TECHNICAL BULLETIN – TB198

POOL COPING AND WATER LINE TILING – FIBREGLASS AND CONCRETE SWIMMING POOLS

Date, Wednesday, 1 February 2017

INTRODUCTION & SCOPE

A typical construction method for swimming pools is to install a pre-formed fibreglass liner into the ground, usually with a concrete surface or Compressed Fibre-Cement (CFC) sheet surround deck. This liner has a visible horizontal top edge around 100-150mm wide where the coping tiles are to be laid. It is a common request made to ARDEX to supply an adhesive that will bond a coping tile to the top edge of the pool, and often the inquirer wants to span the joint between the liner and the surround.

The same general situation occurs with pools that have concrete shells or rendered blockwork rather than fibreglass, and hence the same rules about joints and coping in this discussion still apply.

In this bulletin we will examine why such a course of action is not a sound practice, and some suggested ways to install tiles or 'pavers' in this situation. We will also briefly look at bonding waterline tiles within the pool as well.

THE REQUESTED DETAIL

The usual request made is, 'what adhesive would you recommend for the installation of coping tiles on a fibreglass or concrete pool edge?' A bit of further inquiry to the customer reveals that it is intended to bond the tiles across the boundary between the liner or shell and onto the surround. Usually these tiles are large format or pavers and both overhang the water and extend on the surrounds. In other words, the tile covers over the joint to create an homogenous tile appearance to the finished job.

WHAT IS THE PROBLEM?

What is the problem with this scenario? Well, the problem with having a solidly fixed tile across the pool surround boundary in this way, is that it spans what is in effect a movement joint.

The definition of a movement joint in this particular case can be found in the tiling standard AS3958.1-2007,

> 'Clause 5.4.5.3 Movement joints should be installed at the following locations:
>
> c) At junctions between different background materials, when cladding is continuous across varying types of background'

and

> 'E2.10 Movement joints
>
> …Movement joints should be inserted to coincide with the structural junction of the pool shell and the surrounding slab..'

What are the consequences of ignoring this requirement and tiling straight across the boundary? The pool shell and surround are made from two different materials with different expansion and movement characteristics creating unbalanced movements either side of the joint.

Also the pool fill and substrate below the surround create differences in movement due to their thermal properties, expansion and contraction during water absorption of the soil,

ARDEX TECHNICAL SERVICES DEPARTMENT

structural movement of decks and in the case of the pool water itself movements and seiching due to winds or pressure loading due weight falling into the pool (i.e. diving).

These factors mean that anything rigidly bonded across the joint will very likely crack as shown in Fig.1 below (for simplicity the schematics show fibreglass shells).
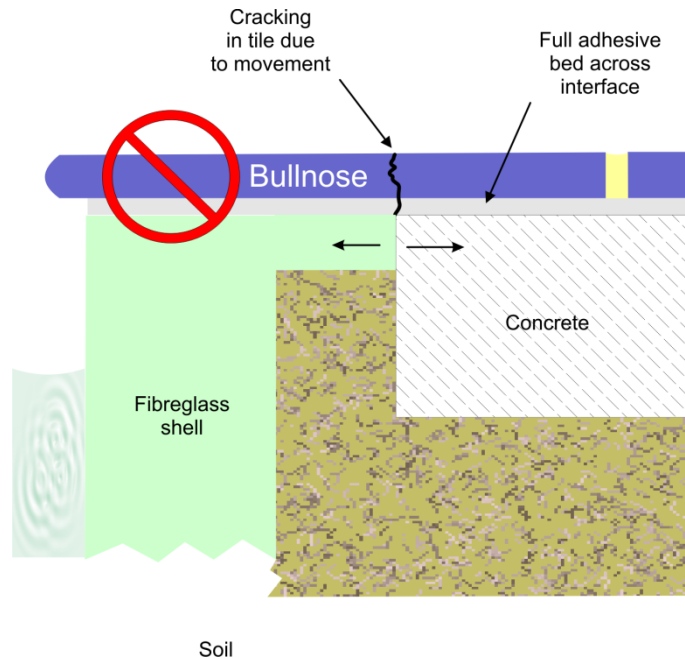

Figure 1. Schematic showing the situation where tiles have been bonded across the pool shell and surround junction.

