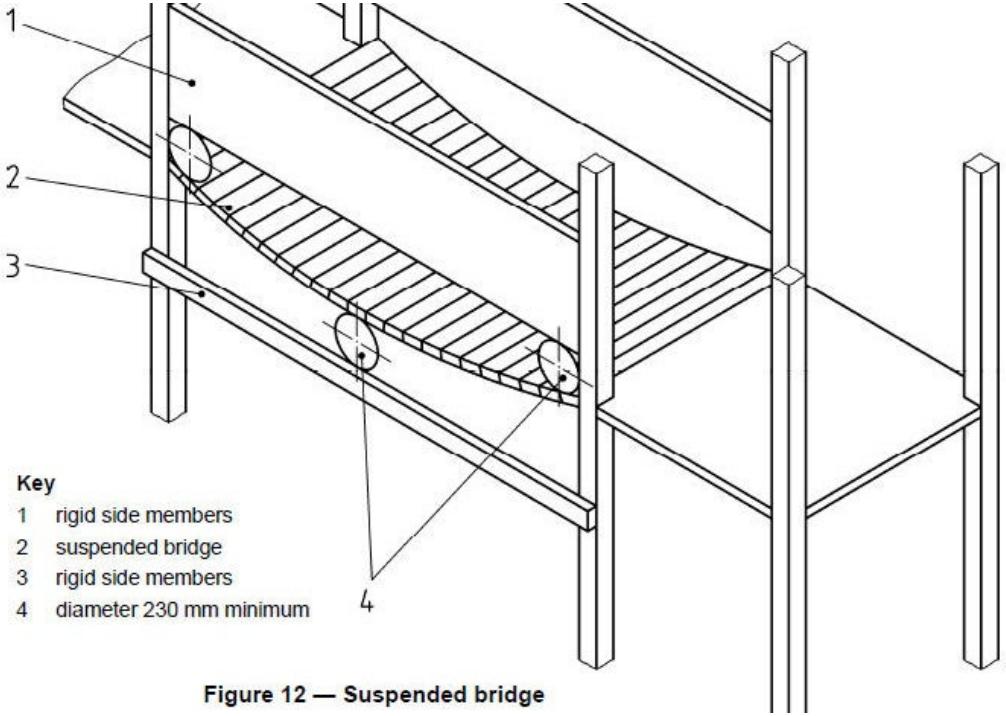


Figure 12 — Suspended bridge

Barrier head entrapment (gap >89mm wide)

Neck Entrapment Test (Cl.4.2.7.2, App D.2)

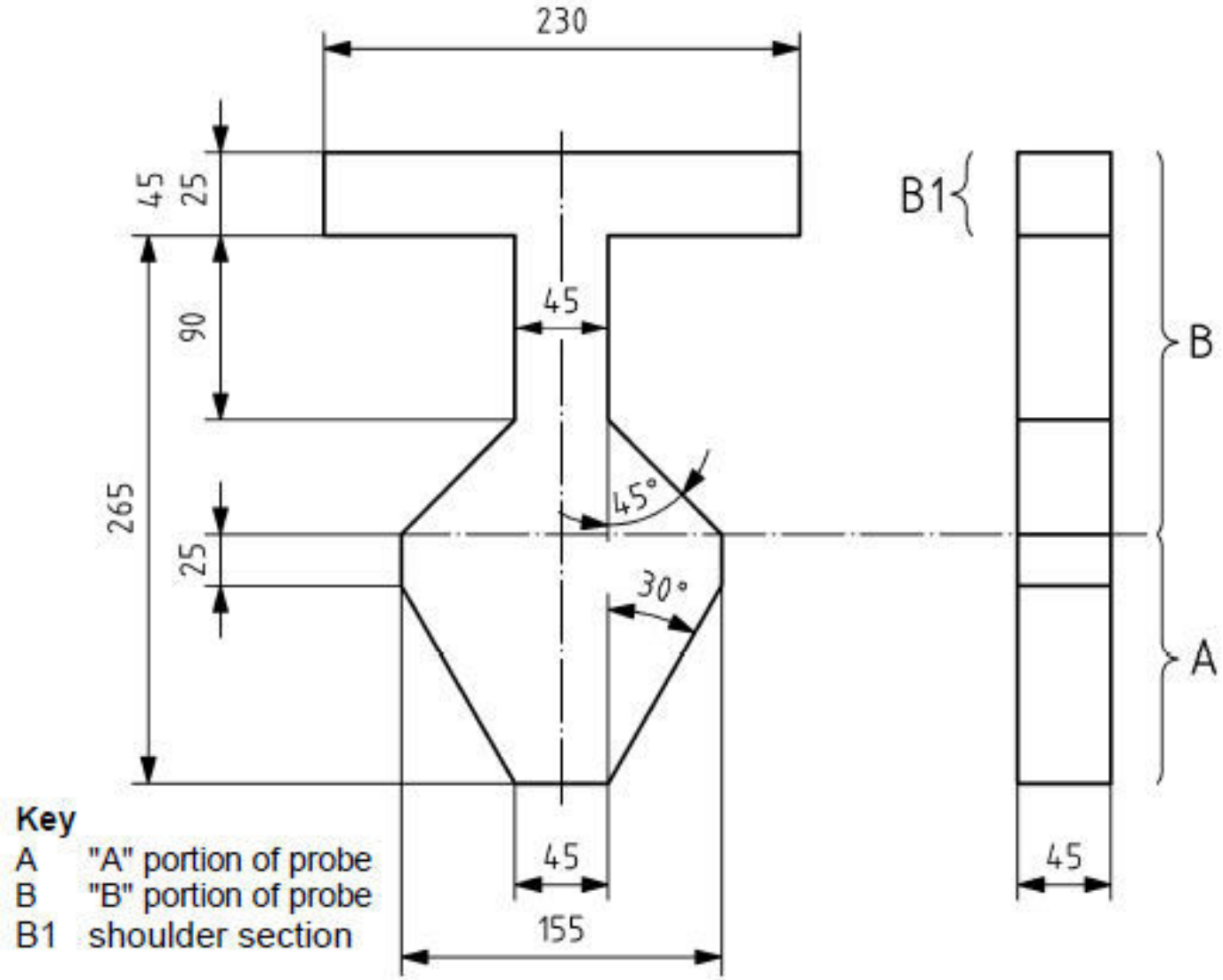


Figure D.2 — Test template for assessment of head and neck entrapment in partially bound and V-shaped openings

- **Applicable to unbound openings >600mm high.**
- **Applied differently depending on whether the opening angled at < or > 45 degrees to the horizontal.** **(previously was more straightforward to use)**
- ***Generally V's <60^{o} or open topped gaps >45mm deep and between 45-155mm wide could be potential neck entrapments.***
- ***155-230mm wide openings could also fail if >265mm deep or angled <45^{0} from the horizontal.***

Neck Entrapment Test (Cl.4.2.7.2, App D.2)

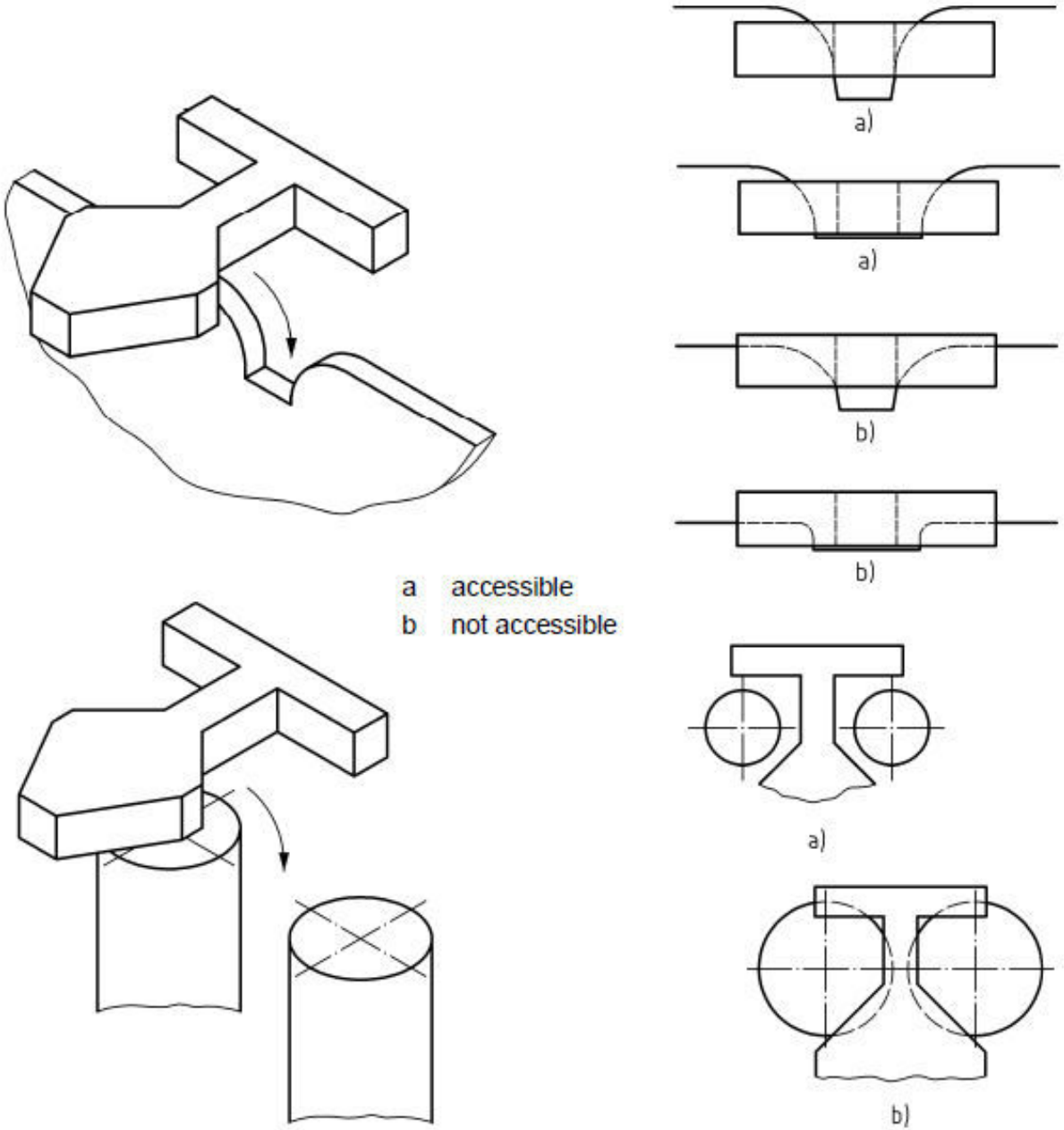
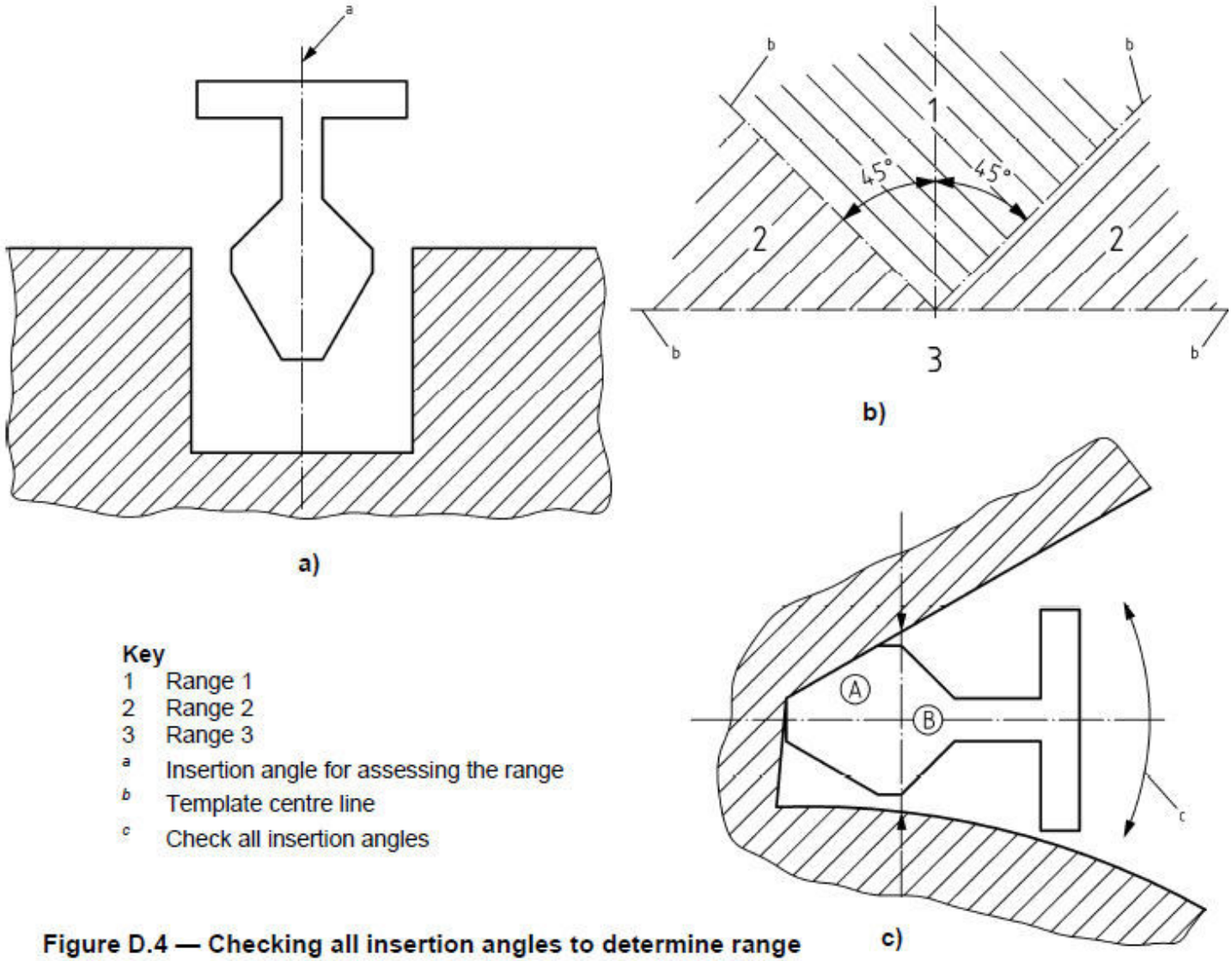


Figure D.3 — Method of insertion of the "B" portion of the test template

- **The first part of the neck template test is to insert the neck (B) portion of the probe perpendicular to the boundaries of the opening.**
- **Then push it down into the opening and see if it is accessible to a depth greater than the thickness of the template (45mm).**
- **If it isn't then there is no neck entrapment.**
- **If it is >45mm deep then move onto part 2 of the procedure.**

Neck Entrapment Test (Cl.4.2.7.2, App D.2)



