CONCRETE BASICS

Temperature

by John Albinger, IRMCA Technical Consultant

It's the time of year when we start thinking about heating our materials. Some of you may have already gotten calls from contractors complaining about slow setting. First you should be aware of your responsibility as a producer. What you are obligated to provide? ASTM C-94 states that for sections under 12" thick the minimum concrete temperature, as placed, should be 55°F. ACI 306, Cold Weather Concreting, says if the ambient temperature is above 30°F the concrete should be 60°F, between 0°F and 30°F the concrete should be 65°F. As the sections get thicker the minimum concrete temperature is reduced.

In order to take the temperature of the concrete you must use a calibrated thermometer. Do not assume your thermometer is right! Buy a glass mercury thermometer from a lab supply company and use it to calibrate your concrete thermometers at least once a month.

As weather begins to cool, we normally start heating water. It's easy, relatively inexpensive, and effective to a point. A chart in ACI 306 tells you how hot the water is to be to compensate for various aggregate temperatures. This means you have to know the temperature of your aggregates. (If you don't already have a copy of ACI 306, get one and read it) There are some concerns you must be aware of when you only use heated water to control the temperature of the concrete. The capacity and recovery time of the heating system should complement the yards per hour you anticipate producing. If not, the concrete temperature and its setting time will fluctuate throughout the day. Also, when using only hot water there may be a temperature loss in route to the job because the mass of the colder aggregate is so much greater than that of the water. The cold drum of the first load of the day can also contribute to temperature loss for that load.

When it becomes time to heat aggregates there are many options: steam, hot air, in the stock pile or in a bin. What or where are not the issues to be discussed here. Like water, the aggregate heating system must be able to provide an adequate and consistent supply throughout the day. No contractors like warm concrete in the morning and cooler concrete as the day progresses. Cool concrete in the afternoon means longer setting times, overtime, and an unhappy customer. Be careful that the system you use doesn't create hot pockets in the aggregate. Because of the moisture and voids in the sand, you may determine that heating only the sand and water is adequate. Take concrete temperatures throughout the day; at least three times.

Besides controlling the temperature of the concrete as required you must, as always, cover your butt. That means take your calibrated thermometer to the job. If someone on the job is taking temperatures compare your thermometer to his. The good news is you know yours is right because you recently calibrated yours. (???) When you are on the job, record the time of day, the temperature of the concrete as it arrives on the job, if it's a slab on grade the temperature of the base, if possible the temperature of the concrete after its been in place for an hour or two. and lastly what, if anything, the contractor is doing to keep the heat in the concrete. All this accomplishes two things, you may be able to tell the contractor something he doesn't, but should, know and secondly if there is a complaint regarding setting times you have all the information you need to explain why the concrete "laid there".

Once the concrete arrives on the job and is placed, it is the contractor's responsibility to maintain temperature in order to assure that the concrete sets in a timely fashion and subsequently develops the compressive strength needed to perform as intended.

At least three times a day, have someone at the plant record the ambient temperature and other weather conditions, year around.

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