A second option occasionally suggested is to only adhere the tile one side of the joint or the other. Usually this is the concrete side since the width of the fibreglass edge is usually less than 150mm and therefore the concrete provides a larger and ultimately more compatible surface to bond to.

However, this leaves the edge of the tile cantilevered and unsupported, hence subject to breakage due to lever arm moments from swimmers climbing out of the pools, or flexural compressive forces from being stood on. This situation is shown in Fig.2.
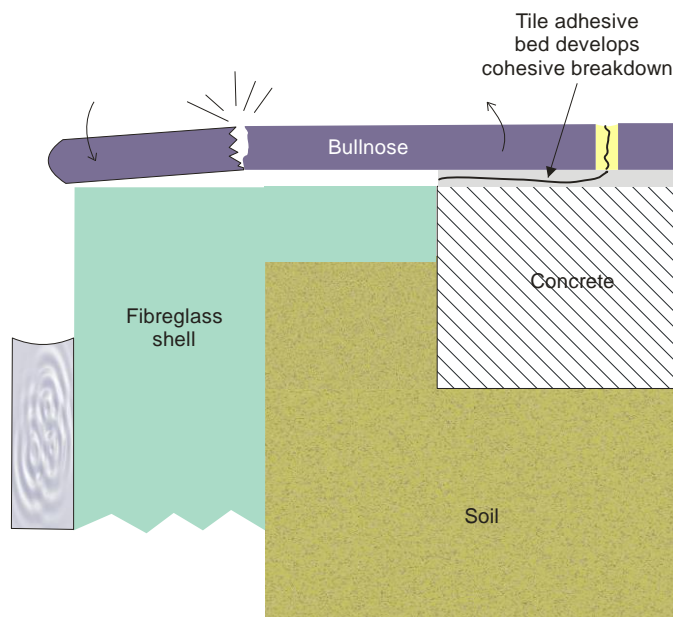

Figure 2. Effect of cantilever tiles subjected to either bending moments from swimmers exiting the pool, or compressive flexure from being stood on.

ARDEX TECHNICAL SERVICES DEPARTMENT

DESIGN SOLUTIONS

The preferred solution as specified in the standard is to create a movement joint around the edge of the pool that corresponds to the shell-surround boundary. The general design is shown in Fig.3a and 3b. The major point with this detail is that it might require the tiles or pavers be cut to create the joint which adds an extra process, but also affects the aesthetics of the finished job.
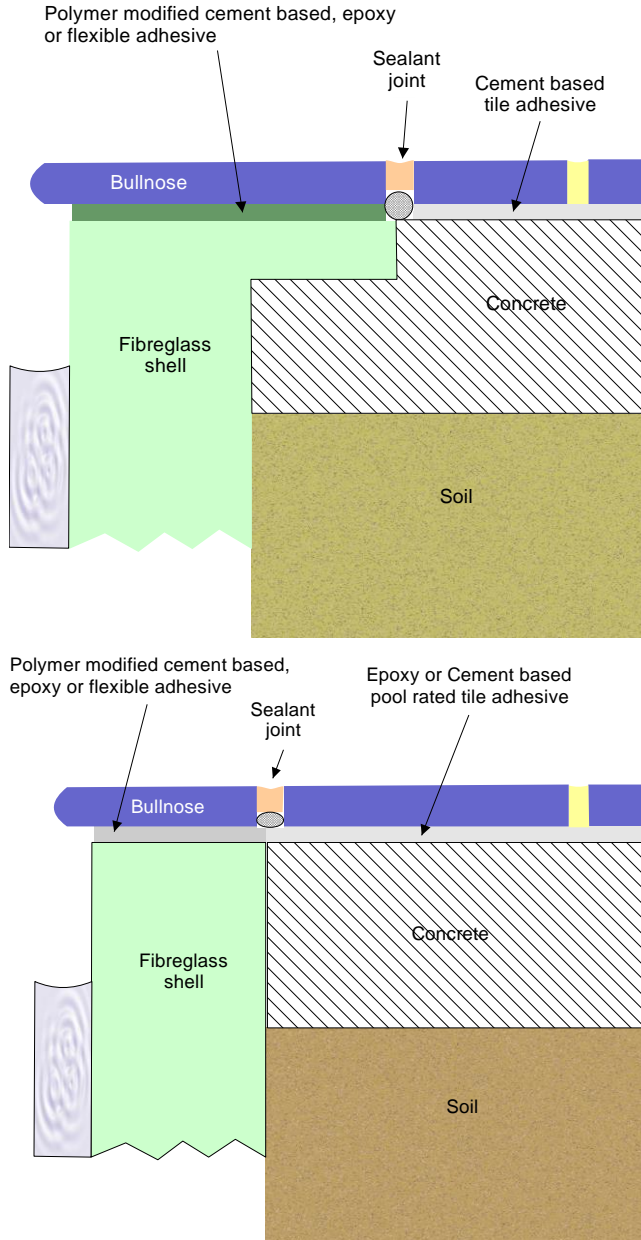
Figures 3a and 3b. Schematics showing the presence of the movement joint, and the cut that may be required in the bull-nose tile (configuration depends on the shape of the pool shell).

