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23/02/2021

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Normatives

- National Construction Code – NCC
- AS 3958.1 – 2007 Ceramic Tiles : Guide to the installation of ceramic tiles.
- Australian Tile Council – 2018 Tiles and Tiling Guide.
- AS 3740 – 2010 Waterproofing of domestic areas.
- AS 4654.2 – 2012 Waterproofing membranes for external above ground use.
- HB 198-2014 Guide to the specification and testing of slip resistance of pedestrian surfaces.
- AS 4586 – 2013 Slip Resistance classification of new pedestrian materials.
- AS 4663 – 2013 Slip Resistance of existing pedestrian surfaces.
- IAP – Industry Accepted Practise
- Common Sense

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Falls to shower floors

Basic requirements to construct suitable falls to waste in a shower recess;

- A design to suit the tile size to be used.
- Hob / hob-less.
- Minimal wastes to suit the design.
- Adequate concrete set down allowing installation of sand/cement screeds falls to minimum fall ration.
- Minimum fall ration to shower floor 1:80 (AS 3958.1)
- Minimum fall ratio to non shower floor 1:100 (AS 3958.1)
- Definitive ridge separating shower and non shower floor

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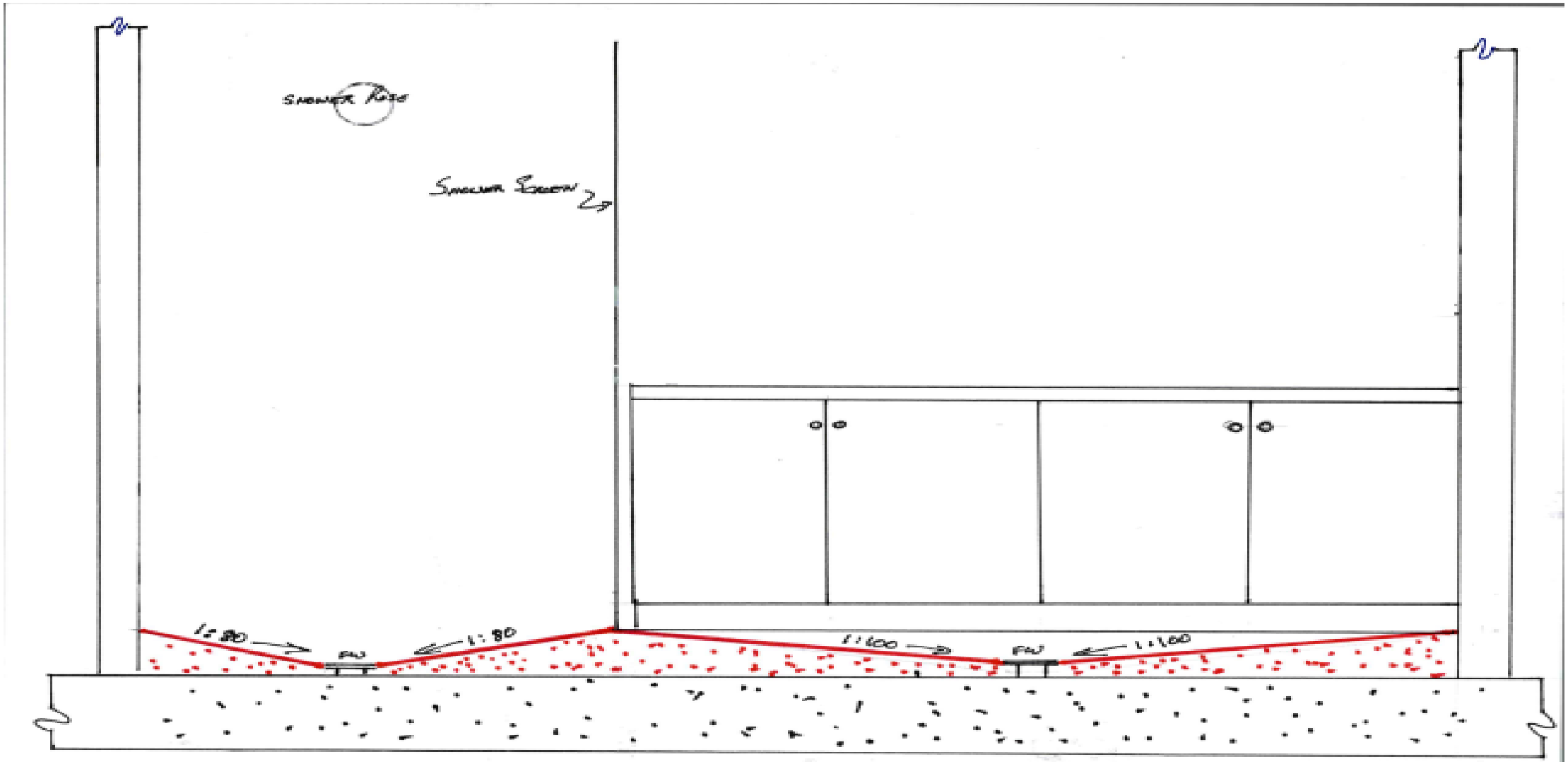

