massDOT
Massachusetts Department of Transportation

Transportation Research Quarterly

Providing highlights of MassDOT's transportation research activities and other helpful information **2025 Q2**

Focus on Research

"Leave sooner, drive slower, live longer." - anonymous

INSIDE THIS ISSUE

Recently Completed Projects

A Pavement Marking Inventory and Retroreflectivity Condition Assessment Method Using Mobile LiDAR – Phase II
Completion Date: February 2025
Duration: 19 months.
Budget: $200,000.00
The research team utilized the developed automated algorithms and methods and investigated the deterioration trends for the three pavement marking materials in the selected testing sections. The findings will provide a consistently accurate and efficient methodology for MassDOT to evaluate the retroreflectivity of its in-service pavement markings.

Robust Decision-Making Framework for Sustainable Operations and Planning of MBTA Rapid Transit Vehicles
Completion date: September 2024
Duration: 18 months.
Budget: $124,999.00
This study presents a Long Short-Term Memory (LSTM) recurrent neural network, the model can accurately predict daily energy consumption and average daily temperature. A decision-making tool was developed to simulate various operational strategies and their impacts on energy consumption and temperature.

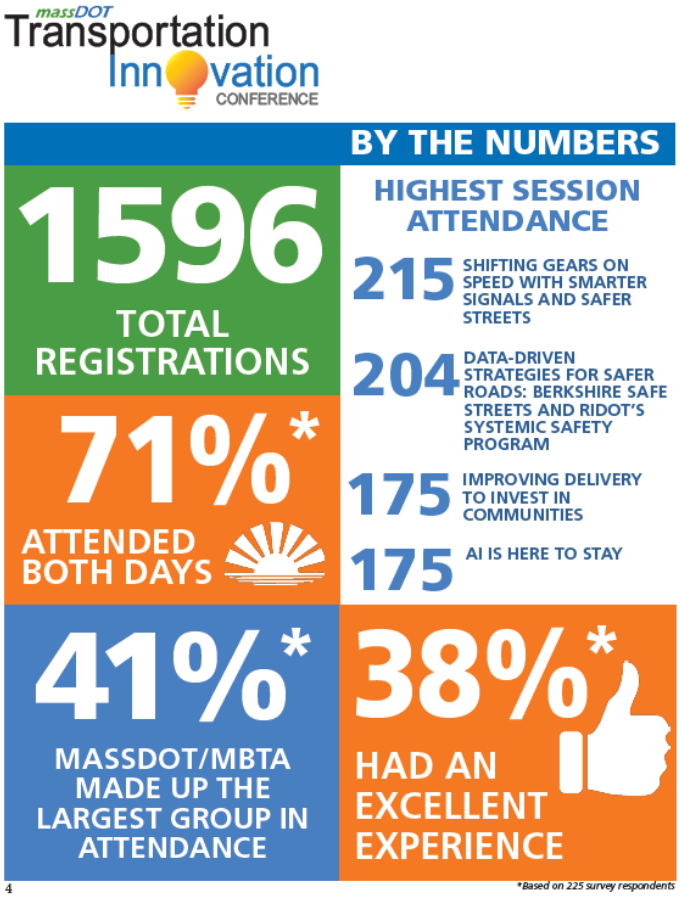
Evaluation & Mitigation Methods for the Prevention of Cement Concrete Deterioration due to Pyrrhotite: Part I
Completion Date: September 2024
Duration: 6 months.
Budget: $81,500.00
Preliminary laboratory tests confirmed that electrochemical accelerated testing (EAT) on pyrrhotite-induced concrete samples effectively replicated deterioration patterns observed in the field, while control specimens without pyrrhotite remained intact.

