TECHNICAL BULLETIN – TB252

INJECTION OF CRACK REPAIR RESIN UNDER DRUMMY TILES

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SCOPE AND INTRODUCTION

A common situation concerns drummy tiles which may not have de-bonded from the subfloor, and can still be 'held' in place by surrounding tiles, grout or partial adhesive bed. The problem with partially drumminess, apart from sounding wrong when walked on, is that they are more susceptible to damage from loading and impact, but can then also progress to full de-bonding.

One option to this problem is simply to remove the tile and either replace it or clean and reset it. However this can be problematic where removal of the tile would create more problems, such as damage to grout or risk of damaging further areas, difficulties in removing partially bonded tiles, the tile cannot easily be cleaned of adhesive, and / or there are no available replacement tiles if something goes wrong.

Another approach is to inject a resin into the cavity under the tile, which then fills the void, and can also adhere the tile to the substrate. In this bulletin we will examine this option using the ARDEX and also Dunlop branded crack injection resins.

BACKGROUND

There are a number of reasons for drummy tiles, but also there is the question of whether a drummy tile is a problem or not.

WHAT IS DRUMMINESS?

There are two types of drumminess, the first is caused by a void under the tile sounding hollow when tapped, whilst the second is effectively the ringing sound that happens when the tile is actually loose or free of the adhesive bed and is tapped. In the former case, filling with resin is simply making the void go away, but in the latter case it 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 on completion.*
> *After handover, tiles are defective when caused by the builder's workmanship, 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*.

However this no longer appears to be the case, 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 indicates that loose tiles are not acceptable, but drumminess may not be a problem. The reality is that it depends on the degree of drumminess. For example, small voids may not result in looseness, but can become a point of weakness where a point load is applied (or dropped) that cause the tile to crack. Clearly however, a loose drummy tile is a different matter and certainly requires rectification. Cass (in Tile Today, August 2014) addressed the issue of drummy tiles and whether they are a problem or not, and AS3958.1-2007 puts it this way,

> **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.

CAUSES OF DRUMMY TILES

The usual causes of drummy tiles are either poor contact coverage at time of placement, or partial or complete de-bonding of the tile. The latter can be caused by a wide range of problems, including but not restricted to, adhesive de-bonding from the tile (poor adhesion, exceeding open time, poor applied pressure), cohesive fracture of the adhesive (differential movement of tiles or substrate issues) and de-bonding from a poorly prepared subfloor.

QUALIFICATIONS

This process has a number of issues which need to be considered before proceeding.

A) The method described in this bulletin should be considered a last measure fix since it does not strictly address the underlying cause of the original de-bonding. ARDEX cannot guarantee that it will be successful in all cases, and 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 sheet 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 need to be in place and not removed from the tiled field. As soon as the tiles have been removed or are too loose, they have to be properly reset with tile adhesive.

D) Grout lines need to be reasonably intact and not badly cracked. Where they are compromised resin will seep out of the cracks. This can be difficult to remove and leads to whitish to glossy clear deposits in the grout. Any areas exposed to sunlight will see such exudates turn yellow over time. In that case the grout should be dug out and replaced as well.

E) There needs to be several millimetres of clearance under the tile, and pathways for the resin to flow and spread out. For example, tiles that have de-bonded from the adhesive, or the adhesive with the tiles from the substrate can be worked on this way. However, what has to happen is that the resin can develop a grip to both surfaces (tile and substrate), and where the resin is only adhering to the adhesive one side, clearly 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 simply then become embedded in the resin. Sufficient clearance needs to be available for the resin to do this.

G) Holes need to be drilled in the tile field which then are likely to be visible even if filled with coloured grout or some other form of filler material. This will need to be colour matched where the holes are drilled into the tile field. Drilling into the grout lines are also feasible, but tricky because of the weakness of the grout which can lead to breaking up.

H) This is not recommended for damp slabs or where water is present under the tiles. The urethane and epoxy resins can be inhibited by the presence of moisture; the urethanes actually foam. Damp substrates may not be able to be treated in this way and tiles removed and replaced.

I) Injection and stabilisation can then result in strains being shifted to surrounding areas that may be metastable, but then become unstable and de-bond.

J) Injection resin shall not be used to replace flexible joints and sealant lines and should not be injected under existing sealant joints. This leads to the joint becoming a solid joint.

K) Depending on the stability and strength of the tiles, drilling in to 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) and **do not** use hammer action on the drill, use of hammer action can fracture tiles or cause the whole tile to break free. Use the minimum force necessary to drive the drill and a low to medium drilling speed.