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Possible issues affecting fall ratio:

- Insufficient concrete set down. Particulary in hob-less installation.

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- Tiles too large. Will cause lipping or ponding.
- Location of floor wastes.

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Obstructive building elements and Impractical design

- Nib Walls extending into bathroom
- Island spa/bath
- Island vanity
- Columns
- Multiple entries.

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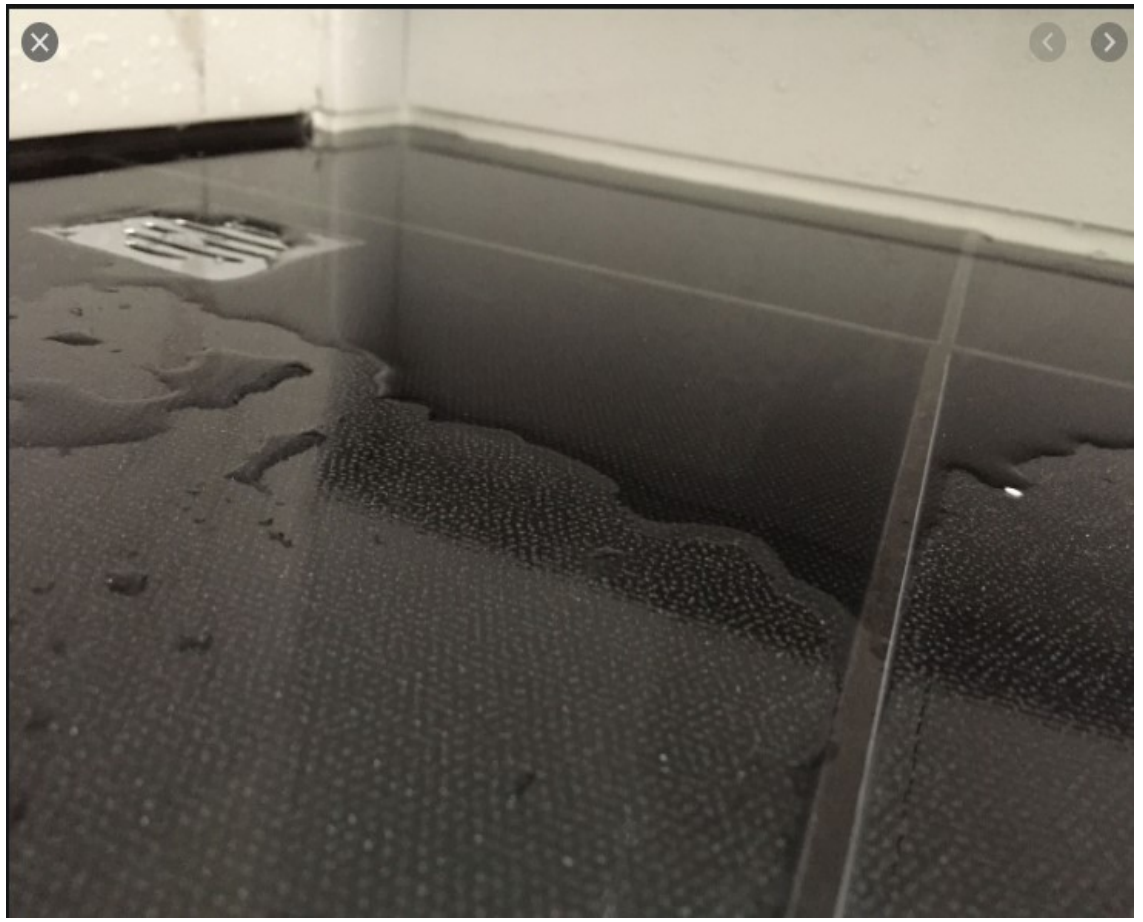
Inexperienced installer.



