massDOT
Massachusetts Department of Transportation

Transportation Research Quarterly

Providing highlights of MassDOT's transportation research activities and other helpful information **2022 Q2**

Ask the Right Research Question

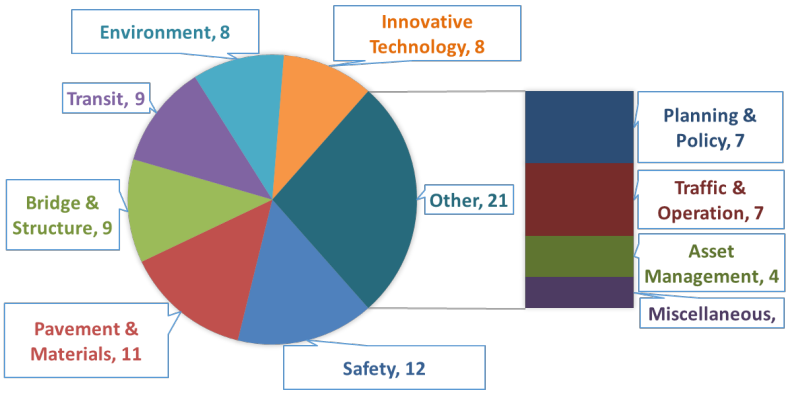
If you don't ask the right questions, you don't get the right answers. A question asked the right way often points to its own answer. Asking questions is the ABC of diagnosis. Only the inquiring mind solves problems.

– Edward Hodnett, Author of "The Art of Problem Solving"

INSIDE THIS ISSUE

Annual MassDOT SPRII Research Problem Statement Solicitation Remains Open until May 31

The Commonwealth strives to be a national leader in transportation research and practice. Our research program is driven by our agency's needs and our staff's innovative ideas to continually improve and transform the work we do at MassDOT and the MBTA. As shown in the chart below, our SPRII research projects cover many areas of surface transportation.

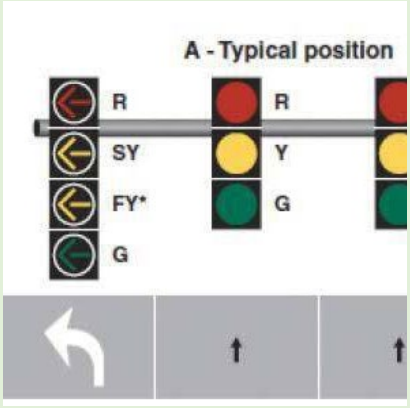


To participate you do not need to know the answers, just clearly define the problem that MassDOT or MBTA needs to solve and how the results would be implemented. Should your project be selected, you will serve as the Project Champion. Working alongside the contracted researchers and Research Section staff, you will ensure that the results of the research address the most pressing issues facing us as an agency and that the recommendations result from solid scientific investigation and are readily implementable.

To submit a research project idea, please complete the online research problem statement submission form. The submission form and accompanying guide sheet provide detailed directions to help you create a strong proposal.

MassDOT's AASHTO High Value Research Award Winning Projects

2022: Evaluating the Safety Impacts of Flash Yellow Permissive Left-turn Indications



MassDOT has been systematically upgrading all State Highway intersections that have Protected/Permissive Left Turn (PPLT) phasing and a separate left turn lane, to incorporate Flashing Yellow Arrow (FYA). Using before- and after-FYA-treatment crash data and Massachusetts-adjusted FHWA costs, this study estimated crash reduction impacts and benefit-cost ratios of three types of installation: 3-way intersections with one FYA; 4-way intersections with one FYA; and 4-way intersections with two or more FYAs. Results provided overwhelming evidence that the FYA reduced the average annual number of injury-related crashes and led to a lower economic cost of injuries at all three of the treatment types, suggesting FYA signal retrofits should be widely implemented regardless of intersection type.

