RESEARCH NEEDS FOR STRUCTURES TAG

EFFECTIVE/UPDATED 7/17/2018

ISSUE

Reduction of Field Cure Time for Concrete

SUMMARY OF PROBLEM

The typical seven day cure time for structural concrete is based on Type I cement achieving 70 percent of the specified strength per a Portland Cement Association Article “Role of Concrete Curing” by Jerzy Z. Zemajtis, Ph. D., PE (WA). AASHTO LRFD Bridge Design Specifications state that for other than top slabs of structures serving as finished pavements and Class A (HPC) concrete, the curing periods specified by AASHTO may be reduced and curing terminated when test cylinders cured under the same conditions as the structure indicate that concrete strengths of at least 70 percent of that specified have been reached. The proposed research would evaluate the possibility to end field cure times for concrete when 100 percent of the specified strength has been achieved. This would be considered for all structural items, pavements, and other incidental concrete construction items. The idea to end curing when strength has been obtained is nothing new for the precast industry.

The proposed research would evaluate any detriments caused by reduced curing times such as the potential for thermal cracking, and the reduction of concrete permeability. The research would also consider different curing methods, curing conditions, and strength requirements to determine their influence on the quality of concrete with shorter curing times. The detriments, if any, would be compared to the benefits of a shorter time frame to complete a project. These benefits include lower project overhead costs, lower traffic control costs, and less inconvenience to the public.

To facilitate shorter cure times, the research shall include an evaluation of how strength specimens are cured. It is well known that concrete strength is influenced by temperature. However, the temperature obtained in a concrete test specimen will be much different than the concrete temperature obtained in a concrete patch or structural member. The slower strength gain from test specimens is a result of the small mass volume and corresponding lower heat generated. The slower strength gain will delay when a road can be opened to traffic, a structure can be loaded, or curing can be terminated. Florida DOT has done research “Long-Life Slab Replacement Concrete / FDOT Contract Number: BDV25-977-01” using an insulated cooler and a heavily insulated foam cooler to provide better retention of heat in strength specimens. The research showed strength specimens broke higher when cylinders were cured in the coolers when compared to ambient air cured strength specimens. In addition, there is a
manufacturer that makes an insulated concrete test cylinder, which could also be evaluated as a comparison to the insulated cooler.

**DESIRRED RESULTS/OUTCOME**

To reduce the required field cure time for concrete, and to provide concrete strength test results which are more representative of in-place concrete strength.