



TECHNICAL BULLETIN – TB252

INJECTION OF CRACK REPAIR RESIN UNDER ‘DRUMMY’ TILES

SEPTEMBER 2024

INTRODUCTION & SCOPE

Tiles can be considered drummy when not de-bonded from the subfloor and are still being ‘held’ in place by surrounding tiles, grout, or partial adhesive bed. The problem with partial drumminess (apart from the hollow sound when walked on) is that they are susceptible to damage from loading and impact and can also progress to full de-bonding.

Rectification can involve removing and replacing the tile or cleaning and resetting it. This can be problematic, as removal would create more problems, such as damage to grout and surrounding tiles. Removing partially bonded tiles could be difficult, or the tile may not easily be cleaned of adhesive. If something goes wrong, there may also be no available replacement tiles.

Another rectification technique is to inject resin into the cavity under the tile to fill the void and adhere the tile to the substrate. This bulletin examines this option using ARDEX and Dunlop-branded crack injection resins.

BACKGROUND

There are various reasons why tiles can be drummy. However, the question is whether a drummy tile is a problem.

WHAT IS DRUMMINESS?

There are two types of drumminess. The first is caused by a void under the tile, which results in a hollow sound when tapped. The second is ringing when a tile is loose or free of the adhesive bed. Resolution in the former case involves filling the void with resin to make the problem disappear. Resolution in the latter case involves re-securing the tile.

IS DRUMMINESS A PROBLEM?

Drumminess can be classed as a defect, as was the case in the general Guide to Standards & Tolerances in 2007,

*11.05 Cracked, pitted, chipped, scratched, loose or **drummy** tiles*

Tiles are defective if they are cracked, pitted, chipped, scratched, loose or drummy.

Tiles are regarded as defective when caused by the builder’s workmanship, if they become cracked, pitted, chipped, loose, or drummy and such in more than five per cent of the tiled area within 24 months from completion.

This situation changes, as indicated in the NSW 2017 version,

12.5 Cracked, pitted, chipped, scratched, or loose tiles

Tiles are defective if they are cracked, pitted, chipped, scratched or loose at handover.

After handover, tiles are defective where the builder’s workmanship causes the tiles to become cracked, pitted, chipped or loose within 24 months.

The 2016 QLD tolerance guide is worded similarly, whilst the 2015 Victorian one is the same.



The above statements indicate that loose tiles are unacceptable, but drumminess may not be a problem. It all depends on the degree of drumminess. Small voids may not result in looseness but can become a point of weakness when a point load is applied or dropped. This can cause the tile to crack. A loose drummy tile is a different matter and requires rectification. The issue of whether drummy tiles are a problem or not is mentioned in AS3958.1-2007.

5.4.7 Bonding

In some installations small hollow-sounding areas may be found. Although they do indicate incomplete bond, they are not necessarily indicative of imminent failure; however, cases where more than 20% of the tile sounds hollow when tapped (drummy) would have to be considered suspect over the long term. Needless to say, this ratio would need to be varied depending on –

- (a) Whether the tile is fixed to the floor or wall; and
- (b) The anticipated form and amount of traffic

The causes of drummy tiles can be:

- poor contact coverage at the time of placement.
- partial or complete de-bonding of the tile.

The latter can be caused by a wide range of problems, such as adhesive de-bonding from the tile (poor adhesion), exceeding open time, poor applied pressure, cohesive fracture of the adhesive (substrate movement) and de-bonding from a poorly prepared subfloor.

QUALIFICATIONS

This process has several issues which need to be considered before proceeding.

