



Early Age Concrete Acceptance

Problem Description

The design strength of traditional concrete is obtained at 28 days. However, there is an increasing need to predict design strength at earlier ages. Often, projects cannot wait to verify in place concrete has reached the desired strength, particularly with increased use of acceleration construction schedules. Presently, TDOT accepts the design strength of traditional concrete at 28 days and still bases acceptance and payment on 28-day cylinder breaks. However, TDOT is administering more early strength requirements in plans due to accelerated project delivery timelines. Therefore, TDOT needs to set early age acceptance criteria that can be used to approve early strength concrete at the age that it is intended to be in service. TDOT has standard (Classes) of mixes, it would be possible to determine calibration curves over a range of mixes and apply this range to field placement. If done properly, it may be possible to eliminate most destructive field cylinder testing.

PROJECT NUMBER:

RES2024-06

PRINCIPAL INVESTIGATOR:

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TDOT LEAD STAFF:

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PROJECT SCHEDULE:

August 2023 to July 2024

Research Objectives

The primary objectives of this study are to:

- Synthesis report on the maturity method and other possible early age predictors - The objective of the synthesis report is to increase TDOT's knowledge of the state of art and practice in the maturity method. The existing literature, as well as specifications used by other DOTs, will be summarized.
- Maturity Method Guidelines - This objective would develop a program (Standard Operating Procedure for TDOT personnel) to be able to predict 28-day strength using early break cylinders and temperature monitoring for early age concrete acceptance in the field.
- Field Testing and Verification - The objective of field testing would be to apply the developed maturity program to a field site for verification and any refinement.
- TDOT Maturity Specifications - This objective of the specification is to allow the maturity method to be effectively implemented on TDOT projects, within defined limitations, if any. Without a specification in place, it is difficult to implement the process on actual projects.

Potential Implementation and Expected Benefits

TDOT will benefit from the proposed project in multiple ways:

- Increased knowledge of the maturity method and associate relationships.
- The guidelines developed will assist TDOT and its contractors for standard operating procedures.
- New Standard Specifications will allow the maturity concept to be implemented more effectively in TDOT plans and workflow, and in accordance with the state of practice.
- The ability to predict concrete acceptance on early age strength for known, standard mix designs.
- Improved ability to base acceptance and payment for achieving required maturity at early ages as a predictor of later age strength.
- Facilitate the use of accelerated project payment schedules.