

STUDY TIMELINE

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INVESTIGATORS

Eshan Dave, University of New Hampshire, PI,
eshan.dave@unh.edu

Jo Sias, University of New Hampshire, co-PI,
jo.sias@unh.edu

Saeed (Yashar) Eftekhar Azam, University of New Hampshire, co-PI,
saeed.efteklarazam@unh.edu

AOT CONTACTS

James Lacroix,
Structural Design Engineer,
james.lacroix@vermont.gov

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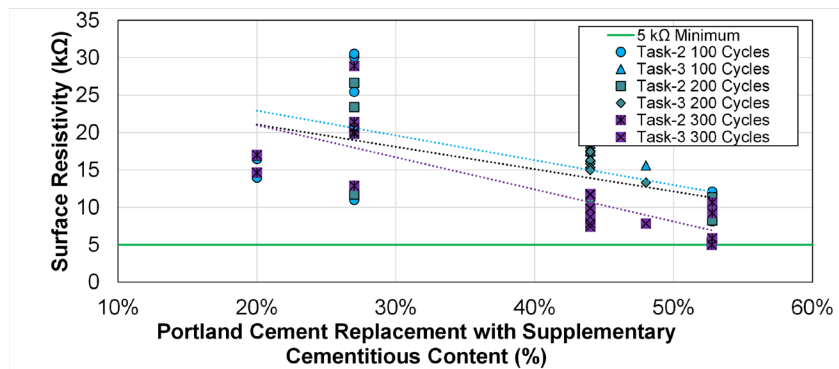
\$142,999



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

Introduction (or Problem Statement)

Vermont Agency of Transportation was an early adopter of the accelerated bridge construction (ABC) approach. While ABC projects enjoy high material quality, connections between pre-cast elements must be placed in-situ. VTrans has adopted the use of rapid-setting concrete (RSC) for construction of connections between precast elements in ABC. Current VTrans practice dictates use of a membrane and overlay on ABC projects due to concerns of poor durability of RSC in ABC connections. Durability concerns that have prevented use of bare decks have not been studied or evaluated.



Project Methodology

This research study focused on an extensive laboratory evaluation of currently used RSC by VTrans to assess durability of these materials as well as to assess their structural performance. Testing scope included strength (compressive and flexural), elastic modulus, chloride permeability, and bond capacity measurements for several RSC materials and their variations that have been used on VTrans ABC projects. Lab tests were conducted on control specimens as well as those with laboratory-imposed freeze-thaw cycling. Further, several variations on RSC mix designs used in past were evaluated.

Conclusions/Next Steps

Laboratory evaluation conclusively demonstrated that there is not a concern for loss of durability in RSC materials due to freeze-thaw cycling, specimens with up to 300 freeze-thaw cycles maintained mechanical performance, bond strength and lower permittivity to chloride ions. Through statistical analyses of laboratory experimentation data, the research team has proposed material compositional limits for RSC materials that would reduce performance testing requirements for RSC used on individual projects. The target for total cementitious content of 850 lbs./yd³ with 44% supplementary cementitious content is recommended.

Impacts and Benefits

This research provides several potential benefits to VTrans that will improve the performance of bridges in the state as well as decreasing both initial and life cycle costs. The initial costs of ABC projects will be reduced via use of proportion-based RSC mix design(s) that are less prone to variability in properties; therefore, requiring less quality control tests. The life cycle costs of ABC projects will be reduced due to demonstrated durability of RSC materials which results in changes to agency practice that will eliminate the need for membrane and bituminous overlay treatments on ABC projects. Also, the improved and more cost-effective RSC material specifications will allow for an increased number of ABC projects as the structural performance will not be compromised; this has the potential to limit traffic disruption and overall construction time. The project outcomes have the significant potential to reduce the initial project costs and maintenance costs and provide VTrans with the means to repair or replace more structurally deficient bridges with a limited budget.