In this article, Colin Cass, a tiling consultant and member of the Tile Today editorial board, looks at issues related to falls in floors and the requirements of the recently revised Australian Standard on waterproofing of wet areas within residential buildings.

Fall, slope or gradient, whatever you call it, how much is enough to effectively remove waste water from a floor?

There appears no simple answer to this simple question.

The water removal needs of a shower floor are different to those of a toilet floor, and different again from an exterior balcony. The type of tile also affects the “run off” of water. Too much fall doesn’t look good, and a slip hazard can be created, too little, and water may stay in puddles.

Traditionally tilers tended to incorporate more than the minimum required, as problems seldom come from too much fall, complaints definitely come from too little. Low amounts of fall put increased pressure on tilers to be accurate in screeding the bedding mortar, as even a slight deviation from plane could leave a hollow that would hold water, and this is regarded as a health hazard.

But with the increased use of larger format tiles, particularly those larger than 300mm x 300mm, tilers encountered problems of incorporating reasonable falls and avoiding tiles tipping as their large flat surfaces didn’t fit the “dish” to the waste.

Large tiles in shower recesses were laid with crossways or transverse cuts radiating from the waste so tipping was minimised, however, these transverse cuts were often considered ugly, so less fall was incorporated to minimise these cuts.

The increase in use of polished porcelain tiles and polished natural stone has seen a change in the surface tension of the tile finish. How can one expect all the water to flow to the waste water pipe, when the surface causes beading by its very nature. No amount of slope would see all the water run off. Think of the angle of a car windscreen, water still beads on vertical window glass, so complete and immediate water run off is unrealistic.

HOW IS FALL MEASURED?

While it is sometimes referred to in “degrees” and sometimes as a certain measurement over a certain distance, most construction specifiers stipulate it as a ratio. For example 1:100 means for every 100 units along a floor, the floor should fall by 1 unit, 1:60 is steeper than the floor would fall 1 unit in only 60 units, and a 1:1 ratio would be a 45° angle. (1:100 is 10mm per lm, while 1:60 is 16.6mm per lm and 1:50 is 20mm per lm.)

WHAT DO THE CODES SAY?

The codes related to tiling and waterproofing are very vague when it comes to prescribing an amount of fall. AS 3958.1 “A guide to the installation of ceramic tiles” refers only obliquely to falls in statements like “where possible, falls in the floor should be formed in the base concrete so that an applied screed is of uniform thickness.”, or “slope, where essential, should be in the sub-floor” Ratios are never mentioned.

AS 3958.2 “A guide to the selection of a ceramic tiling system”, in clause 4.4.6.2 states, in an equally non committal manner;

“FALLS: Where it is necessary for the finished floor surface to be provided with falls to drainage outlets and the like, where possible these falls should be constructed in the supporting structure.”

Clause 5.2 related to the design of tiling systems that may be installed in areas of “chemical attack” makes the only reference to a ratio of fall in the standards when it recommends between 1:80 and 1:40 for such situations.

These standards are guides, but AS 3740, 1994 “Waterproofing of wet areas within residential buildings” is a “deemed to comply” standard, and it is called up as a method of meeting the “performance requirements” of the Building Code of Australia (BCA). However, this standard only makes one reference to the ratio of fall required, and that is in figure 9C related to access for people with disabilities. Here it states “Fall: minimum 1:60 to shower outlet, and minimum 1:80 to bathroom area.”

THE BUILDING CODE OF AUSTRALIA.

The BCA is the supreme document when it comes to setting down the requirements for construction in Australia. It is very clear in its “functional statement” (F2.4.1) when it states for wet areas; “A building is to be constructed to avoid the likelihood of -

a) the creation of any unhealthy or dangerous conditions ; or
b) damage to building elements, caused by dampness or water overflow from bathrooms, laundries and the like.”

If this functional statement is met, the wet area can be regarded as acceptable under the code. And even though clause 3.8.1.4 (b) states a shower MUST “have a grade of not less than 1:60 to the shower trap or drainage flange;” this becomes inconsequential, as tiling carried out to comply with AS 3740 is deemed to satisfy the code, even though it does not stipulate any ratio of fall except for showers for people with disabilities.