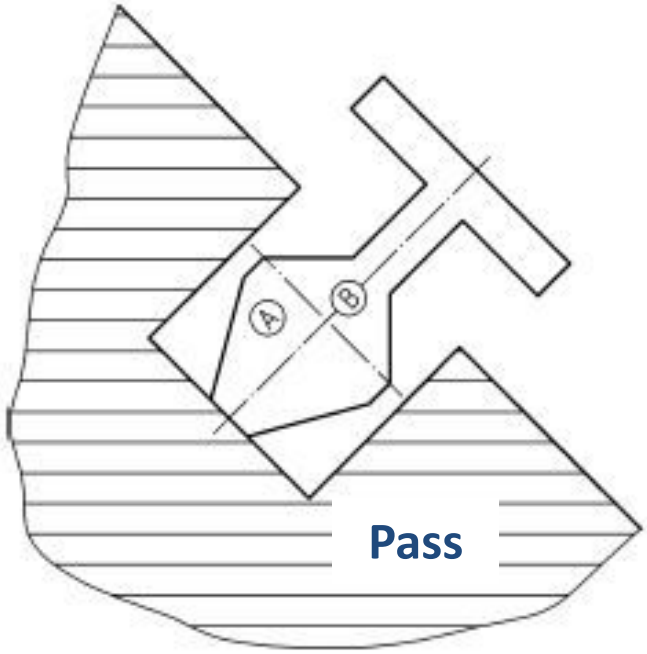
Key

1 Range 1
2 Range 2
3 Range 3
[a] Insertion angle for assessing the range
[b] Template centre line
[c] Check all insertion angles

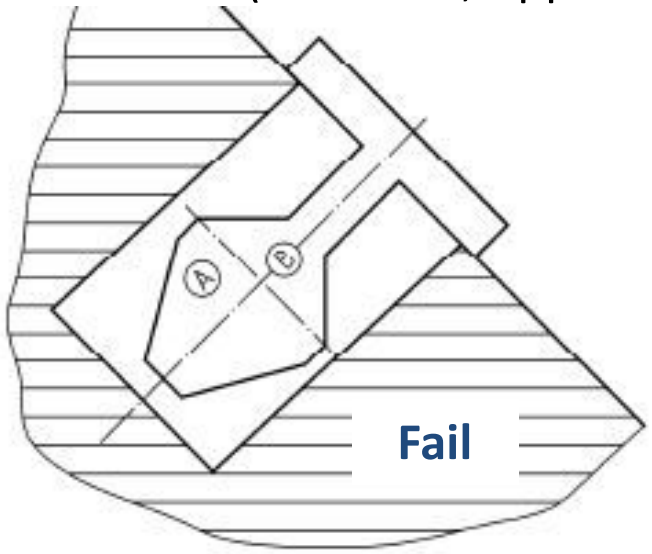
Figure D.4 — Checking all insertion angles to determine range

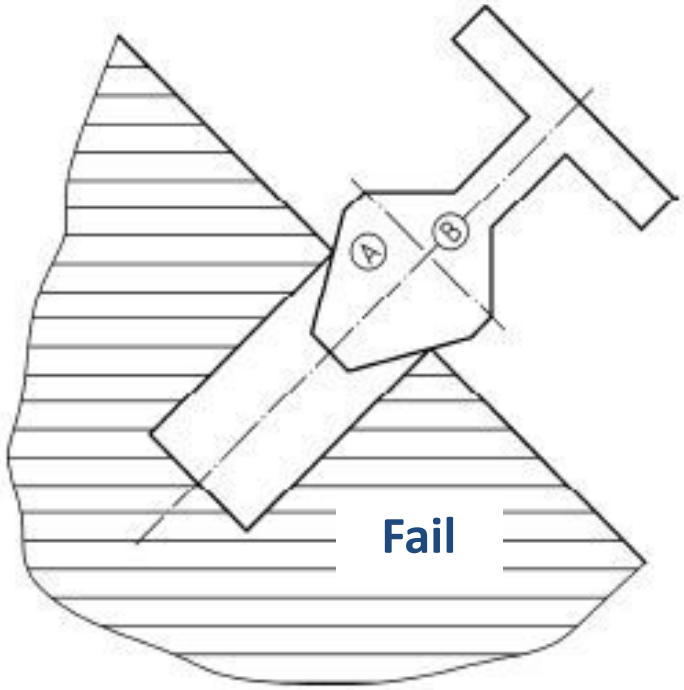
- **The second part of the neck template test is to check the insertion angle Range**
- **This determines pass/fail criteria for the third part of the test.**
- **If in Range 3 then it passes and no further testing required.**

Neck Entrapment Test (Cl.4.2.7.2, App D.2)



a) Passes if front section fully enters aperture to a maximum depth of 265 mm



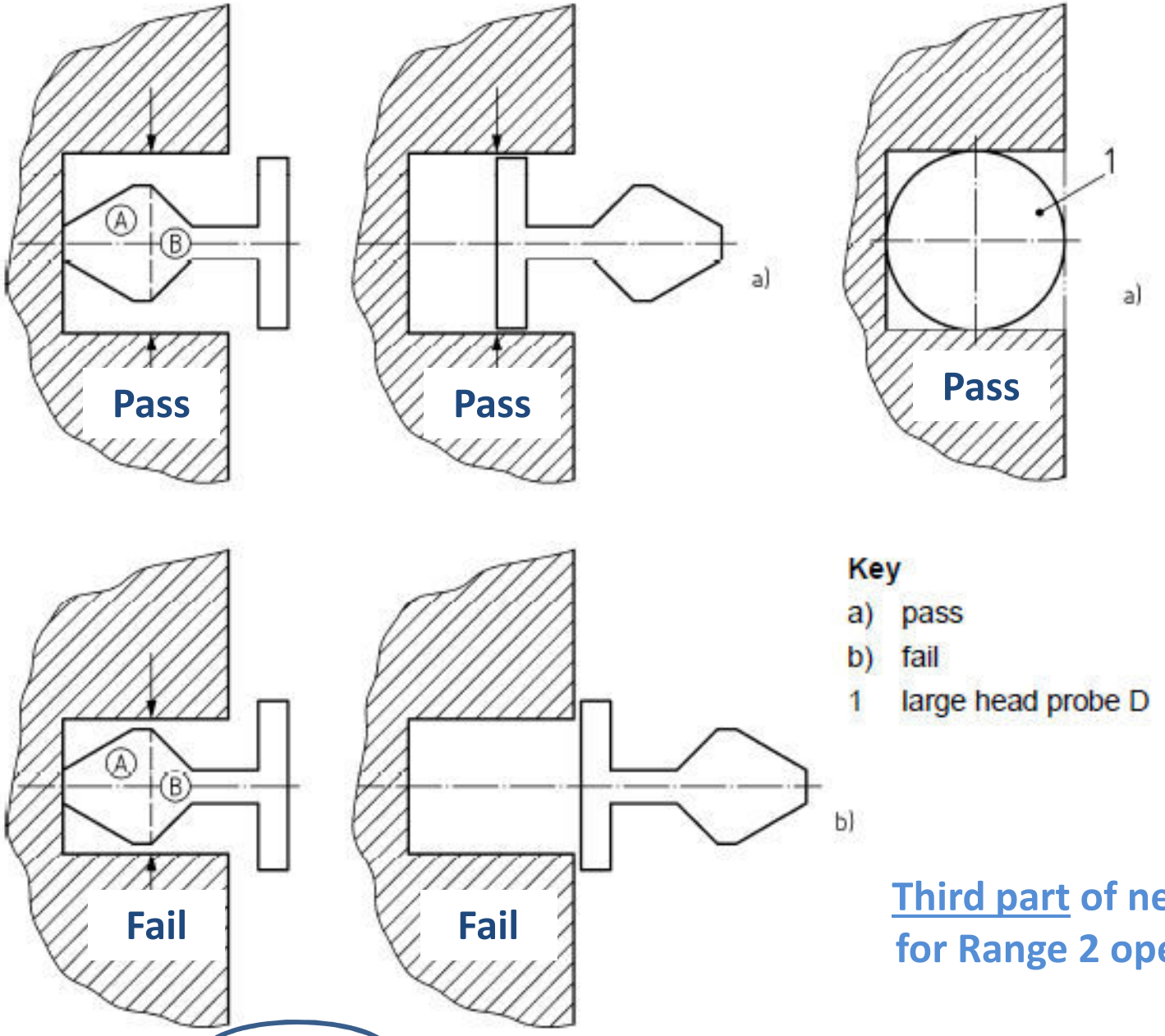


b) Fail

Third part of neck test for Range 1 openings.

Figure D.5 – Range 1 method of insertion of the 'A' portion of the test template

Neck Entrapment Test (Cl.4.2.7.2, App D.2)



Key

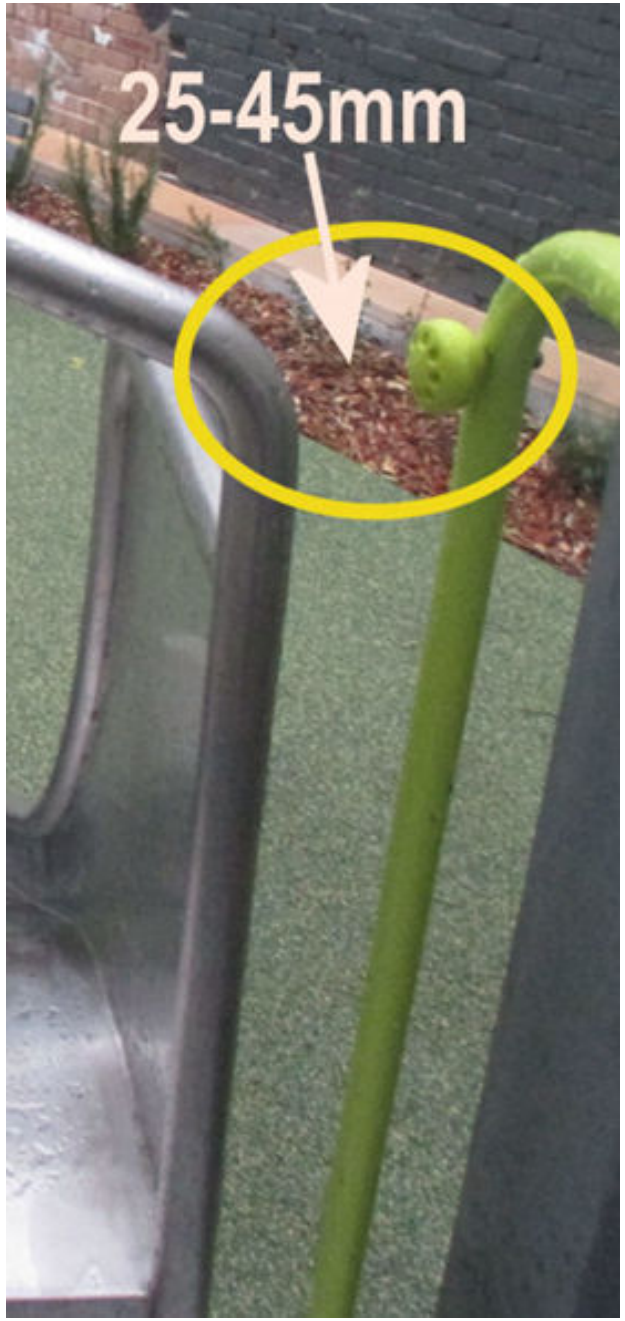
a) pass
b) fail
1 large head probe D

Third part of neck test for Range 2 openings.

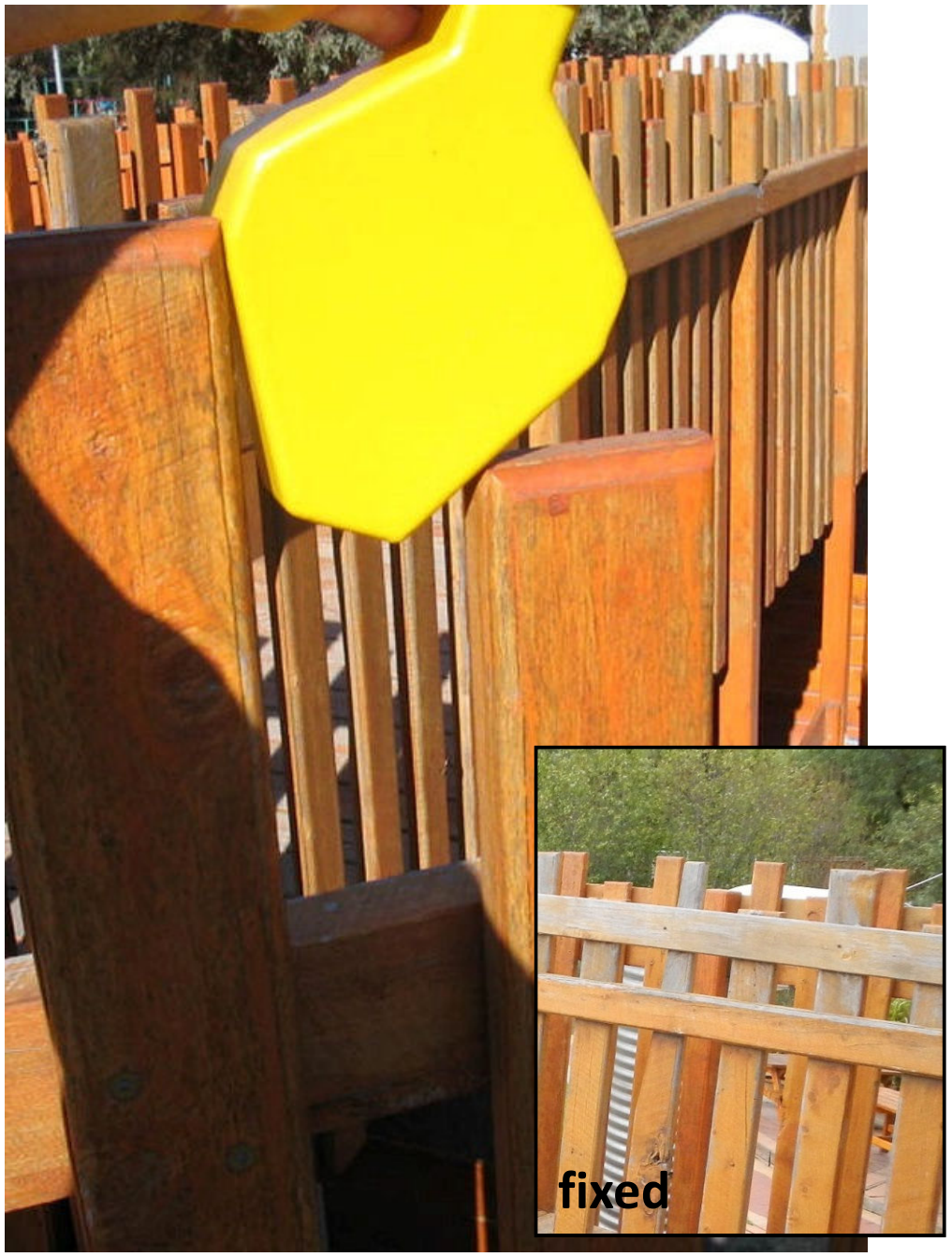
Figure D.6 – Range 2 method of insertion of the 'A' portion of the test template followed by insertion of the shoulder of the template or probe D