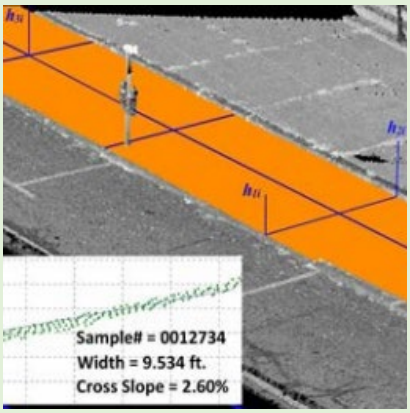
Principal Investigators: Dr. Francis Tainter & Dr. Cole Fitzpatrick, UMass Amherst
Project Champions: Jim Danila, MassDOT Highway
Project Manager: Drew Pflaumer, MassDOT OTP

2021: Characterization of Reclaimed Asphalt Pavement in Massachusetts

Reclaimed Asphalt Pavement (RAP) is a valuable recyclable material. It contains aged asphalt binder and aggregates that can be utilized in new asphalt paving mixtures. Using RAP can also reduce pavement projects' environmental footprint. This study investigated the RAP properties available throughout Massachusetts and developed a guideline to safely maximize the use of RAP without negatively impacting the performance of an asphalt paving mixture. Informed by the study findings, MassDOT has been piloting high RAP (25-30%) pavement mixtures with carefully selected binders at several Interstate roadway locations. New RAP design and construction specifications are expected to be issued based on the field experiment at these pilot sites. Watch the recorded presentation.

Principal Investigators: Dr. Walaa Mogawer, UMass Dartmouth
Project Champion: Ed Naras, MassDOT Highway
Project Manager: Patrick McMahon, MassDOT OTP

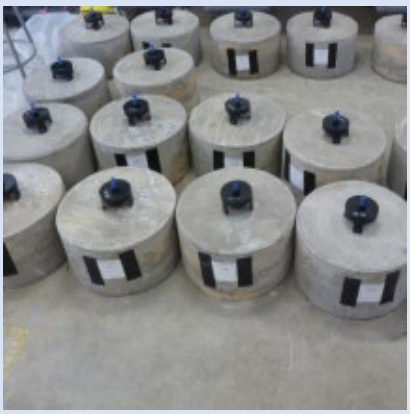
2020: Improving Pedestrian Infrastructure Inventory Using Mobile LiDAR



This research demonstrates that mobile LiDAR and computer vision technologies provide an efficient and effective solution for streamlined data collection and processing; and can be seamlessly integrated with existing asset management software and inventory geo-database. Using a passenger vehicle equipped with a LiDAR device, the project team collected roadside data along the 271-mile State Route 9 corridor at travel speed. Once the automated computer algorithms, interfaces, and processing steps were developed and calibrated, 85.1 miles of sidewalk and their geometric measurements were extracted in less than 30 hours and 1,297 curb ramps and their measurements, within 10 hours. This success has led to new efforts to automate other types of asset inventories and condition assessments using LiDAR.

Principal Investigators: Dr. Chengbo Ai, UMass Amherst
Project Champion: Jack Moran, MassDOT Highway
Project Manager: Nicholas Zavolas, MassDOT OTP

2019: Performance of Adhesive and Cementitious Anchoring Systems



The MassDOT's Qualified Construction Material List needs to be constantly updated to allow new and better performance materials being utilized on MassDOT projects. Prior to this research, the adhesive and cementitious material list could not be updated because of limited information on adhesive anchor performance nationwide. The corresponding performance test methods must be established to allow new materials to be evaluated and added to the list. The study verified testing methods and recommended an implementation plan, which allowed MassDOT to accept new bonding materials for adhesive anchors onto the List upon specific testing conditions being met. As a result, multiple qualified products have been added to the list and used on MassDOT bridge replacement projects.

Principal Investigators: Dr. Scott Civjan, UMass Amherst
Project Champion: John Grieco, MassDOT Highway (former employee)
Project Manager: Patrick McMahon, MassDOT OTP

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 "Evaluating the Safety Impacts of Flashing Yellow Permissive Indications" project team.