L) The resins used are very rapid hardening and unless there is a large supply of nozzles on hand, if multiple smaller voids are to be filled, they need to be pre-drilled, cleaned and quickly filled in sequence.

M) A strong vacuum cleaner is required to remove dust and debris from in the hole and the area under the tile adjacent to the drill hole.

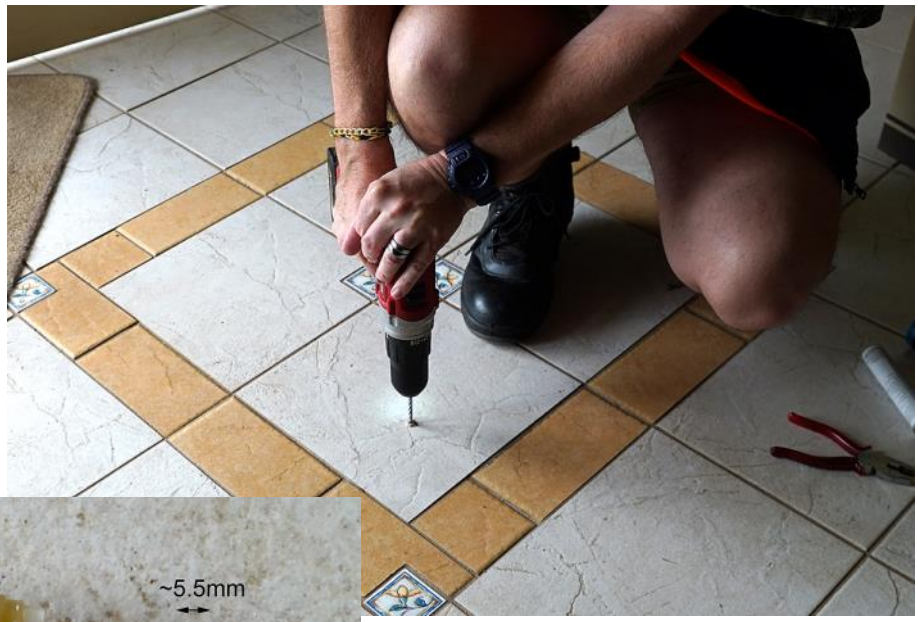
An example of a tile that was drummy and had bowed slightly off the adhesive bed (it had to be re-stuck).

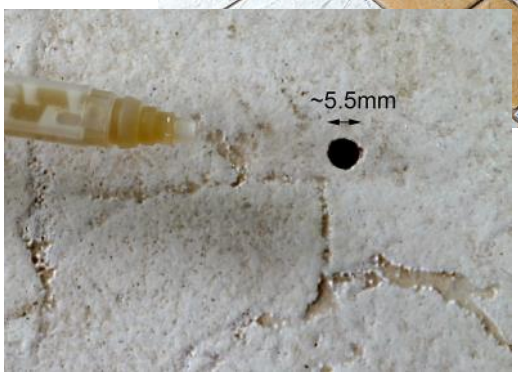
In this case the adhesive was poorly adhered to the concrete too. Surrounding drummy tiles were successfully injected (as shown later) but this is an example of points C), E) and F). The old adhesive was removed and the surface mechanically prepared, and it was then re-bonded with tile adhesive.

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 screw driver. The drummy tiles should be marked with chalk or removable marker.

2) Once the drummy areas have be identified then the position for drilling of holes needs to be decided. They should be as unobtrusive as possible and preferably be in the centre of the drummy area so the resin can spread out easily. It is preferred that injection starts at the lowest point in the tile field. Where larger areas require filling, injection can performed by injection at one point till it emerges at another point. In this case the holes should be around 300mm apart, this can vary according the depth to be filled and the actual 3 dimensional shape of the voids.





Nozzle for RA56 shown. The drill size needs to be slightly larger than nominal size of the resin mixing nozzle; this means a hole drilled approximately 5.5-6mm for the ARDEX RA56 and Dunlop Ardit Crack Filler (needle like nozzle extensions are also available).

Where the ARDEX RA142 or RA144 are to be used, the hole size needs to match the nozzles.

3) Once the hole has been drilled, the dust and debris must be vacuumed out vigorously to make sure that injection point is clear. Where the tile is lifted off the surface this is easy to do. If there is little clearance visible through the hole, injection could be difficult.

4) The injection resin is prepared in accordance with the product packaging and datasheet instructions (shaking). Before opening the resin confirm that the nozzle will fit in the hole and has clearance under the tile to eject the resin.

5) Start the resin off in the nozzle and then place the nozzle in the hole and start injecting. Depending on how much clearance and space is the under the tile, in part controls how much resin escapes onto surface of the tile. Injection the resin with constant pressure and not make erratic pulses by rapid squeezing of the trigger. Fill till either the is expired, the resin overflows, or escapes from another drill hole.