Neck Entrapment Photos

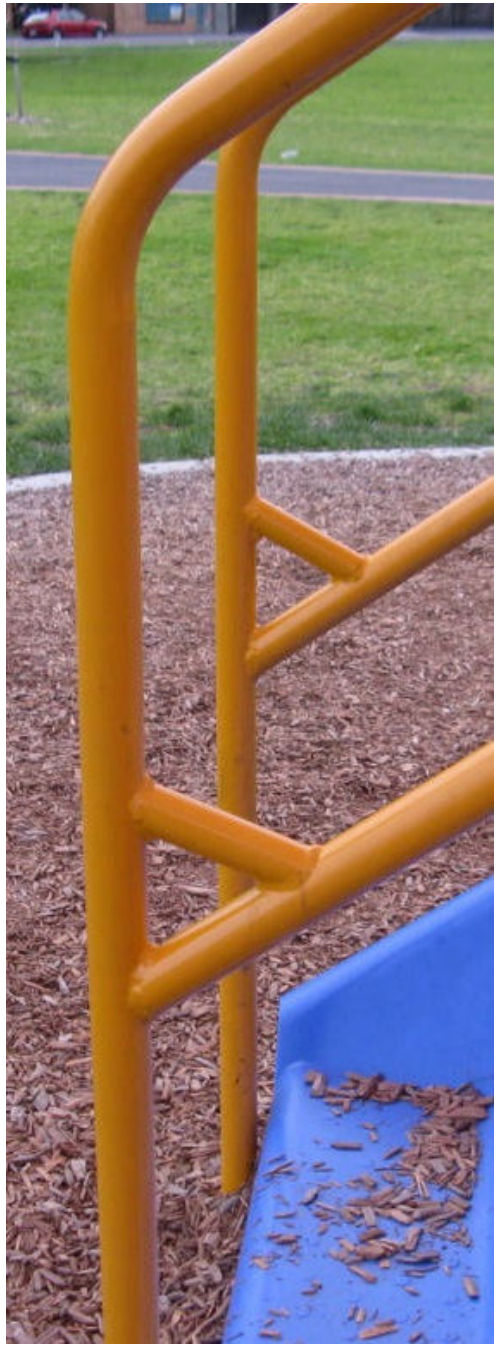
No potential neck traps at sides by having a bar across the top of the gap



No potential neck traps at sides of slide by having gaps between 25-45mm



Gap at side of barrier and gaps between barrier slat tops are potential neck traps (>45mm wide and >45mm deep)



None of these have potential neck entrapments

straight section at base

small plate at the base

crossbars at the base

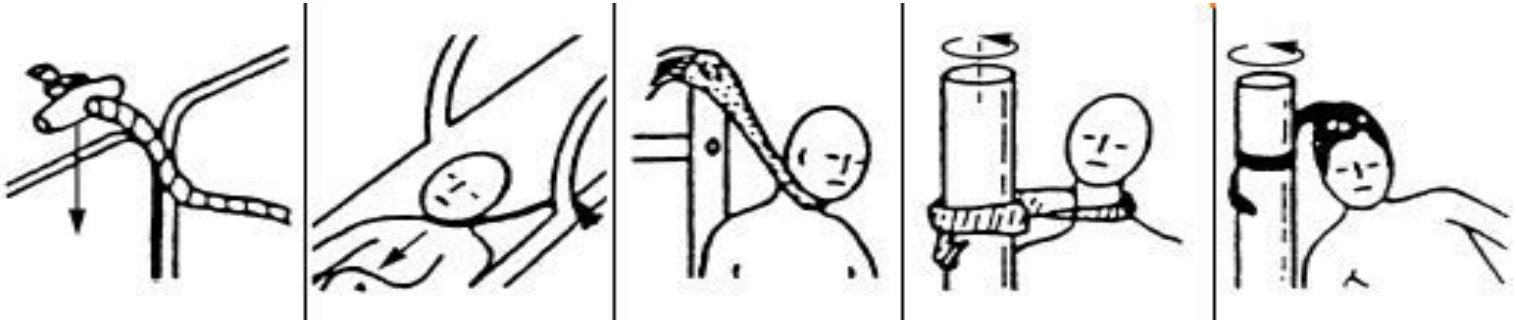
Potential neck traps top of fence – not play equipment but not recommended!

Hair / Clothing Entrapment (Cl.4.2.7.3)

This could be caused by the following:

- Gaps or V-shaped openings where clothing can get trapped near, or in, forced movement areas.
- Protrusions.
- Spindles / rotating parts.

The free space areas of slides and fireman's poles, and roofs, shall not trap a toggle when tested in accordance with Annex D.3 of the Standards.



Whole Body Entrapment (Cl.4.2.7.4)

This could be caused by the following:

- Tunnels into which children can crawl.
- Suspended parts that are heavy or have rigid suspension.

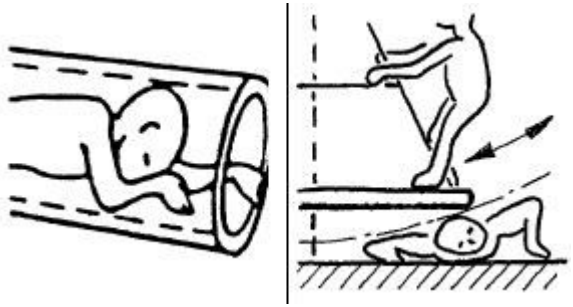


Table 1 — Requirements for tunnels Linear dimensions in millimetres

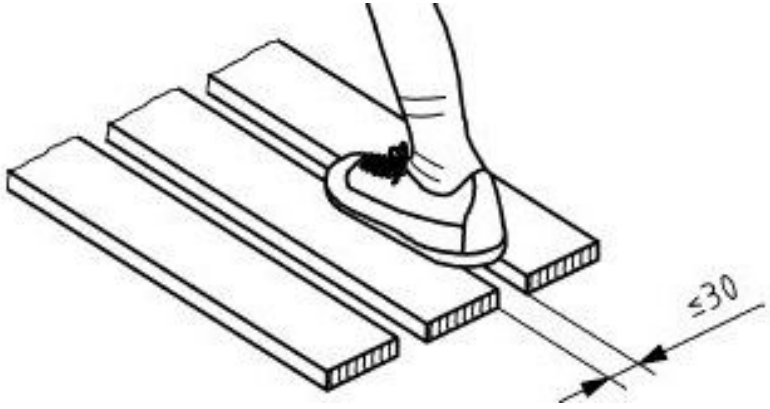
	Open one end	Open both ends			
Inclination	≤ 5° and upwards only when entering	≤ 15°			> 15°
Minimum internal dimension [a]	≥ 750	≥ 400	≥ 500	≥ 750	≥ 750
Length	≤ 2 000	≤ 1 000	≤ 2 000	None	None
Other requirements	None	None	None	None	Provision for climbing e.g. steps or handles
NOTE For tunnel slides, see EN 1176-3.					
[a] Measured at the narrowest point.					

Foot or Leg Entrapment (Cl.4.2.7.5)

This could be caused by the following:

- Completely bound rigid openings in surfacing on which children can run or climb.
- Footholds, handholds, etc. extending from these surfaces.

- Surfaces intended for running shall not contain gaps in the main direction of travel that are >30mm wide.
- This requirement does not apply to surfaces inclined more than 45 degrees.



Finger Entrapment (Cl.4.2.7.6)

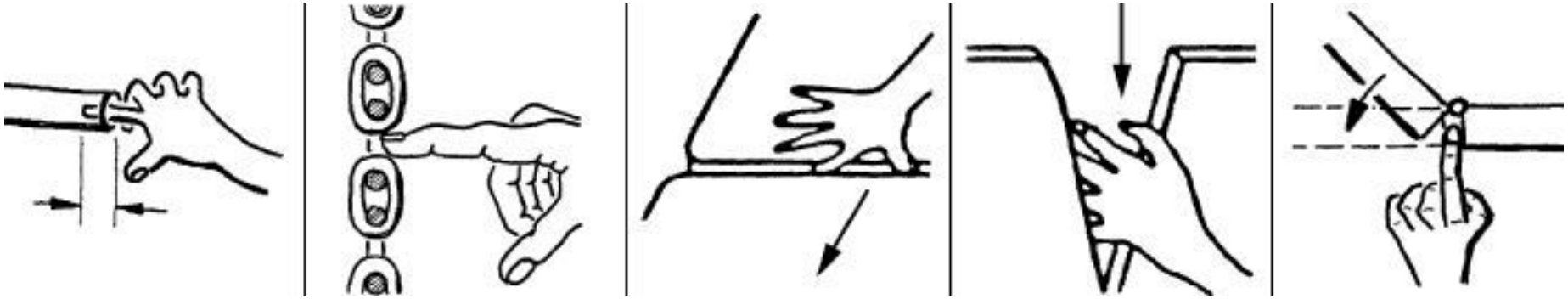
This could be caused by the following:

- Gaps in which fingers can be trapped while the remainder of the body is moving.
- Variable gaps (excluding chains).
- Gaps that can close to <12mm are finger crush points.

Openings or holes within a free space area, or that are >1000mm above the potential impact area shall pass the finger probe test as detailed in Annex D.2. In short:

- If an 8mm diameter finger probe enters an opening, then a 25mm diameter probe shall also pass through the opening. That is:
- *Avoid openings/holes between 8-25mm diameter/wide.*

Finger Entrapment Examples



Chains / Finger Traps (Cl.4.2.13)

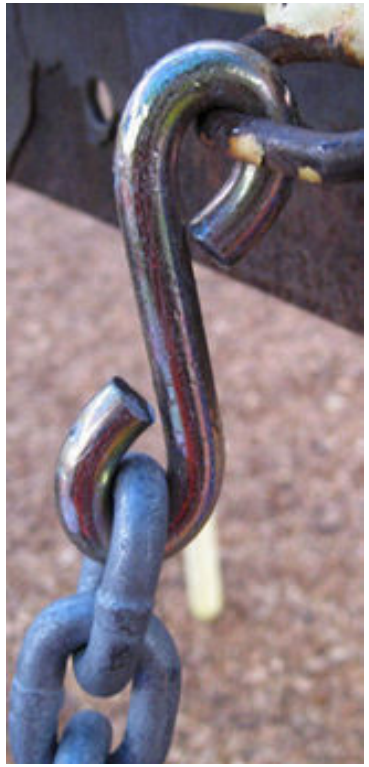
- Chains shall have a maximum opening of 8.6mm in any one direction. (so a chain opening can be <8.6mm in one direction but >8.6mm in the other)
- Where connections are made the maximum opening shall be >12mm or <8.6mm. (I prefer the latter)
- There are 8.6 and 12mm diameter probes to test this.

Fail
8.6mm probe fits

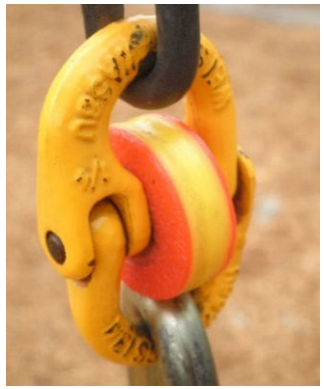
Fail
8.6mm probe fits
12mm probe doesn't

Fail & Pass!
missing grommet

Pass
12mm probe fits



Pass (best)
8.6mm probe doesn't fit



Pass
Holes filled with bolts / grommet

Moving Parts (Cl.4.2.6)

- There shall be no crushing or shearing points between moving and/or stationary parts of the equipment.
  In addition, there shall be no entrapment points.
- Parts from which high impact force can emanate should be impact attenuated (eg. at the ends of track rides).
- If a moving part can endanger the body, there shall be a ground clearance of at least 400mm.
  (some exceptions to this are made for specific equipment items such as swings, carousels and rockers)

Play Equipment Standards Overview

Part 3a – AS4685.1 / NZS5828.1

Miscellaneous

AS4685.1 / NZS5828.1 - Miscellaneous

- Grip: Holding of the hand around the entire circumference of a support (16-45mm). (Cl. 3.15)
- Grasp: Holding of the hand around part of the circumference of a support (<=60mm). (Cl. 3.16)
- Structural Integrity can be assessed by calculation (Annexes A & B) or by physical testing (Annex C); or a combination. (Cl. 4.2.2)
- Finish of Equipment. (Cl. 4.2.5)

  Wood shall have low susceptibility to splintering.
  Surfaces of other material shall be non-splintering.
  No protruding nails, wire rope ends or pointed / sharp edged components.
  Rough surfaces should not present risk of injury. All welds to be ground smooth.
  Accessible bolt threads shall be permanently covered.
  Nuts and bolt heads shall not have sharp edges and be free from burrs.
  Corners, edges and projecting parts shall have a minimum radius of 3mm.

Exposed horizontal rigid bar at base of scramble net could be a risk

Flexible chain at base of scramble net is good

Small foot pad (and footbars) at end of track glide could be a risk – have nothing at one end at least

Horizontal rigid footbar at end of monkey bars could be a risk

Wide rubber footpad at end of monkey bars is better than a bar

Small foot support to the side of the end of monkey bars (or a track glide) is best

Play Equipment Standards Overview

Part 3b – AS4685.2 / NZS5828.2

Swings

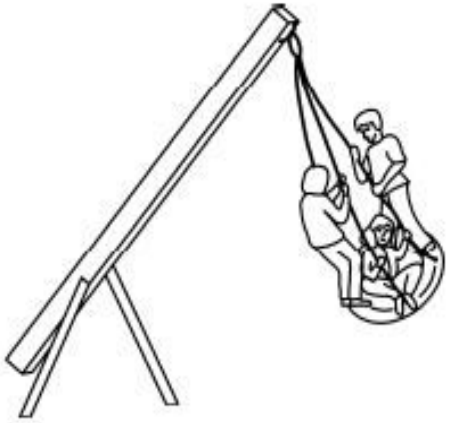
Swing Types (Cl.3)

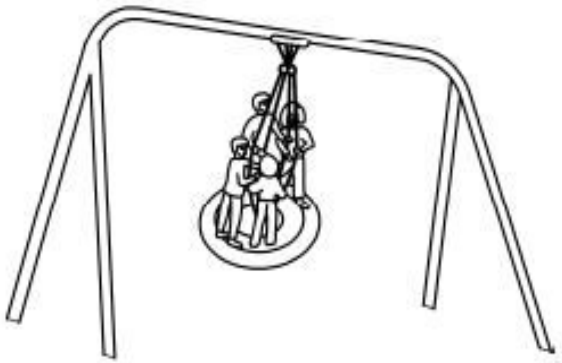
<u>There are 4 types of swings.</u>

1. One Rotational Axis

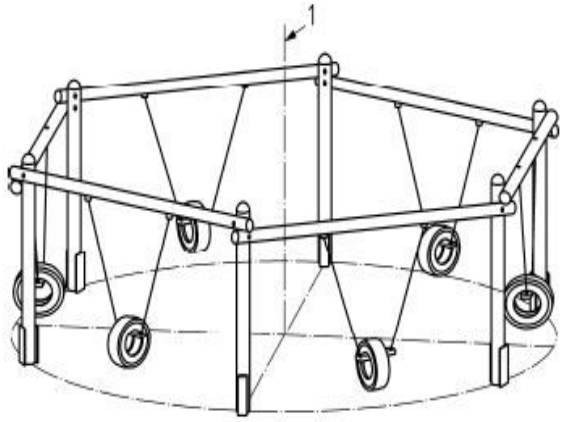
2. Several Rotational Axes (rare)

