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New Hampshire DOT
Department of Transportation

Focus on Research

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Update on Research: Living Bridge

Memorial Bridge crosses the Piscataqua River to connect Portsmouth, New Hampshire to Kittery, Maine. The bridge does more than carry people and goods across the river; it is also a connection to the future of smart, self-monitored infrastructure and clean, renewable energy.

NHDOT is a partner in a much larger project known as the Living Bridge, which includes funding from the U.S. Federal Highway Administration, National Science Foundation (NSF) and the U.S. Department of Energy. (INFO)

Sensors installed on bridge provide data on how the bridge responds to traffic loads, center span lifts, and even the weather. The bridge can tell us how it "feels".

The bridge is also being used to explore the viability of generating electricity using the tides. Guides installed on the bridge pier will dock a floating platform, which will soon include a tidal turbine.

Sensors on the platform will collect environmental data on the river and wildlife monitoring prior to the installation of a turbine this fall.

This innovative bridge project has been showcased in videos produced by the NSF (VIDEO) and Science 360 (VIDEO).

Principal Investigators: UNH Professors Erin Santini Bell (Civil Engineering), Ken Baldwin (Ocean Engineering), and Martin Wosnik (Mechanical Engineering)

NEW PROJECTS GET STARTED

Unmanned Aircraft Systems (UAS)

UAS are being used nationwide in an effort to improve efficiency, reduce costs, and increase safety. This research project will conduct several case studies to evaluate the capabilities and limitations of UAS for a variety of NHDOT actives ranging from construction to traffic operations to bridge maintenance. (INFO)

Principal Investigator: UVM Professor Jarlath O'Neill-Dunne

Professor O'Neill-Dunne holding an Unmanned Aircraft

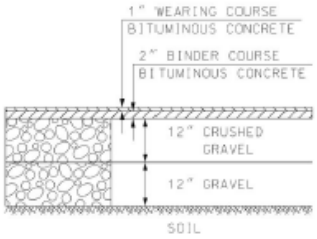
Gusset-less Truss Connections

The Memorial Bridge in Portsmouth was built with a gusset-less connection. Testing on large scale models of the connections will provide information to better understand how this innovative bridge design will react to loads and perform under stress. The models will be fully instrumented and then loaded in a 300 thousand pound press for evaluation. (INFO)

Principal Investigators: UNH Professors Erin Santini Bell and Ricardo Medina

A gusset-less connection from Memorial Bridge

Updated Layer Coefficients



Asphalt pavement design has changed a great deal in the last 40 years but the design coefficients we use haven't been updated. A UNH team will establish new layer coefficients so that NHDOT pavement designs take full advantage of modern asphalt mixes. (INFO)

Principal Investigator: UNH Professor Eshan Dave

Binder Aging

NHDOT routinely allows the use of recycled asphalt pavement (RAP). This is a money saving practice we've had in place for 20 years. The residual binder in the recycled asphalt has been aged two ways:

- by exposure to elements for years
- by reheating during the mixing of the new asphalt.

This study seeks to identify how this aging affects long-term asphalt performance. (INFO)

Principal Investigators: UNH Professor Jo Sias Daniel and Eshan Dave

Testing apparatus to evaluate asphalt cracking

NEW PROJECTS GET STARTED

Reducing Premature Cracking in Concrete Bridge Curbs

Reconstructed concrete bridge decks and bridge curbs often develop cracks at regular intervals. These cracks are not large and do not threaten the structural integrity of the bridges, but they do allow chlorides (salt) to penetrate deeper into the concrete. Bridge Maintenance will work with the UNH team to evaluate different construction methods and materials and how this affects cracking. A senior project team developed a cart to house cameras to gather photographic data of curb cracking. (INFO)

Principal Investigator: UNH Professor Eshan Dave

Senior Project team and their data gathering cart

Iron Fouling

Red-orange biofilm in a waterway

Rock fill placed in contact with wet areas can release high concentrations of iron. A red-orange film can form in adjacent drainage ways as a result of iron compounds within the rock being transformed by naturally-occurring bacteria. This study, conducted by the U.S. Geological Survey will develop a tool to predict when there is a high probability of iron fouling due to the characteristics of the rock fill, waterway, or both. (INFO)

Principal Investigator: USGS Researcher James Degnan

Active Transportation

Bicycles and pedestrians use public roadways, but NHDOT does not have a great deal of information on the patterns of existing bicycle traffic. Plymouth State University (PSU) will leverage efforts to develop and apply a Level of Traffic Stress (LTS) model for bicycling to assess patterns of current bicycle activity and identify potential barriers for origin and destination points. This information will enhance the ability to evaluate future needs of active transportation. (INFO)

Principal Investigator: PSU Professor Amy Villamagna

Sharing the road

Assessment of Lower Impulse Loading in Reinforced Pavement

NHDOT has installed fiberglass grid reinforcement in asphalt pavement at several locations. While these surface treatments are performing well, there is not a method to quantify that benefit. A study performed in 2014 collected data using a Falling Weight Deflectometer (FWD). The 2014 study only evaluated the highest loading and did not find any correlations with performance. The current study will evaluate the data from the Light Weight Deflectometer (LWD). Results could be used to implement cost-saving changes to pavement design standards. (INFO)

Principal Investigator: CRREL Researcher Lynette Barna

Implementing Research: Airport Paint Evaluation

Airports use white paint on runways so pilots can distinguish them from the yellow-painted taxiways. Many New Hampshire airports have a problem with staining that makes the white paint appear yellow. This staining creates a safety hazard because landing aircraft can mistakenly use the taxiway.

In this aerial view of Laconia Airport, the white runway paint is heavily stained and appears yellow.

A previous NHDOT study (INFO) determined the staining is caused by iron in the pavement aggregate. The report recommended a modified paint specification.

This summer the recommended paint will be applied at two airfields: the Laconia Airport (LCI) and the helipad at the Errol Airport (ERR). An upcoming study will monitor the performance of the modified paint over the next two years. If this paint performs as expected the specifications for airport paint will be updated for FAA-approved routine use.

Update on Research: Limited Reuse Soils

Soil adjacent to roadways may contain levels of regulated compounds that exceed naturally occurring background levels. These regulated compounds are not an issue while the roadside soils remain undisturbed. Once a construction project excavates the soil, it may need to be treated differently than clean, uncontaminated soil.

NHDOT is working with the New Hampshire Department of Environmental Services to develop guidance for these soils.

The research supporting the effort to develop guidance determined that the compounds present in roadside soils are not likely to move into groundwater.

Fourteen states provided information (LINK) regarding how they manage these soils and related materials.

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New Research Ideas are *ALWAYS* Welcome!!

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"Somewhere, something incredible is waiting to be known."

-Carl Sagan

American Author, Educator, and Cosmologist

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