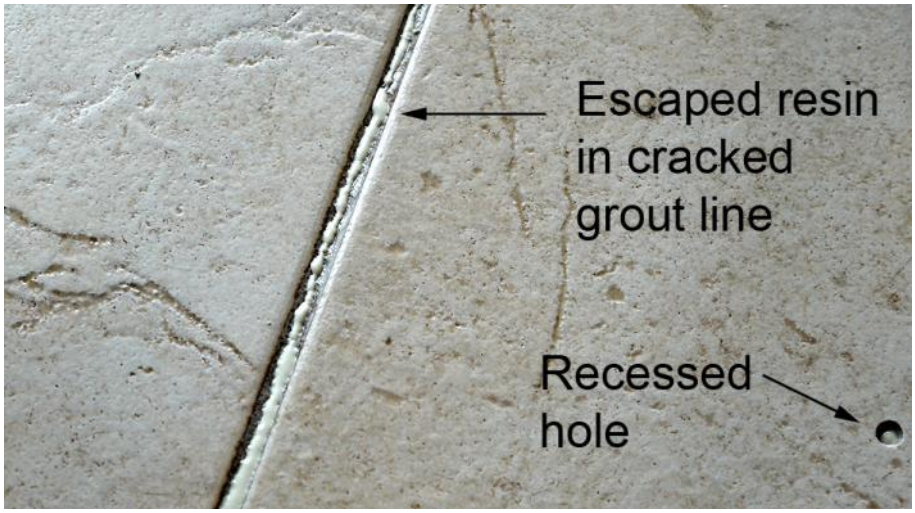
Injecting ARDEX RA56 at left and Dunlop Ardit Crack Filler at right

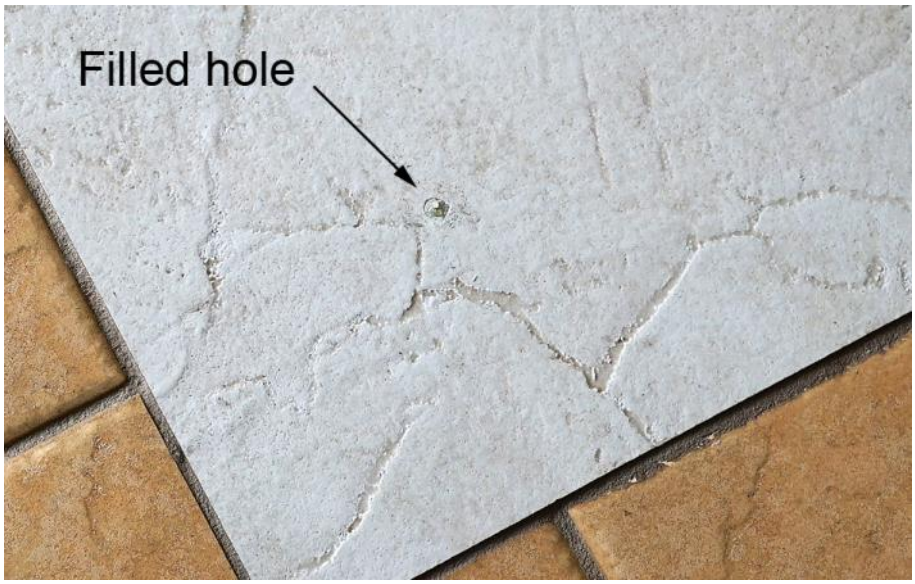
6) The injection continues until either the material puddles too much on the surface or the cartridge is expended. Multiple injection points are a better option than attempting to inject several cartridges into the same hole. This is especially important in warm weather where the resin will set rapidly and can block up the areas away from the injection port. Note that if the concrete is damp, then foaming can occur with the urethane resins. The picture below shows a trapped air bubble escaping.

7) Excess resin that ends up on the tile surface needs to be wiped off rapidly with a rag (wear protective gloves) and it is soluble in mineral turps or white spirit when liquid.

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

9) Where the grout is cracked or damaged, the resin can be escape out and come to the surface. Where this happens and appearance is important, the grout lines need to be ground out full depth and the grout replaced. Grout can also be used to fill any holes to be flush with the tile surface. Note that the filler resins can change colour over time so it may be preferable to clean out holes after the resin is hard and filling them with grout. The depth needs to be 4-5mm, and ARDEX FG8 or FSDD can be used. However colour matching may be difficult and grout paint can be an alternate finish.





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 or Ardex New Zealand 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.

REASON FOR REVISION - ISSUER

New document

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