3. Single Point Swings



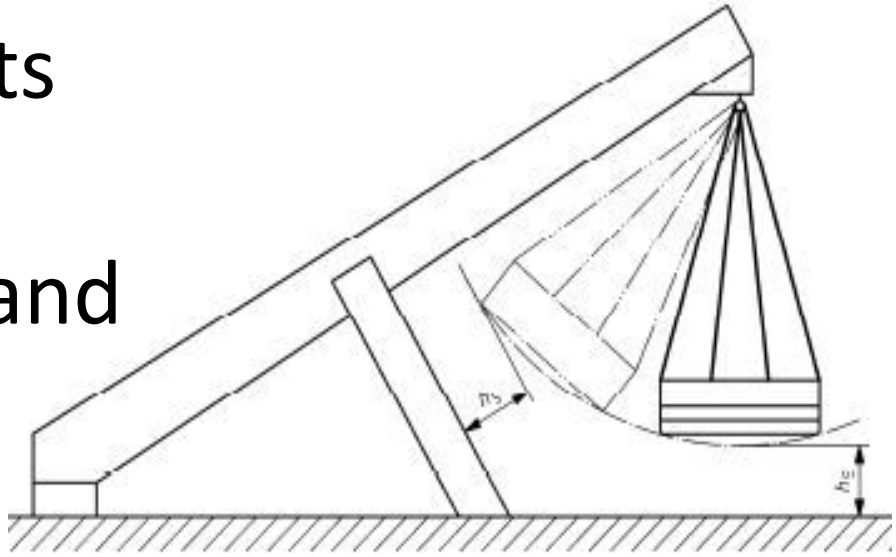


4. Contact Swings



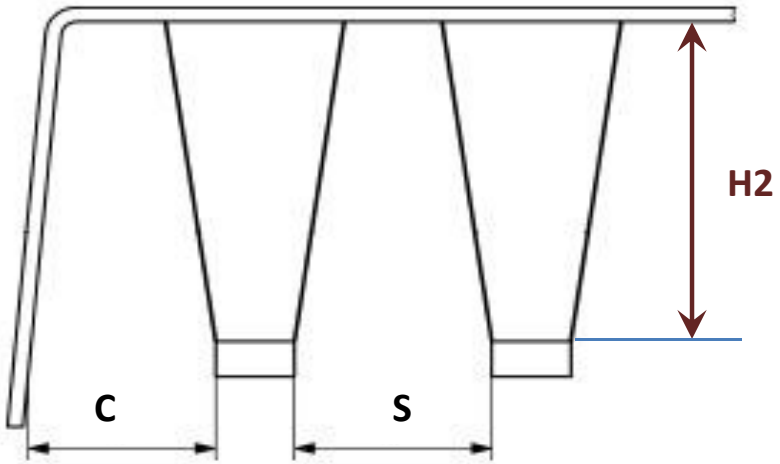
Swing Seat Clearances (Cl.4.2 & 4.3)

- Minimum Ground Clearance at rest = 350mm.
  Except in Australia at SECS this can be 300mm.
- Tyre swings shall have a minimum ground clearance of 400mm. (this should also be applied to nest and basket swings as there have been several reported instances of broken lower legs)
- Single point suspension seats shall have at least 400mm clearance from the ground and frame, expect in the direction of the beam to which it is fixed.

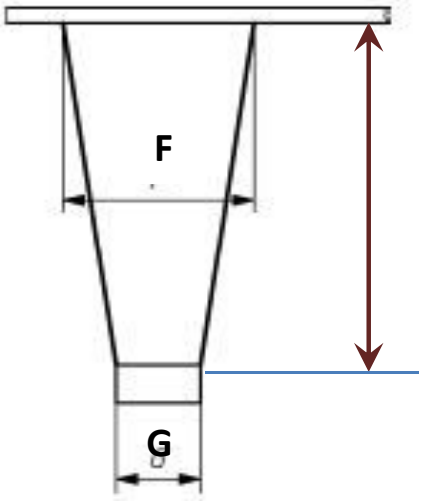


Swing Seat Clearances (Cl.4.5)

- Seat Edge to Frame (C) >= (0.2 x H2) + 200mm
- Seat Edge to Edge (S) >= (0.2 x H2) + 300mm
- Distance between the tops of the suspension chains (F) >= (0.05 x H2) + G (where G=seat width)



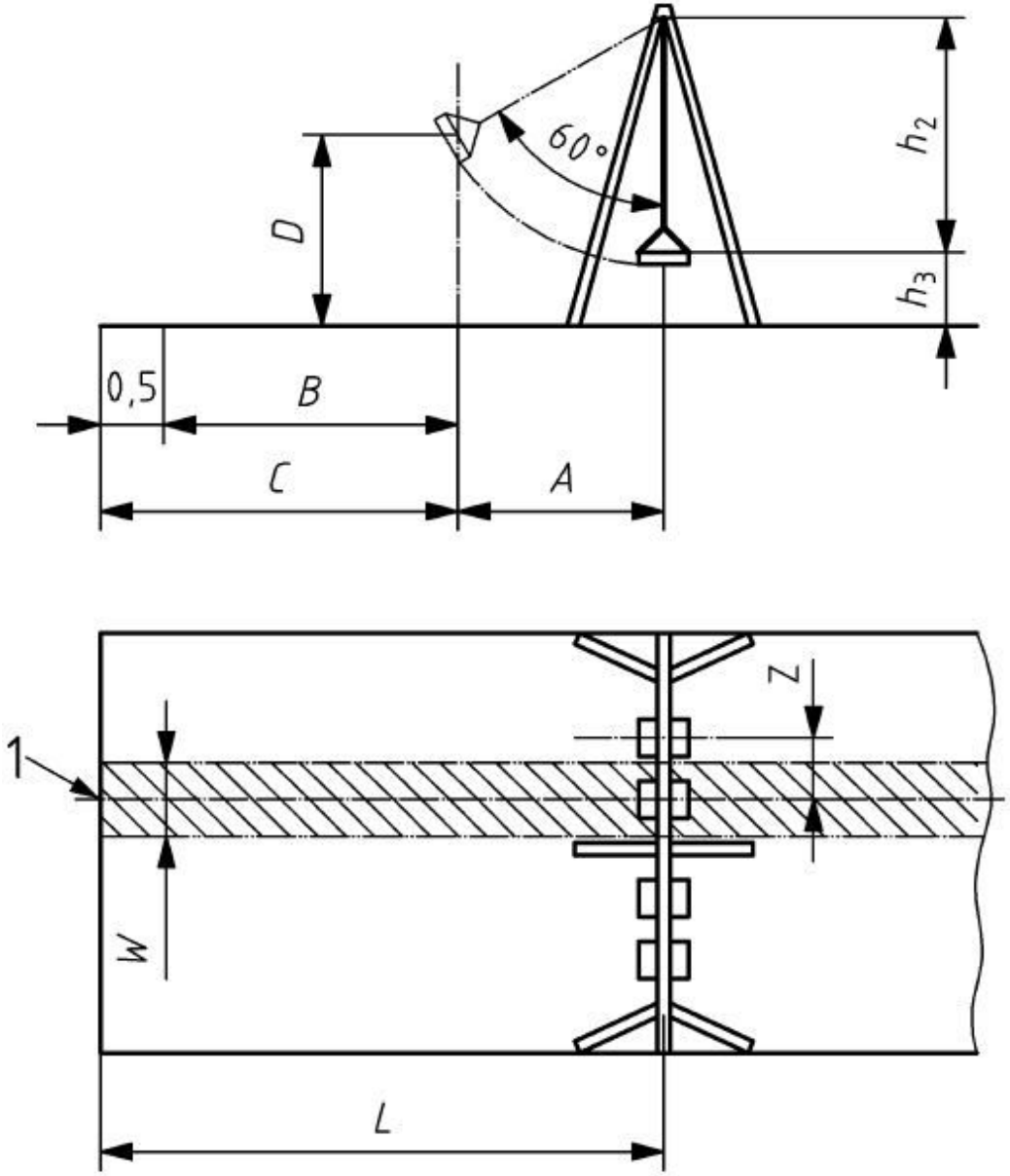
a) Minimum space between the seats of swings and an adjacent structure



b) Lateral stability of swing seats

H2 is Suspension Length, which is the vertical distance from the top fulcrum to the lowest part of the top surface of the seat.

Swing FHOF and Impact Areas (Cl.4.10)



Key

A	0,867 × *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 **(can be up to 3m)**
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

- **So impact area length in the swing direction is:**
  = (0.867 x H2) + 2.25m;
  = (0.867 x H2) + 1.75m for impact areas level with surrounding surfacing or (in Aus) at SECS;
  = (0.867 x H2) + 1.5m (in NZ) at SECS
- **Impact area width (W) = 1.75m; or**
  Seat width + 1.25m (for seats > 500mm wide)
- **Impact areas of other equipment cannot overlap into swing impact areas**

Figure 9 — Free height of fall and surfacing requirements beneath a swing

Contact Swings (Cl.4.13)

- Type 4 Swings are known as Contact Swings.
- The swing seat surfaces must be a minimum of 400mm from the central axis when swung through 90 degrees.
- The swing seats shall discourage jumping from them towards the central axis (e.g. use a vertical tyre or restraining bar) .

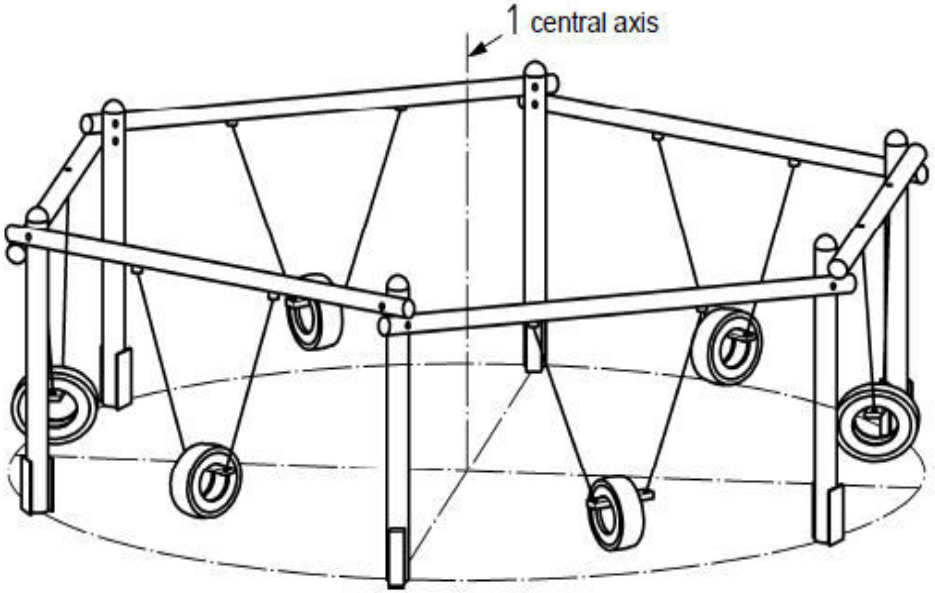
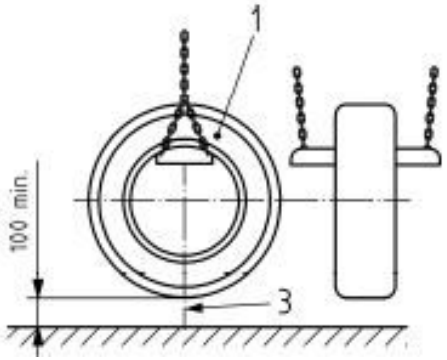
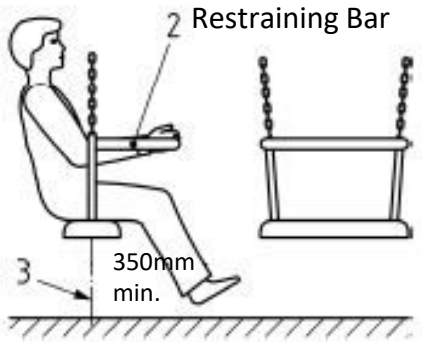


Figure 4 — Example of a contact swing (Type 4)





Play Equipment Standards Overview

Part 3c – AS4685.3 / NZS5828.3

Slides

Slides - Access & Starting Section (Cl.4.2 & 4.3)

- Access to a slide Starting Section can be by ladder, stairs, climber or directly from a mound.
- Free-standing slides can have stairs up to 2.5m high with no intermediate deck. (usually 2.0m)
- Attachment slides with a fall height greater than 1000mm shall have a 600-900mm high crossbar above the Starting Section.
- Starting Section length >=350mm and 0-5 degrees.
- Starting Section shall have guarding/barriers as per Part 1 of the Standard if: >400mm long; OR is easily accessible and FHOF is > 1m; OR FHOF is >2m.
- If attachment slide Starting Section is beyond the deck edge, it shall have 500mm high guarding at some point.

Slides - Sliding Section (Cl.4.4)

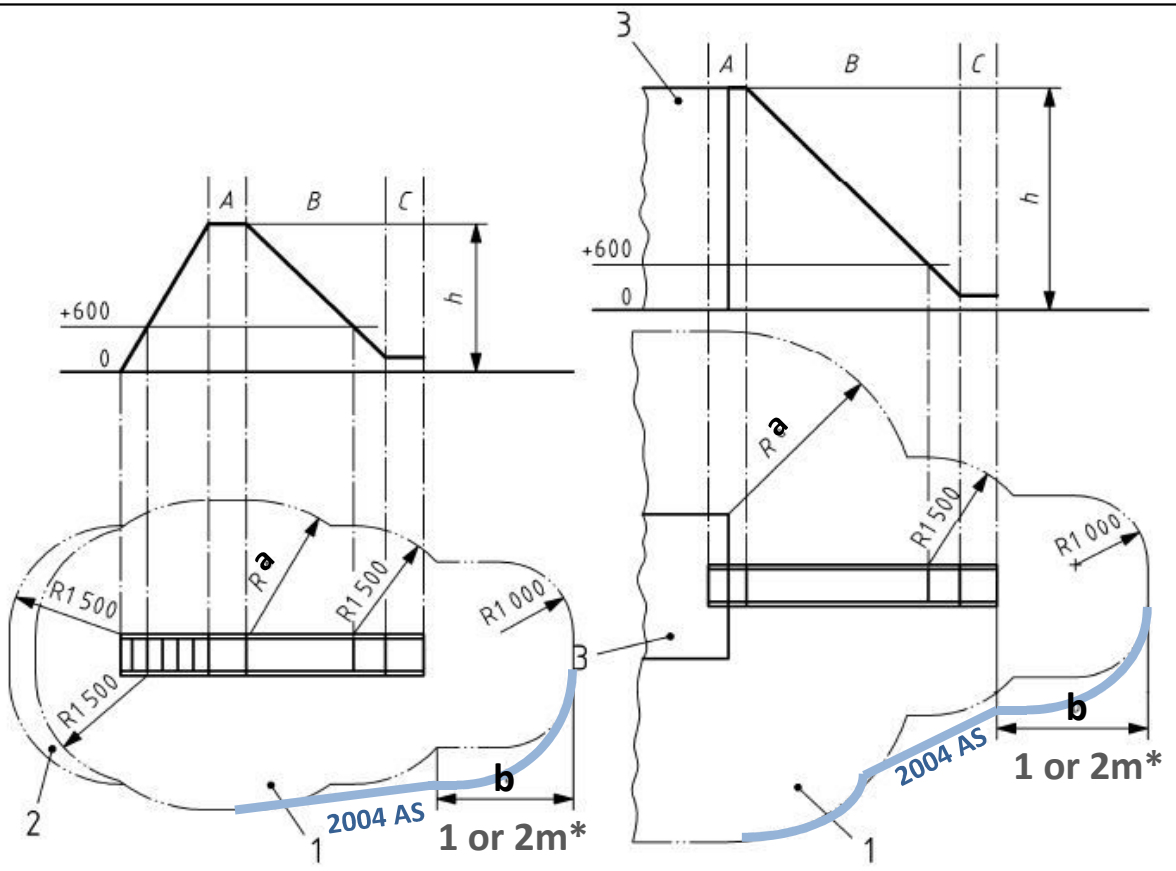
- Maximum sliding angle <= 60 degrees, and not exceed an average of 40 degrees over the Sliding Section.
- For changes in angle of >15 degrees, the radius shall be:
  >=450mm for the initial 2m change in height; and
  >=1000mm for the remainder of the slide.
- Widths
  - Open and straight slides: <700mm or >950mm
  - Helical and curved slides: <700mm
  - Tunnel sections of slides: >750mm wide & high (Cl.4.9)
- Side heights
  Aus: >=50mm for FHOF < 1m; >=100mm for FHOF > 1m.
  NZ: >=100mm for FHOF <1.2m; >=150mm for FHOF 1.2-2.5m;
  >=500mm for FHOF >2.5m, or easily accessible and FHOF >2m.
- Flat slide sides shall be at least 60 degrees steep.
  Curved sides shall pass the template test as per Figure 5.

