

## 2018 Research Symposium

## Bridge Deck Rehabilitation

## & STIC Annual Meeting

### RESEARCH PROJECT TITLE

Bridge Deck Rehabilitation

### STUDY TIMELINE

June 2018 – On Going

### INVESTIGATORS

Sean Wines, UVM

### VTRANS CONTACTS

Rob Young, Structures

James Lacroix, Structures

### MORE INFORMATION

[POSTER](#)

This fact sheet was prepared for the 2018 VTrans Research and Innovation Symposium & STIC Annual Meeting held at the State House in Montpelier, VT, on **September 12, 2018** from **8:00 am– 1:00 pm**.

Fact sheets can be found for additional projects featured at the 2018 Symposium at

<http://vtrans.vermont.gov/planning/research/2018symposium>

Additional information about the **VTrans Research Program** can be found at

<http://vtrans.vermont.gov/planning/research>

Additional information about the **VTrans STIC Program** can be found at <http://vtrans.vermont.gov/boards-councils/stic>

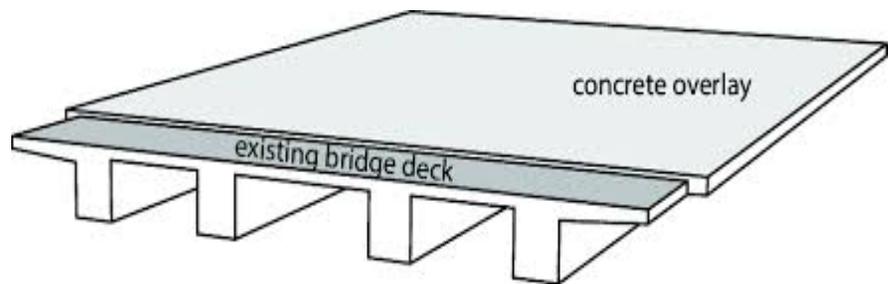
### Introduction or Problem Statement

What new ways of deck preservation can be implemented on Vermont bridges to help extend the life of the deck before needing replacement? The Bridges in Vermont are deteriorating at a rapid rate due to deicing operations during the winter months of the year. Bridge decks are the most susceptible to this because of the direct contact they have with these chlorides. When chloride is introduced to concrete it eventually seeps through and makes contact with the reinforcing rebars. The steel rebar will begin to corrode causing spalling in the concrete and causing it crumble at a rapid rate.



### Methodology or Action Taken

This research has entailed looking for new bridge deck rehabilitation methods used in cold climates. Research has been performed by many institutions throughout the United States on new protocols for concrete bridge deck protection and treatment. The best study that was acquired thus far was done by the Wisconsin Department of Transportation. Specifically, the Wisconsin Highway Research Program. The findings from this research have shown that the best forms of bridge deck rehabilitation are deck overlays. Since bridge decks in Vermont are failing due to chloride infiltration the best options are making the surface of the concrete impervious. The longest lasting overlay options for this have shown to be polymer overlays along with a new method of using Ultra High-Performance Concrete. These two methods have shown great results in the studies they have been implemented in. The one repeating problem with any bridge deck overlay is a problem with bonding to the existing surface. Prep before applying either of these methods should be done very diligently and with care or the new surface will fail prematurely.



## Conclusions or Next Steps

Ultra High Performance concrete has the most promising results for long lasting repairs to Vermont bridges. The concrete makes for a very strong wearing surface, along with being nearly impervious. It would prevent chlorides from damaging rebar as quickly and resist damage from plows and the freeze thaw cycle. The one setback for this type of repair is that UHPC is a very costly material.

Although the material is costly it has many long-term benefits. Research should be performed by VTrans material labs to get a better understanding of how the material works. This would allow for a greater knowledge of the material and a possibility of decreasing its cost to produce. Since UHPC was not originally designed for bridge deck overlays it has strength properties that are not necessary for this application. A better understanding could allow for a better formula to be made that is cheaper and still very capable for this application.

Polymer Concrete Overlays are a much cheaper fix to bridge deck rehabilitation. The Big difference could be the number of times that it may have to be applied over the years. The overlay typically needs to be replaced every 10 years. UHPC has not been in use long enough to compare directly but it is predicted that it could last at least double the lifespan of Polymer overlays.

Currently according to an Iowa State University research study 34 states use polymer concrete overlays as a bridge rehabilitation technique and about 1/3 of those states are located in areas with climates the same or worse than Vermont's. Michigan has been applying polymer overlays on their bridges for more than 20 years and would be a good source to contact if polymer overlays were to be used more heavily in Vermont.

## Potential Impacts and VTrans Benefits

The infrastructure in Vermont is deteriorating at a fast rate. This makes it difficult to keep up with the maintenance on bridges along with a lack of funding. Innovative bridge deck overlays could help protect the bridges which are in decent condition from further deterioration. This could save the state money along with creating a safer travel experience for the residence of Vermont.

These overlays should also be considered on new bridge construction projects to help extend the overall life of the bridge. The sooner impervious layers are added to a bridge deck the longer it will take chlorides to reach the rebar inside the concrete. This could help the bridge live a significantly longer life saving the state time and money in replacement and repair.