Another solution is to bond the tile to the surround side with a modified cement based tile adhesive, and to the pool rim with either a flexible sealant or sealant adhesive. For example, the pool side bond could be performed with a well spread polyurethane, epoxide, silane-urethane, or even suitable silicone sealants (>75% coverage is required rather than a few thin beads). This design is more difficult to do because it uses two separate products on the same tile, but effectively eliminates the flexing of an unsupported tile, and allows the system to move because of the low E-modulus of the sealant.

ARDEX TECHNICAL SERVICES DEPARTMENT

Caution may be required with CFC decks as they may move more than concrete (the framing) and possibly even exceed the capabilities of the sealant. This design is shown in Fig.4 for a concrete surround.
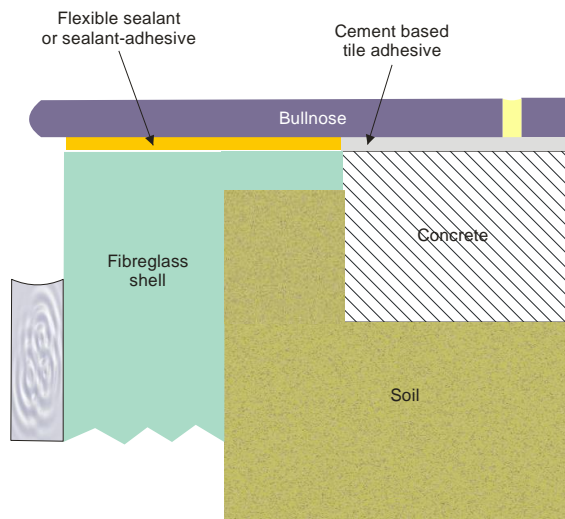

Figure 4. An installation using the sealant/adhesive and normal tile adhesive combination rather than cutting the tile for a visible joint.

A CASE HISTORY

The following pictures show a fibreglass pool installation where the general rules given above were not followed. In this particular situation the paving coping tiles were bonded directly across the ring beam joint between the pool shell and the surrounding concrete, a non-approved type of adhesive was used, and poor adhesive application and tile bedding were evident. The pool was installed circa 2007, and the problems were evident at some time between 2012 and 2015. The pavers were loose and unsafe at the time these pictures were taken.
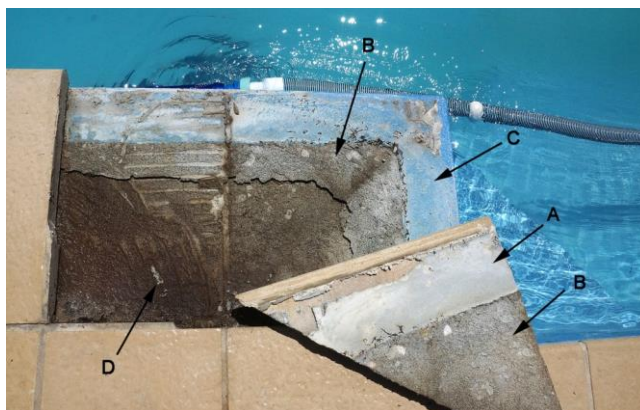

Figure 5.