Slides - Runout Section (Cl.4.5)

There are two types of slide runout:

- Type 1 Runouts can have a declination of up to 10 degrees and generally have a shorter length.
  Length >500mm for Sliding section length of 1.5-7.5m.
  Length >1500mm for Sliding section length >7.5m.
- Type 2 Runouts can have a declination of up to 5 degrees.
  Length > 0.3 the length of the sliding section.
  It is expected users have almost stopped once at the end.
- Runout length >=300mm, for the sliding length <=1.5m.
- End drop height <=200mm, for sliding section length <=1.5m.
  End drop height <=350mm, for sliding section length >1.5m.
- The Type of Runout affects Impact Area requirement. (as per next page)

Slide - Impact Areas (Cl.4.8)



a) Free-standing slide

b) Attachment slide

Key

A	starting section
B	sliding section
C	run-out section
1	impact area
2	impact area surface with no test requirement (see EN 1176-1:2008, 4.2.8.5.3)
3	play structure
h	free height of fall
a	depending on free height of fall
b	depending on the type of run-out section

Figure 9 — Impact area of slides

This looks confusing but the impact area extents simply relate to the heights as per Part 1 of the Standards, apart from the runout which has an impact area of 1m to the sides, and 1 or 2m beyond the end*.

The Runout impact area shall have surfacing with a Critical Fall Height of at least 1m.

Slides also have a 1m radius Free Space along their centre (excluding tunnel sections).

*** For Type 2 slides, the runout fall zone extent can be a minimum of just 1m beyond the end of the slide. This is because a Type 2 slide is one with a long, flat runout section. The Type 2 runout section must be at least 30% as long as the sliding section and have a maximum angle of 5 degrees.**

Play Equipment Standards Overview

Part 3d – AS4685.4 / NZS5828.4

Cableways (Runways / Flying Foxes)

Cableways - Heights & Clearances

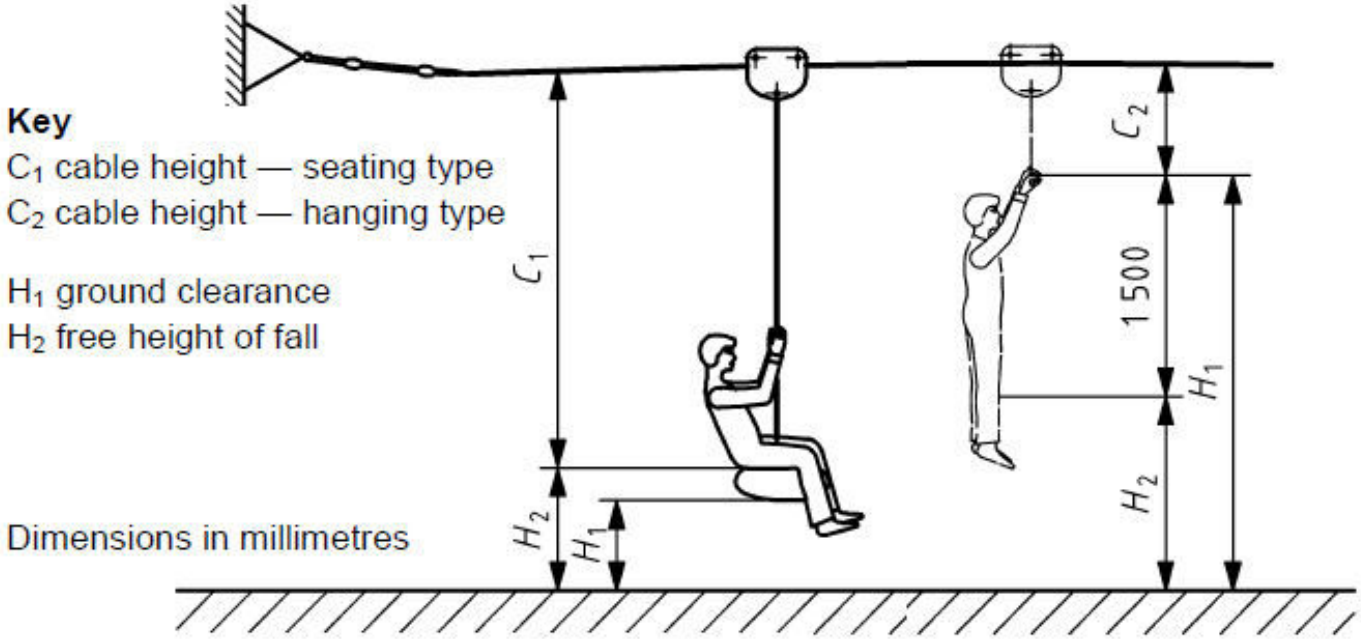


Figure 2 — Determination of cable height, ground clearance and fhof

When loaded with 130kg and pulled back 30 degrees at the start:

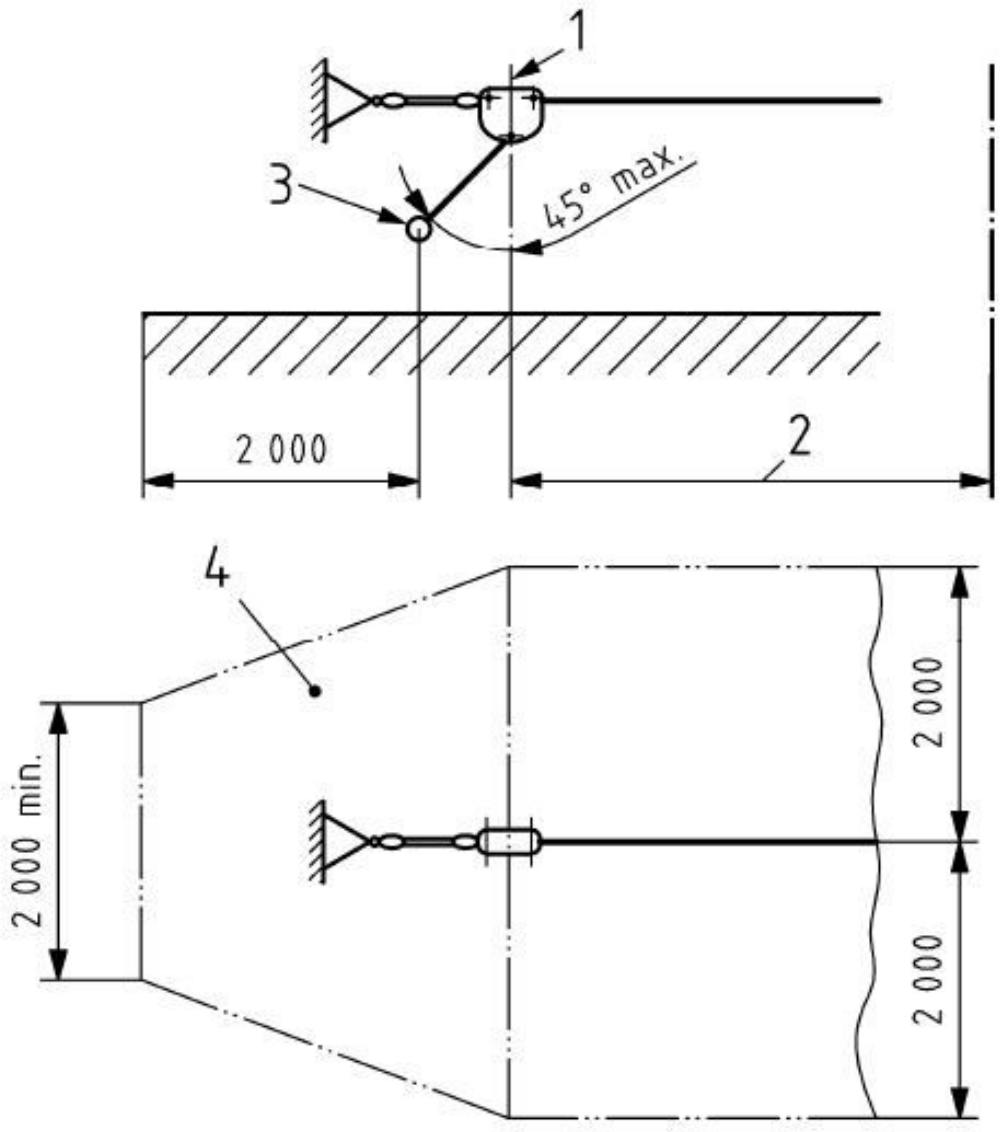
- Speed <= 7m/s

- End Swing <= 45 degrees

The stopper at the end should progressively slow down the traveller.

Attribute	Seat Type	Hanging Type
C1 & C2 (cable height)	>=2100mm	>=300mm
or C1 if traveller fully enclosed:	>=1800mm	
H2 (FHOF)	<=2000mm	<=1500mm
H1 (ground height)	>=400mm (130kg)	>=2000mm (69.5kg)
or at start point for non-rigid hanging types:		>=1500mm (unloaded)

Cableways – Impact Area (Cl.4.14, Fig.4)



Dimensions in millimetres

Key

1 end of travel
2 area of travel
3 maximum swinging position of seat or grip (see 4.14)
4 impact area (see 4.14)

- **Dual cableways shall have at least 2000mm between them.**
- **The impact area shall have surfacing with a Critical Fall Height of at least 1.25m (Aus) / 1.0m (NZ).**
- **Where the FHOF <=1m, starting platforms and ramps (timber, metal, plastic) do not require impact attenuating surfacing.**
- **Cableways have a 1m radius Free Space.**

Play Equipment Standards Overview

Part 3e – AS4685.5 / NZS5828.5

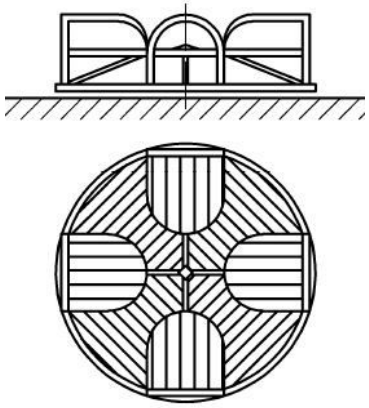
Carousels

Carousels – Types (Cl.3)

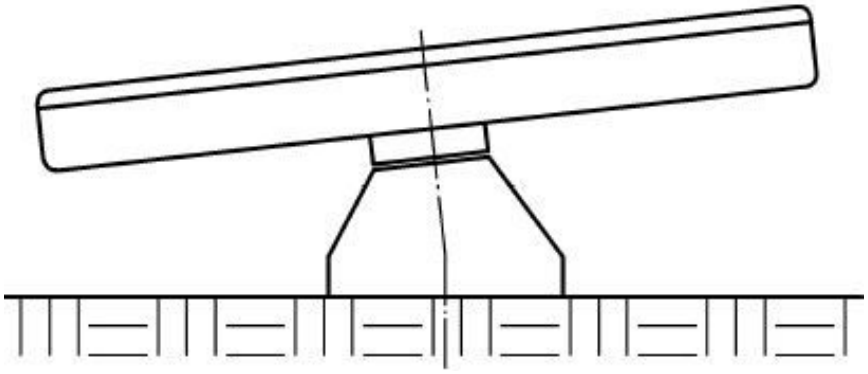
The Standard is for carousels > 500mm diameter intended for more than 1 user. There are 5 Types:

A. Rotating Chairs
B. Classic Carousel (most common type)
C. Spinning Mushrooms / Hanging Glides
D. Track Driven Carousel
E. Giant Revolving Discs (becoming more common)

Type B



Type E



Note: Spin poles are not carousels as <500mm diameter

Carousels – Impact Areas / Spaces (Cl.4.2 & 4.3)

- FHOF <=1000mm (on Type C, measured from 1500mm below grip)
- Impact Area >=2m from the edge
  >=3m for Type E (giant discs)
- Free Space / Falling Space are the same as the Impact Area, and up to 2m above the carousel. Larger than other items due to the centrifugal force.
- The Impact Area shall have surfacing with a Critical Fall Height of at least 1.5m (Aus) / 1.0m (NZ), regardless of Free Height of Fall.
- Maximum Speed at periphery <=5m/s.

Carousels – Type B, Classic (Cl.5.2)

There are several clauses relating to Ground Clearance which cannot be easily summarised in a talk but some points are listed below:

- If flush with ground, the gap around the outer edge shall be <8mm and the platform shall be <=20mm above the ground.
- If not flush, then ground clearance shall be at least 60mm.
- If ground clearance is between 60-110mm then the underside shall be smooth within the first 500mm towards the axis.
- If ground clearance is between 110-400mm or >400, the underside shall be a continuous smooth surface, or it shall have a skirt around the outside that hangs down to 60-110mm above the ground. There are different rules for skirts depending on if the ground clearance is less or greater than 400mm.

