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ARCHITECTURAL TILES

## **Specifying & Selecting Tiles with correct slip ratings for commercial projects**



## Outcomes

- Understand what guidelines and standards apply to tile products in Australia and how these impact product selection
- Learn the various slip resistance tests used and what to look for when making tile selections
- Understand what other factors come into play once tiles have been installed and how they can affect slip resistance over time





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## ASTM Definitions (American Society for Testing and Materials)

**Slip resistance, *n***—the relative force that resists the tendency of the shoe or foot to slide along the walkway surface. Slip resistance is related to a combination of factors including the walkway surface, the footwear bottom, and the presence of foreign materials between them.

**Slip resistant, *adj***—the provision of adequate slip resistance to reduce the likelihood of slip for pedestrians using reasonable care on the walking surface under expected use conditions.



## **Importance of Slip Resistance**

- Slip resistance is a significant functional design issue affecting building safety. Inadequate specification, application and installation can expose those involved in the process, to litigious risk.
- The Royal Australian Institute of Architects suggest that falls are the most common cause of personal injury claims against architects.
- In 2006, the Australian Building Codes Board (ABCB) commissioned a study to identify health and safety risks in buildings. The study found that slips trips and falls accounted for the greatest risk to health and safety over the lifetime of a building.



## **Specifying Slip Resistance**

- Safe design employs a risk management approach and evaluating safety in terms of the likelihood and consequence of an incident to occur.
- As well as providing slip resistive flooring other design features should be considered to mitigate risks
- These can include awnings, airlocks and matting to reduce the extent and likelihood of contamination, visual aids (warning signage and contrasting stair nosings), administrative controls (cleaning regimes and maintenance), fall prevention aids (barricades and handrails) and consideration the environmental conditions (lighting and sloping surfaces) along with the footwear to be worn.



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## **What elements of legislation drive slip resistance requirements?**

- Design for Access & Mobility AS1428
- Disability Access Slip Resistance Requirements AS1428.1
- Slip resistance classification of new pedestrian surface materials AS4586:2013
- Slip resistance measurement of existing pedestrian surfaces AS4663:2013
- Guide to the specification and testing of slip resistance of pedestrian surfaces HB198:2014
- Occupational Health & Safety Slip Resistance Requirements
- National Construction Code (NCC) Slip Resistance Requirements
- Local Government Development Control Plans
- Common Law (Negligence)



## WHAT IS THE NATIONAL CONSTRUCTION CODE (NCC)?

The NCC provides the minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new buildings (and new building work in existing buildings) throughout Australia.

### **NCC Volume One**

primarily applies to Class 2 to 9 buildings which are commercial, industrial and multi-residential buildings.

### **NCC Volume Two**

primarily applies to Class 1 and 10 buildings which are houses, sheds and carports.

### **NCC Volume Three**

applies to plumbing and drainage for all classes of buildings.

### **The Consolidated Performance Requirements**

is a collection of the Performance Requirements and the supporting General Requirements for all classes of buildings.

The NCC is a 'performance based code'. This allows flexibility in how you comply with the Code and encourages innovation.



The primary users of the NCC include architects, builders, plumbers, building certifiers/surveyors, hydraulic consultants and engineers.



