



STOPPING SLIPS AND FALLS

Within New Zealand homes a slip, trip or fall injury occurs every 3 minutes. This affects around 400,000 adults and children each year – that's more than all sports and road injuries. Using the right surface could prevent many of these.

By Trevor Pringle, BRANZ Principal Writer

Slips usually result from wet or greasy surfaces, shiny floors, loose floor coverings, step/stair edges with no grip, footwear with little grip or step treads that are too small. The end result is usually a loss of balance and a fall.

To reduce the risk of slipping, a finished floor surface needs to provide sufficient friction so that it is slip resistant.

Slip resistant access routes

Under the New Zealand Building Code Clause D1 *Access routes*, the objective in D1.1(a) is to safeguard people from injury during movement into, within and out of buildings. The functional requirement is that buildings are provided with reasonable and adequate access to allow safe and easy movement of people.

Translating this into practical design solutions to prevent slipping under all conditions, D1/AS1 requires that slip resistance is provided to public access routes, including accessible routes, ramps and stairways.

Access routes are defined as 'a continuous route that permits people and goods to move between the apron or construction edge of the building to spaces within a building, and between spaces within a building.'

Commercial buildings

For commercial buildings the surfaces that require mandatory slip resistance are relatively easy to define, but for domestic spaces it's not quite so straightforward.

In commercial buildings (schools, motels, shopping malls, offices) slip resistance is required for:

- stairs
- approaches to all buildings to which the public have access

- all escape routes
- all public lobbies and foyers
- corridors within buildings and within tenancies.

Any part of an access route which is protected from direct wetting but which may become wet during normal use must also meet the requirements for a wet surface. These are areas such as:

- transition zones between wet and dry areas, like a building foyer where water may be carried into the foyer on the shoes of the occupants, or the areas immediately outside a showering facility
- areas where wet cleaning methods are regularly used.

Domestic buildings

For a standalone domestic building, the comment to D1/AS1 2.1.1 describes access routes which the public use as 'walking surfaces such as decks, patios and steps on the approach to the main entrance to housing and common areas of communal residential and multi-unit dwelling accommodation.'

Apart from stairs there is no mandatory slip resistance requirement for floor surfaces within individual dwelling units.

Minimum slip resistance

D1/AS1 specifies a coefficient of friction (μ) of 0.4 for flat surfaces. This is sufficient to provide a safe level of slip resistance. For surfaces that are wet in service, the



Slip resistance varies for different surfaces.

minimum slip resistance needs to be achievable under these conditions.

For ramps the slip resistance is determined using the D1/MM1 formula:

$$\mu = 0.4 + 0.0125 S$$

where S is the slope of the walking surface expressed as a percentage.

For example, a ramp with a 10% slope has a minimum slip resistance of:

$$0.4 + (0.0125 \times 10) = 0.4 + 0.13 = 0.53.$$

Surfaces with too much grip (a coefficient of friction of more than 0.6) can also be dangerous as they may create a tripping risk.

Floor finishes listed in table

Slip resistance is measured by testing the material in accordance with AS/NZS 3661.1: 1994 *Slip resistance of pedestrian surfaces – Guide to the reduction of slip hazard*. This uses a pendulum with a RAPRA S4 foot-type tester to simulate the action of a foot coming into contact with a surface. Such tests are carried out by a recognised testing authority to determine the actual slip resistance under the expected (wet or dry) conditions.

NZBC D1/AS1 Table 2 lists the generic coefficient of friction for a wide range of floor finishes. BRANZ recommends that the actual slip resistance of the product is determined prior to use as many of the generic products listed may not be capable of achieving the minimum requirements.

Slip resistance is good design

As the accident statistics highlight, floor surfaces within the home can be dangerous. It is good design practice to select floor surfaces and finishes to provide sufficient slip resistance in normal use so that occupants can safely and securely move around the house under all conditions.

Spaces that have a higher risk of slipping due to the type of floor finish used and/or the presence of water on the surface are:

- kitchens
- bathrooms, particularly open European style flat floor designs where more of the floor gets wet
- laundries
- entry porches
- secondary entries
- deck steps
- paths and driveways
- decks
- balconies
- stairs and steps.

Floor finishes that are slippery, even when dry, can include:

- polished tile, stone and concrete
- gloss finished timber
- loose rugs or mats.

Choosing the right coefficient

To achieve satisfactory slip resistance on walking surfaces around the home, BRANZ recommends that the coefficient of friction should be no less than:

- 0.4–0.6 where there is a high risk of slipping as a result of the use of the space, such as in showers or swimming pool surrounds (because the users tend to have bare feet and children tend to move fast around the pool), rooms or cubicles
- 0.4 for areas where the floor surface is likely to have water on it during normal use, such as floor areas adjacent to external doors, changing or drying areas immediately adjacent to a shower, bathrooms, kitchens and decks and balconies
- 0.25 for all other areas which remain permanently dry. A figure of 0.25 is generally considered the minimum coefficient of friction necessary to provide a relatively safe non-slip floor surface.

Other factors which can affect how slippery a floor is, but for which there is no simple design cure, include:

- the type of footwear worn by the user, particularly its sole
- walking disabilities – this can be helped by the generous use of handrails
- the speed of travel of the users
- surface contamination from a lack of or improper cleaning
- the surface finish. ◀



Handrails that can be easily grasped and installed at the correct height reduce the risk of slipping and tripping on stairs.



Single steps and doorways can create a tripping risk if surfaces are not clearly delineated.

Grooved or smooth timber decking?

Timber decking that is smooth can be slippery when wet.

Better wet slip resistance is provided by decking that has grooves but only when the direction of travel is at right angles to the grooves. It is actually more slippery than smooth timber when the travel direction is parallel to the grooves because the contact area between the shoe and the profile ridges is much less. ◀