



Texas Aggregates and Concrete Association

Position Statement #5

Application of a Max Temperature Specification *Does a Maximum Concrete Temperature Make Practical Sense?*

Hot weather concrete practices are generally governed by ACI 305 Hot Weather Concreting. This document is typically the basis for most specifications that directly address the allowable temperature of concrete at placement. However, in reading the document and others, there are some interesting contradictions regarding the application of a maximum allowable concrete temperature. In Section 2.3.1, it states,

"In the more general types of hot weather construction (as defined in Section 1.2), it is impractical to recommend a maximum ambient or concrete temperature because the humidity and wind speed may be low, permitting higher ambient and concrete temperatures. A maximum ambient or concrete temperature that will serve a specific case may be unrealistic in others."

Section 3.2.1 goes on further to state,

"Concrete can be produced in hot weather without maximum limits on placing temperature and will perform satisfactorily if proper precautions are observed in proportioning, production, delivery, placing, and curing."

There is no graph, table, chart, or statement within ACI 305 that shows that a limitation of concrete temperature exists at 90°F. This value stems back from an earlier definition of when "hot weather" conditions were thought to exist. The intent was that when the ambient temperature goes above 90°F hot weather conditions now exist, and certain precautions should be taken. This was misinterpreted and accepted within the industry to mean that the concrete temperature could not exceed 90°F.

The ACI document does not support this type of "maximum concrete temperature" specification, and gives clear and suggestive guidelines where numerous precautionary measures that should be taken under hot weather conditions, but there is no upper limit of concrete temperature specified within ACI 305. The 90°F temperature specification is arbitrary and NOT based on the ACI 305 code.

However, some specifiers will reference ACI 301 Section 5.3.2.1.c that states,

"The temperature of concrete as placed shall not exceed 90°F unless otherwise permitted. Loss of slump, flash set, or cold joints due to temperature of concrete as placed will not be acceptable. When temperature of concrete exceeds 90°F, obtain acceptance, when required, of proposed precautionary measures."

Or ACI 301 Section 4.2.2.7, which states,

"Unless otherwise specified or permitted, the temperature of concrete as delivered shall not exceed 90°F."

Both parts of the code clearly allow for the concrete temperature to exceed the 90°F limit as long as it is permitted. There is no indication in either section of the code as to the actual relationship that 90°F has to the hydration process, formation of hydration products, or impact on performance or durability of the concrete.

The typical approach to reducing concrete temperature to this level or below is the use of ice in the mix design. The use of ice is just an issue of an increased cost for the owner, and as long as someone is willing to pay for it (regardless of whether the benefit is actual or perceived), most producers will supply it. In many cases the temperature differential is only 10 to 15 degrees, at an enormous cost per yard. Because the temperature differential is so small, the actual benefits or perceived improvements to the performance of the concrete do not actually exist.

Finally, there is the concern by some specifiers that the temperature of the concrete is linked to finishing and water demand. None of the referenced documents actually make that connection. The basic assumption is that temperature drives setting time and setting time drives finishing. With the chemical technologies available (which are significantly less expensive than the use of ice) it is entirely possible to adjust the setting time, to handle increases in ambient temperature regardless of the concrete temperature. In doing so, the temperature of the concrete can exceed 90°F, but still allow adequate time for good quality placement and finishing and overall quality concrete.

This position statement from the Texas Aggregate and Concrete Association is presented for reader interest by the editors. The opinions expressed are not necessarily those of the "magazine". Reader comment is invited.

Texas Aggregate and Concrete Association
900 Congress Ave., Suite 200
Austin, TX 78701 Phone: 512-451-5100 FAX: 512-451-4162
www.tx-taca.org