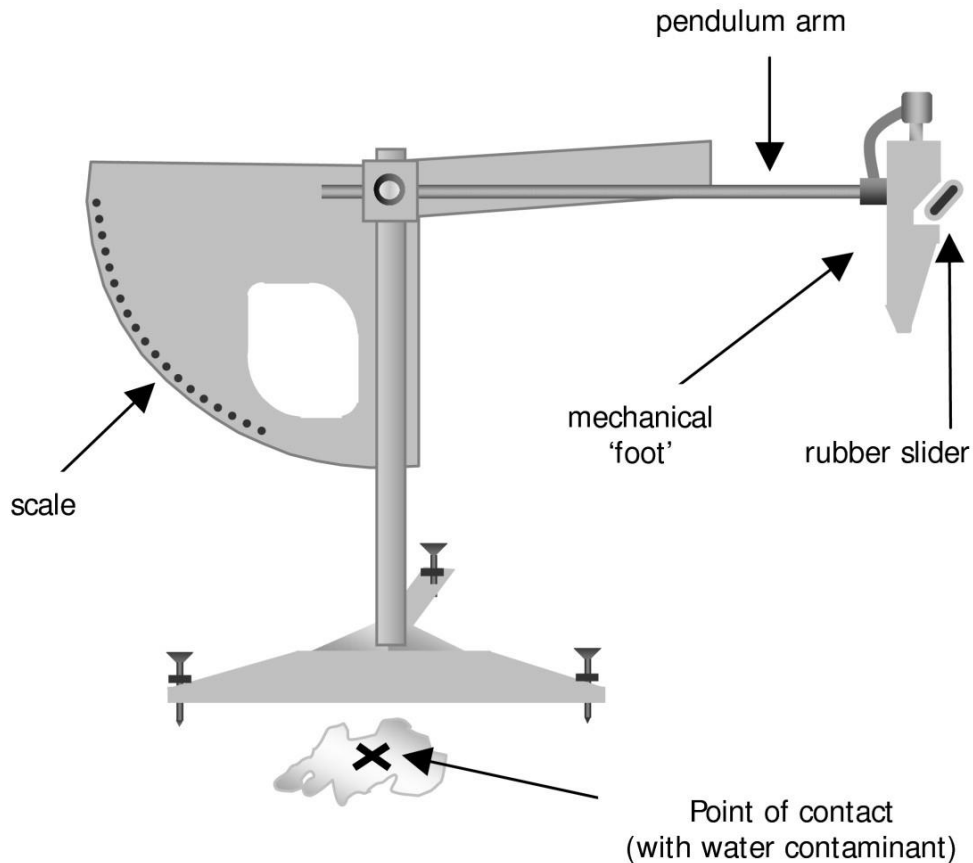
## Appropriate Slip Resistance Test

Test	Contamination	Footwear	Application Example	Insitu Testing
Wet Pendulum	Water	Simulation of smooth soled shoe	Entry Foyer (wet)	YES
Dry Floor	Dust/Soil	Simulation of smooth soled shoe	Internal dry areas	YES
Wet Barefoot Ramp	Water	Simulation of bare feet	Showers/pool	NO
Wet Oil Ramp	Oil	Simulation of work boots	Workshop	NO



## Wet Pendulum Test

- P Rating (P0 – P5)



## CLASSIFICATION OF PEDESTRIAN SURFACE MATERIALS ACCORDING TO THE AS 4586 – 2013 WET PENDULUM TEST

Classification	Wet pendulum SRV	
	Slider 96 rubber	Slider 55 rubber
P5	>54	>44
P4	45-54	40-44
P3	35-44	35-39
P2	25-34	20-34
P1	12-24	<20
P0	<12	