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Solutions

Pre installation:

- Ensure concrete set down is adequate.
- Consult owner re tile size and design waste positions, hob/hob-less and obstructions to suit adequate installation.

Post installation.

- Common Sense – falls may be just under requirement but water still drains to waste. Water tension not a fault.
- Tile over top ensuring new fall ratio. This must include new Water Proofing.
- Remove and replace. This must include new Water Proofing.

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Balconies – fall to waste

- Similar design requirements as per bathrooms regarding screeds.
- The most common issue is designing a suspended slab with sufficient set down from balcony edge to furthest point from edge
- NCC does allow water to flow over the edge onto next balcony below, as long as the process repeats. Water cannot pond.
- More new building are now installing balcony edge barriers and floor wastes on balconies.
- Again sufficient set down to facilitate proper falls to waste are a common problem.
- Fall to waste ratio required id 1:100
- Again common sense should prevail.

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- Threshold requirement.

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Options and solutions .

- Again , designers and installers need to be aware of design requirements.
- Most problems , nowadays , are discovered in much older buildings or small investor type apartments. The larger apartment blocks are very well designed for this type of installation and any mistakes are usually from a tiling installation perspective.
- Solutions are few and can be expensive but before you send the jackhammers in, is water draining to the waste ?? If it is and is taking longer to do so, without ponding, the common sense must prevail and accept the installation.
- Negative or reverse drainage and/or ponding will require a demolition and redo.

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Cracked Tiles

- The complaint begins with an allegation that the tiles must be faulty as they are cracking after installation.
- The supplier maintains their tiles are manufactured to standards and not faulty , the complainant maintains the tiles must be faulty.
- It the complainant is the end user , no builder, they will assume the supplier is trying to back away from a possible problem.
- If a builder is involved they will state emphatically the tile are faulty as they have their 6 year defects and workmanship warranty to protect.
- Depending on the extent of the damage , a total removal and reinstall may be required. A very expensive exercise as all accessories have to be removed and re installed i.e shower screens , mirrors etc.
- An investigation is commenced and as someone who has been involved in dozens of these investigations I look for;