Carousels – Type E, Giant Discs (Cl.5.5)

- These have an inclined axis up to 5 degrees, with no clearly defined user stations.
- The upper side shall be a continuous smooth surface.
- The underside shall be a continuous smooth surface with no radial variations to the ground clearance.
- Ground Clearance >=300mm (or >=400mm for rubber)

Key

1 bearing
2 upper side
3 inclination
4 underside
5 footing/mounting

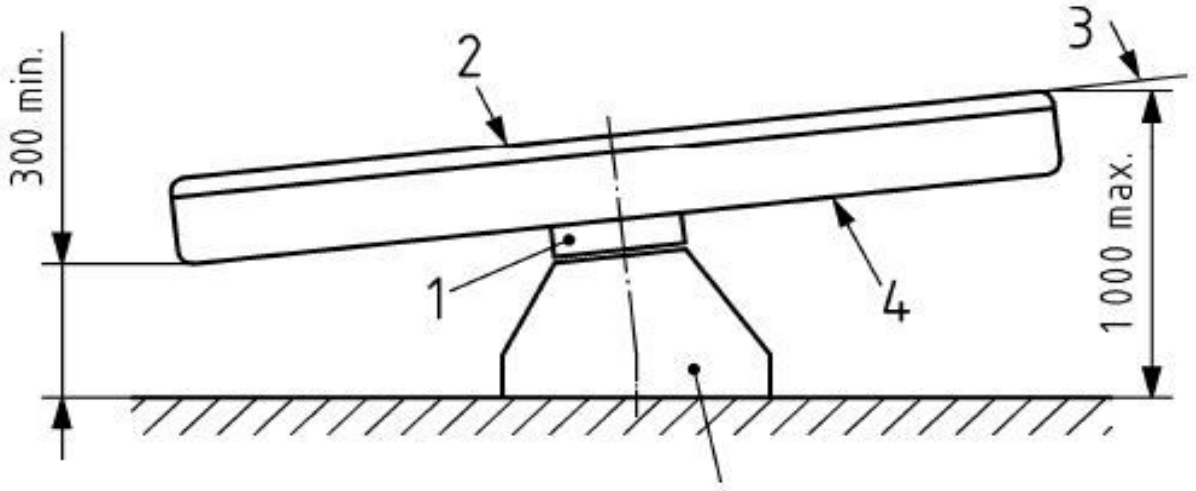


Figure 11 — Example of carousel type E (giant revolving disk) showing requirements for ground clearance

Play Equipment Standards Overview

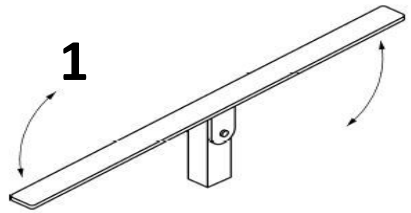
Part 3f – AS4685.6 / NZS5828.6

Rockers

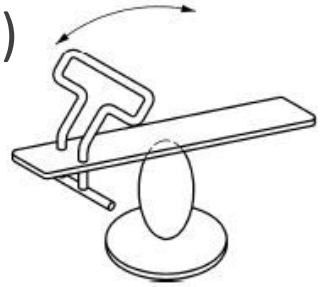
Rockers – Types (Cl.3)

There are 6 Types of Rockers:

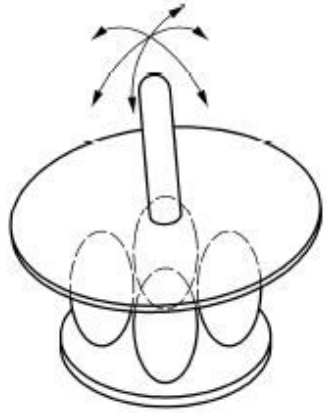
1. Axial Seesaw (on a central fulcrum, no spring)



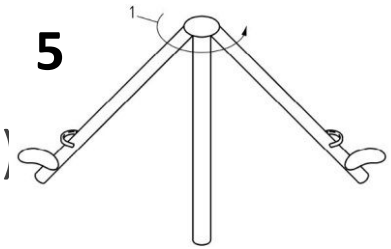
2. Single Point Seesaw / Rocker (most common type)
   - 2A has a pre-determined main direction of movement
   - 2B has multi-directional Movement



3. Multi-Point Seesaw / Rocker
   - 3A has a pre-determined main direction of movement
   - 3B has multi-directional Movement



4. Rocking Seesaw (e.g. like a traditional rocking horse. Rare)
5. Sweeping Seesaw (supported above the user position)



6. Overhead Single Axis Seesaw (e.g. scale rocker)

Rockers – FHOF, Slopes, Clearance (Cl.4)

Table 1 — Safety requirements

Type	Maximum free height of fall (see 4.2) mm	Maximum slope of seats/stand (see 4.3) °	Ground clearance [a] mm
1	1 500	20	230 min.
2A	1 000	30	optional
2B	1 000	30	230 min.
3A	1 000	30	optional
3B	1 000	30	230 min.
4	1 000	20	230 min.
5	2 000	–	230 min.
6	2 000	–	230 min.

[a] Minimum ground clearance is not required when:

1) there is a damping effect, e.g. the supporting component is a spring;

2) the motion of the extremity of the structure is mainly in a horizontal direction (deflecting effect).

Rockers – Miscellaneous (Cl.4.6 – 4.9)

- Restraint of motion at the extremities should be regulated so there is no sudden reversal of movement (e.g. damping such as a spring)
- Foot rests shall be provided when the ground clearance is <230mm and there is no damping (rare).
- Hand supports shall be provided for each seat/stand position. These shall meet the requirements for grip (16-45mm but pref. <=30mm), and pass the 44mm ring gauge test.
- Equipment should be designed to prevent entrapment. E.g. The Spring shall not compress by more than 5% and the 12mm probe should be able to be inserted at all extreme positions.

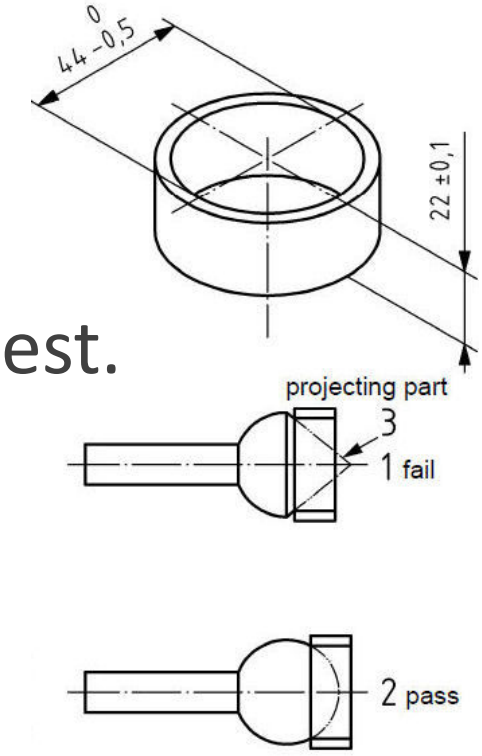


Fig. E1 & E2 – Gauge Test

Rockers – Impact Areas / Spaces (Cl.4.10)

For equipment Types 1, 2, 3 and 4, when measured from the perimeter of the equipment in its most extreme positions the falling space shall be a minimum of 1 000 mm (see Figure 9).

Key

1 space occupied by the equipment

2 falling space

3 free space

4 impact area

x extent of falling space

y height of falling space

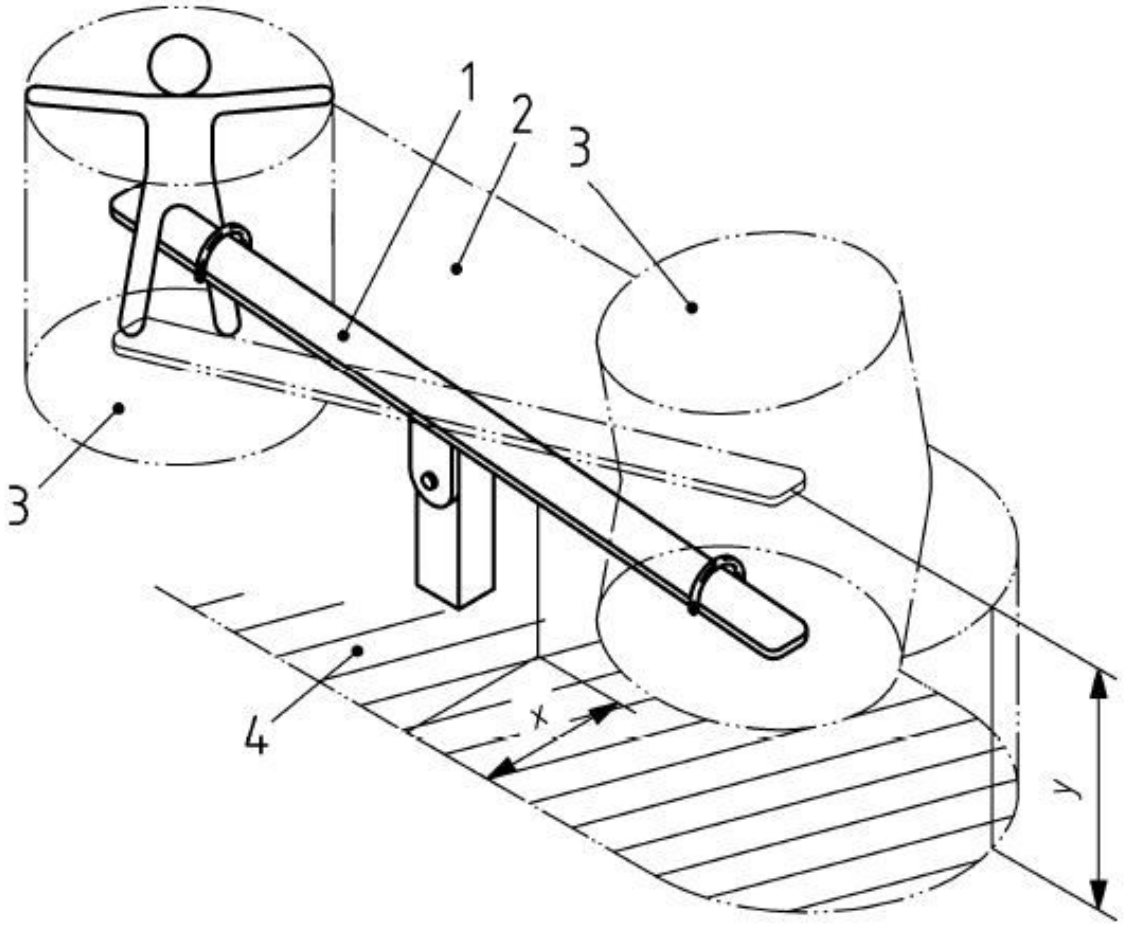


Figure 9 — Examples of falling space of rocking equipment Type 1

For equipment Types 5 and 6, the requirements for the impact and falling space shall be in accordance with EN 1176-1:2008, 4.2.8.2.4. and 4.2.8.2.5.

Rockers – Type 6 (Cl.5.4)

- Overhead seesaws are now formally recognised in the Standards.
- The seat / pommel can have FHOF <=2000mm. This will limit the maximum inclination of the beam.

NOTE As the main motion of the user is rocking, the angle of the swinging part of the motion should be not more than 20°. **(but how?)**

Key

α maximum inclination of the beam during use of the equipment

a free height of fall

Dimensions in millimetres

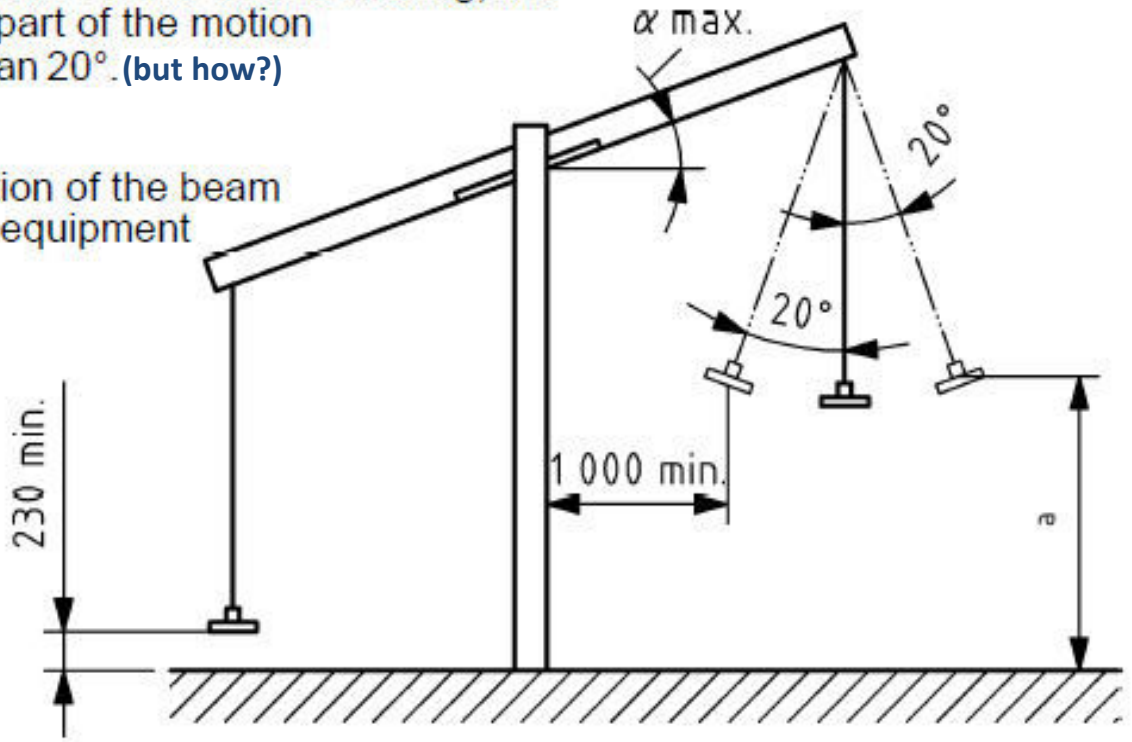


Figure 12 — Free height of fall of overhead single axis seesaw (Type 6)

Play Equipment Standards Overview

Part 3g – AS4685.11 / NZS5828.11

Spatial Networks

Spatial Networks

Spatial Network is defined as geometric 3-dimensional assembly of flexible elements which will yield by design.

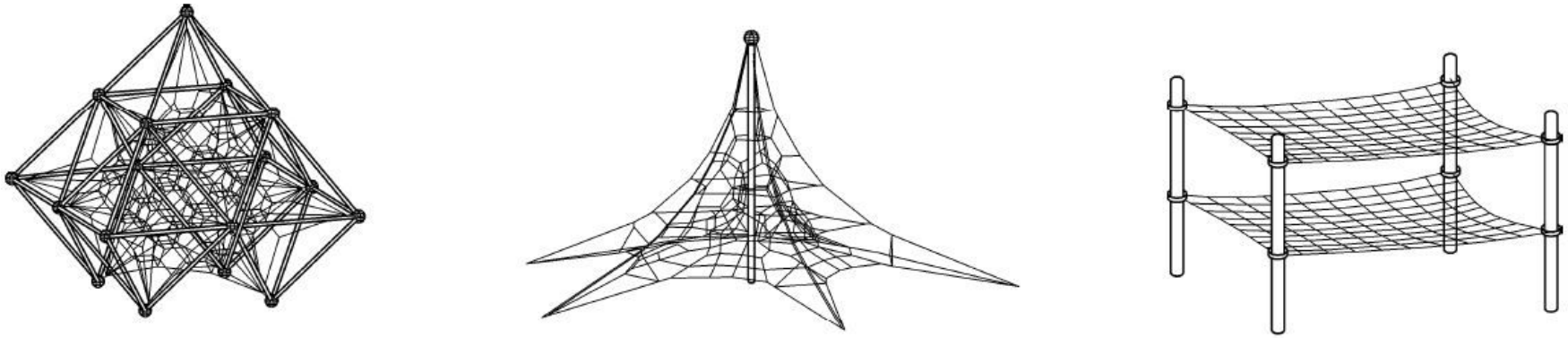


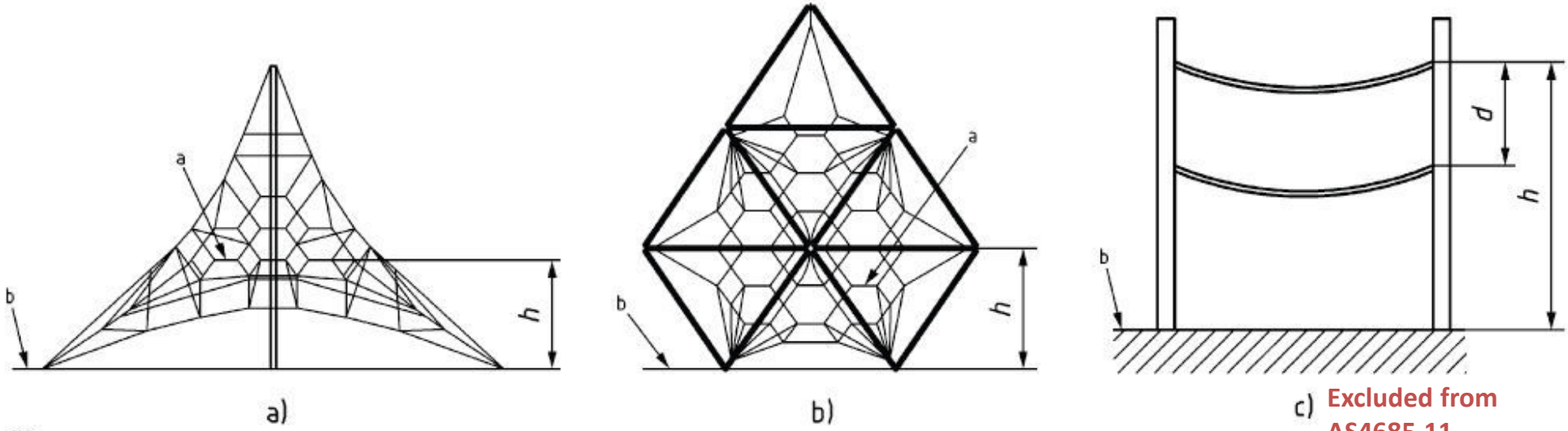
Figure 1 — Examples of spatial network

Excluded from AS4685.11

- Structural elements outside the net are not considered to be in the falling space, because of the way the equipment is used with users expected to fall vertically downward into the net. (Cl.3.1)
- Meshes of a spatial network shall not be so large as to allow an imaginary cylinder 600mm diameter and 1800mm high to pass through. (Or FHOF and impact attenuation shall relate to the higher sections) (Cl.4.1)
- Where 2 linear elements converge at least one shall be flexible. If the angle formed has a lower edge above the horizontal then the angle shall be >20°.