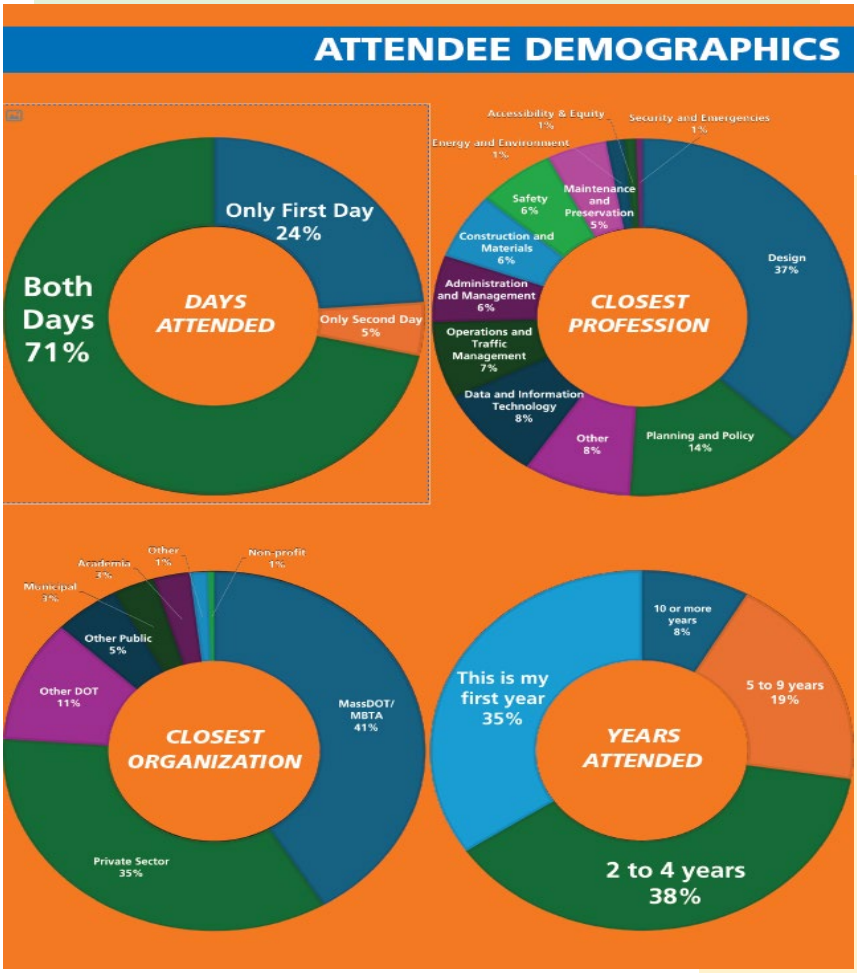
Annual MassDOT Innovation Conference 2025

The annual Transportation Innovation Conference provides a forum for sharing knowledge and ideas on innovative transportation initiatives, technologies, and systems. The Innovation Conference is supported by the MassDOT Research and Technology Transfer Program.

The Transportation Innovation Conference took place on May 6th and 7th at the DCU Center in Worcester. A total of 1,596 people registered for the conference. People registered for the conference from 31 states, the District of Columbia, Ontario, Quebec, and Japan.

By organization type, one-third (33 percent) of registrants were from MassDOT/MBTA, 47 percent from the private sector, 9 percent from local/regional government, 3 percent from academia, 3 percent from other state DOTs, and 4 percent from other organizations or registered as individuals.





MassDOT Bicycle and Pedestrian Program Coordinator Pete Sutton served as the conference's Master of Ceremonies, additionally, Sutton and Highway Administrator Jonathan Gulliver gave the opening plenary. Highlights of the conference included: lunchtime keynotes by Monica Tibbits-Nutt, Secretary and CEO of MassDOT, and by MassDOT Undersecretary Hayes Morrison; a MassDOT-led session with a peer exchange on road safety audits, and a session moderated by Steve Woelfel on incorporating artificial intelligence (AI) into MassDOT's practices and procedures. 71 percent of the 225 respondents indicated that they attended both days, and 83 percent said that overall, they had a favorable — either "Good" or "Excellent" — experience at the conference.

Ongoing Research Project Highlights

Evaluating the Effectiveness of Drivers' Education Modules on Safety

There is mixed evidence as to the effectiveness of drivers' education courses. It is also unknown whether drivers' education can be used to train drivers on how to effectively use driving automation. Goals of this project are examining how differences in drivers' education program delivery effects novice drivers' behavior, crashes, and citations within 12 months of licensure, examining how differences in novice drivers' pre-license behaviors affect crashes and citations within 12 months of licensure, as well as examining how driver education and training programs can help improve novice drivers' use and understanding of ADAS.

Methodology:

1. We will begin by examining stakeholder insight using interviews and/or focus groups to develop an informed perspective on current drivers' education and training in Massachusetts.
2. The insights gained from the stakeholder surveys and interviews will be leveraged to inform the design of the content and delivery of a drivers' education training program for ADAS -- advanced driving assistance systems.
3. To assess the effectiveness of drivers' education, we will undertake a longitudinal, between-subjects research experiment where each participant will complete a series of surveys and a driving simulator experiment.
4. Approximately one year about the experiment (in step 3), we will extract crash and citations records of the teen drivers.