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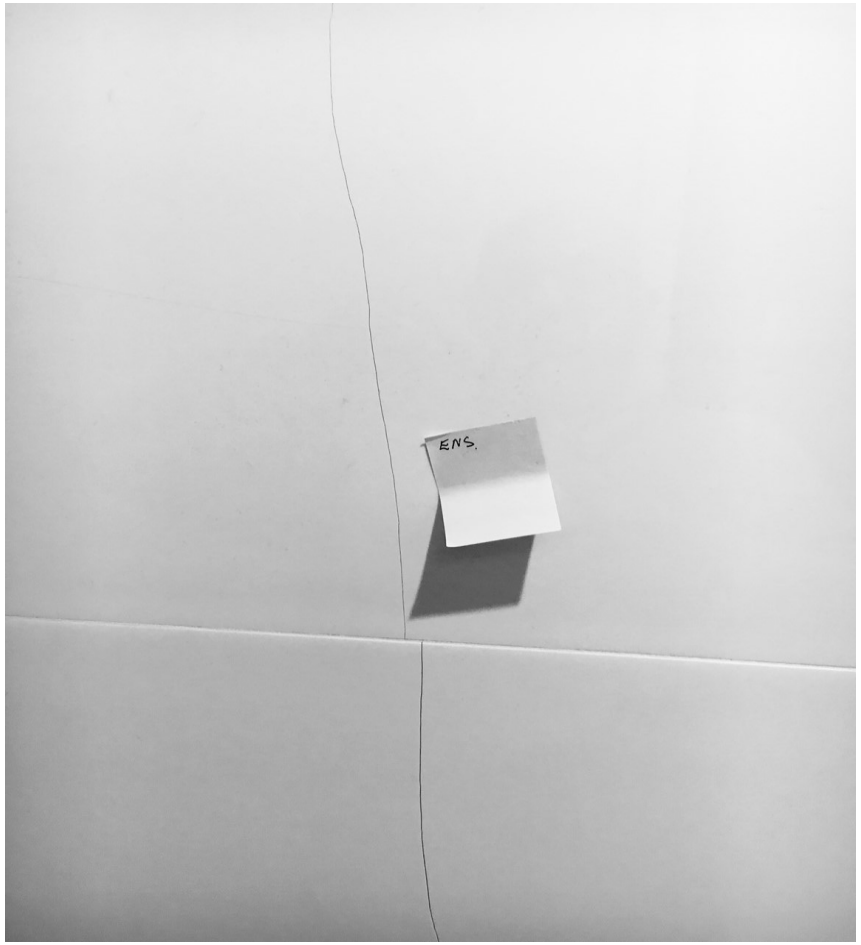
- 1. Nature of the crack, multiple tiles cracking, cracks following eachother, and cracked substrate.



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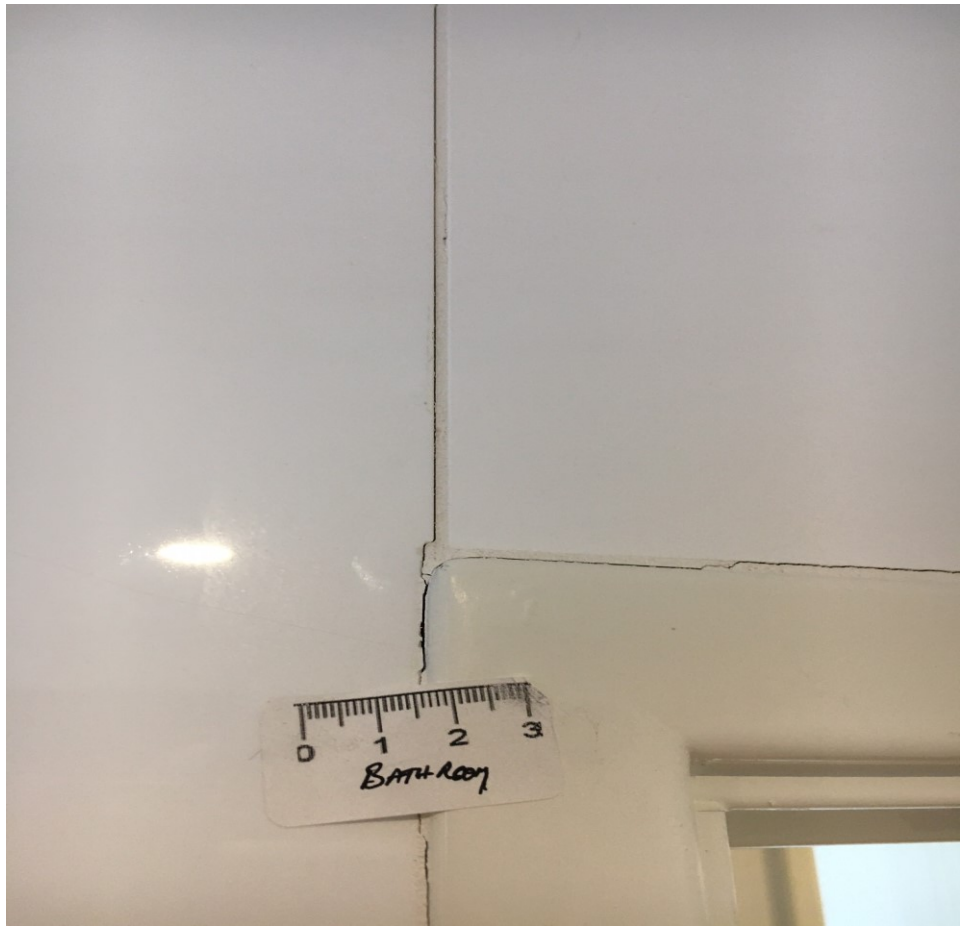
- Cracked grout joints in both axes.



