TECHNICAL BULLETIN – TB130
Sources of Grout Discolouration
Real and Perceived

Date, 28 May 2009

INTRODUCTION & SCOPE

One of the more common issues that can occur with cementitious tile grouts is discolouration of the finished grout. There can be a number of causes of this phenomena and this bulletin will look at the issues involved.

COLOUR DOES NOT SEEM TO MATCH SAMPLES

NATURAL MATERIALS

The grouts are made from materials including cement and coloured oxides. These are based on natural substances and there can be a degree of variation in both the raw feed stocks and hence finished product. This can lead to slight variations in the colour of the grout itself.

VISUAL PERCEPTIONS

In some cases there is a visual illusion where the colour of the grout does not to seem to be right when adjacent to the tile. For example an old Ardex product FLEXGROUT came in two shades of white, Polar White and Ultrawhite. Though both looked white, in fact Polar White was slightly blue-grey and this may not become apparent till put up against a white tile. It is a good idea to try and compare the tiles and grout at the time of purchase.

It is also important to recognise that fluorescent, incandescent and natural light will all change the perceived colour of an object. The most accurate colour comparisons are done under sunlight, but it may be necessary to compare samples under the light in use at the site.

SAMPLE SWATCHES

The printed colour swatches on the grout packaging are for information only and are restricted by the printing process and may vary from the mixed colour.

The powder grout in the bag is usually a pale colour which is predominantly due to the cement. The mixed colour is darker and different in tone, so the powder shall not be used as an indication.

SHELF LIFE

When grouts have exceeded their recommended shelf lives, the changes in the cement component due to ageing can result in unpredictable colour effects. Some colourants may also alter with time.

Grout passed its shelf life shall not be used for this reason, as well as possible problems with cement curing.

NON UNIFORM JOINT DEPTH

Where the grout depth varies the shade of the grout can be irregular due to differential drying rates and shadows. When installing, keep the grout levels consistent, and rake out old grouts and excessive adhesive fully to ensure a constant thickness. Tile spacers must be removed and grout not put over these plastic sections.

Uneven tile glaze on edges

This can result in variations in colour due to differences in moisture absorption by the tile. This can be limited by misting the edges of the tiles with a fine water spray prior to grouting.

Installation & Site Moisture Issues

The grout application can have a bearing on the final colour due to both practice and site conditions.

Over-watering

The grout is designed to be mixed with a certain ratio of water to form a soft paste of roughly creamy consistency that holds its shape like toothpaste. Where the installer has added too much water, this can alter the colour due to both alterations in the cement properties and also separation of the colouring oxides from the mix. Also, the excess water takes longer to dissipate from the grout leading to apparent darkness however, the final resultant grout can be paler than expected, and also streaky or blotchy in appearance.

There is no simple remedy to this problem other than re-installation.

Poor mixing

If the grouts are badly mixed, then the colours can be variable because the colourants are not properly dispersed through the grout.

Ensure grouts are thoroughly mixed before application and mixing should be sufficient to ensure water is absorbed. The grout powder is added to water and mixed to achieve a consistent paste, let stand for 3 minutes, restirred and then applied.

Efflorescence

This is a physical condition that occurs where water soluble salts rise to the surface and then when the water evaporates the salts deposit out as a powdery or crystalline crust. These salts mainly come from cement based substrates such as the floor slab, adhesives or grouts, however in areas of high water table and rising damp these salts can come from the ground water and contain chlorides and sulphates.

With grout efflorescence is typically whitish in colour and results from soluble calcium salts being deposited. It can be blotchy or produce an overall light colouration. Primary efflorescence occurs immediately and secondary occurs at a later date.

Dark coloured grouts are more likely to show efflorescence due to colour contrast and *all* cement based materials can show efflorescence.

Efflorescence occurs due to several conditions and is made worse by cool temperatures and overall dampness, therefore winter and coastal or very humid environments are more likely to show efflorescence.

Sources

Where the tile installer has used excess water in both mixing the grout and also clean up, soluble salts can be leached from the grout cement (this also applies to the tile adhesive) and then deposits on the grout surface as drying occurs.

Cool temperatures at the time of installation both prolong cement curing and also retards water evaporation. This can increase the likelihood of efflorescence.

Where there is ground water, rising damp or damp slab, soluble salts can move with the ground water, or be leached from the slab, tile adhesive or grout and

deposit on the grout, since this is the most porous area for evaporation to occur. Efflorescence may also appear on porous tile surfaces and brickwork. Ground water and rising damp are beyond the scope of this bulletin, but should be addressed as they lead to other more serious problems.

