

## Avoiding Colour Variations

Architectural and coloured concretes are susceptible to colour variations and other defects, which can detract from the appearance of the finished areas. Colour variations can appear or go away quite quickly, or over a longer timeframe. These colour variations are variously described as efflorescence staining, pinto, burnishing stains and possibly other names as well.

The final colour of a concrete surface is driven initially by the water content of the freshly placed concrete, its curing regime and the texture of the top surface (smooth, broomed or etched for instance).

**Water content is the most important influencer of colour consistency. The water content of the placed concrete will be influenced by the following:**

1. Mix design and slump of the concrete
2. Substrate absorption capacity. If the substrate density is variable, then its water absorption rate will also vary across the slab.
3. Placing and compaction methods used on the day
4. Weather conditions (evaporation rates from the concrete) or shading on site
5. Finishing techniques used during the final finishing operations (has the top surface been sealed or not, and in a consistent manner.

**Curing will influence the colour of the concrete as it has a direct affect on the water content of the concrete at the surface.**

1. Poorly executed curing can lead to colour changes across a slab. Water is the best method but it has to be applied in a manner to achieve full

and total coverage.

2. Some early age sealers are now available which cure and seal the top surface for the critical first 5 to 7 days of the slab's life and before any long term systems can be applied.
3. Generally speaking, poorly cured surfaces will appear as a lighter shade than a similar one that is well cured.

**Surface texture will influence the colour of the top of the concrete.**

1. Ensure that the finishing process produces an even and consistent finish. Smooth trowelled surfaces can be slippery when wet.
2. Apply texture (brooming or sponging) in a consistent direction. Consider where you want water to drain and apply the brooming finish in the direction of the required fall.
3. If you are acid etching the top surface, ensure that the treatment is applied in a manner that produces a uniform degree of exposure. A denser or tighter top surface will appear a different shade to the rest of the concrete.
4. Surface textures will attract dust and ultimately moss or biological growth, leading to a darker and uneven appearance. This type of surface will require a higher level of maintenance than a simple trowelled finish.

## Minimising the risk of disappointment

It can be very difficult to meet the customer's expectations for a coloured or otherwise special concrete slab. The concrete arrives on site in its unfinished state and is dependent upon the skills of the placing contractor to achieve the desired result. Pre-pour planning will minimise the risks of unintended colour variations. Consider the following strategies to lower the risks of unintended cracking.

1. Agree with your placer / main contractor who is going to be responsible for managing the concrete pour. Ask the following questions:

- Who is responsible for deciding if the pour is going ahead? (who makes the weather call).
- If an accelerator is required, ensure that a chloride free one is used. Who decides this, and who is responsible for the cost.
- Who is going to check on the weather app to see what the risk of cracking is? This will indicate a high evaporation rate environment, which could also affect the final colour.
- Can the timing of the pour be shifted to a time of lower risk on the same day?
- Is the pour size manageable with the expected weather and resources available on the day?
- Who is responsible for the supply and use of the anti vap spray (this ought to be the placer)
- Who is responsible for the curing?
- Who is signing for the concrete and accepting it on site?

### On the day:

1. Place and compact all coloured concrete over a consistently placed, well drained and consolidated sub-grade. Consider the use of a polythene membrane under the slab if there is any doubt about the quality of the sub-base material.
2. The concrete slump should be kept consistent at 100mm or less, and should not exceed 125mm for any load. Slumps in excess of this can lead to a highly porous concrete (more prone to colour fade), and also likely to lead to coarse aggregate segregation. This can lead to a variable dispersion

of aggregates, which can be an aesthetic issue in exposed aggregate concretes.

3. No water should be added after a portion of the load has been discharged. If an increase in workability is required due to delays in placement, then use a water reducing admixture or a superplasticiser. Do not overdose and promote segregation issues (see [2] above)

4. For colour uniformity, consistent finishing practices should be used. To achieve a uniformly dense and consistent top surface (which will be less prone to colour variances) machine trowel the surface (one or two passes only, avoid hard troweling of the surface).

5. Hard steel trowelling around restricted access areas, edges and other protrusions could lead to slight colour differences in these locations.

6. Do not add water to the concrete while placing or finishing. If the surface is drying excessively quickly use an anti- evaporative spray to hold the moisture in the concrete.

7. All final hand finishing and texturing should be done in the same direction.

## Remedial Options

### Dark staining.

There are two approaches referred to in the literature for the removal of dark stains (pinto).

1. Physical removal of the top surface to open the pore structure by grinding or sanding
2. Chemical treatment with mildly acidic compounds such as 20% to 30% solution of diammonium citrate or citric acid.

### Colour loss or fading.

Where the concrete is "fading" a 10% acid wash is required then once the concrete has dried, a surface sealer then applied. Follow the instructions of the respective material suppliers.

## Some final comments on overall appearance:

NZS 3114 states that finishes need to be assessed from a distance of 3 metres. This recognises the fact that concrete is inherently variable and will contain blow holes, air voids etc. Concrete made with alluvial aggregates will also contain some driftwood, which may be visible on the surface of the concrete if it is exposed. This is not a defect in the material. For critical applications a test panel may be required but even this will be difficult to organise as it will need to be a panel cast from a full load of concrete and placed in a similar environment to the planned pour. Quoting other jobs as reference work may be a suitable alternative. Which ever approach is adopted, the customer must realise and accept that some variations are inevitable.

Cracking is also another issue that needs consideration. This is especially the case where under floor heating is installed in coloured or exposed concrete. This topic is covered in more detail in our brochure "Managing cracks in architectural concrete".



Pictured above: Pinto, relatively infrequent problem but one that leaves all parties in a project disappointed. ... It happens regardless of concrete company, location, season, cement, admixtures, aggregates, and importantly for us happens in jobs both with and without colour.

Consult your Allied Concrete representative for specialised information.

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