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Sometimes a destructive investigation is required.

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Other signs of structural movement

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- Where a case for bad workmanship is evident, and is referenced back to AS 3858.1 the tiler will be coerced to rectify at his own cost and no further action needed.
- Where bad workmanship can be ruled out and the inspector believes structural movement (SM) may be the cause, the effort to prove SM is very costly involving extensive destructive investigations and structural engineers. The builders knows no one is willing to pay for this and therefore will insist the tiles are faulty.
- “SOME” structural engineers will even sign off on the site plan confirming the house was built to confirm.
- In these cases the supplier usually concedes and pays for rectification as there is no other avenue to follow.

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- In the last 18 months CC has developed a better defence in this matter as follows.
- Australian Consumer Law , lawyers and any “court” will confirm that if an allegation of a defect is made , reasonable proof must be provided.
- So firstly I examine and make a determination regarding the tiling installer`s workmanship.
- If the installation is declared compliant the I ask for between 7 and 10 loose tiles to be taken away and tested.
- Ceramic tiles are manufactured to standards called ISO 13006-2018 and depending on their water absorption rate , are assigned a breaking strength.
- Compliancy to ISO 13006-2018 is determined testing methods ISO 10545.2 - 2020 which include a breaking strength test , also known as Modulus of Rupture.

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- Modulus of Rupture (MoR), in accordance with ISO 10545.2 – 2020 and Nata Accredited, can be tested here in Perth for less that $ 500.00.
- The layman`s explanation for the inclusion of breaking strength in the manufacturing standards is considering a harmonised limitation to installation environments, adhesives types and strengths and building methods subjecting tiles to a **measurable amount stresses**, tiles of a particular manufacture and absorption rate will require a specified breaking strength to endure the said stresses.
- Tiles tested for MoR are either classed as pass or fail.
- So if we first eliminate workmanship as the cause of damage.
- And the tiles tested pass MoR. Which basically means the tiles do not crack of their own accord.
- And there is evidence of “movement” within the building element.

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- Then one must consider the following “quote” which has been proposed in several variations
- **"Once you have eliminated the impossible, whatever remains, however improbable, must be the truth.“**
- We have eliminated the first two possible causes so what is left ?
- I have used this strategy six times , only once in a court proceeding.
- All six complaints were initiated by a builder and still within the 6 year warranty period.
- In all six matters the complainant withdrew the complaint based on lack of evidence proving the tiles are defective.
- Estimated costs to repair all six complaints totalled approx. $82,000.00

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Expansion Joints in Balconies.

- AS 3958.1 requires any structural movement joints in the substrate to be “continued” in the tiling installation . This includes any screeds.
- The stresses of expansion/contraction of the various materials within the localised building element, thermal stresses and building element deflection will have a discernible impact on tiling installation.