Rain water running down tiled facades between the masonry walls and the tiled surface can generate significant efflorescence on the grout lines. Run off can also create efflorescence on the edges, but also within the field of decks and verandahs.

The tile grout has been applied too soon after the tile adhesive which has not fully dried. The moisture from the tile adhesive then leaches through the grout carrying soluble salts which deposit at the surface.

The slab or screed was not dry, or insufficiently cured and then moisture travels up through the grout.

Solutions

I. Stick to the correct water mixing ratios during installation.
II. Check that the slab or screed is properly cured and dry. Slabs typically take 28 days to cure, though drying is typically 25mm per month of slab thickness. Screeds take around 7 days to cure, and dry around 1mm per day.
III. Check that rising damp is not present.
IV. Try to work at temperatures above 10^0C and have adequate ventilation to promote water evaporation.
V. Allow adequate curing times for the tile adhesive.
VI. Where rising damp occurs a subfloor membrane may be required.

Cement derived efflorescence can be washed off by several processes -

I. Where it is light, use of a white nylon bristle brush can loosen the powder enough to be vacuumed up.
II. Where the efflorescence is slight to medium, scrubbing with a white bristle nylon brush and several water washes should progressively remove the deposits. A more aggressive method is to use white vinegar (commonly around ~5% acetic acid) which will neutralise the deposits and dissolve them. Thorough water rinsing is required afterwards.
III. Medium to heavy efflorescence may require more vigorous methods of cleaning. This involves using a dilute solution of hydrochloric acid (<5%) and a stiff white nylon brush. The acid will need to be neutralised afterwards either by household ammonia or 10% Sodium Carbonate solution (10gms washing soda dissolved in 100ml water).
IV. This is then followed by water washing to remove the residues.

WARNING – WHEN USING HYDROCHLORIC ACID, IT IS COMMERCIALLY AVAILABLE IN APPROXIMATELY 32% SOLUTIONS WHICH ARE HIGHLY CORROSIVE AND ALSO RELEASES IRRITATING ACID VAPOURS. (MAY ALSO BE CALLED MURIATIC ACID).

NEVER ADD WATER TO ACID WHEN DILUTING THE ACID. ALWAYS ADD ACID TO WATER WITH STIRRING.

WEAR SAFETY EYEWARE, PREFERABLY GOGGLES. IF THE ACID GETS INTO THE EYES, WASH IMMEDIATELY WITH FLOWING WATER FOR 10 MINUTES AND SEEK URGENT MEDICAL ATTENTION.

WEAR PROTECTIVE RUBBER GLOVES.

SUPPLY GOOD VENTILATION TO REMOVE ACID FUMES.

THIS ACID WILL READILY ATTACK UNPROTECTED STEEL, ALUMINIUM AND MAY ALSO MARK STAINLESS STEEL.

DISCOLOURING UNDER SEALERS

Where a sealer has been applied too soon after the grout has been installed, the moisture from the grout, and probably the adhesive can rise to the surface under the sealer and produce colour variations and patchiness.

The grout and adhesive must be allowed to cure for at least 14 days before sealers are applied.

COLOUR LEACHING IN POOLS

Where a coloured grout has been used in a pool or chlorinated pond, the chlorine acts as a strong oxidiser or bleaching agent and will over time fade the grout colour. Therefore Ardex does not recommend the use of coloured grouts other than whites in these situations.

Note: Bromine compounds used in spas are even more aggressive than chlorine chemicals.

MOULD GROWTH

Mould and algae are ancient forms of plant and well adapted to survival. Black mould can grow on the grout surface where the installation is dirty, the area is dark and ventilation poor.

The simplest solution is to clean the surfaces regularly, and have adequate air movement to allow moisture to disperse.

CONTAMINATION

Dirt and other rubbish can change the grout colour due to settling on the grout before it dries, or from dirty tools and/or work areas. Always ensure tools, mixing containers and work areas are clean before starting the job.

Never add extra colourants or other additives not approved by Ardex as these can alter the grout properties in unpredictable ways.

CLEANING

Cement based grouts are porous even when they contain additives such as grout booster. As a result they can discolour over time with cleaning, and this is particularly noticeable where the grout is a light colour.

Use of excessively concentrated acid when cleaning will cause severe discolouration and decomposition of the grout.

REASON FOR REVISION
24 month review. Flexgrout noted as obsolete and minor modifications made to the text for Visual Perceptions and Effloresence sections.

REVIEW PERIOD
24 months from issue

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