

Performance Structural Concrete Optimized for Cost, Durability and Manufacturability

PROJECT TITLE

Performance Structural Concrete Optimized for Cost, Durability and Manufacturability TIDC Project 2.13

STUDY TIMELINE

January 2021 – December 2023

INVESTIGATORS

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KEYWORDS

Concrete, mix design, prescriptive, performance, cost-effective

Introduction

This research develops prescriptive concrete mix designs that meet modern high-performance durability requirements while being practical to manufacture in New England. These innovative Performance Concrete or High Performance Concrete (HPC) mix designs use graded aggregates, silica fumes, slags, fly ash, fibers, and other admixtures.



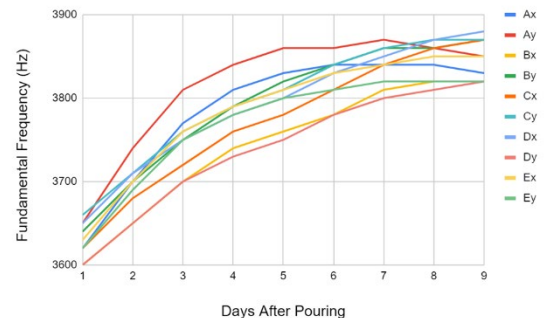
a.



b.



c.



d.

Figure 1. Selected performance tests: a. Shrinkage ring, b. Freeze-thaw damage on a cylinder, c. Frequency testing of cylinder for stiffness estimate, and d. Shift in cylinder frequency with stiffening due to cure

Methodology or Action Taken

The project is at an early stage. Primary actions have been to line up test equipment and meet with concrete suppliers, Figure 1.

Conclusions or Next Steps

The overall deliverable is a prescriptive concrete mix that suppliers can use with New England sourced materials for performance concrete. This project is using machine learning to predict the performance of new mix compositions, test the performance in benchtop scale mixes, and then in a pilot batch run at a concrete producer's facilities.

Potential Impacts and VTrans Benefits

The development of prescriptive formulations of concrete mixes that meet performance specifications using Vermont and New England sourced materials has the potential to increase the flexibility in delivery options from local suppliers, reduce costs, while maintaining or even increasing strength and durability.

More information about the VTrans Research Program, including additional Fact Sheets, can be found at: <http://vtrans.vermont.gov/planning/research>