The ratio of 1:60 comes from traditional references in the times of imperial measurement. The classic tiling text book, written by Charlie Hart and Bill Davies in 1947, refers to a gradient of one inch in 5 feet for exterior areas, this equates to exactly 1:60. However, while this gradient might be required for wind driven rain, it is regarded as too steep for areas within a house where only occasional wetting can be expected. For example, if the floor waste in a bathroom or laundry was 2.5 metres from the door, and a 1:60 fall was installed, the door strip would have to be over 40mm higher than the waste. (1:60 is 16.6mm per lm)

If the concrete substrate was level, and there was a minimum 20mm depth for tile and bed at the waste, the finished height at the doorway would be over 60mm.

WHAT DO OTHER COUNTRIES SAY?

Basically, not a lot. The American ANSI standards simply call for a “proper slope to the drain”, but waterproofing membranes need to be sloped at a whopping 1/4” per foot, or 1:48. I doubt if this is often complied with. The British standards on tile and stone installation BS 5385 and BS8000 again don’t mention ratios of fall. This means there is little guidance to builders, designers and tilers as to what is an adequate amount of fall.

Changes to the Australian Standard on waterproofing of wet areas within residences.

With the exception of wet areas for people with disabilities, the 1994 version of AS 3740 gives no guidance to what ratio of fall is recommended. But the revision of that standard, which is currently in draft form but due for release within months, is more prescriptive.

It states;

“Where floors are designed for waste water to escape to a predetermined outlet, the gradient of fall shall not be less than 1:100. If the area is a shower compartment it is recommended that the fall be between 1:60 & 1:80.

It is required that the fall in a disabled shower floor be between 1:60 & 1:70.”

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This gives designers, builders and tilers a minimum fall, and a recommended range of ratios for areas where greater water run off is required. While this is considered a step forward in defining the requirements for fall, and in giving guidance to all involved, it is rather prescriptive however, in that a minimum fall is stipulated in a “deemed to comply” document. Does this mean any wet area floor that fails to provide a fall of 1:100 can be condemned? Technically, yes!

**LET COMMON SENSE PREVAIL.**

So what is the fall in an interior wet area floor trying to achieve? Supposedly, the performance requirements of the BCA mentioned above; that water does not build up and become a risk to health. In other words, it should not lie in puddles, but should make its way off the surface in a reasonable time. (though some amount will always be left to evaporate.) If the water gets away, the objective has been achieved.

In common sense terms, waste water needs to go down the drain, and not exit the room at the doorway. The reasonable test for this should be what happens in the most likely overflow scenarios. It is reasonable to expect that at some time, a child could turn a shower recess into a mini bath by covering the waste with a face cloth. What happens to the overflow? Basins can be filled to overflowing, just as bath tubs can, and it is not unusual for a toilet cistern to occasionally overflow. In any of these scenarios the water should not exit the room at the doorway. However, the forceful dispersion of the contents of a bucket of water on a floor will certainly see the contents run uphill, maybe sufficiently to see it leave the room. The consequences of this kind of occasional or accidental spill should not be taken to indicate that the fall in a floor is inadequate.

The widely used Natspec specification system has used a 1:100 minimum fall requirement for years. And experience has shown this ratio does not generally cause excessive lipping in large format tiles.

**DON’T FALL FOR THIS!**

Sometimes the tiler’s options in creating a fall are severely restricted. If the lowest and highest points in a floor are pre-determined by fixtures or datum considerations, the tiler’s ability to create a fall are equally restricted.

I have observed many cases where the floor ridges of frameless shower screens have been set at heights that allowed insufficient fall to pre-set stack work plumbing wastes. Tilers were thus left to tile between two fixed heights, with no chance to vary the fall. Even if this is brought to the attention of the builder, the instruction is likely to be “do your best” rather than I’ll get the fixtures moved.”

**SO.**

If the minimum fall that the tiler can achieve in a shower is less than 1:80, advice should be sought as to the acceptability of the system, and if the fall will be less than 1:100 authorisation to proceed should be obtained in writing. This saves having to argue over whether a floor, with a fall of less than 1:100 but where the water still exits at the waste and does not lie in puddles, should be condemned.

I say “look around you” there are plenty of wet area floors with less than 1:100 fall that are meeting the needs of the occupants adequately. Let common sense prevail.

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