Spatial Networks – FHOF / Falling Space

FHOF (h) is the highest foot position giving an unimpeded fall, and is measured as shown below. (This Figure is from the 2014 EN, but same principal applies to 2012 AS)



Key

a mesh size smaller than the diameter of the imaginary cylindrical body (see 4.1)
b impact absorbing surface
d distance between the nets:
h free height of fall

d = max. 1,8 m for mesh size up to 420 mm × 420 mm
d = max. 1,0 m for mesh size bigger than 420 mm × 420 mm

Figure 5 — Free height of fall

The Impact Area and Falling Space extents around a Spatial Network are based on the Free Height of Fall (h) as per Part 1 of the Standards, including Figure 17.

Spatial Networks – Internal Falls

When non-flexible elements (e.g. support poles) are arranged in a slanted position and have a smooth surface they have a deflecting character and the impact energy is reduced.
The maximum internal height of fall can then be increased in accordance with Table 1.

Table 1 — Maximum internal height of fall

Deviation from horizontal °	Factor	Height of fall equivalent to 600 mm vertical mm
30	1,15	700
45	1,41	850
60	2,00	1 200
70	2,92	1 750
80	5,76	3 000 max.

NOTE This table shows mathematical ratios that relate only to the structure. Appropriate IAS materials are required on any surrounding impact area.

Rope structures which are designed to yield in use are not regarded as hard objects in the falling space.

Play Equipment Standards Overview

Part 3h – AS4685 / NZS5828

Supervised Early Childhood Settings

Supervised Early Childhood Settings

Both AS4685 (parts of Appendix ZZ) and NZS5828 (Appendix A) list specific extra requirements for Supervised Early Childhood Settings (SECS).

A Supervised Early Childhood Setting is defined as:

- (Aus) A defined play space used by an education and care service or children's services, for children under school age, which is supervised by educators (early childhood practitioners).
- (NZ) Services licensed in accordance with the Education (Early Childhood Services) Regulations 2008.

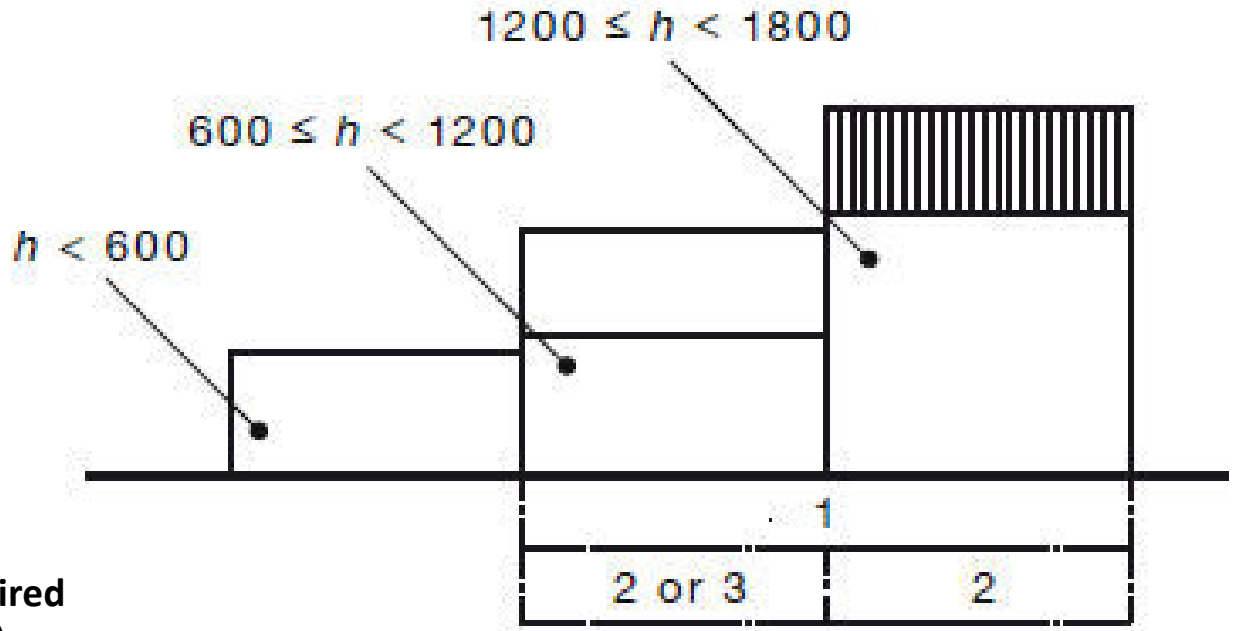
SECS – AS4685: FHOF & Impact Area

- The maximum allowable FHOF = 1.8m.
- For Moveable Equipment FHOF shall be <=1.5m.

Impact Area extents are determines as usual, this being:

- Items 600-1500mm high shall have a minimum impact area of 1.5m with impact attenuating surfacing. (Fig. 17)
- Items 1500-1800mm high shall have a minimum impact area of 1.5-1.7m based on (2/3 FHOF) + 0.5m. (Fig. 17)
- Items up to 600mm high do not require impact attenuating surfacing unless there is forced movement such as sliding, rocking, etc.

SECS - AS4685.1: Barriers / Guardrails



Key

1 **Impact attenuating surfacing required**
2 **Barriers required (>= 700mm high)**
3 **Guardrail required (600-700mm high)**

Fig. 8 c) Equipment for SECS

- Stairs / Ramps (Cl.4.2.9.2 / 4.2.9.3)
  Handrails (450-700mm high) or barriers are required for stairs / ramps to platforms up to 1.2m high. If deck is >1.2m high then barriers shall be used. If a set of stairs is higher than 1m and >45º steep then the barrier shall be graspable or a handrail shall be provided.
- Rigid Bridges (Cl.4.2.4.1)
  Just handrails / guardrails can be used if bridge height <1.5m, or if the bridge is not easily accessible. Barriers are required for easily accessible bridges >1.5m high.
- Moveable Play Equipment: Handrails, guardrails or barriers not required.

SECS - AS4685.1: Moveable Play Equipment

This is now formally recognised and defined as: (Cl. 3.34)
a range of purpose-made manufactured equipment used in supervised settings (e.g. SECS, schools etc.) that is not permanently fixed in place and can be adjusted and moved by educators on a regular basis to vary play opportunities.

Educators should apply a risk assessment approach to the setting up of moveable play equipment suitable to the ages and developmental stages of the children utilising the moveable play equipment. (Cl. 4.2.16)

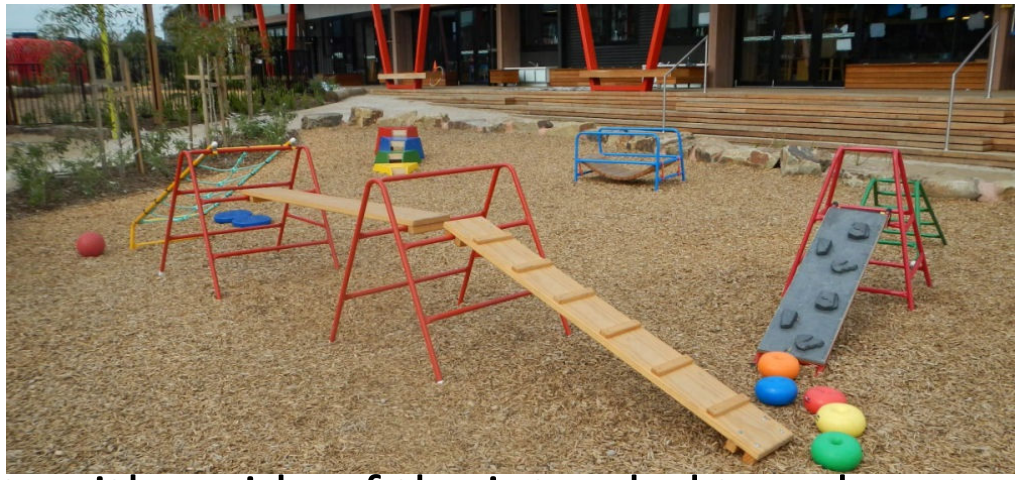
Related to this is the use of Clusters, being where: two or more separate pieces are designed to be installed in close proximity for continuity in a sequence of play activity. (Cl. 3.19)

SECS - AS4685.1: Moveable Play Equipment

Apply risk assessment when setting up especially in relation to falling.

Too close to edging / wall

Cluttered too close together



Well spaced equipment allowing falls to either side of the intended travel routes

SECS – NZS5828: Some Requirements

- FHOF for moveable boxes or similar equipment <=1200mm
  FHOF for overhead equipment <=1700mm
  FHOF for all other equipment <=1500mm
- The NZ Standard defines Moveable Equipment as:
  a range equipment that is not permanently fixed in place, and can be moved on a regular basis to extend play opportunities.
- Examples of Moveable Play Equipment are provided (e.g. climbing boxes, planks, A-frames, nets, slides) and states they shall be under constant supervision, and be stable on hard and soft surfaces.
- Swings may have more than 2 swings per bay and may be combined with swinging ropes and other suspended equipment. The fall zone shall be determined by using the 60 degree angle and extending this by 1500mm (in lieu of the usual 1750 or 2250mm).

Play Equipment Standards Overview

Part 4 – AS4422 / EN1177 (used in NZ)

Playground Surfacing

Impact Attenuating Surfacing

AS4422 (2016) and EN1177 (2008) provide information on testing of impact attenuating undersurfacing.

- Specialist training and equipment are required to undertake impact attenuation testing hence just an overview is provided as part of this documentation.
- Critical Fall Height (h_c) is the "*maximum free height of fall, for which the surface will provide an acceptable level of impact attenuation*". (i.e. HIC*<=1000, g_{max}<=200)
- Testing uses a 4.6kg headform with an accelerometer on it to measure impact. This headform is dropped onto the surface with the g_{max} and HIC then calculated by an attached data recorder.

*HIC – Head Injury Criteria

Impact Attenuation Testing

In Australia, field testing can be undertaken by testing a prescribed number of locations in a playspace and dropping the headform from the adjacent equipment fall height +10% and checking HIC and g_{max}.

For laboratory testing in AUS & NZ and field testing in NZ (also could be used in field testing in AUS on sites that fail between 1 to 1.1 times the required fall height rating), three sets of drop tests are performed on each surfacing sample to determine the Critical Fall Height (h_c).

- Loose Fill (e.g. mulch). Each of the 3 drop test sets consists of three impacts performed at four different drop heights (so 72 drops in total as need to test both wet and dry samples).
  The worst result of each of the three impact drops is used.
  Two of the four drop heights should have HIC >1000 or g_{max}>200.
- Solid / Unitary (e.g. rubber). Each of the 3 drop test sets consists of four consecutive impacts (so 12 drops in total).
  Two of the four impacts should have HIC >1000 of g_{max}>200.

Impact Attenuation Testing

Each of the four drop heights are then plotted on graphs of g_{max} against drop height, and HIC against drop height (sample below). The heights at which HIC = 1000 and g_{max}=200 are determined, and the lowest of the 2 heights is them deemed to be the Critical Fall Height (H_c) for that test. The Lowest H_c for all three tests is then taken as the Critical Fall Height (H_c) of the sample being tested.

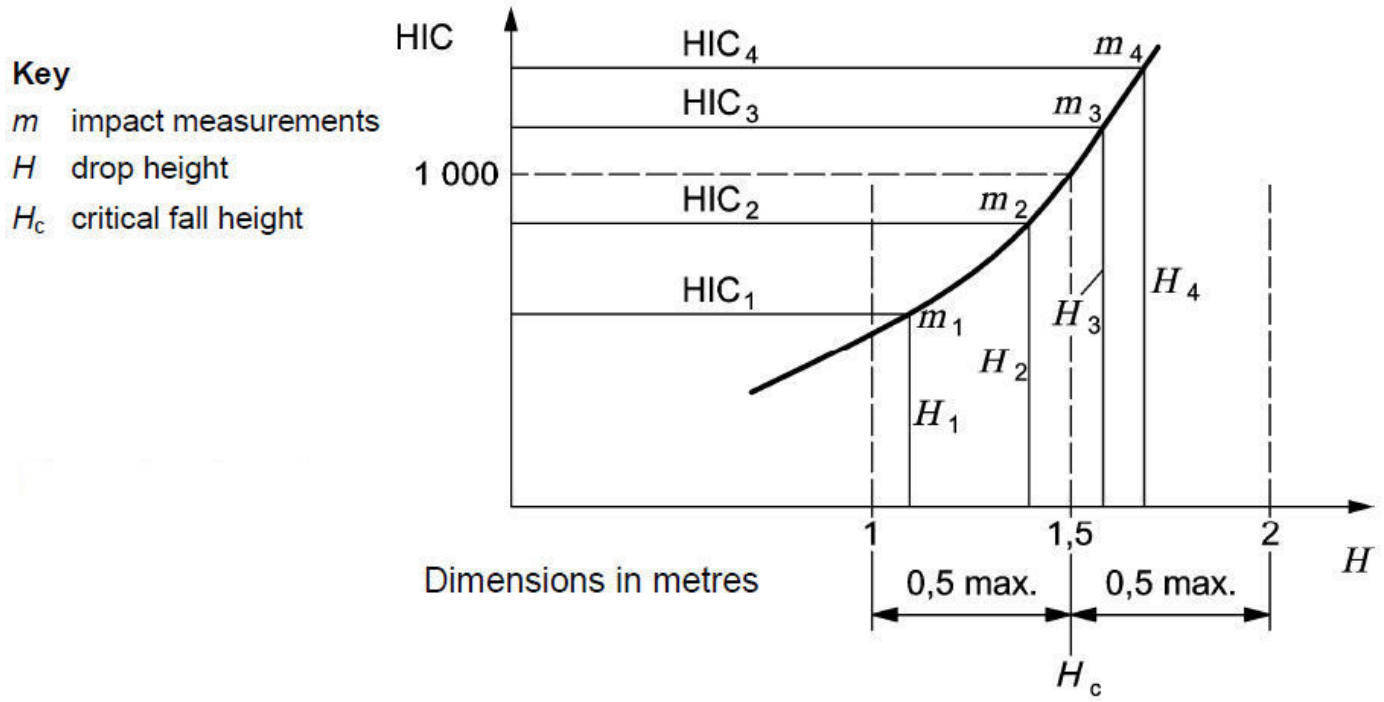


Figure B.2 — Typical curve of HIC values against drop height

Note1: In Australia this method is no longer prescribed for site testing. As of 2016 this can now be done by simply taking the FHOF +10% and if a single drop at that height passes then that point is deemed OK – this is then repeated for a specified number of points. If a site fails at FHOF +10% then the method here can be used to determine the Critical Fall Height of the surfacing.

