

Approved Research Ideas

April 2012

Summary

Table 1 identifies all the approved research ideas for the MDOT State Planning & Research (SPR) Part II. These ideas can be reviewed by clicking on the research idea number in the table and bringing up the idea. MDOT plans on developing these ideas into the request for proposals (RFPs) for projects starting fiscal years (FY) 2014 and 2015 and in some cases 2013.

Background

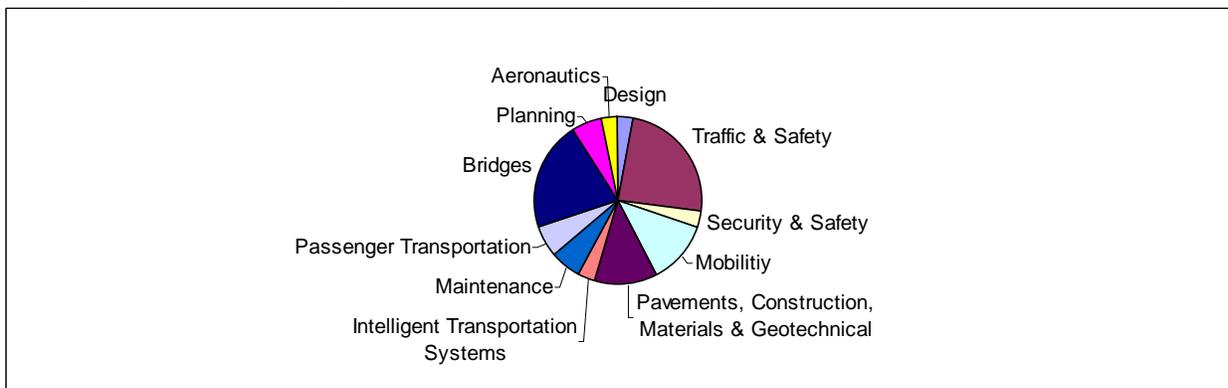
On November 29, 2011, the Research Executive Committee (REC) developed the Strategic Research Priorities for FY 2014 and 2015, listed in **Table 2**.

In January 2012, Research Administration requested the development of research ideas addressing these priorities. All of the research stakeholders were contacted. Research Administration received an outstanding response of more than 120 ideas.

In March, meetings were held with each Research Advisory Committee to determine what research ideas to recommend to the Research Executive Committee. There are four RACs that are composed of a chair, region staff, and focus area managers. On March 29, 2012 the Research Executive Committee approved the list of recommended research ideas.

Recommendation

There are a total of 33 ideas listed in **Table 1** addressing 18 of the research priorities. Each research idea in Table 1 is included in **Appendix A**. Many good problem statements were received however MDOT only selected those that addressed MDOT's needs directly. In some cases, these research ideas were improved by MDOT staff based on the submitted ideas to more directly meet the needs. **Figure 1** shows the areas of approved research ideas listed in **Table 1**.



Next Steps

- Research Summit May 2012
 - Develop research ideas marked as summit topics further.

- Develop Problem Statements May- June

- Approve Program July- August
 - REC members review problem statements.
 - FHWA reviews problem statements

- Post RFP's
 - Post FY14 RFP's in the winter of FY13
 - Post FY15 RFP's in the winter of FY14

