

Performance Through  
Technology and Service

## INFO SHEET

# Discussion about Coatings and Hydrostatic Pressure

Hi Performance Pool Coatings can generally be considered both water and vapour proof. This means that neither liquid water nor water vapour (gas) can pass easily through the coating when applied at the correct film thickness.

Concrete is a hygroscopic material meaning it tends to absorb moisture like a sponge. If humidity on one side is different to the other, it will transmit moisture as liquid or gas, through the concrete.

**Hydrostatic water pressure:** Hydrostatic or “head” pressure is the force caused by a column of liquid water and is present when the concrete structure is below the water table or in the middle of a course of water, and the waterproofing membrane, if installed, has failed.

It generally does not harm solid concrete; however, it will force itself through as a liquid, even in quite dense concrete, particularly if there are imperfections such as sand streaking, honey combing, cracks and areas of lower density. High water - cement ratio concrete (<0.40) tends to form more permeable concrete, with lots of capillaries being created. Hydrostatic water pressure is only a problem when liquid water is in direct contact with the concrete.

**Water Vapour:** Water vapour (gas) molecules (not liquid) can more easily pass-through concrete and they are much smaller and compressible too.

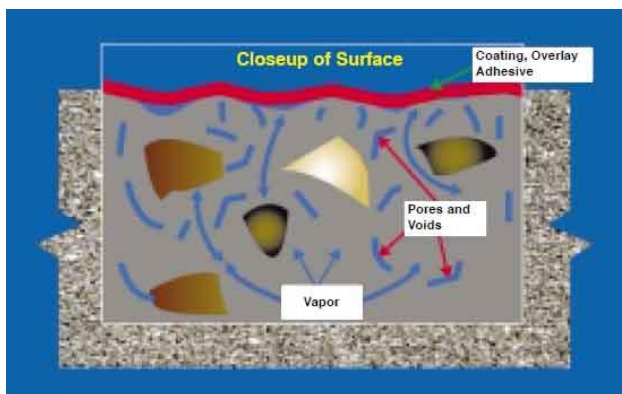


Figure 1 Voids in concrete provide space for condensation

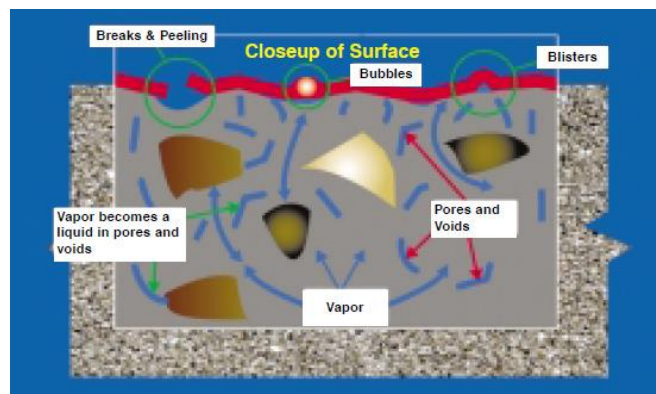


Figure 2 A void near the surface can lead to de bonding

**What causes the Water Vapor to move within concrete?** As gases can change shape they can wiggle through tiny voids as small as 0.2 mils. The gas is harmless to the concrete, however as the concrete cools (such as in winter - pool water cools) its ability to stay as water vapor in a gaseous phase diminishes and it condenses into larger liquid form. This liquid “soft” water, because of its low ion content, will leach ions from the hydrated concrete matrix and will cause the breakdown of the concrete composite. Over time the destructive effect grows, creating voids in the concrete matrix.

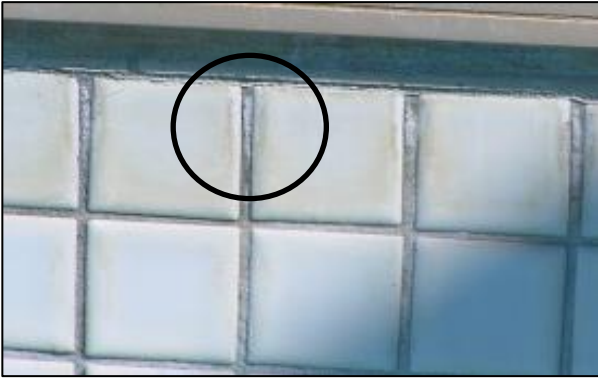
Also, when vapour turns into liquid, another force comes into effect, called capillary action, where the surface tension of the water forces it against a pressure gradient. This means that it can move around both vertically and horizontally within the pores and capillaries in the concrete matrix. As this water gets near the outer deteriorating concrete surfaces just below the coating, it will often force the coating to blister or bubble just before final delamination.