Note2: The new NZ Standard also refers to British Standard BS 7188 which provides test methods for abrasive wear, slip resistance, indentation resistance, ease of ignition and tensile properties.

Play Equipment Standards Overview

Part 5 – AS3533.4.2 (2013)

Contained Play Facilities

AS3353.4.2 – Contained Play Facilities

This Standard sets out minimum safety requirements for the design (covered in this talk), development, installation, inspection, maintenance, supervision level and operation of Contained Play Facilities. These are defined as:

- Composite of children's play equipment and associated facilities within commercial premises (e.g. pubs, shopping centres, fast food outlets and pay-for-play centres) which may be free access or paid access.

Part 1 and 2 of AS3353 should also be referred to.

Note that just because a playspace is at a commercial premises, doesn't mean AS3353.4.2 is always used. Playspaces that are like a traditional public playspace may still be assessed under AS4685.

Note: The new NZ Standard is likely to adopt EN1176.10 - Fully Enclosed Play Equipment, which has many of the same principals as AS3353.4.2. However this talk provides information only on AS3353.4.2. It may be updated once sure of what Standards NZ are to adopt and any amendments for NZ conditions.

Contained Play Facilities – Design (Cl.3)

Many of the design requirements are the same as those in AS4685, however significant differences and important issues are noted below and on the following pages.

- Fire. Safe egress of patrons in the event of fire shall be ensured, and be part of design risk assessment. Enclosed parts with an internal distance >2m from an entry point shall have at least 2 access openings with no dimensions <500mm. (Cl.3.2.1 & 2)
- Structural Integrity can be assessed by calculation (Appendices A & B) or by physical testing (Appendix C); or a combination. (Cl.3.2.4)
- Free Height of Fall <=3m, or <1.5m in toddler areas. This is measured that same way as per AS4685. (Cl.3.2.5)

Contained Play Facilities – Design (Cl.3)

- **Free Space.** This is the same as defined in AS4685. (Cl.3.2.6)
- **Fall Zones.** This differs from AS4685 as per the graphs below.
  Where FHOF > 600mm (or <=600mm and the equipment is used for climbing or has forced movement), then any objects or surfacing within the fall zone shall have impact attenuating surfacing or covering with HIC < 1000 and g_{max}<200. (Cl.3.2.7)

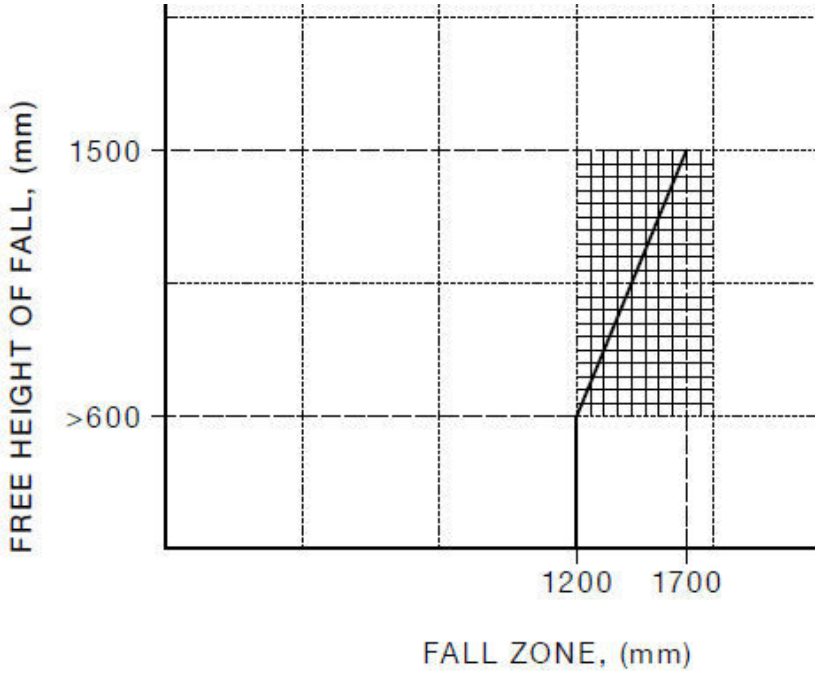


FIGURE 3.4 MINIMUM EXTENT OF FALL ZONE —TODDLER AREAS

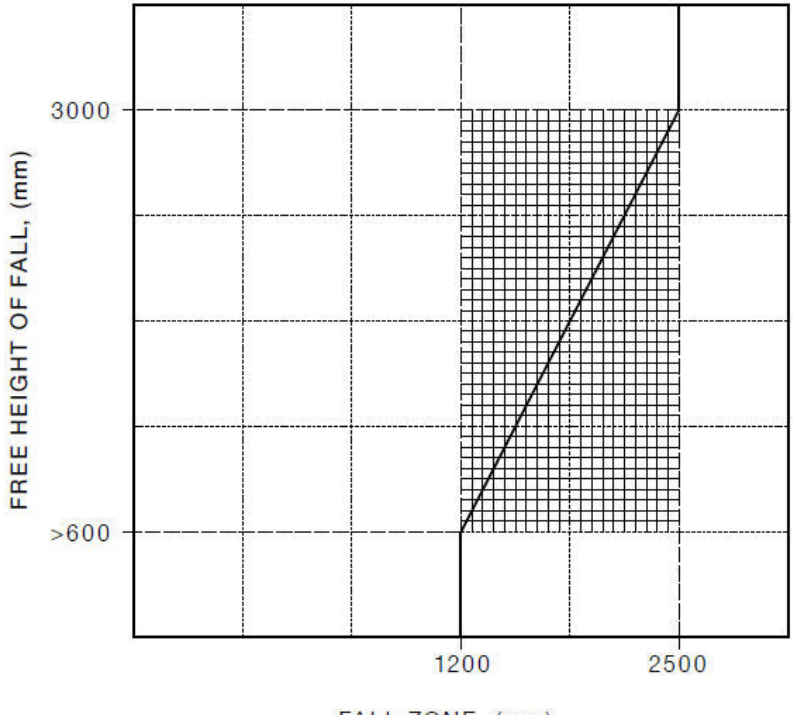


FIGURE 3.5
MINIMUM EXTENT OF FALL ZONE—OTHER CASES

Contained Play Facilities – Design (Cl.3)

- **Entrapments.** This is almost exactly the same as 4685.1, with the main difference being the requirements for tunnels (which are commonly used in Contained Play Facilities). (Cl.3.2.8)

TABLE 3.3 REQUIREMENTS FOR TUNNELS

Description	Open one end	Open both ends			
Inclination	≤5° and upwards only when entering	≤20°		20° > inclination ≤ 45° NOTE: Optimum 30° to 38°	
Minimum internal dimensions*, mm	≥750	≥750		≥750	
Length, mm	≤2000	≤5000	>5000	≤5000	>5000
Other requirements, mm	None	None	Provision of additional access or egress every 5000	Provision to assist climbing and prevent sliding, e.g. steps or handles	Provision of additional access or egress every 5000 and provision to assist climbing and prevent sliding, e.g. steps or handles

* Measured at the narrowest point.

Contained Play Facilities – Items (Cl.4)

- Inflatable Devices. If used these shall comply with AS3533.4.1. (Cl.4.2)
- Ball Pools. (Cl.4.3)

  - Balls should not be able to be pushed through a 44.5mm diameter test template with a force of 30N as per Appendix H.
  - Guidance on cleaning ball pools is provided in Appendix I. Balls that can absorb fluid (e.g. foam, fabric) shall not be used.
  - The depth shall not exceed 400mm when no patrons in it.
  - Opportunities for jumping into the pool shall be minimised.
  - Entry points and platforms shall be <300mm above top of balls.
  - The base shall have a Critical Fall Height rating of >=700mm.
  - Ball pools can be used as a landing area for forced movement (e.g. slides) but shall be separated from ball pool areas used for general play and the base shall have a Critical Fall Height rating of >=1000mm over a minimum fall zone of 2000mm.

Contained Play Facilities – Items (Cl.4.4)

Contained Play Structures

are those typically used in commercial centres with netting on the sides and many different play items. Some components are indicated on the right but could also include balance beams, spider web and activity ramps. Cl4.4 has four pages of design requirements for the components, hence not summarised here apart for some points on climbing ramps:

- Angle: 15-45 degrees.
- If >2000mm high there shall be intermediate landings >=950mm long with a Critical Fall Height >=1m.
- The final falling surface shall be 500mm to the sides and 1500mm out from the base of the ramp, OR 950mm out to a 1500mm high impact attenuated vertical surface.

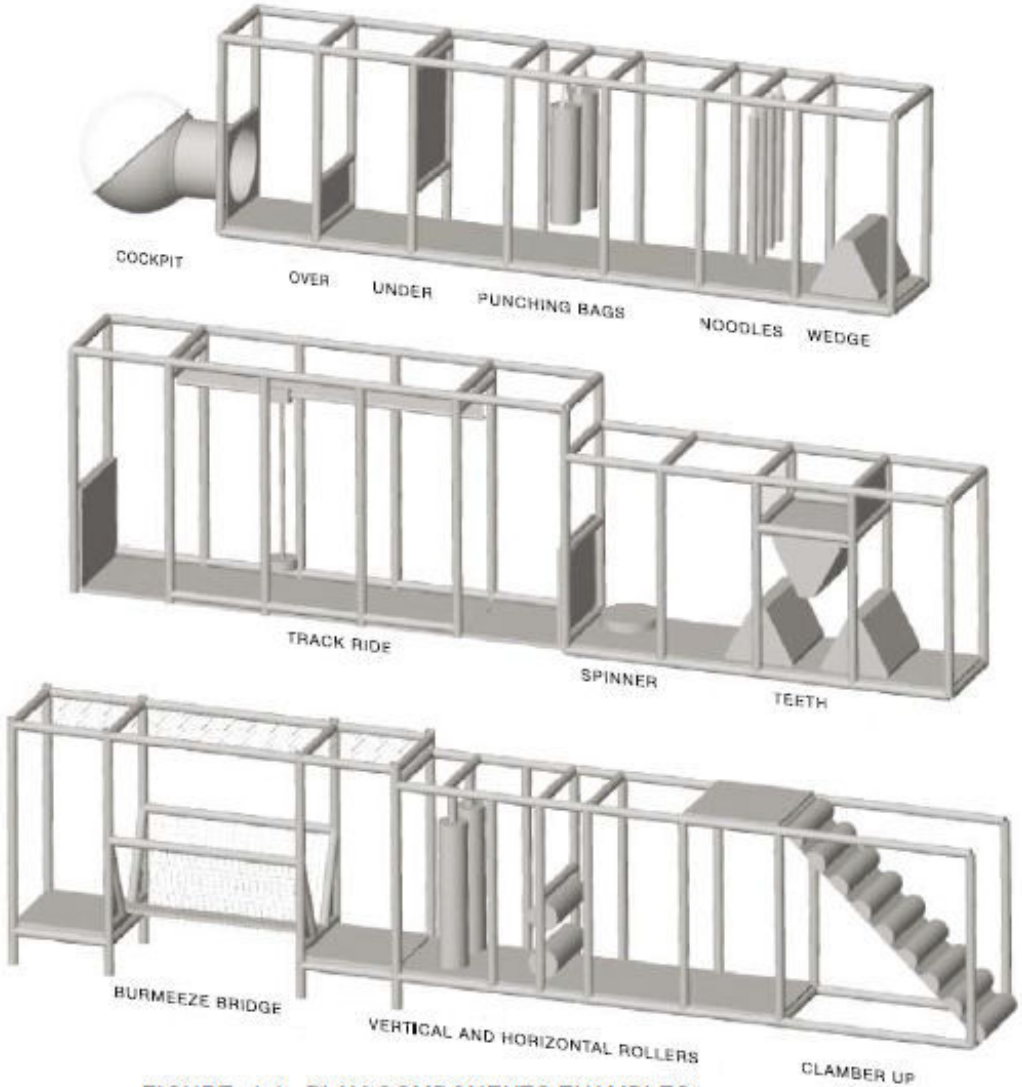


FIGURE 4.1 PLAY COMPONENTS EXAMPLES

Contained Play Facilities – Items (Cl.4)

- Other Play Areas (tables, machines, etc.). These shall be risk assessed. (Cl.4.5.1)
- Patron Propelled Vehicles. (Cl.4.5.2)
  - Contained within a barrier not less than 400mm high.
  - No crushing, shearing, entrapment hazards.
- Toddler Area (Cl.4.6)
  - Contained within a barrier >=400mm high. If a gate is a provided it shall be self-closing with a child-proof latch.
  - The floor shall have impact attenuating surfacing commensurate with the associated fall height.

Contained Play Facilities – Forced Movement (Cl.4.7)

The requirements of Clause 4.7 take precedence over other general requirements where they conflict.

- Slides. There are many attributes that differ from AS4685, with some of the more important ones listed below: (Cl.4.7.2 - 4)
  - If Stating Section FHOF >1.5m, the slide shall be fully enclosed to at least 1500mm beyond the start of the sliding section.
  - Parts of the sliding section >1.5m FHOF shall be fully enclosed.
  - Width >=300mm for toddlers area, 410mm otherwise.
  - Lateral Protection height >=100mm, or >150mm for FHOF >1.2m.
  - End Velocity shall be 0m/s unless a bump stop is provided.
  - Bump Stop height >=800mm with HIC<=1000 and g_{max}<=200.
  - No runout section fall zone required for fall height <=100mm. If fall height >100mm then Surfacing Critical Fall Height >=1m.
- Swings. Shall comply to AS4685.2 and be in a fenced area. (Cl.4.7.5)

Contained Play Facilities – Other Items (Cl.4.7 - 10)

- **Track Rides.** These shall be risk assessed, with the end stop positions and the free space provision increased commensurate with increased risk. (Cl.4.7.6)
  - End stops shall be at least 800mm from end of the enclosure.
  - Overhead parallel track rides shall have a barrier between them.
  - Seats shall be impact attenuating and at least 350mm high.
- **Spider Mountains.** Test for entrapment loaded and unloaded. (Cl.4.7.7)
- **Trampolines.** Shall comply with AS4989 and be risk assessed. (Cl.4.7.8)
- **Fireman's Poles.** Not recommended but can be used if risk assessed. (Cl.4.7.9)
- **Rotating Seats and Poles.** Locate in a dedicated area with a free space of 500mm (seats) or 1500mm (poles), and surfacing with a Critical Fall Height of >=1m (seats) or >=1.5m (poles). (Cl.4.7.10)
- **Mechanical Rides.** Shall be controlled and supervised. (Cl.4.8)
- **Airplay Devices.** Shall be risk assessed. Balls to use low density foam. (Cl.4.9)
- **Climbing Walls.** Height<=2.5mm. If used to access a deck the wall shall be at least 600mm above the deck with a safety rail over the top. (Cl.4.10)
  Note: Walls >2.5m high can be used if in accordance AS2316.1.

Play Equipment Standards Overview

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