Project Champion – Jim Danila

James M. Danila, P.E. & PTOE, became the State Traffic Engineer at the MassDOT Highway Division in 2021 and had served as the assistant State Traffic Engineer prior to that. Before joining MassDOT, Jim worked as a Transportation Engineer at several private engineering design firms, including Howard Stein Hudson. He received his B.S. in Civil Engineering with a Minor in Environmental Science from Lafayette College in Easton, Pennsylvania. Jim is an active member of the AASHTO Standing Committee on Highway Traffic Safety and a member of the Institute of Transportation Engineers.

Principal Investigator – Dr. Francis Tainter

Francis Tainter is a Research Assistant Professor in the Transportation Engineering Program at the University of Massachusetts Amherst. His main research focuses include transportation safety, operations, policy, and human factors. Francis is featured in multiple "Transportation mini-series" educational videos produced by the UMass Transportation Center. He is an active member of the TRB ACH50 Committee on Road User Measurement and Evaluation and serves as a paper reviewer for several TRB committees, including the Traffic Control Devices Committee (ACP55) and the Vehicle User Education Training and Licensing Committee (ACH60). You may contact Francis at ftainter@umass.edu.

Principal Investigator – Dr. Cole Fitzpatrick

Cole Fitzpatrick is a Research Assistant Professor in the Transportation Engineering Program at the University of Massachusetts Amherst and an active member of the UMassSafe Program. His research interests include data analytics, human factors, and traffic safety. Dr. Fitzpatrick is the Principal Investigator on several traffic safety projects, including a MassDOT-funded project to explore the efficacy of a computer-vision-based approach to autodetecting vehicle trajectories at large intersections using videos collected with drones. At Umass, Cole also serves as a student advisor and data scientist. You may contact Cole at cfitzpat@umass.edu.

Research Section Staff – Drew Pflaumer

Drew Pflaumer is a transportation planner with the Research Section at the Office of Transportation Planning. He joined MassDOT in November 2019 after approximately five years in Rhode Island working for the Office of Statewide Planning, the Rhode Island Public Transit Authority, and as a municipal planner. Drew earned his Master of Urban Planning degree at Ball State University in 2015 before moving to New England. In his spare time Drew can be found riding his bike to destinations near and far. Drew prepared our successful submissions to the 2021 and 2022 AASHTO HVR competition. You may contact Drew at Drew.Pflaumer@dot.state.ma.us.

News and Events

massDOT Transportation Innovation CONFERENCE

In-person 2022 MassDOT Innovation Conference with Virtual Attendance Option

Date: May 24-25, 2022 Location: DCU Center, Worcester

The annual MassDOT Transportation Innovation Conference provides a forum for innovative transportation systems, management ideas, and initiatives. The conference is an important opportunity for transportation practitioners to share knowledge, sponsor peer-to-peer learning, and collaborate on issues of mutual interest. This year's conference features keynote speeches by **Governor Charlie Baker, Lt. Governor Karyn Polito, MassDOT Secretary & CEO Jamey Tesler, Highway Division Administrator Jonathan Gulliver and Chief Engineer Carrie Lavallee**.

The specific focus of this year's conference is on MassDOT's investment in infrastructure, and topic categories include:

- Innovations in Construction Methods
- Promoting a Safe and Equitable Transportation Culture
- Streamlining the Project Delivery Process to Improve Infrastructure
- Best Practices in Municipal and Regional Transportation
- New Techniques in Design and Materials
- Implementing New Technologies

TRANSPORTATION CURRICULUM COORDINATION COUNCIL

A TECHNICAL SERVICE PROGRAM OF: TRAINING AASHTO

The AASHTO T3 Training Program TC3's curriculum offers over 190 web-based training (WBT) in the areas of construction, maintenance, materials, pavement preservation, traffic and safety, and employee development. Over 90% of these courses are recommended for professional development hours (PDHs). A WBT is located online, self-paced, and can be accessed from any computer with an internet connection. **MassDOT subscribes to the AASHTO TC3 technical services and our employees can take TC3 WBT courses free of charge.** Please view the current TC3 WBT course listing by categories. You can also directly browse all courses and register for a course through the AASHTO bookstore. To learn how to register for an AASHTO account using your MassDOT email address and to enroll in TC3 web-based training courses, view How to Register guide.

