TECHNICAL BULLETIN

ISSUES WITH SAND-CEMENT SCREEDS AS SUBSTRATES FOR NON-CERAMIC TILE FLOORING SYSTEMS

INTRODUCTION & SCOPE

From time to time we encounter jobs where resilient flooring such as sheet or strip vinyl, linoleum, bonded timber, or a coating system such as epoxy has been specified to be applied over a sand-cement screed. These are used because they are egregiously perceived to be a cheaper alternative to engineered cement systems, and can be installed by less technical trades.

This bulletin discusses some of the issues and problems with this substrate when used with vinyl floor coverings.

WHAT SORT OF SCREEDS ARE WE DESCRIBING?

For the purposes of this discussion we are referring to screeds made from mixes of quartz sand-Portland cement, typically used for tile installations in the ratio of 1 part cement to 3 or 5 parts sand by volume, mixed with sufficient water to make the material workable. Typically screed thicknesses are 15 to 40mm for bonded screeds and a minimum of 40mm for un-bonded self supporting screeds (as defined in AS3958.1).

This discussion is not directed towards true concretes (sand-cement-gravel) or DUNLOP liquid applied self smoothing toppings.

WHAT DOES THE STANDARD SAY?

The 2012 revision to AS1884 makes the following comments about sand-cement screeds;

3.3 SAND-CEMENT SCREED SUBFLOORS

Sand-cement screed subfloors without polymer additives shall not be used for the installation of resilient flooring and their preparation products. This form of subfloor does not possess the required tensile and compressive strength for resilient floor covering installation.

Sand-cement screed subfloors with polymer additives that achieve a compressive strength of 20 MPa and tensile strength of 1.5 MPa are considered acceptable.

WHAT ARE THE ISSUES?

Whilst the standards committee has made this concession as a result of lobbying by builders and the construction industry, in our experience, this type of substrate is not normally satisfactory for a number of reasons.

The drying time of screeds is one millimetre screed thickness per day to reach an acceptable moisture content figure (as defined in AS1884-2012, which has tighter requirements than the 1985 version). This means that vinyl typically cannot safely be laid for anywhere from 40-60 days after the screed is placed, dependent on screed thickness. If flooring is applied directly over the 'young screed' there is a risk of development of moisture related de-bonding of the adhesive and blisters in the vinyl or coating. This prolonged drying also means that the job can be delayed for significant periods until a satisfactory measured moisture content is reached. Whilst this moisture issue can be alleviated with a coating of an Ardex water based epoxy sealer, or DUNLOP DAMPROOF such a process does not cure problems such as the next two below.

Primary issues

A) We have seen a number of institutional wet area installations where vinyl flooring has been applied over sand-cement screeds. Whilst the screed might be initially 'rock solid', the point loading of wheel chairs, commode chairs and trolleys, and also the shearing forces these devices create when turning eventually causes the screed to break down and fail. The vinyl then breaks away from the weakened surface, taking the top layer with it.

We have also inspected installations where epoxy coatings have lifted the top off the 'screed' in sheets as a result of drying ten-

sion, and also where bonded timber has torn chunks out of the screed when it has moved after being subjected to moisture change related movements.

Whilst concrete typically has compressive strengths from 20MPa upwards (minimum required), sand cement screeds are commonly in the range 1 to 5MPa so are not very strong. To some extent low strength can be ameliorated by the use of additives such as DUNLOP PRIMER & ADDITIVE or Ardex related products to the gauge water, but this still does not increase the strength to that of sound concrete, or get around slow drying and cure. To achieve even 10MPa is not easy with sand-cement, and to have a hardness of 20MPa or tensile of 1.5MPa requires correct densification and good compaction, which is rare in the Australian building environment.

The low strengths usually seen are not as problematic where a hard floor covering such as ceramic tiles are installed, but when a thin soft covering such as vinyl or low thickness epoxy coating is used, loads are applied more directly to the screed itself.

There is no easy way to determine whether a screed is sound enough by visual examination, and the only way is to conduct a program of tensile surface tests throughout the screed installation area. That being said, the properties of a screed can vary by the metre so even this is not a 'bullet proof' proposition.

B) Sand-cement screeds suffer from great variability in properties including sand-cement ratios, quality of mixing and degree of aeration, degree of compaction, and amount of gauge water used. These variability issues make traditional sand-cement screeds unsuitable for direct application of thin floorcoverings where a consistent and sound substrate is required.

Other issues

So called Granolithic screeds provide a stronger screed than pure sand-cement because the range in aggregate size (typically 0.1 to 4mm size sand and gravel) provides a more effectively packed matrix. These screeds can achieve the required strengths with the correct compaction, however drying times are still problematic and smoothness is not guaranteed. It can also be difficult to obtain correctly graded sand-aggregates.

The use of reactive 'densifiers' is not an absolute cure to strengthen a sand-cement screed because they do not work as effectively on the open matrix of a screed. If there is insufficient cement in the screed then the reaction cannot occur effectively anyway. By the same token application of epoxy binders may not also harden up a screed sufficiently, or worse will only harden the surface leading to formation of a crust over weak material.

Sand-cement screeds often do not provide a sufficiently flat-smooth surface for vinyl where even small irregularities can show through. The required flatness and smoothness defined in AS1884-2012 are:

3.1.1.4 Surface quality

The surface of a concrete subfloor shall be thoroughly checked for the following:

(a) Planeness When a straightedge 2000 mm long is placed at rest at two points 2000 mm apart on the surface, no part of the surface shall be more than 4 mm below the straightedge.

(b) Smoothness When a straightedge 150 mm long is placed at any position at rest at two points on the surface, no part of the surface shall be more than 1mm below the straightedge.

(c) Soundness The surface shall be without cracks, crazing, dusting, rain damage, spalling, efflorescence or blistering.

Sand-cement screeds would require high levels of preparation to achieve these figures, however the required compaction to create the strength needed

would also assist in the flatness and smoothness.

It should also be noted standard sand-cement screeds are not suitable substrates for DUNLOP Liquid Smoothing Cements to be applied over, and DUNLOP reserves the right not to make recommendations for, or warrant its flooring products where sand-cement screeds have been installed as the base.

WHAT IS THE SOLUTION?

Thinner layers 3-12mm

The recommended DUNLOP smoothing systems for the installation of resilient flooring, timber or coatings are based around a smoothing cement applied over the rough concrete substrate. The smoothing cements provide a smoother, flatter, harder, stronger and more homogenous surface. More critically the smoothing cements cure in as little as 60 minutes, or up to 48 hours for the slower products, which means the job is not held up waiting for the substrate to dry. DUNLOP smoothing cements offer superior performance to sand-cement screeds and are acceptable underlayments under Australian floor covering standards.

Thicker layers >10mm

Where there is an existing screed of significant thickness, a cost effective solution is replace the screed with an aggregate filled smoothing cement. The surface can then be smoothed with a thin layer of liquid smoothing cement or patch mortar.

Notes

Always refer to the product data sheets for specific usage details.

The information contained herein is to the best of our knowledge true and accurate.

No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of the product application.

Users are asked to check that the literature in their possession is the latest issue.

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