Completed Research Project Highlights

Methods to Identify Problematic Carriers and Prevent Infrastructure Damage

Identifying and quantifying oversize/overweight (OS-OW) trucking operations in Massachusetts, as well as their violation types and rates, is necessary to improve roadway safety and prevent further damage to the Commonwealth's aging and evolving bridge and roadway systems. This study was accomplished by compiling a comprehensive classification of relevant state and federal data sources, fields, and their frameworks of interoperability. Data canisters successfully linked multiple datasets, demonstrating that a decoupled analysis approach improves OS-OW vehicle and carrier trend identification. Challenges in OS-OW permit processing were noted, including extensive manual steps and a lack of documentation for FMCSA Safety Measurement System verification. Stakeholder collaboration is essential for improving data-sharing, enforcement coordination, and infrastructure protection.

This initial research and feasibility phase has identified stakeholders for collaboration across multiple departments and agencies. Growing their familiarity of available datasets will improve data architecture for future integration efforts.

This study also resulted in the following recommendations:

- Improve carrier identification methods by standardizing company names in data collection and implementing validity checks.
- Implement a factor-weighted scoring system to assess carrier risk and prioritize enforcement actions based on permit and violation history.
- Develop real-time analysis tools for tracking OS-OW vehicle movements and optimizing enforcement efforts.
- Integrate permitted routes into the ArcMap geoDOT platform to enhance visualization of infrastructure vulnerabilities and optimize routing decisions.

A Look at Who We are – Team Highlights

Each MassDOT research project team is comprised of a Project Champion(s), a Principal Investigator(s) and a Project Manager. The Project Champion serves as the MassDOT technical representative, the Principal Investigator conducts research investigation and produces deliverables per project scope and schedule, and the Project Manager takes charge of the overall project administrative management and coordination. Highlighted below are the key members of "Methods to Identify Problematic Carriers and Prevent Infrastructure Damage" project team. This project was managed by project manager Nicholas Zavolas from our research team.

Principal Investigator – Robin Riessman, MPH

Robin, who has been with UMassSafe since its inception in 2001, has been extremely instrumental in visualizing, strategizing and implementing the myriad of UMassSafe programs. She has worked in the field of highway safety for nearly 30 years including as the Associate and then Deputy Director of UMassSafe for 17 years. As the UMassSafe Deputy Director, and Principal Investigator for many research projects, she has been responsible for the oversight of staff, projects, research, strategic planning, grant writing and management, and project evaluation. As Director, her role includes overall strategic and operational responsibilities for UMassSafe staff, programs, expansions and execution of its mission.

Principal Investigator – Jennifer Gazzillo

Jenn has been with UMassSafe since her years as a student research assistant dating back to 2005. As a full-time research staffer since 2008, she has developed expertise in crash data analysis, GIS mapping, technical writing and website development. She now guides daily activities and oversees projects ranging from the Law Enforcement Crash Report E-Manual to the Traffic Safety Data Warehouse. She prides herself on being a jack-of-all trades and loves the extreme variation of projects that UMassSafe tackles.

Co-Principal Investigator – Cole Fitzpatrick

Cole Fitzpatrick, recently officially joined the UMassSafe team. He is a Research Assistant and Professor in the Transportation Engineering Program in the Department of Civil and Environmental Engineering at the University of Massachusetts at Amherst. He has been an active member of the UMassSafe program since his time here as a graduate student. His research interests include data analytics, human factors, and traffic safety. He currently splits his time between the UMass Transportation Center and UMassSafe. Here at UMassSafe, Dr. Fitzpatrick is the Principal Investigator on several projects, as well as serving as a student advisor, and data scientist.

Project Champion – Makaela Niles

Makaela Niles is a transportation planner in the Office of Transportation Planning's Multimodal section. Since joining MassDOT in 2019, Makaela has been engaged in studies and initiatives that aim to improve access and multimodal mobility. In addition to her work on freight planning activities, Makaela is involved in a variety of efforts, including the Northern Tier Passenger Rail Study and the Wellington Circle Study. She holds a B.A. in English and an M.S. in Urban Planning and Community Development, both from the University of Massachusetts Boston.