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## Dry Floor Friction Test

**TABLE 2**

**CLASSIFICATION OF PEDESTRIAN  
SURFACE MATERIALS ACCORDING TO THE  
AS 4586—2013 DRY FLOOR FRICTION TEST**

Classification	Floor friction tester mean value
D1	$\geq 0.40$
D0	$< 0.40$





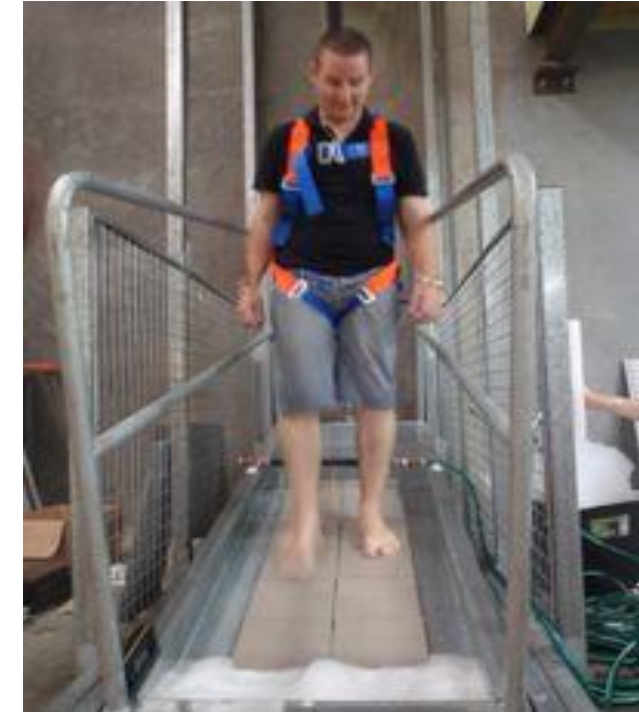
## Wet-Barefoot Inclining Platform Test



TABLE 4

**CLASSIFICATION OF PEDESTRIAN SURFACE  
MATERIALS ACCORDING TO THE  
WET-BAREFOOT INCLINING  
PLATFORM TEST**

Classification	Angle, degrees
No Classification	$<\alpha_{\text{barefoot}}$ Verification Surface A
A	$>\alpha_{\text{barefoot}}$ Verification Surface A $<\alpha_{\text{barefoot}}$ Verification Surface B
B	$\geq\alpha_{\text{barefoot}}$ Verification Surface B $<\alpha_{\text{barefoot}}$ Verification Surface C
C	$\geq\alpha_{\text{barefoot}}$ Verification Surface C





## Oil-Wet Inclining Platform Test

**TABLE 5**  
**CLASSIFICATION OF PEDESTRIAN**  
**SURFACE MATERIALS ACCORDING**  
**TO THE OIL-WET INCLINING**  
**PLATFORM TEST**

Classification	Angle, degrees
No Classification	<6
R9	$\geq 6 < 10$
R10	$\geq 10 < 19$
R11	$\geq 19 < 27$
R12	$\geq 27 < 35$
R13	$\geq 35$





## Slip Treatments

- Non Slip or anti slip proprietary treatments generally use an acid etching
- The technique of acid etching increases the surface roughness by chemically changing the structure of the tile surface.
- This change in microstructure changes the overall surface roughness and porosity of the tile, hence increasing the slip resistance
- As well as acid etching, other examples of non slip & anti slip treatments include:
  - a) Application of abrasive tapes
  - b) Coatings such as paint or epoxy with grit
  - c) Shot blasting or grinding of the surface honing to a rougher texture





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## Cleaning & Effect on Slip Rating

- The installation cleaning should incorporate removal of excess adhesives and grouts resulting only in a light haze remaining on the finished surfaces
- Routine maintenance will provide a cleaning regime that should ensure the cleanliness and safety of the floor while maintaining the integrity of the tiling system.
- An understanding of the surface characteristics of highly slip-resistant tiles will often dictate which cleaning methods should be used.
- Abrasive cleaning methods should generally be avoided as they can contribute to excessive wear.
- It should be noted that regular use of scrub and rinse cleaning machines fitted with abrasive pads, other than the finest grades, is likely to damage the surface of some tiles, and may result in gradual loss of thickness in the wear layer.





## Accelerated Wear Test

- Ceramic tiles along with most flooring surfaces can become less slip resistant with use
- **Currently there are no Australian Standards to identify this reduction in slip resistance**
- Accelerated wear slip test methods have been developed to evaluate long term slip resistance
- The development of accelerated wear slip testing started by investigating the effect of abrasive materials on ceramic tiles in combination of the pendulum test.
- A machine was devised to wear samples by sliding an abrasive pad with a prescribed force over the tiles' surface, when wet with water. The slip resistance is measured initially according to AS/NZS 4586 wet pendulum method and again after 100, 500, 1000, and 5000 cycles of wear.
- Whether or not a standard exists, the onus is for the manufacturer/supplier to ensure that the product that they are supplying is fit for its intended purpose.
- Higher levels of slip resistance may be required initially to ensure that the minimum slip resistance is maintained throughout the service life of a floor, taking into consideration, the installation process, wear characteristics, cleaning regime, anticipated traffic and contamination.



## **Accelerated Wear Test Conclusions**

- The greatest loss of slip resistance generally occurred during the first 50 cycles with comparatively little loss after 500 cycles.
- The slip resistance after 500 cycles was found to be consistent with the in situ measurements at a high traffic volume restaurant after one year of usage.
- This initial investigation highlights the potential benefit of using abrasive cleaning pads as part of an accelerated wear test in order to determine the probable long term slip resistance.
- Mechanically aggressive cleaning systems are known to have caused near-instantaneous slip resistant losses in some surfaces. Thus the cleaning and maintenance regime must be taken into consideration when assessing the potential long term slip resistance of a flooring system.



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