

SLIP RESISTANCE PERFORMANCE

INTRODUCTION

Accidental falls can be attributed to:

1. Physical factors, such as footwear, surface material, surface contamination, surface conditions, slope and lighting conditions. These can all be minimised or improved through design, installation, maintenance, safety audits, policy and legislation.
2. Environmental factors, such as age, impaired vision, general health, stress, fatigue, drug and alcohol use and activity e.g. carrying, pushing, rushing.



Tests for slip resistance

Standard	Coverage/Relevance
AS 1428.1	Extensively cited in the NCC. Clause 1.4.22: Slip-resistant definition. Clause 4.1: 'A continuous accessible path of travel and any circulation spaces shall have a slip-resistant surface.'
AS/NZS 3661.2	Guidance on the selection, installation, care and maintenance of pedestrian surfaces in domestic, commercial and public areas for the purpose of reducing slip hazards.
AS 4586	Cited in NCC for slip resistance classification of stair landings, treads, nosings to stairways and pedestrian ramps. Testing and slip resistance classification of new products. No advice on which value is acceptable for a particular application or environment. Rejects the use of a universal minimum slip resistance threshold value. Recognises that a number of relevant variables contribute to slip potential including footwear, activities, gait, contamination, environment and other factors.
AS 4663	Slip resistance measurement of existing pedestrian surfaces.
SA HB 197	Guidance on slip resistance classifications appropriate to different locations. Does not refer to Dry floor friction testing as products are tested in an unnaturally clean condition.
SA HB 198	Guidance on AS 4586 and AS 4663 and on verifying compliance with the NCC.

The **Wet pendulum test** simulates the slipping action of a shod foot on a water contaminated surface. An imitation heel clad with standard soling rubber is swung over the wetted test surface. It is appropriate to specify this test method where smooth soles are commonly worn and the surface may be wet, for example, external walkways and commercial entry foyers. This test is portable.

The **Dry floor friction test** uses a portable, self-propelled mobile apparatus which moves across the test surface and measures the coefficient of friction. It may be appropriate to specify this test where surfaces in normal use have no contaminants and smooth soles are commonly worn such as in retail shopping in internal areas.

CLASSIFICATION

AS 4586 classifies new products according to their frictional characteristics when tested with one of the following four methods:

Test	Class	Units	
Wet pendulum		Pendulum SRV	
		Slider 96	Slider 55
	P5	> 54	> 44
	P4	45 - 54	40 - 44
	P3	35 - 44	35 - 39
	P2	25 - 34	20 - 34
	P1	12 - 24	< 20
Dry floor friction		Floor friction tester mean value	
	D1	≥ 0.40	
	D0	< 0.40	
Wet-barefoot inclining platform		Angle (degrees)	
	A	≥ 12	
	B	≥ 18	
Oil-wet inclining platform		Angle (degrees)	
	R 9	≥ 6 < 10	
	R10	≥ 10 < 19	
	R11	≥ 19 < 27	
	R12	≥ 27 < 35	
	R13	≥ 35	

The **Wet-barefoot inclining platform test** is performed by an operator, in safety harness, who walks barefoot on a test surface which has been sprayed with soap solution. The inclination of the test surface is gradually increased and angle at which slip occurs when walking up or down the slope is recorded. This angle is used to establish a classification or rating value. This test cannot be performed in situ but may be suitable for specifying surfaces for swimming pool surrounds.

In the **Oil-wet inclining platform test**, which is similar to the **Wet-barefoot inclining platform test**, an operator wearing safety boots walks up and down a sloping test surface contaminated by oil. This test cannot be performed in situ either and is most suitable for specialised applications such as commercial kitchens.

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DESIGN

Design consideration should be given to the following:

- Use of space – Wet, dry or transitional areas?
- Surface level – Gradient and changes in level?
- Wear – Polishing action over time may reduce the slip resistance.
- Maintenance – Slip resistant products are harder to clean than smoother, less profiled surfaces and may affect operating costs and appearance of the building.

SELECTION

What actions should a specifier take?

- Review NCC requirements.
- Use the SA HB 197 and SA HB 198 Handbooks to identify the minimum pendulum or ramp recommendations for specific locations within and around the building.
- Base the specification on the test method(s) that most closely simulates the normal usage of the flooring. Consider the likely floor surface contaminants and footwear.
- Check that available slip resistance data relates to the specific product being considered. There can be variations within a single product range, such as with colour or size, as well as from batch to batch.
- Consider, in addition to slip resistant flooring, the following: lighting, colour (or luminance) contrast at transitions between surfaces, handrails, door mats, bathmats, signage, drainage slopes, maintenance policies and rainfall intensity.
- Obtain test reports from the manufacturer and/or supplier for each product specified.
- Confirm that the specified product meets the performance criteria and document the process to provide evidence of due diligence.
- Consult with an independent specialist if appropriate.
- For commercial kitchens and industrial applications, select the required displacement volume (V4, V6, V8 or V10).

