TECHNICAL BULLETIN – TB173

RAIN AFFECTED SURFACES

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INTRODUCTION & SCOPE

During construction and renovation of buildings, one of the enemies builders face is the weather. In particular when rail falls on incomplete constructions a number of complications can arise which then potentially jeopardise the performance of underlayments, membranes and tile systems.

In this short bulletin we will look at two problems areas, timber floors that are rained on or flooded, and new concrete rained on before cure.

TIMBER FLOORS

Timber is considered to be a 'living' thing and moisture can produce significant changes in the substrate. The two main situations encountered are new floors that are rained on during construction or renovation, and floors that are flooded by rising waters. The type of timber the floor is constructed from partially controls the type of corrective action required, and the final outcome.

Particleboard

This type of floor is made up of fine woodchips held together with a glue which is usually water based. Some types have waterproof or resistant coatings to protect the surface from temporary wetting.

Where this floor type is rained on, the degree of damage is dependent on the amount of water that has pooled on the surface. Where pooling water has occurred the particleboard can lose the adhesive (brown stains are good indicators) and the board swells. Typically the surface becomes rough and lumpy and the fibres appear prominent. The depth of damage depends on how much water was present and for how long. In more severe situations the boards warp and can be structurally weakened to the point of requiring replacement.

Floors that are flooded by rising water display similar properties to rain damage, however water effects both sides of the board and not just the top. Floors that have been flooded are likely to have been structurally damaged and should be considered suspect and unsuitable for bonded floor coverings unless shown to be otherwise by the flooring manufacturer or an engineer.

AS1884-2012 says;

> ***3.2.6.5*** *Particleboard subfloors*
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> *(b) The subfloor shall be inspected for dampness before proceeding with sanding and other finishing operations. This is particularly important for platform construction where exposure to the weather has occurred. The underside of the floor shall also be inspected. A damp particleboard subfloor shall be left to dry until a moisture content of less than 15% is obtained throughout.*
> *(c) Where particleboard has been exposed to the weather during construction, the entire surface shall be finished to a firm tight level surface using normal timber sanding equipment.*

Rectification

Where the floor is structurally sound, the surface will require complete sanding to remove all loose and damaged material. The depth of sanding will have to be determined in each case. In particular the sheet joints require attention as cupping curling of the sheets occurs, with the edges being most affected. When sanding significant depths off the floor,

it becomes necessary to consider whether too much material will need to be removed, thus making the floor structurally unsound.

After the floor has been sanded, the surface requires complete vacuuming and de-dusting.

The preferred option prior to ceramic tiling is to apply fibre-cement sheet underlay which provides a more stable surface for bonding.

Where smoothing cements such as Arditex or Feather Finish are to be applied, these can be poured directly onto the primed surface of the prepared timber. Hardboard underlay can also be used prior to application of carpets or resilient flooring. It is not recommended to apply high strength materials such as K15 onto water damaged particle board.

Waterproofing can be applied as per the relevant product recommendations, however it is preferable to sheet the floor with fibre-cement underlay sheets as these provide a more stable base than the particleboard itself.

Plywood

Plywood is made from thin layers of wood that are glued together with an adhesive and compressed. The thicker the plywood, the more laminate layers are present.

The situation with water exposed plywood is similar to particleboard, though water resistant marine grade ply is much less likely to be damaged by short lived exposure.

Plywood swells and the laminates de-bond when water exposed. Sanding the surface of plywood is not going to fix problems of this type and only removes surface roughness. As a result flooded plywood floors are more likely to require replacement than particleboard.

AS1884-2012 says;

> ***3.2.6.4*** *Plywood subfloors*
>
> *(b) The subfloor shall be inspected for dampness before proceeding with sanding and other finishing operations. This is particularly important for platform construction where exposure to the weather has occurred. The underside of the floor shall also be inspected. A damp plywood subfloor shall be left to dry until a moisture content of less than 15% is obtained throughout.*
> *(c) Where plywood has been exposed to the weather during construction, the entire surface shall be sanded to a firm tight level surface using normal timber sanding equipment. The first cut shall be with not less than 60 grit paper and may be followed with 100 grit paper as a finishing cut.*

Strip Timber

These floors are made from planks of timber and not are ‘man made’ like particleboard and plywood. Typically the planks are between 75 and 120mm wide and 18-20mm thick.

Where these floors are water exposed the timber swells, deforms and can develop permanent warping. Significant forces can be generated which may cause other structural damage to surrounding building elements such as walls. Where the floor has not been permanently warped, the boards will usually return to their previous dimensions over time as they dry out.

Rectification

Permanently warped and distorted floors will require replacement. Floors that return to their original dimensions and are ‘dry’, require the nails to be re-secured, followed by sanding and vacuuming.

Where tiles are to be installed, it is recommended that the floor be clad with fibre-cement underlay sheets. Underlayment cements can be directly applied after appropriate priming. Strip timber floors are not classified as suitable for wet areas under AS3740 so waterproofing does not apply in this case.

Where rain falls onto 'wet' or partially hardened concrete, the surface can suffer significant damage. The degree of damage depends on how hard the concrete is, how much rain falls, and how hard it falls onto the surface.

Heavy rain both physically roughens the concrete surface making it irregular, and also leaches out the cement part of the concrete. Material is washed away, and wet concrete can be completely removed. The cement reduced concrete is much weaker because it contains more sand and aggregate, and also typically has a crust of laitance (leached materials) on top. The depth of damage is again dependent on the heaviness of the rain and the amount of flooding, but damage can extend down to 20mm into the concrete.

Rain damaged concrete is typically powdery and weak on the surface and is unsuitable for any type of tiling, underlayment or waterproofing.

AS1884-2012 says;

> ***3.1.2 New concrete subfloors***
>
> ***Surface***
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> *"..Concrete surface physical defects which also compromise adhesion of flooring systems, such as laitance or rain damage to the concrete surface, shall also be removed by mechanical preparation methods…."*

Rectification

The only method of preparing rain damaged slabs is via mechanical methods, using processes such as heavy grinding, or more typically scarifying and scabbling are required. Thickness of material that requires removal may be up to 15-25mm depending on the degree of damage. However, the process of scabbling is quite severe and needs to be done with caution as it is easy to remove excess material, and also overstress suspended slabs.

We have had inquiries concerning strengthening the surface by the use of reactive densifiers or epoxy resins. The reactive densifiers based on silicates (SiOx) require there to be cement and free lime present. The rain damage process leaches the cement away and hence the lime is missing, so there is little for the SiOx to react with. The sandy matrix also tends to be too porous leading to problems with the limited void bridging properties these materials have. Even if they penetrate and harden the surface lower down, there is still the weak surface material present. This is the opposite to the issue with application of hardening resins like epoxies. The surface material is bound up, but the lower down the weak material can remain. In this case, the applied strains can remove the hardened material which de-bonds in the weaker material beneath it.

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