DATAsheet

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DUSTING Concrete Surfaces

WHAT IS DUSTING ?

A dusting floor surface is marked by an accumulation of fine material requiring to be swept up after the floor has been used. A hand rubbed over the surface of a dusting floor will be coated with a fine powder.

WHAT CAUSES DUSTING

Dusting is caused by the wearing surface being weak and the matrix not properly bonding the fine aggregate particles. The major causes are:

- Inappropriate concrete specification for the required strength and abrasion resistance.
- The addition of water in excess of that required by the mix design. This generally increases bleeding which results in more water and fines at the surface of the slab and ultimately in a weak, permeable surface layer with low wear resistance.
- Premature finishing. If finishing operations are performed while bleed water is on the surface, the water will be worked back into the surface layer of the concrete producing a very high water-cement ratio and, therefore, a low-strength surface layer.
- Excessive use of water during finishing. Spraying the surface with water during finishing to facilitate either the movement of the trowelling machine from one area to another, or to wet a surface that has not been adequately protected against hot or drying conditions and allowed to dry out, may have the same effect as premature finishing.
- Rainwater. Rainwater falling onto the surface before the concrete has achieved final set may also have the same effect as premature finishing.

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- Inadequate curing. Failure to adequately cure (or not cure) concrete and allowing rapid drying of the surface (especially in hot, dry and windy weather) often results in a weaker surface layer which may dust even under foot traffic. Proper curing is an essential requirement for good quality concrete and a durable surface.
- Inadequate compaction. If the surface is not adequately compacted or finished, reduced abrasion resistance will result.
- Use of dry cement. If dry cement is used to soak up surface water to allow earlier finishing, the quantity of fine material at the surface is increased, often resulting in a weak surface layer.
- Freezing of the surface. If the surface freezes prior to sufficient strength gain, the concrete matrix can be disrupted by the expansion of the water, creating a weak layer.

PRACTICES TO MINIMISE THE RISK OF DUSTING

To minimise the incidence of dusting:

- Specify an appropriate concrete strength for abrasion resistance, ie not less than that given in Section 4 AS 3600[1].
- Do not add excess water to the concrete mix.
- In general, use concrete with a moderate slump, say 80 mm. In cold weather, delayed setting will increase bleeding and may require the use of a lower slump. In hot weather, acceptable setting times and bleed rates can still be achieved with higher slump levels, providing the mix is designed to perform at such slumps without causing excessive bleeding or segregation.
- Do not overwork the concrete initially as this may seal the surface and trap bleed water under the surface layer. Also, fine material may be brought to the surface.
- Do not perform any finishing operations with bleed water or rainwater present on the surface. If rain threatens, a method to protect the surface should be available. Final bull-floating or trowelling should be performed only after all the bleed and surface water has evaporated or been removed.
- Do not sprinkle or trowel dry cement into the surface of plastic concrete to absorb bleed water or rainwater. Remove bleed water by dragging a garden hose across the surface or by using a rubber squeegee.
- Compact the surface of the floor with a surface vibrator and/or use one of the finishing techniques giving improved abrasion resistance, eg several passes with a helicopter float[2].
- Ensure the concrete is properly cured either by keeping the surface continuously damp for three to seven days, coating it with an appropriate membrane curing compound, or covering it with a polythene sheet[3].
  Note that covering the surface with polythene sheeting, hessian or sand should not be used for coloured concrete, as these materials may promote uneven colour or staining.

REPAIR OF DUSTING SURFACES

Repair of dusting floors is difficult; it is best to avoid or minimise the risk by adopting the techniques outlined above. Recommended repair methods include:

- Application of a chemical surface hardener or dust inhibitor. In the majority of cases, dusting can be rectified by the use of a surface hardener such as sodium or fluoro silicate. These products react with the calcium hydroxide in the concrete to produce additional cementitious compounds. They should be applied only to concrete that is at least 28 days old. Some surface hardeners may restrict future application of finishes. Surface hardeners should be applied in accordance with the manufacturer's recommendations. Note that they will not improve the appearance of the surface if it has been affected by the loss of the surface layer through wear.
- Grinding the surface. In more severe cases, the complete removal of the weak surface layer with a concrete grinder may be required. This will alter the appearance by leaving a smooth 'polished' concrete surface having the aggregate visible. Note that the depth of the weak surface layer does not increase with time, so grinding back to sound concrete of adequate strength can be an effective solution.
- Applying a topping. The weak surface layer could be removed by scabbling and replaced by a topping. If levels need to be maintained, a number of proprietary topping products that bond to the existing concrete can be placed at thicknesses of about 10 mm. If levels are flexible, a 70- to 80-mm-thick unbonded topping (overlay) on the existing floor can be used.
- In some domestic applications, installation of a floor covering such as carpet or tiles may be a cost effective solution. The concrete surface should be checked for adequate strength if the floor covering is to be bonded to it.

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REFERENCES

1 AS 3600 *Concrete Structures* Standards Australia.

2 *Industrial floors and pavements: Guidelines for design construction and specification* Cement and Concrete Association of Australia, 1999.

3 *Guide to Concrete Construction* (T41/HB64) Cement and Concrete Association of Australia and Standards Australia, 2002.

FURTHER INFORMATION

Further information can be found on the Cement Concrete and Aggregates Australia website: **www.concrete.net.au**.

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