

Focus on Research



NHDOT

Spring 2014

Showcasing the Benefits of Research and Innovation

“Everyone Wins With Research and Innovation.” Those words spoken by the Federal Highway Administration’s Patrick Bauer summed up why those of us in transportation must never sit still when it comes to the way we do business. The FHWA Division Administrator for New Hampshire was speaking at the opening of the November 2013 NHDOT Research and Innovation Showcase. Highlighted research projects extended to nearly every major technical discipline in the Department: the NHDOT’s dramatic increase in the use and savings of recycled asphalt pavement (RAP), the latest tools in winter snow and ice control and removal, high performance bridge coatings and innovative bridge design applications, implemented construction and maintenance innovations, and low-cost initiatives for traffic safety, to name just a few. Jerry Zoller, project engineer in Bridge Design, had this response to the event; “Perhaps the most valuable feature of the Showcase for me was simply associating specific DOT people with various topics that I otherwise didn’t know about. It also impressed me with the variety of issues that the Department is involved with improving and solving. I appreciate more what is going on within the Department outside my world of steel bridges.”

Every display at the showcase highlighted cost-savings or efficiencies combined with technological improvements, safety enhancements or environmental stewardship. In addition to in-house participants from across the Department, presenters included five professors and eleven students from the University of New Hampshire, on hand to share their findings from NHDOT-sponsored research on pavements, structures, and geotechnical issues.

At the beginning of each hour, another transportation Bureau provided a presentation on innovations within their department. Attendees learned about bridge scour countermeasures, I-93 stormwater treatment systems, and permissive left turn movements from Bridge Design, Highway Design, and Traffic respectively.

Besides presentations and more than 30 posters focusing on recent research and innovations, several past winners of the Annual NHDOT Plow Rally were on hand to demonstrate their safety innovations that have been implemented at District Maintenance sheds. The highway maintainers are constantly thinking about ways to make their jobs safer. Of course there are always ways to improve in all areas of its mission, but the NHDOT remains committed to using its resources wisely, with the goal of better, faster, and cheaper for long-lasting transportation.

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RESEARCH

Correlation Between Lab- and Plant-Produced High-RAP/RAS Mixtures

This project is investigating the use of laboratory mixtures for evaluating and approving higher percentages of Recycled Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS). The goal is to determine if lab testing can be done to establish the grade of asphalt binder needed for various percentages of RAP or RAP/RAS combinations, reducing or eliminating the significant expense and effort required to produce test mixtures at the plant. If successful, these tests would verify similar long term performance as the virgin regional asphalt grade. Additionally, the project is evaluating several sources of asphalt binder to determine if this makes a difference in performance. A resurfacing project on NH Route 12 in Westmoreland provided three test sections; two fully reclaimed and one overlay. The test sections included mix designs with 1% TRB (total replacement binder)(22% RAP), 1% TRB (22% RAP/RAS), 1.5% TRB (35% RAP) with two different virgin asphalts; PG 58-28 and PG 52-34. Laboratory testing on the mixtures and recovered binders is underway.

PROJECTS

Research Freight Information and Data in NH

This project will deliver a comprehensive multi-modal (air, rail, roadways and port) statewide freight plan that addresses all the requirements of MAP-21, with consideration of environmental impacts, improved mobility, safety, economic development, and quality of life. Negotiations are underway with Whitman, Requardt & Associates, LLP to develop the plan.

UPDATE

Fingerprinting Sources of Nitrogen in Wells near Blasting Sites

Through a joint-funding agreement with NHDOT, the U.S. Geological Survey (USGS) is conducting research to determine the source of nitrates in drinking water wells near New Hampshire blasting sites. Blasting operations for bedrock excavation on construction projects such as the I-93 widening in Windham are potential sources for nitrate contamination. Other common sources of contamination frequently exist in close proximity to affected wells, such as septic systems, animal wastes, fertilizers, decomposing vegetation or landfill leachate. Differentiating between blasting-related causes and other potential sources would aid in determining, limiting, or managing the Department's liability in such matters. Standard water quality analyses designed to determine the safety of drinking water are not sufficient to identify the source(s) of contamination. The USGS is using isotopes of nitrogen and oxygen in water sampled from private wells, monitoring wells, and surface water locations, along with conventional hydrologic and geologic data, to indicate the source of contaminants near the I-93 blasting sites. The ongoing investigation has detected temporal changes in water sampling results thus far, suggesting that blasting operations are playing a contributing role. Additional data are now being collected to fully characterize the source(s) and dissipation of contaminants. The research will be completed in mid-2015.

NH

PARTNERS

IN

RESEARCH

New England Transportation Consortium

13-1 Development of High Early Strength Connections for Accelerated Bridge Construction

The objectives of this research are to develop and validate concrete mixes that develop high early strength and that are durable for adequate long-term performance of bridges built using accelerated bridge construction techniques.

- 13-2 HMA Mixtures containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures** The objective of this research will be to evaluate plant-produced HMA mixtures containing RAS to identify the critical material properties and plant operations that are needed to produce RAS mixtures with fatigue and low temperature cracking properties equivalent (or better than) typical mixtures that are produced.

13-3 Improved Regionalization of QA Functions

To compile regional Quality Assurance (QA) efforts currently underway, to look into other areas for possible inclusion in this and create a plan for implementation. One topic that needs to be reviewed is in the area of prestress/precast production.

