

Goal and Objectives

Primary goal of the proposed study is to assess durability and structural performance of rapid setting concrete (RSC) used in current VTrans ABC Projects through laboratory testing, including the exploration of standard mix designs and technology transfer, and provide tools for implementation in the field and quantification of the benefits.



Figure 1. VTrans ABC Connections (in red boxes) ready for RSC placement

Laboratory Evaluation of Current VTrans RSC

Evaluation focus is on durability and structural contributions. Durability will be tested through 300 freeze thaw conditioning cycles. Surface resistivity, alkali-silica reactivity, and mechanical property measurements. Mechanical properties including elastic modulus, bond strength, compressive strength, and flexural strength will be evaluated at 1, 3, 7, and 28 days.



Figure 2. Laboratory Testing.

Exploration of Standard RSC Designs

The exploration will use fractional factorial design to assess effects of various mix components by using materials assessed in the Laboratory Evaluation. The exploration will have two stages, component material selection and proportion trials. An assessment of material cost for all alternatives and use for design optimization will be included.

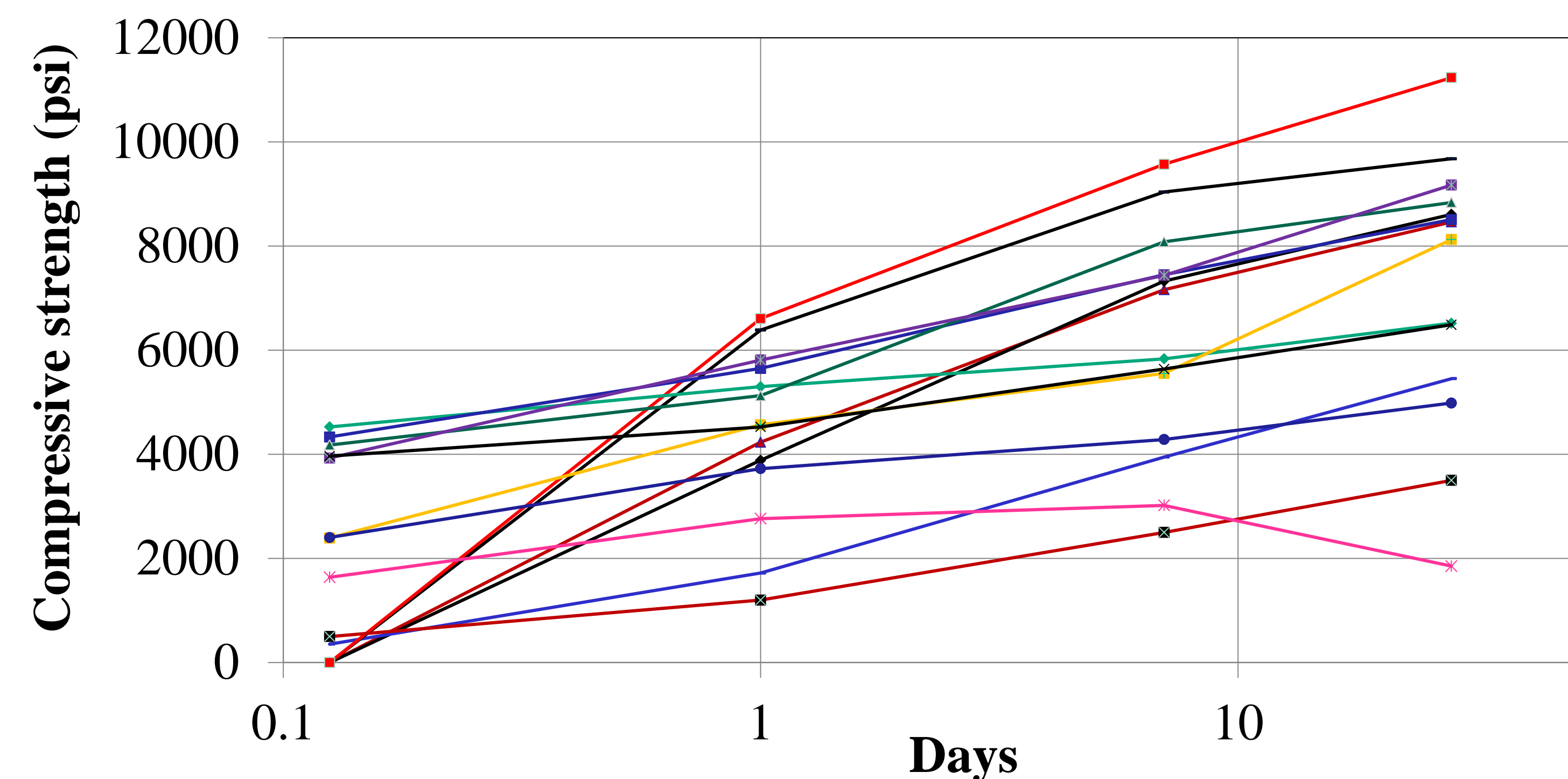


Figure 3. Sample Results on Rapid Set Materials (from literature review, Dave et al., 2014)

Potential Impacts

Initial project costs savings as well as life cycle cost savings can be determined based on the expected improvements in performance and durability using improved RSC designs. Overall design can be applied to other VTrans projects.

Acknowledgments

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References

- Gholami et al. (2020): *Performance of Portland Cement-Based Rapid-Patching Materials with Different Cement and Accelerator Types, and Cement Contents*
- Idaho Transportation Department (2019, 2020): *Field Performance of HES Class 50AF Concrete with Fibers as Field-Cast Connection between Deck Bulb-T Girders in ABC Applications*
- Dave et al. (2014): *Evaluation of Concrete and Mortars for Partial Depth Repairs*