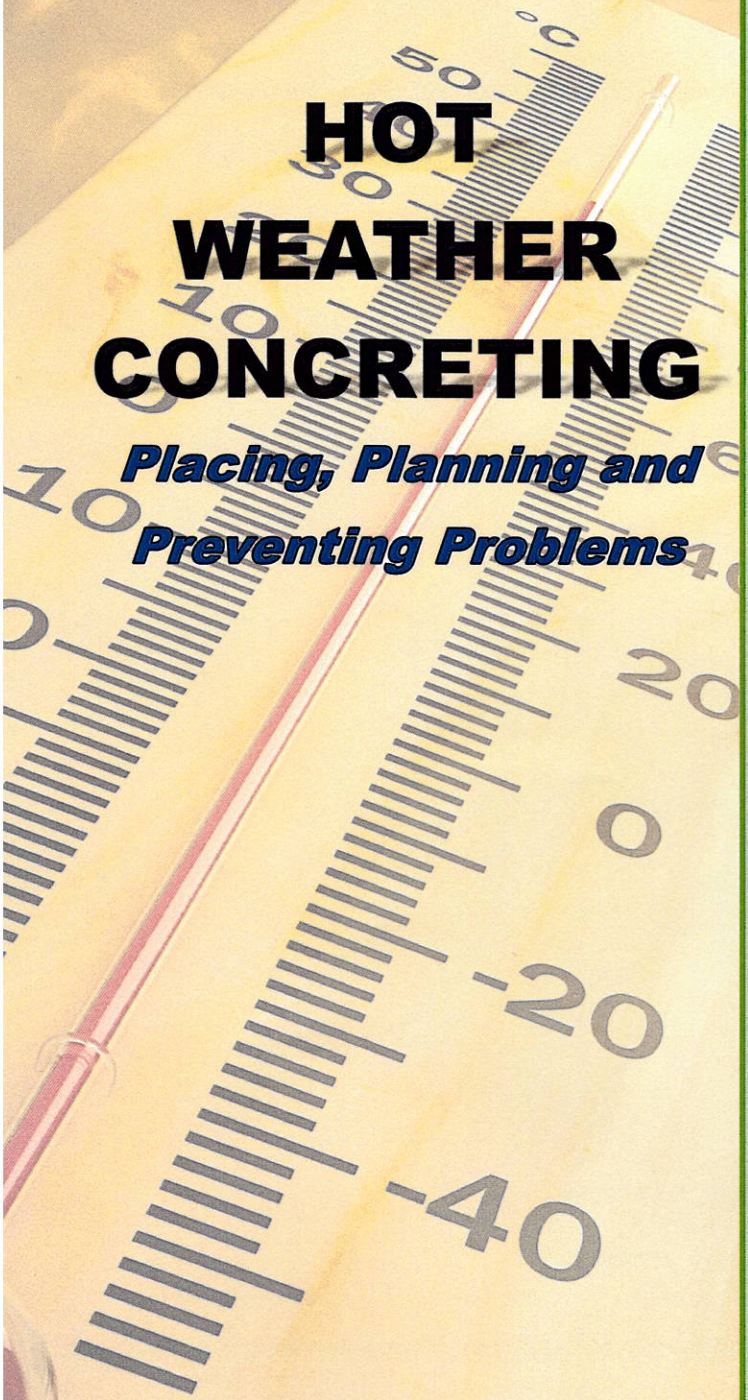
THE Concrete DIFFERENCE

Concrete Information for the Owner, Designer, Contractor and Producer

HOT WEATHER CONCRETING

Placing, Planning and Preventing Problems



Placing, finishing, and curing concrete in hot weather requires extra care and a little extra planning. Hot weather issues encountered in plastic concrete include increased water demand, increased rate of slump loss, increased concrete temperature, shortened setting time, and possible increased plastic shrinkage and craze cracking. Issues encountered in hardened concrete include lower strengths, increased potential for uncontrolled cracking, and decreased durability.

When the temperature of freshly mixed concrete starts to exceed 77° F, precautions to ensure a quality finished product should be implemented. As a general rule of thumb an increase in the concrete temperature by 20° F will reduce the setting time of a concrete mixture by as much as 50 percent. As an example, a concrete mixture that typically reaches final set in six hours at 60° F may actually reach final set in as little as three hours at 80° F. The first steps in controlling concrete temperature are taken at the batch plant, including, but not limited to; using a mix that has performed properly in hot weather, using chilled water or ice, shading and wetting aggregate stockpiles, incorporating supplementary cementitious materials, and using a retarding admixture. Precautions such as these should be planned in advance with the contractor to counter the effects of high temperatures.

Precautions for the contractor dealing with plastic concrete issues should include; having the forms set and ready for placement, moistening the subgrade prior to placement, providing sufficient labor to minimize the time required to place and finish the concrete, erecting temporary wind breaks and sunshades to reduce concrete surface temperatures, and protect the concrete surface during placement with evaporation retarders or plastic sheeting to maintain the initial moisture in the concrete mixture.

Careful testing and proper cylinder care can eliminate some of the disputes and job delays that result after low strength test results are reported. ACI puts the responsibility on the shoulders of the contractor to ensure that proper testing and curing of cylinders is performed. Test cylinders must be kept between 60° F to 80° F immediately after they are cast and until they are transported to the testing lab. An easy way to accomplish this is to place test cylinders in a water filled tank or curing box. Keep the box out of the sun and cool the water with ice if necessary. High initial curing temperatures alone can significantly reduce the 28-day strength by as much as 10 percent. Prevent test cylinders from moisture loss by casting them in plastic molds with plastic lids or by covering them with plastic sheets.

Be sure to monitor the addition of water added at the job site. Added water can decrease strength, durability, and abrasion resistance while increasing shrinkage and permeability.

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When producing and placing concrete in hot weather, advance planning and communication by the engineer, contractor, testing laboratory, and ready mixed concrete producer can prevent hot weather concreting issues. It may be as simple as scheduling a preconstruction meeting to discuss the aforementioned precautions and the plan to control the effects specific to the project and expected conditions. Preventing issues before they occur can result in concrete that is of greater durability and higher quality to the owner.

References:
ACI Committee 305, Hot Weather Concreting, American Concrete Institute, Farmington Hills, MI
"Hot Weather Concreting," Design and Control of Concrete Mixtures, Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois
"What, Why, & How – Hot Weather Concreting," Concrete in Practice Note 12, National Ready Mixed Concrete Association, 900 Spring Street, Silver Spring, Maryland

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