Approved Research Ideas

April 2012

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Approved Research Ideas

Table 1

Table 1- Approved Research Ideas							
RAC Chair Focus Area	Strategic Priority	Research Idea # (click on number to view)	Research Idea Title	Submitting Agency	Summit Topic	Project Start Date	Project Manager
Planning/Finance-Planning	18	18-4-a-1	Maintaining Transportation Programs in a Time of Financial Uncertainty-Lessons from other States	WMU	X	2013	Michele Fedorowicz
Planning/Finance-Planning	19	19-4-a-1	Economic Benefits of Bus Rapid Transit	MDOT		2014 or 2015	Stu Lindsay
Muti-Modal- Aeronatics	21	21-3-d-2	Evaluating Methods and Counting Aircraft Operations at Non-Towered Airports	MTU	X	2014 or 2015	Matt Brinker
Muti-Modal- Passenger Trans	24	New combine w/24-3-b-1 & 24-3-b-2	Determining Feasibility of Developing a Statewide Transit Mobility Measurement Tool	MDOT	X	2013	Jill Adams
Muti-Modal- Passenger Trans	25	25-3-b-1	Use of University and/or Consultants in Transit Vehicle Specifications: A synthesis of State DOT Practices	MDOT	X	2014 or 2015	Michael Frezell
Delivery & Operations-ITS	9	New combine w/9-2-d-1 & 9-2-d-2	Cost and Benefits of MDOT ITS Deployments	WMU/ CMU/ MDOT	X	2014 or 2015	Collin Castle
Delivery & Operations-Security & Safety	n/a	0-2-a-3	Research Effective Links Between Safety and Health Programs and Worker's Compensation Programs	MDOT	X	2014 or 2015	Jim Gaus
Delivery & Operations-maintenance	11	New combine w/11-2-e-1 & 11-2-e-3	Development of Performance Measurers for Highway Winter Maintenance Operations	WMU/ MDOT	X	2013	Tim Croze
Delivery & Operations-maintenance	11	0-1-e-2	Evaluating the use of Tow Plows	MDOT		2014 or 2015	Tim Croze
Delivery & Operations-Pavements	12	12-2-c-2	Use of Recycled Concrete Fines for Sub-Grade Stabilization	MDOT		2014 or 2015	Nishantha Bandara
Delivery & Operations-Pavements	12	12-2-c-12	Method to Assess the Role of Alternative Materials in Pavement Design, Construction, and Performance	MTU	X	2014 or 2015	Nathan Maack
Delivery & Operations-Pavements	12	12-2-c-1	Long Term Performance Evaluation of Sub-Grade Stabilization with Recycled Materials	MDOT	X	2014 or 2015	Nishantha Bandara
Delivery & Operations-Pavements	n/a	0-2-c-3	Adequacy of Michigan Climatic Files for Mechanistic Pavement Design	MDOT	X	2014 or 2015	Mike Eacker
Delivery & Operations-Mobility	8	8-2-b-1	Optimization Strategy for Highway Work Zone Mobility and Life-Cycle Cost	WMU	X	2015	Hilary Owen
Delivery & Operations-Mobility	8	8-2-b-3	Evaluating all the Costs of Mobility Investments	MDOT	X	2013	Hilary Owen
Delivery & Operations-Mobility	n/a	0-2-b-1	Commercial Vehicle Enforcement Strategies	MDOT	X	2013	Jason Firman
Delivery & Operations-Mobility	7	7-2-b-2	Assessing Mobility Impacts of Modeled Signal Timing Optimizations	MDOT\WSU	X	2014 or 2015	Tom Fisher
Development- Design	10	10-1-b-1	Developing Performance-Based Lighting Standards	MDOT	X	2013	Steve Urda
Development- Traffic & Safety	5	NEW Combine w/5-1-d-3, 5-1-d-5, 5-1-d-6, 5-1-d-7	Association of Michigan's Older Driver crashes with Roadway Features	MDOT/ CMU/ WSU / CMU	X	2014 or 2015	Kim Lariviere
Development- Traffic & Safety	5	NEW Combine w/5-1-d-1, 5-1-d-2	Evaluation of Michigan's Engineering Improvements for Older Drivers	MDOT/ WMU	X	2014 or 2015	Kim Lariviere
Development- Traffic & Safety	6	NEW Combine w/6-1-d-1, 6-1-d-2, 6-1-d-3, 6-1-d-4, 6-1-d-5, 6-1-d-6	Michigan Rural Safety Performance Function (SPFs) Development and Support	MDOT/ WMU/ WMU/ WMU/ WSU		2014 or 2015	Dean Kanitz
Development- Traffic & Safety	6	NEW Combine w/6-1-d-1, 6-1-d-2, 6-1-d-3, 6-1-d-4, 6-1-d-5, 6-1-d-6	Michigan Urban Safety Performance Function (SPFs) Development and Support	MDOT/ WMU/ WMU/ WMU/ WSU	X	2014 or 2015	Dean Kanitz