A – The adhesive that was in contact with the fibreglass shell. As can be seen there was negligible adhesion. B – sheared and water effected rubber modified C blass tile adhesive. C – Fibreglass shell, no evidence of preparation. D – Water damaged and shear rubber modified C class adhesive
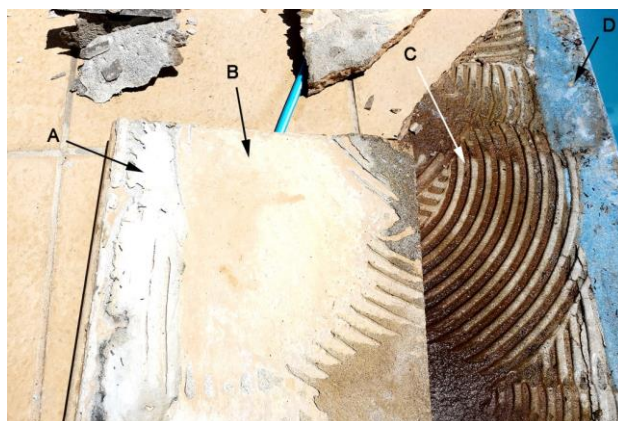

Figure 6.

A – The adhesive that was in contact with the fibreglass shell. B – Rear face of paver tile with no adhering adhesive (the pool shell sat proud of the concrete so the tile was tilted and there was no way it would bed). C – Uncompressed adhesive notch lines, full of water in the voids and water damaged. D - Pool shell.
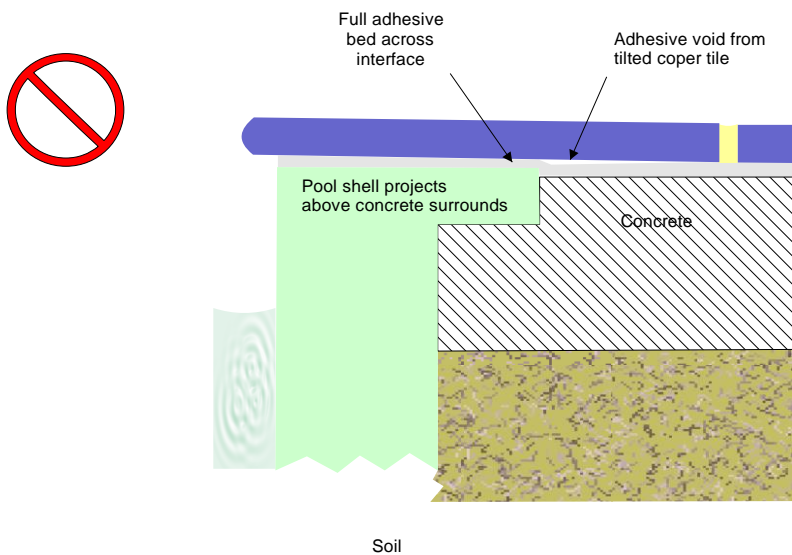
ARDEX TECHNICAL SERVICES DEPARTMENT

Figure 7.

This is schematic showing the problem in Figures 5/6. The edge of the pool shell projected above the concrete resulting the in paver coping tile being tilted and then not achieving correct adhesive bed contact.

WATERLINE TILES

The final part of this installation is usually the installation of water line tiles. ARDEX has a recommendation for bonding tiles above, on, and just below the waterline for fibreglass pools, but not at depth. There are no such restrictions on concrete pools where the correct adhesive is used for the full pool lining (usually with a membrane system); Figure 8 shows the general arrangement.
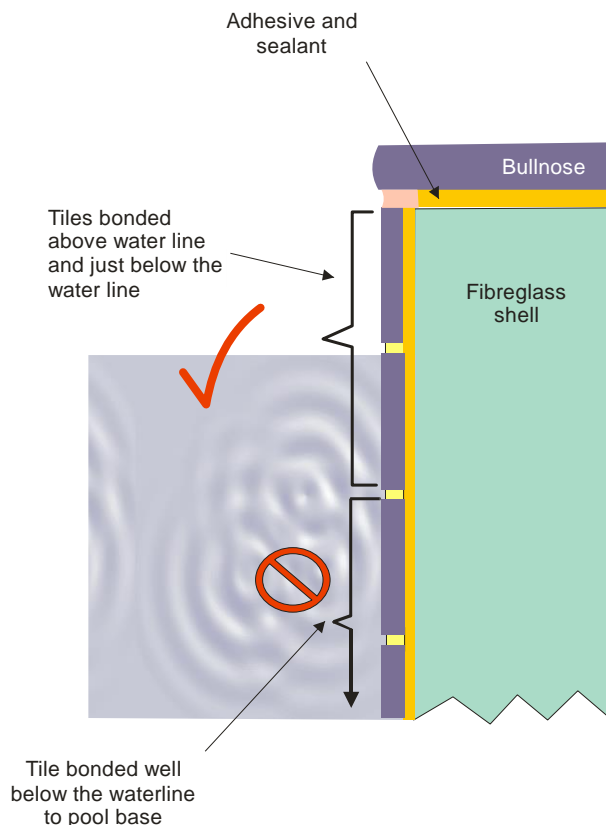

Figure 8. The bonding of tiles to the upper edge of the fibreglass pool liner and to just below the waterline is acceptable, but not at depth below the waterline.