News and Events

SAVE THE DATE!
2025 MassDOT Moving Together Conference
OCTOBER 28, 2025
Sheraton Boston Hotel, 39 Dalton St., Boston, MA 02199

massDOT Innovation Webinar Series

Robust Decision-Making Framework for Sustainable Operations and Planning of MBTA Rapid Transit Vehicles - July 24, 2025
Understanding and predicting energy consumption patterns in Urban Rail Transit (URT) systems is vital for sustainable urban planning, especially during disruptive events. This study presents a Long Short-Term Memory (LSTM) recurrent neural network, the model can accurately predict daily energy consumption and average daily temperature, with root mean squared errors (RMSE) of 50.6 MWh and 6.62°F. These findings provide URT operators with a robust framework for making data-driven decisions and improving energy efficiency in URT systems.
Click here for the webinar recording

Materials and Construction Best Practices for Exterior Slab Concrete - June 26, 2025
It is no secret that exterior slab concrete can be subjected to a myriad of challenges. However, these challenges are not insurmountable. Premature deterioration of concrete is attributed to one or more of the following factors: insufficient maturity, low durability, poor workability, improper workmanship.
Click here for the webinar recording

Optimizing of MassDOT's High Performance Asphalt Overlay (HPOL) Mixtures - April 24, 2025
The objective of this study was to conduct a comparative evaluation of three TOPS (Targeted Overlay Pavement Solutions, FHWA) types for asphalt pavements—Asphalt Rubber Gap-Graded, Stone Matrix Asphalt, and High-Performance Thin Overlay—in terms of their performance, their ability to extend pavement service life, and whether they can be used interchangeably.
Click here for the webinar recording

Research Resources

In Progress MassDOT Research

	Start Date
Development of Improved Inspection Techniques Using LIDAR for Deteriorated Steel Beam Ends	March 2022
Smart Work Zone Safety Control and Performance Evaluation	April 2022
Field Study to Determine Salt Usage Efficiency on Two Pavement Types	August 2022
Implementing AASHTO Mechanistic-Empirical Pavement Design Guide Phase III	November 2022
Effect of Asphalt Binder Source on Asphalt Mixture Performance	February 2023
Evaluating the Effectiveness of Drivers' Education Modules on Safety	April 2023
Measuring Food Access to Improve Public Health Phase II	September 2023
Recycled Ground-Glass Pozzolan (RGGP) for Use in Cement Concrete	September 2023
Cracks of Low-P Rapid Set Concrete in Deck Repairs: Analysis, Prevention, and Alternatives	December 2024
MassDOT Speed Regulation Editing Support	January 2025
Environmental Scan of Community Transit Needs Among Older Adults in Massachusetts	February 2025

Recently Completed MassDOT Research

	Completion Date
Post-Fire Damage Inspection of Concrete Structures (Phase II) – Experimental Phase	February 2023
Building Information Model for Transit Infrastructure: Feasibility and Gap Analysis	August 2023
Implementing AASHTO Mechanist-Empirical Pavement Design Guide Phase II	September2023
Developing Massachusetts-Specific Trip Generation Models for Land Use Projects	September 2023
Revised Load Rating Procedures for Prestressed Concrete Beams	November 2023
Ultra-High-Performance Concrete Reinforced with Multi-scale Hybrid Fibers	December 2023
Artificial Intelligence Framework for Midblock Crosswalk Detection Across Massachusetts	February 2024
Using Traffic Signals to Reduce Speeding Opportunities	February 2024
LIMMS Development Planning	July 2024
Development of a Salt Spreader Controller Program	July 2024
3D Printing Applications for Bridge Element Repair	August 2024
Data-Driven Approaches for Transit Capital Planning	August 2024
Cross-Modal Assessment of Sustainable Transportation Networks	August 2024
Evaluating Safety Impacts of Two-stage Bike Boxes	August 2024
Evaluation & Mitigation Methods for the Prevention of Cement Concrete Deterioration due to Pyrrhotite	September 2024
Accessible Bus Stop Design in the Presence of Bike Lanes	September 2024
Speed Management and Emergency Response – A Synthesis Study	September 2024
Post-Fire Inspection of Concrete Structure Phase III- In-Situ Experiments	December 2024
Methods to Identify Problematic Carriers and Prevent Infrastructure Damage	December 2024
Tree Preservation and Planting for Complete Streets Development	June 2024
Fare Payment Compliance on MBTA Buses and Light Rail	October 2024
A Pavement marking Inventory and Retroreflectivity Condition Assessment Method Phase II	February 2025

Additional Resources

Transportation Research and Information Database (TRID) is a comprehensive bibliographic database containing more than 1.2 million records of transportation research.

Research in Progress (RiP) Database contains information on more than 13,000 current or recently completed federally-funded transportation research projects.

AASHTO Publications include the most accepted technical guides, specifications, and manuals of the industry.

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