**Other related causes:** These can be from rain runoff, such as when water absorbed into the soil near the pool and runs past, under or around the pool and in so doing saturates the pool structure. This can be seen on pools on hillsides and near to buildings where the collection of water from nearby areas is channeled to areas around the pool. Pathways, patios and lawns near pools are also ways to generate large areas that saturate ground with rain runoff, causing the pool to get “wet feet.” Sometimes we find leaking plumbing can also be a cause, especially if blisters near to outlets below the water line.

PaintNForget US Operations

Phone: 321 3105346 Web: [paintnforget.com](http://paintnforget.com) Email: [info@paintnforget.com](mailto:info@paintnforget.com)

All information is given in good faith but without warranty. No liability will be accepted for any damage, loss or patent infringement from use of this information. This information does not constitute a specification and is subject to modification in the course of further development



**Figure 3 Showing telltale efflorescence on tile grout indicating water passing out from pool shell.**



**Figure 4 Effects of poor drainage around pool and causing in part delamination of render.**

**What do you see?** Fortunately, in our experience it's not a common problem as most pools are well constructed and in dry areas. Often, in pools painted with thick coatings, if there is to be an issue with this, it will show up after some time (months to years). The exception being when heavy rain occurs soon after application and the ground is wet due to an increased water table level.

Also, more often than not, it will be seen first on pool walls that face North to Northwest and are heated by the (afternoon) sun causing more water vapour activity within the walls.

To check, drop the water level enough to expose some blisters. Carefully pry open with a sharp knife, if water comes out (maybe dark in colour) it confirms hydrostatic pressure is at play.

Sometimes blisters are seen on the pool floor, but this is usually long after it's seen in the walls. Pool surrounds (coping and paths) that are dark coloured also impact on the rate of activity as they absorb more heat from the sun, drawing moisture up the walls to the top.

**Why do I see it on my pool now?** If the pool was not coated but had a plaster rendered surface, e.g. Marcite or Pebble Tec finish, these are all quite porous and the issue may have been going on for a while but without showing any noticeable defect. Old painted pools, where the paint film is very thin or has worn out, the defect may not be easily seen. This issue largely arises and is noticeable when an impermeable coating is applied. Such coatings make for a much easier pool surface to keep clean as algae and dirt don't stick but may have this drawback.

#### **How to deal with this?**

In simple terms there is no easy answer. The primary cause is to do with the condition of the concrete itself, not something is easily noticeable.

It may be caused by a high-water table due to a lot of rain saturating the ground around the pool.

The natural idea is to empty the pool and have it recoated. This may or may not be successful, as stated above, previously painted pools that didn't show any defects, may do so after recoating. Simply recoating may in fact result in the same outcome again.

Check if there are ways to direct the water away from the pool. Such as making sure it is not directed anywhere near the pool or if it is, adding drainage nearby so it can escape quickly,



**Figure 5 Painted wall showing hydrostatic blisters**

before saturating the soil near the pool. **If that is the case, these measures should be attempted first.**

If not appropriate or not relevant to your pool, then consider the climate and in some cases recent above average rainfall. If this is the likely cause, then maybe best to leave the pool as is for a few years until the weather patterns are dryer (rainfall tends to be in cycles) then empty, prepare and recoat. If you follow this suggestion the blisters may continue to develop during the few years while you wait and then slow down as the hydrostatic pressure becomes less. The blisters may break and yes allow water into the structure which helps the equalization somewhat. However, be aware that the blisters may return after the pool is recoated.

The other way is to consider a permeable finish that will allow this hydrostatic situation to continue, unheeded.

Contact us for more detailed information re your pool. We are happy to assist.