In this situation it is critical to make sure that the correct adhesive is used and that the pool shell is properly prepared. Bonding tiles to the fibreglass for waterline tiles – the fibreglass gelcoat surface needs to be roughened which may compromise the integrity of the liner if

ARDEX TECHNICAL SERVICES DEPARTMENT

done excessively.

Roughened means, that the surface of the fibreglass gel coat shall be mechanically prepared such 100% of the surface is treated to produce a rough surface finish of equivalent appearance to CSP2 or CSP3 finished concrete (see Fig.9).

The fibreglass fibrils must be visible, however this process of preparation also has the potential effect of exposing the fibreglass to adhesive attack.
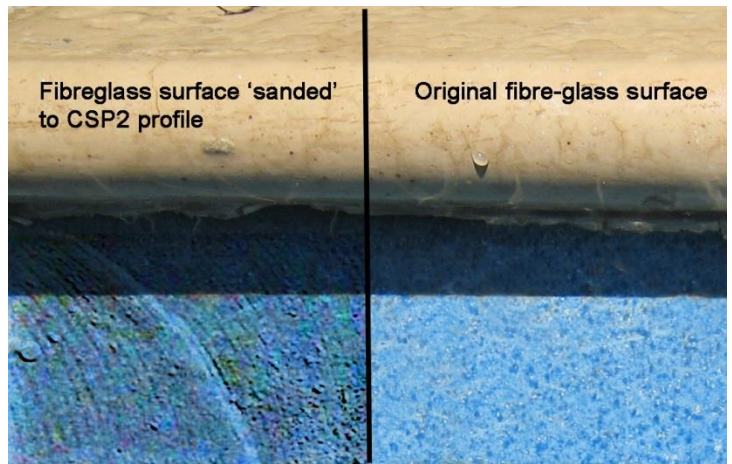

Figure 9. A schematic showing a fibre-glass pool that has been surface prepared to CSP2 profile.

A final note concerning pool tiles, where sheet mosaic tiles are used, they must be of a type that is not affected by water immersion. The tiles must not be fixed to any 'backing' material such as mesh with an adhesive that is water softening or soluble. Also, the tiles need to have at least 85% of the back face of the tile available for the adhesive contact. Where these conditions are not observed, failures of the tiling are a significant risk, see Figs.10/11 and ARDEX Technical Papers TP013 and TP002 for more information.
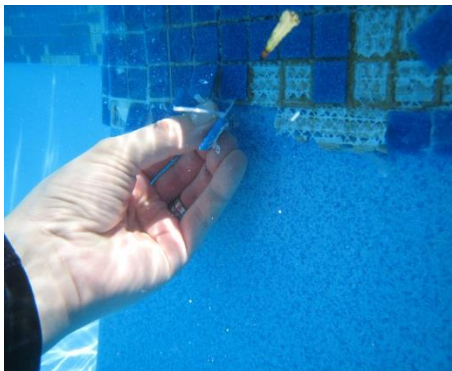

Figure 10. An example of a tiling installation where the pool shell has not been properly prepared prior to the application of 'waterline tiles'. The adhesive has not bonded.

Figure 11. An example of mesh mosaic tiles that have failed at the waterline because of an inappropriate adhesive choice for a fibre-glass pool shell, but also because the mesh adhesive was water softening and obstructed the adhesive contact coverage with the tile itself.

RECOMMENDED ADHESIVE SYSTEMS

The following ARDEX or ABA tiling and accessory products are recommended for this type of installation.

Note: Certain DUNLOP products can be substituted for *performance equivalent* ARDEX products in cases where hardware sourced products are easier to obtain.

Tile Adhesives

Cementitious surfaces

Bonding tiles to the <u>concrete</u> or <u>compressed fibre-cement</u> pool surrounds or inside *<u>concrete</u>* pools shells (not fibreglass). See ARDEX Technical Bulletin TB088 for information on tiling concrete pool shells.