- A) The method described in this bulletin should be considered the last repair option as it does not strictly address the underlying cause of the original de-bonding. ARDEX cannot guarantee success in all cases nor predict how long such a fix will last.
- B) This process only applies to injection over concrete substrates and sound screeds. It is not recommended over timber or compressed fibre-cement sheets because of the rigidity of the resin and flexibility of those substrates. It is not recommended over waterproofing and should not be considered a waterproofing process where leaks are a problem.
- C) The tiles must be in place and not removed from the tiled field. When they have been removed or are too loose, they must be properly reset with tile adhesive.
- D) Grout lines need to be intact and not cracked. If compromised, the resin will seep out of the cracks, which can be difficult to remove. This leads to whitish and sometimes glossy, clear deposits in the grout. Any areas exposed to sunlight will turn yellow over time. In that case, the grout should also be dug out and replaced.
- E) There needs to be several millimetres of clearance under the tile to allow the resin to flow and spread out. Tiles that have de-bonded from the adhesive can be worked on this way. The resin needs to bond to both surfaces (tile and substrate). If the resin only adheres to the adhesive side, the performance will depend on how well that adhesive remains bonded to the surface. Tiles that have significant-sized voids can also be dealt with.
- F) This process does not 'stabilise' damaged adhesive beds. If they are disrupted and loose, they remain embedded in the resin. Sufficient clearance needs to be available for the resin to do this.
- G) Holes must be drilled in the tile field, which will likely be visible even if filled with coloured grout or some other filler material. This will need to be colour-matched into the tile field.



Drilling into the grout lines is also feasible but tricky because of the grout's weakness, which can break up.

- H) This procedure is not recommended for damp slabs or where water is present under the tiles. The cure of urethane and epoxy resins can be inhibited by moisture. The urethanes foam. Damp substrates cannot be treated in this way. The tiles must be removed and replaced if the underlying substrate is damp.
- I) Injection and stabilisation can result in strains being shifted to surrounding areas that may have originally been stable but then become unstable and de-bond.
- J) Injection resin should not be used to replace flexible joints and sealant lines. It should not be injected under existing sealant joints. This leads to the joint becoming a solid joint.
- K) Drilling into tiles to stabilize them can result in cracking and potential spalling at the drilling point. Always use drills suitable for masonry (such as tungsten-tipped or tile drills). Do not use hammer action on the drill. Hammer action can fracture tiles or cause the whole tile to break free. Use the minimum force necessary to drive the drill at a low to medium drilling speed.
- L) The injection resins are rapid-hardening. This means a large supply of nozzles may be needed. If multiple smaller voids are to be filled, they must be pre-drilled, cleaned, and quickly filled in sequence.
- M) A strong vacuum cleaner is required to remove dust and debris from the drilled hole and the area under the tile adjacent to the drilled hole.



An example of a tile that was drummy and had bowed slightly off the adhesive bed (it had to be re-stuck). In this case, the adhesive was also poorly adhered to the concrete. Surrounding drummy tiles were successfully injected (as shown later), but this is an example of points C), E), and F). The old adhesive was removed, the surface was mechanically prepared, and then re-bonded with tile adhesive.

PREPARATION

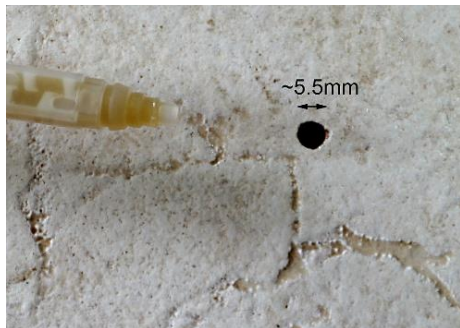
- 1) The first step is to identify where the tiles are drummy. This can be done by tapping **lightly**



with a hammer or a screwdriver. The dummy tiles should be marked with chalk or a removable marker.



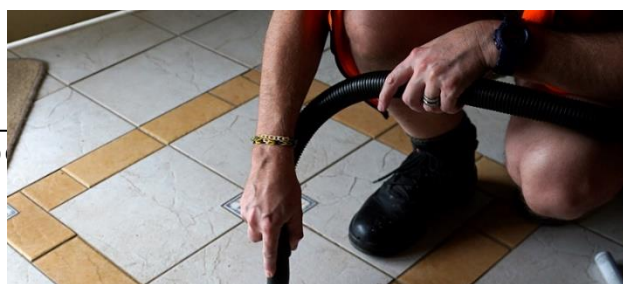
- 2) The locations where holes must be drilled can be decided once the dummy areas have been identified. They should be as unobtrusive as possible and preferably in the centre of the dummy area to allow the resin to spread out quickly. Resin injection should start at the lowest point in the tile field. Where larger areas require filling, injection occurs at one point until the resin emerges at another point. In this case, the holes should be around 300mm apart. This can vary according to the depth to be filled and the actual 3-dimensional shape of the voids.