VERIFICATION

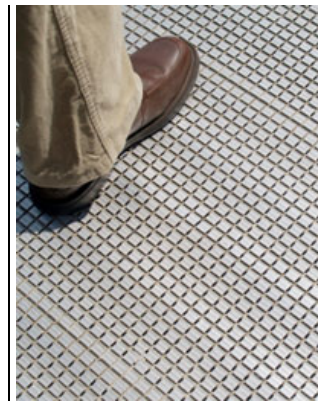
AS 4663 (2013) concerns the measurement of the frictional characteristics of existing pedestrian surfaces in wet and dry conditions. It is important to note that *Wet- barefoot inclining platform test* and *Oil-wet inclining platform test* cannot be conducted onsite to verify the initial documented slip resistance. Only the *Wet pendulum test* and *Dry floor friction test* can confirm the on-site performance. Relevant NATSPEC worksections include prompts for specifying these field tests at the date of Practical Completion as a means of recording a benchmark value against which post-contract deterioration, due to wear and cleaning methods, can be compared.

Reports have emerged of instances of ceramic tiles, selected for having a classification of minimal notional contribution to the risk of slip, which, over a short period of time, deteriorated to such an extent that they were re-classified as potentially being a major contributor to the risk of slip.

Accelerated wear testing, now available, may provide a useful indicator of the potential reduction in slip resistance over time. This process involves subjecting the floor sample through a number of cycles of wear in conjunction with wet pendulum testing. The number of test cycles may vary with the organisation performing the test. Since pedestrian surfaces react differently to various wear mechanisms and exposure conditions, there is no single accelerated wear test method that will reliably apply to all materials and situations.

Slip resistance classifications as table below www.abcb.gov.au 2022

Application	Surface conditions - Dry	Surface conditions - Wet
Ramp steeper than 1:14	P4 or R11	P5 or R12
Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11
Tread or landing surface	P3 or R10	P4 or R11
Nosing or landing edge strip	P3	P4



Standards

- AS 1428.1 *Design for access and mobility - General requirements for access - New building work.*
- AS/NZS 3661.2 *Slip resistance of pedestrian surfaces - Guide to the reduction of slip hazards.*
- AS 4586 *Slip resistance classification of new pedestrian surface materials.*
- AS 4663 *Slip resistance measurement of existing pedestrian surfaces.*
- SA HB 197 *An introductory guide to the slip resistance of pedestrian surface materials.*
- SA HB 198 *Guide to the specification and testing of slip resistance of pedestrian surfaces.*

Other documents

- Slip resistance and wood pedestrian surfaces*, WoodSolutions 48. www.woodsolutions.com.au
- Slip Resistance for stairways, landings & ramps Advisory Note 2020 www.abcb.gov.au
- Cement Concrete and Aggregates Australia DATA sheets: *Slip resistance of residential concrete paving surfaces*
- Slip resistance of polished concrete surfaces*
- Skid resistance of residential concrete paving surfaces* www.ccaa.com.au

NATSPEC TECHnote DES 039
Universal design: Slip resistance

Relevant worksections

- 0262 *External sports and playground surfacing*
- 0274 *Concrete pavement*
- 0275 *Paving – mortar and adhesive bed*
- 0276 *Paving – sand bed*
- 0277 *Pavement ancillaries*
- 0279 *Paving – on pedestals*
- 0282 *Pathways and cycleways (Construction)*
- 0310 *Concrete – combined*
- 0314 *Concrete in situ*
- 0315 *Concrete finishes*
- 0383 *Decking, sheet and panel flooring*
- 0411 *Waterproofing – external and tanking*
- 0541 *Access floors*
- 0612 *Cementitious toppings*
- 0613 *Terrazzo in situ*
- 0631 *Ceramic tiling*
- 0632 *Stone and terrazzo tiling*
- 0651 *Resilient finishes*
- 0652 *Carpets*
- 0654 *Multilayered board flooring*
- 0655 *Timber flooring*
- 0656 *Floor sanding and finishing*
- 0657 *Resin based seamless flooring*
- 1145 *Segmental paving*