

TAU CERÁMICA


Frost Proof Ceramic Tile Installations:

It seems to be a commonly held idea that to design a frost proof ceramic tile installation all you need to do is purchase or specify a frost proof ceramic tile. Along with this goes the notion that because New Zealand enjoys a predominantly temperate climate, only locations that actually experience snow or ice require frost proof consideration. Both these ideas are wrong. The latter is the easiest to deal with. In simple terms frost damage is a potential problem wherever you get a number of seasonal freeze thaw cycles which during the winter encompasses most of New Zealand with the possible exception being parts of the far north.

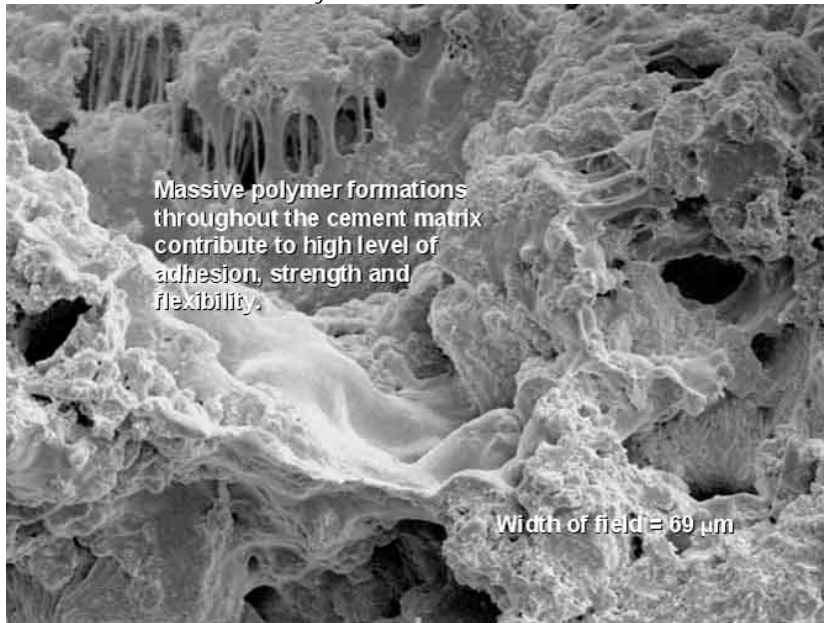
The main belief that all you need is a frost proof tile is wrong because you actually need a complete tile system that is able to resist the damaging forces of frost. Designing a frost proof ceramic tile installation is really about the management of water. When water penetrates a tile or any part of the installation system and freezes it solidifies and in doing so increases in volume. This volumetric change creates mechanical stresses which increase and become more damaging as the cycles of freezing and thawing increase. The stress can damage the body of the tile, the tile surface (especially if it is glazed), the adhesive (in some cases creating a loss of bond) as well as the grout. The key to reducing the risk of frost damage is specify a complete installation system and not just a frost proof tile.

The systems main design goal is to produce the lowest amount of water penetration and retention and this is done by introducing the following:



1. Frost Proof Tile:  The ceramic tile industry has a uniform standard to test and recognize frost proof tiles – UNE- EN ISO 10.545-12. Tiles that pass this test can be recognized by the frost proof icon advertised by the manufacturer. Only tiles that pass this test and exhibit this icon should be used for frost proof installations.
2. Use of a waterproof membrane: Keeping the substrate as dry as possible so that it does not become a source of water retention is also a valuable design consideration. This may be a load bearing waterproof membrane or a damp-proof membrane for slab on grade installations
3. Use of latex or polymer modified cement adhesives and grouts. Cement is widely known to shrink during cure and the control of this shrinkage is critical to its final bond strength and density. The denser the final cement mortar, adhesive or grout the stronger it is and also the less water it will absorb becoming less prone to frost damage. Latex or polymer modification of cement achieves controlled shrinkage as well as giving the cement the ability to withstand some expansion and contraction created by thermal cycles. The photo (fig1) shows how the strands of polymer act as “shock absorbers” and bridges to help

accommodate thermal cycles.



4. **Correct Falls:** Installing correct falls to direct water towards appropriately placed drains is very important so that water is not retained on or in the system where it can freeze. General design standards are falls of 1:40 for tiled decks that are over occupied space and 1:50 for on grade tiled installations.
5. **Grout Joint Widths:** With the advent of rectified ceramic tiles (tiles cut to exactly the same dimensions) there has been an increase in the number of tiles that are installed with no joints. This is not a good practice especially when you are designing a frost proof installation. Closed joints render the tiled surface more rigid and in doing so increase the tensile stresses induced by any movement of the layers under the tile. This reduces the ability of the tiled surface to accommodate the stresses set up by frost.
6. **Full Adhesive Contact:** This is very important not only to promote bond strength but to minimize the risk of any voids appearing under the tile that could collect and retain water and then freeze. Using the correct notch trowel and beating and or twisting the tile into place are both important in maximizing adhesive contact.
7. **Proper use and placement of flexible joints:** The reasons for proper placement of flexible joints are well known however it is less widely recognized that they also play a part in directing water off the tiled surface and into drains. One of the main collection points of water is at floor to wall junctions and it is imperative to direct this water off the tiled surface. Flexible joints are waterproof and hence assist in making sure water is not absorbed at these collection points by the tiled system. They are also used to fill the appropriately placed expansion and or control joints that are also an integral part of accommodating the stresses of frost.
8. **Use of a Sealer:** If the tile or stone is frost proof and is not fully glazed then it can still have a percentage of water absorption. An appropriate sealer (that is not affected by frost) can be applied to further reduce this absorption and in doing so minimize water retention. Even if the tile is glazed or has little to no water absorption do remember that most grout (even polymer modified) has relatively high water absorption and can therefore benefit from the application of a sealer to greatly reduce this.

In summary the sole use of a frost proof tile will not render an exterior tile installation frost proof. Only the implementation of a full system will achieve this result. In fact if you read the frost proof warranty claims of most ceramic tile manufacturers they are dependent on the use of a full system along with a frost proof tile for the warranty to be valid. With New Zealand experiencing frost cycles in most places it is prudent to design your exterior tiled installations with the issues of frost in mind.