The nozzle for ARDEX RA56 is shown. The drill must be slightly larger than the resin mixing nozzle's nominal size. This means drilling approximately 5.5 - 6mm holes for ARDEX RA56 and Dunlop Ardit Crack Filler (needle-like nozzle extensions are also available).

The hole size must match the nozzles used when ARDEX RA142 or ARDEX RA144.

- 3) Once the hole has been drilled, the dust and debris must be vacuumed to ensure a clear injection point. This is easy to do when the tile has lifted off the surface. If little clearance is visible through the hole, injection could be difficult.



- 4) Prepare the injection resin according to the product packaging and datasheet instructions (shaking). Before opening the resin, confirm that the nozzle will fit in the hole and that there is clearance under the tile to eject the resin.



- 5) Discard the first 15ml gunned through the nozzle before placing the nozzle in the hole to start injecting. The quantity of resin that escapes onto the tile's surface depends on how much clearance and space are under the tile. The injection of the resin should be with constant pressure, avoiding erratic pulses of rapid trigger squeezing. Fill until the cartridge has expired or the resin overflows or escapes from another drill hole.



Injecting ARDEX RA56 at left and Dunlop Ardit Crack Filler at right

- 6) The injection continues until the material is too much on the surface or the cartridge is expended. Multiple injection points are better than injecting several cartridges into the same



hole. This is crucial in warm weather as the resin will set rapidly and potentially block the areas away from the injection port. Foaming can occur with the urethane resins if the substrate is damp. The picture below shows a trapped air bubble escaping.



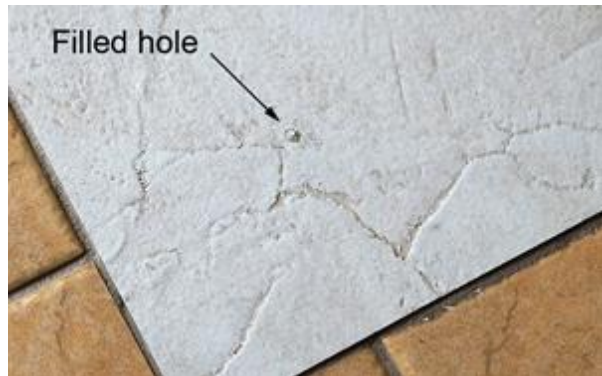
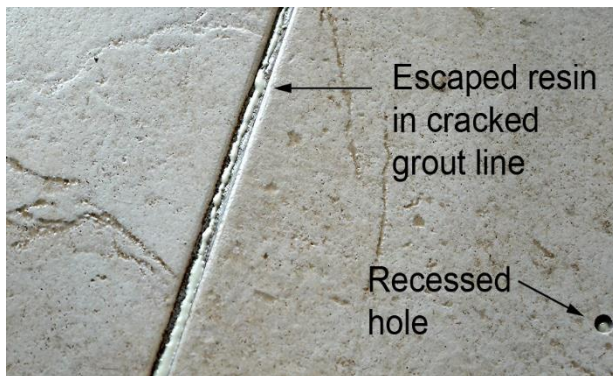
- 7) Excess resin on the tile surface must be immediately removed with a rag. It is advisable to wear protective gloves. Residual resin can be cleaned away with mineral turps or white spirits before it cures.



- 8) The excess can be scraped off the surface with a spatula (note care needs to be taken not to scratch the tile surface) when the resin has just become firm but is still soft and flexible.



- 9) The resin can escape to the surface if the grout is cracked or damaged. If appearance is important, the grout lines should be ground out to the full depth of the tile, and the grout should then be replaced. Grout can also be used to fill any holes in the tile surface. Note that filler resins can change colour over time, so cleaning out holes after the resin is hard before filling them with grout may be preferable. The depth needs to be 4-5mm, and ARDEX FG-8 or FS-DD can be used. Colour matching, however, may be difficult, and grout paint can be used as an alternate finish.





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IMPORTANT

This Technical Bulletin provides guideline information only and is not intended to be interpreted as a general specification for the application/installation of the products described. Since each project potentially differs in exposure/condition, specific recommendations may vary from the information contained herein. For recommendations for specific applications/installations, contact your nearest Ardex Australia Office.

DISCLAIMER

The information presented in this Technical Bulletin is to the best of our knowledge true and accurate. No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of a product for a particular application. Users are asked to check that the literature in their possession is the latest issue.

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DOCUMENT REVIEW REQUIRED

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