# HOT WEATHER CONCRETE
## (An Annual Revisit)

In the concrete business, "hot weather" creates situations that require special procedures for proper concrete mixing, placing, finishing, protection, and curing. "Hot weather" includes high ambient air temperatures, high concrete temperature, low relative humidity, and/or high winds. Any one of these conditions can impair the quality of freshly-mixed or placed concrete. This ***"Lessons Learned"*** briefly discusses the affects of hot weather and some construction practices to mitigate its impacts. The American Concrete Institute's publication ACI 305R-10 is an excellent reference for further information.

### Effects of Hot Weather on Concrete

The most pronounced effects of hot weather on concrete are an increased rate of setting and rapid water loss. Higher temperatures can cause a lower slump, and consequently a decrease in workability. Plastic-shrinkage cracking of placed and finished concrete is frequently associated with hot, windy weather, and is most often the result of rapid evaporation of moisture from the concrete surface. Hot weather can affect both the early and ultimate strengths of concrete. Although initial strength may be accelerated, the 28-day strength of concrete cured at elevated temperatures may be lower than that of concrete cured at more moderate temperatures.

A decrease in slump as mentioned above can lead to the addition of water onsite for increased workability. Addition of water beyond the amount required by the approved mix design can increase the water-cementitious material ratio which can result in decreased compressive strength, an increased likelihood of shrinkage cracking, and a decrease in durability.

### Hot Weather Concrete Construction Practices

There are several basic precautions that should be considered to reduce the damaging effects of hot weather on concrete:

- Use mix designs that are less susceptible to the affects of hot weather. The use of low-heat-of-hydration cement and certain admixtures (such as hydration retarding and/or water-reducing admixtures) are two common approaches.
- Keep concrete as cool as reasonable. ACI 305R does not state a maximum "as-placed" or "as-delivered" concrete temperature, but 90°F is commonly specified. In some instances, substituting chilled water or shaved or chipped ice for a portion of the required mix water is needed.
- Schedule large concrete pours in the early morning or evening when temperatures are cooler.
- Limit the amount of time between concrete loading at the plant and placement and finishing at the site. This may suggest scheduling critical placements when traffic conditions are typically not as congested.
- Limit addition of water at the job site, except to adjust slump upon arrival (when permitted by mix design and project specifications).
- Avoid or limit the use of hydration accelerating admixtures.
- Use temporary wind screens and water misting nozzles to reduce surface moisture loss during placement and finishing.

Initial curing is critical for concrete quality. Once the concrete has been delivered to the site, placed, and finished, efforts must continue to protect the concrete during curing. The most effective technique of curing is moist curing by continuously wetting the concrete surface, and it is the best method for developing the maximum potential for concrete strength and a reduction of shrinkage cracking. Curing compounds are also very popular. While curing compounds can be effective, they must be sprayed onto the concrete in sufficient quantity and evenly to retain moisture in the concrete. The manufacturer's recommendations should be followed to obtain the desired results. Curing compounds are often not used for indoor floors due to possible adhesion-compatibility issues with finished flooring materials.

Special attention should also be paid to the laboratory-cured concrete test cylinders. They should be stored on the job site for the initial curing period of approximately 24 hours at a temperature between 60°F and 80°F for normal-strength concrete, and be covered to reduce loss of moisture. This typically requires a temperature-controlled concrete cylinder curing box that utilizes air conditioning, ice, or other means to maintain the cylinders between 60°F - 80°F.

Detailed planning for hot weather concrete is essential. A special preplacement meeting is highly recommended to clarify the requirements for hot weather concreting to address the wide range of possible actions, and to define responsibilities.

We hope this ***"Lessons Learned"*** is helpful to you on a project this summer, or on future projects. For additional information on hot weather concrete, please contact your nearest ECS office.

Respectfully,

**ECS Corporate Services, LLC**