



## *How to embark on non-structural concrete repairs*

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THE DURABILITY OF CONCRETE IS EXCEPTIONAL AND WELL-KNOWN, BUT SOMETIMES CONCRETE CASTING DEFECTS AND OTHER OPERATIONAL ERRORS CAN CAUSE UNSIGHTLY SUPERFICIAL SURFACE DAMAGE. HERE BRYAN PERRIE, CEO OF CEMENT & CONCRETE SA (CCSA), GUIDES THE BASIC PRINCIPLES OF REPAIRING SUCH NON-STRUCTURAL PROBLEMS.

Firstly, repairs to new concrete should be done as soon as possible after the formwork has been removed to reduce differential shrinkage and improve the bond between the original concrete and the repair material. Before repairing, all dust and residues must be removed from the surface to be treated by, for example, washing vertical and near-vertical surfaces with clean water.

For manual repairs, suitable for small areas, feather edging - trying to blend the repair material into the existing concrete - should be avoided. The outline of a repair should be cut with a masonry cutting disc or saw to ensure a square edge.

Good adhesion between the original concrete and the

repair material is essential and, to ensure this, the surface of the original concrete must be robust, rough, and clean. Any loose or weak material must be removed with sharp chisels, driven by relatively light hammers. But it is crucial to remove the unwanted concrete so that the remaining concrete is not severely damaged. Sand-blasting, which can remove small volumes of concrete, is an excellent means of achieving a rough surface free of loosely adhering material.

In cases where the repair areas are significant (say over 0.1m<sup>2</sup>) and significantly where falling fragments could injure persons, it is strongly recommended not to rely solely on adhesion between repair and background concrete but to provide mechanical fixing.

Such fixing should be done with corrosion-resistant metal devices such as screws or rods, preferably stainless steel. Fixing devices should be installed after the surface preparation is complete but before the surface is cleaned.

To ensure strong adhesion of fresh concrete or mortar to a substrate of hardened concrete, the substrate should have enough suction to absorb the water film at the interface but should not desiccate the repair material. This limited suction can be achieved in different ways, depending on the age and density of the concrete. If the concrete is relatively new - say within 48 hours of being placed - simply allowing the surface to become visibly dry should suffice. Concrete with low absorptiveness does not require pre-wetting and should be repaired in a dry state.

The substrate should be primed with a slurry immediately before the repair material is placed. The primer slurry should be a mixture of equal cement and dry plaster sand with sufficient water to achieve a "paint consistency." Neat cement paste is difficult to mix and is therefore not recommended. Polymer emulsion may be added to the mixing water - one part emulsion to two parts water is usually satisfactory.

Primer slurry must be applied as a thin coating to the substrate using suitable brushes. Do not allow the primer to accumulate in depressions on the surface and prevent the primer from drying before applying the repair material. Priming must therefore be done immediately ahead of repairing and is best done over a small area at a time. Polymer emulsion on its own must never be used as a primer.

Older concrete should be assessed for absorptiveness by wetting the surface: if the water is rapidly absorbed, the absorption rate would be too high, and if the water is hardly absorbed, the rate is too low. Concrete with high absorptiveness should be saturated for some hours before repairs are being carried out. Surface water must then be removed and the surface allowed to become visibly dry, and repairs are undertaken straight away. Remember never to attempt repairs to concrete that has a water sheen.

Good compaction is essential in concrete repairs. Semi-dry mixes must be compacted by heavy tamping and plastic mixes applied with heavy pressure on the trowel or spatula.

Where appearance is essential, repairs should be

finished to match the texture of the surrounding concrete using tools such as wood floats, steel trowels, sponges, wire, and nylon brushes. If color matching is essential, it should be noted that repairs tend to be darker than the original concrete when dried out. So, white portland cement may be substituted for about a third of the grey material if such a color match is required. The optimum substitution ratio should be determined by test: repair an unimportant area and assess color once the repair material has hardened and dried.

Repairs must be moist cured for at least seven days. Plastic sheeting, fixed along the edges of the concrete with pressure-sensitive tape, is effective in trapping moisture and ensure adequate curing. Good quality membrane-forming curing compounds may also be used but remember that drying of the concrete repairs may be retarded if these curing compounds are not removed from the surface.

After completing of the curing period, polymer-modified repairs must be allowed to dry out completely before being subjected to wet conditions. This allows the emulsion to merge and become water-resistant.

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