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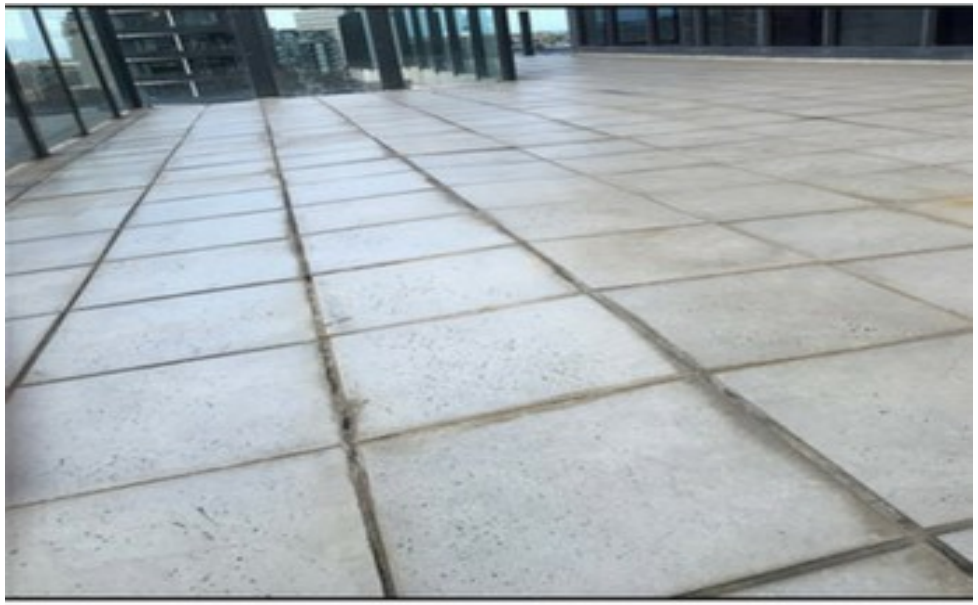
- Where the distance between structural movement joints is greater than 4.5 mts an intermediate movement joint must be installed.
- In most cases the structural and intermediate joint used will be a proprietary brand item readily available.

Probable damage



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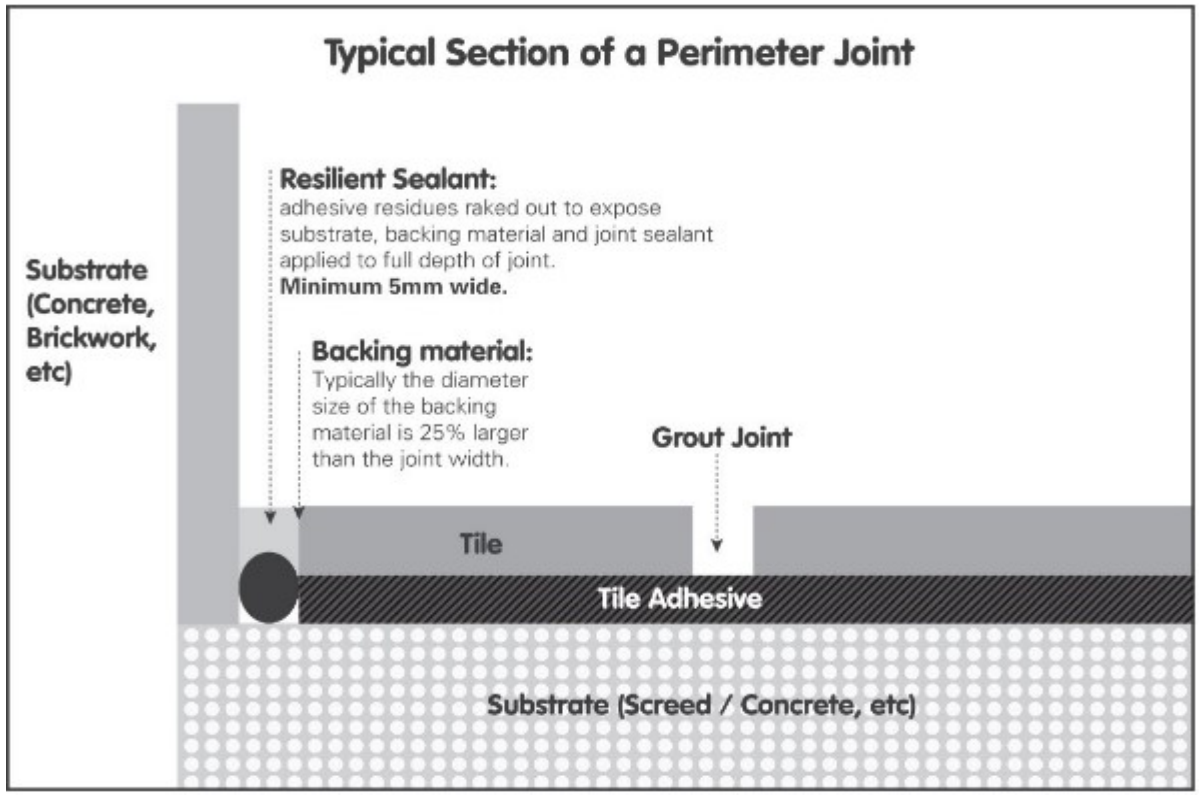
- Balconies also require a perimeter joint where the tiles discontinue, such as wall , columns and penetrations.
- The joint is filled with a permanently deformable material.