TRB TRANSPORTATION RESEARCH BOARD

No time to conduct a literature search yourself? TRB Library Snap Searches can help

Snap Searches are designed for the busy researchers or professionals who would like to quickly get up to speed on complex research topics. They provide a succinct summary of current activities at TRB on a given topic including:

- A list of recent reports from TRB and the National Academies
- Current and upcoming projects related to the topic
- Names of Committees working on relevant issues
- Upcoming events such as conferences and webinars

massDOT Massachusetts Department of Transportation

U.S. Department of Transportation Federal Highway Administration

AASHTO

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

NCHRP COOPERATIVE HIGHWAY RESEARCH PROGRAM

Research Resources

In Progress MassDOT Research

	Start Date
A Pavement Marking Inventory and Condition Assessment Method Using Mobile Lidar	March 2020
Understanding the Asset Management Systems Utilized by Municipalities in Massachusetts	April 2020
3D Printing Application for Transportation Infrastructure and Maintenance	June 2020
A UAS Network for Transportation Emergency Response	March 2021
Discover the Root Causes for Truck Rollover at Highway Ramps	March 2021
Massachusetts Depth to Bedrock	March 2021
Massachusetts-Specific Trip Generation Rates	March 2021
Multisource Data Fusion for Traffic Incident Detection	April 2021
Accessibility to Public Health	May 2021
Revised Load Rating Procedures for Prestressed Concrete Beams	May 2021
Post-Fire Damage Inspection of Concrete Structures (Phase II) – Experimental Phase	June 2021
Using Traffic Signals to Reduce Speeding Opportunities	July 2021
Optimizing MassDOT's High Performance Asphalt Overlay Mixtures	July 2021
Construction and Material Best Practices for Concrete Sidewalk Phase II – Hot Placement	July 2021
Implementing AASHTO Mechanist-Empirical Pavement Design Guide Phase II	July 2021
Mycofiltration Design and Treatment Option	August 2021
Ultra High-Performance Concrete Reenforced with Multi-scale Hybrid Fibers	August 2021
Safety Impacts of Yellow Flashing Permissive Left-Turn Indications – Approach Analysis	October 2021
Development of Improved Inspection Techniques Using LIDAR for Deteriorated Steel Beam Ends*	March 2022
Smart Work Zone Safety Control and Performance Evaluation*	April 2022
Tree Preservation and Planting for Complete Streets Development	April 2022
Building Information Model for Transit Infrastructure: Feasibility and Gap Analysis*	May 2022

Recently Completed MassDOT Research

	Completion Date
Automated Guardrail Inventory and Condition Assessment*	May 2022
Development of Comprehensive Inspection Protocols for Deteriorated Steel Beam End*	March 2022
Impact of Advanced Driver Assistance System on Road Safety*	March 2022
Detecting Subsurface Voids using UAS Infrared Thermal Imaging	February 2022
Best Practices for Cost Recovery	October 2021
Exploring Short-Sea Shipping as an Alternative to Non-Bulk Freight Trucking in Southeastern MA	September 2021
Improving Load Rating Procedures for Steel Beam Ends with Deteriorated Stiffeners	September 2021
Effectiveness of Bike Boxes in Massachusetts	September 2021
Energy Consumption, Cost and Emissions of MBTA Rapid Transit Vehicles	August 2021
Flexible Transit Services in Rural Areas	August 2021
Future of Commonwealth's Curb	June 2021
Implementing the AASHTO Mechanistic-Empirical Pavement Design Guide (Phase I)	June 2021
Translating Data Generated by the Transit App into Insights on Transportation Use	May 2021
Post-fire Damage Inspection of Concrete Structure (Phase I)	April 2021

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.

Contact Us

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* Project documents are being edited for accessibility and will be posted shortly.