

Any factor that delays setting increases the possibility of plastic shrinkage cracking. Delayed setting can result from a combination of one or more of the following: cool weather, cool subgrades, high water contents, lower cement contents, retarders, some water reducers, and supplementary cementing materials.

HOW to Minimize Plastic Shrinkage Cracks

Attempts to eliminate plastic shrinkage cracking by modifying the composition to affect bleeding characteristics of a concrete mixture have not been found to be consistently effective. To reduce the potential for plastic shrinkage cracking, it is important to recognize ahead of time, before placement, when weather conditions conducive to plastic shrinkage cracking will exist. Precautions can then be taken to minimize its occurrence.

- a. When adverse conditions exist, erect temporary windbreaks to reduce the wind velocity over the surface of the concrete and, if possible, provide sunshades to control the surface temperature of the slab. If conditions are critical, schedule placement to begin in the later afternoon or early evening. However, in very hot conditions, early morning placement can afford better control on concrete temperatures.
- b. In the very hot and dry periods, use fog sprays to discharge a fine mist upwind and into the air above the concrete. Fog sprays reduce the rate of evaporation from the concrete surface and should be continued until suitable curing materials can be applied.
- c. If concrete is to be placed on a dry absorptive subgrade in hot and dry weather, dampen the subgrade but not to a point that there is freestanding water prior to placement. The formwork and reinforcement should also be dampened.
- d. The use of vapor retarders under a slab on grade greatly increases the risk of plastic shrinkage cracking. If a vapor retarder is required, cover it with a 3 to 4 inch

lightly dampened layer of a trimable, compactible granular fill, such as a crusher-run material (ref. 2).

- e. Have proper manpower, equipment, and supplies on hand so that the concrete can be placed and finished promptly. If delays occur, cover the concrete with moisture-retaining coverings, such as wet burlap, polyethylene sheeting, or building paper between finishing operations. Some contractors find that plastic shrinkage cracks can be prevented in hot dry climates by spraying an evaporation retardant on the surface behind the screeding operation and following floating or troweling, as needed, until curing is started.
- f. Start curing the concrete as soon as possible. Spray the surface with liquid membrane curing compound or cover the surface with wet burlap and keep it continuously moist for a minimum of 3 days.
- g. Consider using synthetic fibers (ASTM C 1116) to resist plastic shrinkage cracking.
- h. Accelerate the setting time of concrete and avoid large temperature differences between concrete and air temperatures.

If plastic shrinkage cracks should appear during final finishing, the finisher may be able to close them by refinishing. However, when this occurs precautions, as discussed above, should be taken to avoid further cracking.

References

1. *Hot Weather Concreting*, ACI 305R, American Concrete Institute, Farmington Hills, MI.
2. *Guide for Concrete Floor and Slab Construction*, ACI 302.1R, American Concrete Institute, Farmington Hills, MI.
3. *Standard Practice for Curing Concrete*, ACI 308, American Concrete Institute, Farmington Hills, MI.
4. *Concrete Slab Surface Defects: Causes, Prevention, Repair*, IS177, Portland Cement Association, Skokie, IL.
5. Bruce A. Suprenant, *Curing During the Pour*, Concrete Construction, June 1997.
6. Eugene Goeb, *Common Field Problems*, Concrete Construction, October 1985.

Follow These Rules to Minimize Plastic Shrinkage Cracking

1. Dampen the subgrade and forms when conditions for high evaporation rates exist.
2. Prevent excessive surface moisture evaporation by providing fog sprays and erecting windbreaks.
3. Cover concrete with wet burlap or polyethylene sheets between finishing operations.
4. Use cooler concrete in hot weather and avoid excessively high concrete temperatures in cold weather.
5. Cure properly as soon as finishing has been completed.