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- In a large commercial project the requirements are usually specified and met without any objection to price or aesthetic look.
- Smaller residential type projects usually avoid any additions to cost and the aesthetic disadvantage of visible joints. It has been my experience the end user will always disregard the visible joints in favour of looks.
- Inevitably a problem arises and depending on the extent of the damage, what solution is available.
- Obviously worst scenario is a demolition and removal.
- Where the damage is still minor a removal of several tiles from a pre determined area and the installation of an intermediate joint will ease the problem.
- Furthermore, removal of the cement grout joint material from the perimeter of the balcony tilling, where it discontinues, and filled with a permanently deformable material is recommended.

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External common walkways to Strata Titles – slip resistance.

- Compliancy is set out in the NCC and makes specifics references to
- *HB:197-1999 A Guide to the Slip Resistance of Pedestrian Surfaces.*
- *AS 4586:2013 Slip resistance classification of new pedestrian surfaces.*
- *AS 4663:2013 Slip resistance measurement of existing pedestrian surfaces.*
- Slip resistance ratings are given using globally recognized “R” or “P” ratings and both are used in Australia but the P rating is more popular as testing is more readily available.
- The most reliable testing houses are usually NATA accredited and results are accepted by Architects , builders and insurance companies.

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- The “R” rating is determined using the German Ramp Platform. The platform is adjusted to pre set angles and a human walks up and down the platform until an angle is reached where they slip.
- Ratings range from R9 (least slip restant) to R13 (most slip resistant).

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- The “P” rating is determined by using the British Pendulum Tester.
- A swinging arm with a rubber foot stiles the surface and the amount of resistance the rubber fot encounters is measured by a needle and corresponding numbers.
- PO is the lowest resistance and P5 is the highest resistance.

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- Although most strata title situations are private residential use, and the NCC does not specify slip resistance in this area , they so share common entries and walkways which are specified in the NCC.
- Entry foyers to hotels, apartments and offices (wet) require a minimum of P3 or R10.
- Entry foyers to hotels, apartments and offices (dry) require a minimum of P2 or R9.
- External colonnades, walkways and pedestrian crossings require a P4 or R10.
- P and R ratings cannot be correlated

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- Prior to installation ant tile can be tested for slip resistance and a NATA accredited report is issued.
- The same tiles can be tested post installation on a regular basis to ensure surface integrity.
- The general life expectancy of a compliant slip resistant surface is 5 to 10 years. At this point refurbishments are being planned.
- There are projects all around Australia where the tiles tested as compliant pre installation but failed compliance 3 to 6 months after installation.
- Obviously the facility owners had an expectation, and rightly so, of 5 to 10 years before loss of compliancy.
- There are tiles that do provide that sort of life expectancy.
- The tiles losing compliancy early have been identified as originating from a particular manufacturing region of the world where manufacturing methods are substandard and the tile surface will provide a slip resistance for a very short time until the surface is affected foot traffic.
- Unfortunately this sort of product still manages to be in circulation due to price point.

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- I personally am involved with a group attempting to introduce a test known as the Accelerated Wear Test (AWT) into the ceramics industry.
- AWT will provide the supplier, and other stakeholders, with a good indication of the life expectancy of a products surface.
- Determinations cannot be accurate to the month but there is enough empirical data available now , globally, where the testing house can predict a reasonable life span of the tile`s anti slip surface in relation to persons/usage per day.
- An indication will reduce/eliminate the number of costly failures.
- Todays construction culture is very aware of the requirements and the litigation involved where slip resistant surfaces fail or where persons are injured.

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END