Texas Aggregates and Concrete Association

Position Statement #3

Initial Cylinder Curing is Critical

Cure Me Now, or Pay Me Later…

Most of the commercial and municipal jobs use a QCQA program that involves taking concrete cylinders as a means of acceptance. In too many cases the phrase "low breaks" is used to describe the expected results. Often times the verification of in-place concrete strength is made, and the strength of the structure proves to meet design strength requirements. The question then becomes, why did the cylinders indicate a low strength in comparison to the actual structure? Notwithstanding the issues regarding the differences between mass concrete and a simple cylinder, the brunt of the discussion focuses on initial (first 48 hour) curing conditions for the cylinders and was it done correctly and according to the contract documents.

ASTM C31, "Standard Practice for Making and Curing Test Specimens in the Field," clearly states in Section 10.1.2, "…specimens shall be stored for a period up to 48h in a temperature range from 60 and 80°F and in an environment preventing moisture loss from the specimens." With the exception of municipal work, almost every commercial and residential construction project with specifications and contract documents uses ASTM C31 as its referenced standard when it comes to using cylinders for acceptance.

The standard does not state how the cylinders are to be kept within that temperature range. There is no mention in the standard for curing boxes composed of plywood, insulated foam, inclusion of light bulbs, or other field constructed storage units. In fact, there are numerous products available on the market in which the cylinder temperature can be maintained and produce a log of the temperature during the curing time. The cost for such devices is less than the hourly rate for a single conversation that will take place regarding low breaks later on in the project.

According to TxDOT, Concrete Test Procedures Manual, Tex447A, Making and Curing Concrete Test Specimens, "Storage conditions during the first 48 hr. have an important influence on the strength developed in concrete." A 2005 research project for the National Ready-Mix Association (Series D335 and D338) concluded that, "dramatic strength reductions particularly at early ages (28 days or less) are possible if the initial curing conditions of ASTM C31 are not followed."

On most construction projects where cylinders are taken for acceptance, an outside 3rd party testing laboratory has been hired by the owner to perform various tests, including concrete cylinder sampling, molding, and testing, but in most cases, not the initial curing. This function is left up to the Contractor. If the laboratory has been hired to perform ASTM C31 or its municipal equivalent, why not the initial curing? If the Contractor is the expert at concrete installation, why then is the Contractor left to follow through with such a critical element of QCQA for which the Owner has already hired the laboratory? In fact, from a chain of custody standpoint, the lab makes the cylinders to verify that the Contractor is meeting the job specifications, but releases those same verification cylinders back to the Contractor, and then reclaims them back within 48 hrs. Why shouldn't the lab just maintain possession from the beginning of the test?

A more rational approach is to require within the contract documents that the 3rd party testing laboratory is fully responsible for not only sampling and testing the concrete, but using proper and required curing. As part of the contract documents, the costs can be fully included within the bids. The cost to follow the curing procedures as outlined in the Codes and contract documents is minimal compared to the hourly rate for the 1st meeting that results when low cylinder breaks are reported that are ultimately the result of improper initial curing.

Many of the meetings that take place during a project are the result of explicit contract requirements and implicit expectations not being met. When it comes to concrete acceptance based on strength in most cases, when specifications are followed the results typically meet or exceed the expectations.

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