C Class adhesives

> ARDEX X77 ± ARDEX E90
>
> ARDEX STS8 White + ARDEX E90
>
> ARDEX X18 ± ARDEX E90
>
> ARDEX X7 + ARDEX E90
>
> ARDEX Optima
>
> ABA Powerstik Plus ± ARDEX E90
>
> DUNLOP Universal Tile Adhesive
>
> DUNLOP Tile All Tile Adhesive

R Class adhesives

> ARDEX WA epoxy
>
> ARDEX WA100 epoxy

Polymer surfaces

Bonding tiles to the <u>fibreglass</u> for waterline tiles – the fibreglass gelcoat surface needs to be roughened which may compromise the integrity of the liner if done excessively. The best performance on this type of pool shell is really obtained with an epoxy adhesive.

> ARDEX WA epoxy
>
> ARDEX WA100 epoxy
>
> ARDEX Optima or DUNLOP Tile All (after preparation an initial skim coat 1mm thick is applied with a flat bladed trowel, and allowed to cure for 4 hrs, then the main adhesive bed is applied with an appropriate notch trowel for the tile size as defined in AS3958, prior to application of the tiles).

Sealant/Adhesives

Sealant / adhesive suitable for bonding to the <u>fibreglass top edge</u> under the coping tiles.

> ARDEX CA20-P (white - not under the water)
>
> ARDEX ST silicone (several colours - can be immersed)
>
> ARDEX RA030 or ARDEX 040 polyurethane / polyether sealants (grey)
>
> DUNLOP Tile All Plus Adhesive/Sealant (white - not under the water)
>
> DUNLOP Roof, Gutter and Pond Repair (grey - not under the water)

Grouts

C Class

> ARDEX FG8 plus ARDEX Grout Booster
>
> ARDEX WJ50 plus ARDEX Grout Booster
>
> ARDEX FSDD plus ARDEX Grout Booster
>
> DUNLOP Coloured Grout with DUNLOP Primer and Additive

R Class - preferred for waterline tiles on fibreglass shells

> ARDEX EG15 epoxy grout (has a wider range of stable colours)

ARDEX TECHNICAL SERVICES DEPARTMENT

ARDEX WA epoxy

DUNLOP Easy Clean Epoxy Grout (has a wider range of stable colours)

It is strongly recommended that for the cement based grouts only white or off-white colours are used to avoid bleaching of the colourants by chlorine in the pool water.

GLOSSARY

Automatic pool cleaners – These are pseudo-robotic pool cleaners that move around the internal surface of the pool using suction to remove dirt and solids material. The suction created and and will dislodge poorly bonded mosaic and other small size tiles.

CFC—Is the shorthand used for Compressed Fibre-Cement sheeting. In this application it is a minimum of 15mm thick.

Coping tile—The tile which is placed around the top edge of the pool. It usually has rounded bull nose.

Fibreglass—This is used in two ways. It refers in the general industry sense to the polyester resin and glass fibre matt construction of the pool shell. In the strict sense it refers to the reinforcing matting used with the resin. **Fibrils** refers to the individual glass fibres.

Gel coat—This a resin based coating on the surface of the pool shell in contact with the water. The gel coat is applied to the mould first, then followed by the main fibreglass and resin construction. The gel coat is commonly filler rich, and may be a different more chemically resistant polyester resin composition to the main shell body.

Low e-modulus—This is way of describing highly flexible and elastic sealant compounds. It actually refers to the deflection under strain or stress that the material can stand before failure.

Seiche or **seiching**—Waves created in the water by movements. Can be from things dropping into the water, wind movement or even earthquakes. Waves create low level but a continuing source of impact to tiles.

Seiching and surging from the water jet exhausts for the pool filtration system can dislodge poorly bonded tiles.

Waterline—Also called the splash zone is the transition between the subaqueous part of the pool (underwater) and the subaerial environment above the water. This area can be at times fully exposed or fully immersed depending on the pool water level (i.e. low when the pool is being vacuumed or water has evaporated, and high after high rainfall). The transition is a severe environment of wet-dry cycling, rapid temperature changes and moving water waves. This is a very challenging application for pool tile adhesives.

ARDEX TECHNICAL SERVICES DEPARTMENT