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LESSONS LEARNED:
Construction Engineering Services
OBSERVATIONS AND LESSONS FROM THE SCHOOL OF EXPERIENCE

HOT WEATHER CONCRETE

In the concrete business, “hot weather” creates situations that require precautions to be taken for proper concrete handling, placing, finishing and curing. “Hot weather” includes high ambient air temperature, low humidity and high wind. Any one of these conditions can impair the quality of freshly mixed or placed concrete by accelerating the rates of moisture loss and cement hydration in the concrete. This Lessons Learned will discuss: (1) the effects of hot weather; and (2) some construction practices to mitigate their effect.

Effects of Hot Weather on Concrete

The most pronounced effect of hot weather on concrete is rapid water loss. Excessive evaporation of water from the concrete mix results in accelerated slump loss, setting time and, consequently, a decrease in workability. Plastic shrinkage cracking is frequently associated with hot, windy weather, as it is most often the result of rapid evaporation from the concrete surface. Hot weather can affect both early and ultimate strength. The esoteric details of the chemistry notwithstanding, the essence of the matter is that you may see a 10% strength increase before 7 days and lose 20% at 28 days (compared to a mix cured at 70 degrees).

To combat the effects of rapid evaporation and earlier set times, water is often added to the concrete mix during placement. This is known as “retempering”, and it should be avoided. Retempering increases the water/cement ratio, results in less durable, lower strength concrete, and can cause increased shrinkage cracking.

Construction Practices During Hot Weather

There are several cost-effective, relatively simple precautions that can be taken to reduce the damaging effects of hot weather on concrete:

- Keep concrete as cool as possible (ideally 73 degrees),
- Substitute ice for water in the concrete mix,
- Schedule large concrete pours in the morning or later in the day, this will help keep waiting concrete trucks from sitting in the hot sun,
- Limit the amount of time that elapses between the loading at the plant and the placement at the site - excessive time spent traveling to the site or waiting to place concrete will increase the temperature of the mix, and
- Prohibit retempering.

Initial curing is critical to concrete quality. Once the concrete has been delivered to the site, poured and finished, efforts must continue to protect the concrete through curing. Moist-curing is the best method for developing the maximum potential for concrete strength and reduction of shrinkage cracking. The most effective technique of curing is moist curing by continuously wetting the concrete surface. Curing compounds are also very popular. While curing compounds can be effective, they must be sprayed onto the concrete in sufficient quantity to retain moisture in the concrete. The manufacture’s recommendations should be followed to obtain the best results when using curing compounds.

Special attention should also be paid to the concrete test cylinders. According to the American Concrete Institute, it is the responsibility of the contractor to provide adequate facilities for the proper storage of concrete cylinders. While this is a year round code requirement, and independent of the project’s size, it is especially important during hot weather since exposure to high temperatures may lead to erratic strength results. The use of ice in a cylinder box, or onsite air-conditioned space for cylinder curing can avoid the cylinders being subjected to excessive temperatures during initial curing.

We hope this “Lessons Learned” will be helpful to you in planning for your next project.

Respectfully,
ECS Corporate Services, LLC

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