



Surface Cracking

Cracking of concrete surfaces are undesirable and can cause much tension between the owner, concrete supplier, and concrete finishers. Cracks can be repaired later but usually the repair work is not to the owner's satisfaction with the end product well below the owner's expectations. The best ways to deal with the issue of cracking is to prevent them from occurring in the first place. Reinforcement and joints are typically used to control cracking. Excessive cracking can expose reinforcement to air and moisture which leads to corrosion (rust). Corrosion over time stains and weakens the concrete. With proper joint practices the formed, tooled, or saw cut joints can provide a place for cracks to form without leaving the concrete surface randomly cracked.

Types of Cracks in Concrete Surface

Two types of cracks occur in concrete.

Pre-hardened cracks: Cracks that form prior to the stiffening of hardening of concrete or while it is still workable.

Hardened cracks: Cracks that form after the concrete sets and hardens.

Pre-hardened cracks typically form during placing, consolidating, and finishing procedures caused by movements of the concrete prior to developing any significant strength. There are three defined types of pre-hardened cracks:

- 1) Plastic Settlement
- 2) Plastic Shrinkage, and
- 3) Cracks that occur due to movement of formwork.

If detected early enough, the pre-hardened cracks can be remedied by reconsolidating, re-floating, and/or re-troweling.

Plastic Settlement Cracks

When do Plastic Settlement Cracks form?

Plastic settlement cracks form soon after the concrete is placed and while it is still workable. When the concrete begins to dry out the cracks begin to increase in width and the cracks tend to follow the lines of reinforcement. To correct the defect of plastic settlement cracking, the concrete finishers can re-vibrate and re-trowel the surface. This takes an observer to look for cracks to occur while the concrete is setting. Introducing synthetic fibers into the concrete can also mitigate this type of cracking.

Plastic Shrinkage Cracks

When do plastic shrinkage cracks form?

These types of cracks form on hot days when there is low humidity weather conditions and with moderately windy conditions. These cracks can even occur in winter because of cool, low humidity air masses settling into the south when cold fronts pass through from the northern region of the U.S.

Plastic shrinkage cracks appear in lines roughly parallel and are typically 12-24 inches long but sometimes may be anywhere from 1 inch to 2 yards in length. Prevention of plastic shrinkage cracks can be accomplished by keeping subgrade and forms damp during placement. Place, consolidate, and cure quickly on hot days to prevent cracking. Protect concrete surfaces from wind or apply evaporation retarder onto the surface. Synthetic fibers in concrete can combat the appearance of plastic shrinkage cracks, also. Cracks can be closed by reworking the plastic concrete in many cases.

FORMWORK MOVEMENT

If formwork is not strong enough it may bend or bulge. Formwork movement may happen at any time during placement and consolidation. To prevent this from happening make sure the formwork is strong and can withstand the pressure exerted during concrete placement and consolidation. If the concrete collapses, strengthen the formwork and re-vibrate the concrete.

THERMAL SHOCK

Applying cold water for curing over concrete on a hot day can result in cracks from the sudden contraction of the concrete as it cools quickly. To prevent this from happening, only use warm water or other curing methods, like membrane curing compounds.

CRACKS IN HARDENED CONCRETE

Cracks after hardening may be caused by drying shrinkage, movement, or settling of the ground, or placing higher loads on the concrete than it was designed to carry. Little can be done with cracks after hardening. Careful and correct placement helps prevent serious cracking after hardening. Only uncontrolled cracks are a possible problem. Cracking at control joints or controlled cracking by steel reinforcing is expected and acceptable.

With proper concrete design and construction practices that account for anticipated loads, contraction during drying, and uniform subgrade support the outcome will be to the owners liking and averting disputes or litigation.

Additional Questions?

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