14-1 Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians

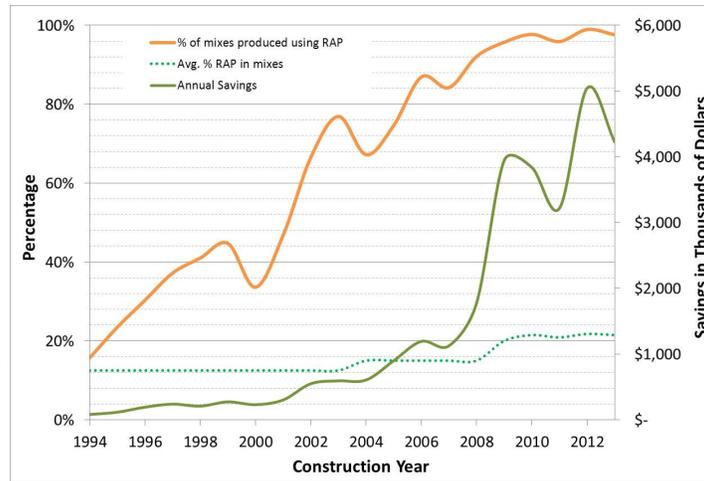
14-2 Investigation of Northern Long-Eared Bat Roosting Sites on Bridges

14-3 Bridge Expansion Joint Deterioration and Repair

14-4 Optimizing future work zones in New England for safety

Recycled Asphalt Pavement (RAP)

The use of recycled asphalt pavement (RAP) in hot mix asphalt is routine in New Hampshire. 99% of all hot-mix asphalt concrete mixtures placed in New Hampshire contain some percentage of RAP. NHDOT and local contractors were interested in pursuing the use of higher percentages of RAP in state projects. Through additional research and study of high RAP mixtures, best practices and procedures have developed. The RAP percentage has increased from the 10-15% range to the current allowance of up to 35% RAP in a mixture.



Patrick Bauer, FHWA NH Division called it “astounding” that NHDOT uses recycled asphalt in 99% of their paving projects. 1994 Savings: \$81,000 2013 Savings: \$4,225,000

W-Beam Guardrail Height Adjustment A Recognized Recipient of the Sweet 16 High Value Research Projects



When measured from pavement surface to top of rail, current acceptable strong post w-beam guardrail height is 27 to 30 inches. Repeated resurfacing of a roadway reduces the height of the guardrail relative to the pavement surface creating an improper safety measure. Replacement of the post to restore the guardrail to a standard height represents a significant cost to the NHDOT. A preliminary literature search indicated that some states have used a process of resetting the existing block and w-beam rail on the post without altering or replacing the post itself. The Federal Highway Administration (FHWA) New

Hampshire Division agreed to consider such treatment, on a state-wide basis, following a monitoring period in order to determine the effectiveness and safety of this procedure. This research project provided the Department with substantial savings while still maintaining safety and security for the traveling public. Savings realized by resetting guardrail blocks and rail verses what the expense would have been to replace it with new post with beam guardrail have been over \$5.2M since 2009.

Qualified Product List (QPL) Update

The QPL is a companion document to the Department’s “Standard Specifications for Road and Bridge Construction” (specifications). The QPL provides a listing of products that have been pre-qualified as being able to meet the requirements of specific sections of the specifications and associated supplemental specifications or special provisions as noted on the QPL. The 2014 update is now available. <http://www.nh.gov/dot/org/projectdevelopment/materials/research/documents/qpl.pdf>

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“I believe in innovation and that the way you get innovation is you fund research and learn the basic facts.”
- Bill Gates

Showcasing the Benefits of Research and Innovation (cont'd)

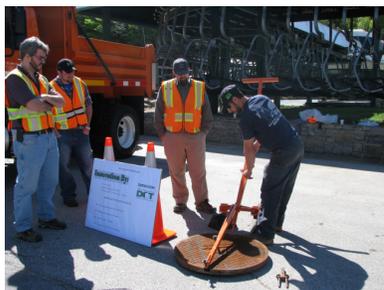
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Corey St. Cyr demonstrates the manhole cover lifter he designed. With this tool, covers can be picked up horizontally and set off to the side without pinching any fingers and straining backs.



Kevin Spaulding developed this plastic pipe puller that was Innovation Winner for the 2013 Plow Rally.



2013 RESEARCH & INNOVATION SHOWCASE

- **9:00 AM - OPENING REMARKS**
Commissioner Chris Clement, Patrick Bauer (FHWA), Chris Kennedy (Governor's Office)
- **10:00 AM - INNOVATIONS IN BRIDGE DESIGN/CONSTRUCTION**
Bill Horne - CHA
- **11:00 AM - INNOVATIONS IN HIGHWAY DESIGN/CONSTRUCTION**
Pete Stannas - Project Management
- **12:00 PM - INNOVATIONS IN TRAFFIC SAFETY**
Bill Lambert, Tobey Reynolds, Sally Gunn - Bureau of Traffic

- | | |
|----------------------------------|----------------------------|
| • Research Projects | • Equipment Innovations |
| • NHDOT Cost-Savings Initiatives | • Software Demonstrations |
| • NHDOT Green Initiatives | • Balanced Scorecard |
| • Plow-Rally Innovations | • ORT, DTZ, GIS, and More! |

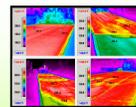
Hosted by the NHDOT M&R Research Section

J. O. Morton Building, Concord

Wednesday, November 13, 2013

9 a.m. to 1 p.m.

Refreshments will be Available!



"I think that it came off very well. I had several people say to me that the showcase made them proud to be a part of the DOT. People couldn't say enough good about it." Alan Rawson, M&R Administrator



Showcase attendees who are professors, current or former undergrad and graduate students from the University of New Hampshire. NHDOT is fortunate to have Principal Investigators from the Civil Engineering program at UNH that are nationally recognized experts in their respective fields. There is a long-standing cooperative relationship between NHDOT and UNH offering UNH resources to fund research for their graduate students and providing NHDOT with highly educated current and future employees.



WHAT'S YOUR PROBLEM?