

Bridge Views



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CURING FOR HPC BRIDGE DECKS – BRING ON THE WATER!

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As we take the next step in the evolution of concrete technology and move toward more widespread implementation of high performance concrete (HPC), we must realize that assuring successful application of concrete in bridge decks is largely dependent on timely and appropriate wet curing. The challenge is defining what is meant by “timely and appropriate” for HPC and how to specify it.

Due to the desire for low permeability, HPC for bridge decks usually contains pozzolanic material. These concretes are especially sensitive to water loss and poor curing practices. Essentially, HPC requires better curing than we use today. Which brings us back to defining “timely and appropriate.”

In my opinion, “appropriate” is best defined as wet burlap or cotton mats for as long a duration as possible. “Timely” means as soon as possible after finishing; to put it in more definitive terms, place the burlap or mats 10-15 minutes after concrete placement. This requires the contractor to have wet burlap or mats on site and ready to be placed, prior to the start of concrete placement. Some may object to this approach because the burlap may leave indentations or impressions in the fresh concrete. However, achieving enhanced durability far outweighs the desire for a pristine appearance. Also, if the burlap is placed carefully, the effect on the surface is kept to a minimum.

A tight operation must be maintained from start to finish. The desired sequence of operations is to place concrete, finish concrete, apply curing compound if necessary, apply tining grooves, apply wet curing material, keep wet and let sit undisturbed, remove wet curing materials, apply curing compound, and saw cut grooves (if not tined).

For HPC, the use of curing compounds should generally be restricted to after the burlap is removed. If they are placed on fresh concrete, it may be difficult to achieve the proper application rate in the limited time available and may lead field personnel to believe they have a time cushion

before applying the burlap. If the evaporation rate is high, curing compounds may be placed if they can be applied properly and without delaying the start of wet curing.

The following two examples clearly demonstrate the benefits of “timely” curing. The Idaho Transportation Department (ITD) tried silica fume concrete on several approach slabs. Curing consisted of applying curing compound with burlap placed 45 minutes later. The slabs experienced severe cracking and ITD staff were understandably hesitant to use silica fume for deck applications. Before abandoning it entirely, ITD placed some additional slabs and cured them with wet burlap placed 10-15 minutes after concrete placement. Only minimal cracking was experienced. Today ITD routinely uses silica fume for bridge deck overlays.

The Maine Department of Transportation experimented with the use of concrete containing a pozzolan as a proposed replacement for granite curbing. Sections that were extruded, sprayed with curing compound, finished, and then covered with wet burlap exhibited cracks every 3 ft (0.9 m). Sections that were immediately covered and then finished by removing isolated areas of the cover exhibited cracks every 15 ft (4.6 m).

I will not dwell on “appropriate” curing, as it is well known that a longer period of wet curing produces a better quality concrete. Curing duration is even more significant for HPC. The New York State DOT, an acknowledged leader in HPC bridge decks, has recently incorporated specification language requiring the contractor to “Leave all burlap in place for 14 curing days. Provide continuous, uniform wetting for the entire curing period.” This includes decks placed in New York City where the demands for an open bridge are tremendous. Nevertheless, they have realized the long-term benefits of extended curing. Perhaps we should all consider this as we progress toward more widespread HPC use and our desire to provide the best concrete decks for the traveling public.

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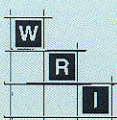
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