Table 1- Approved Research Ideas							
RAC Chair Focus Area	Strategic Priority	Research Idea # (click on number to view)	Research Idea Title	Submitting Agency	Summit Topic	Project Start Date	Project Manager
Development- Traffic & Safety	6	NEW Combine w/6-1-d-1, 6-1-d-2, 6-1-d-3, 6-1-d-4, 6-1-d-5, 6-1-d-6	Michigan Local Agency Safety Performance Function (SPFs) Development and Support	MDOT/ WMU/ WMU/ WMU/ WSU		2014 or 2015	Dean Kanitz
Development- Traffic & Safety	7	NEW Combine w/7-1-d-1, 7-1-d-2, 7-1-d-3	Evaluation of Non-Freeway Rumble Strips (Phase II)	MDOT/ WMU / WSU	X	2013	Jill Morena
Development- Traffic & Safety	14	NEW Combine w/14-1-d-1, 14-1-d-2, 14-1-d-3	Evaluation of Pavement Marking Practices in Michigan	MDOT/ MTU/ Applied Research	X	2014 or 2015	Jill Morena
Development- Traffic & Safety	n/a	0-1-d-2	Comparison of the Efficacy and Cost Effectiveness of In-Street Signs used as a Gateway Treatment at Multilane Crossings	WMU	X	2014 or 2015	Deirdre Thompson
Development- Bridges	1	New combine w/1-1-a-3 & 1-1-a-4	Evaluation and Standardization of MDOT Highway Bridges Built using Accelerated Bridge Construction (ABC) and Prefabricated Bridge Element Systems (PBES)	WMU/ MDOT	X	2014 or 2015	Corey Rogers
Development- Bridges	2	2-1-a-2	Development, Characterization and Applications of a Non Proprietary Ultra High Performance Concrete for Highway Bridges	U of M/ MDOT	X	2014 or 2015	Steve Kahl
Development- Bridges	3	New combine w/3-1-a-1 & 3-1-a-2	Providing for wireless electronic display of bridge management data and wireless electronic data entry of bridge inspection information in the field to support MDOT's enterprise asset management system.	MTU/ MDOT	X	2014 or 2015	Rich Kathrens
Development- Bridges	3	3-1-a-3	The Use of PONTIS in the Network Analysis of Big Bridge Decks	MDOT- IBA	X	2014 or 2015	Beckie Curtis
Development- Bridges	4	4-1-a-2	Examination of Michigan Legal Loads	MDOT/WMU		2014 or 2015	Brad Wagner
Development- Bridges	4	4-1-a-12	Evaluate long term load carrying capacity of Carbon Fiber Reinforced Polymer prestressing strands subject to Michigan's highway environment, live loads, fire damage, and long term creep.	MDOT	X	2014 or 2015	Matt Chynoweth
Development- Bridges	4	New combine w/4-1-a-10 & 4-1-a-9	Development of wireless, real-time, river flood event and bridge scour monitoring	MTU/ MDOT	X	2014 or 2015	Beckie Curtis

Strategic Research Priorities

Table 2

On Nov. 29, 2011, the Michigan Department of Transportation (MDOT) Research Executive Committee (REC) met to discuss the agency's research needs for the program in Fiscal Years (FY) 2014-15 and outlined a number of areas where research may yield significant benefits to the department and improve the state's transportation system. These strategic research priorities will help inform interested stakeholders as they formulate and submit research ideas to MDOT by Jan. 31, 2012.

The strategic research priorities, listed below, are grouped by broad categories and are listed in no particular order. Priorities addressing short-term needs that must have projects started by FY 2013 are noted as follows (2013).

Bridges and Structures

1. **Advancing Accelerated Bridge Construction:** Can we better understand moving, connecting, and monitoring *prefabricated bridge elements* with acceptable construction tolerances? Can savings be realized with prefabricated bridge approach elements and *soil engineering*?
2. **Investigating the Durability of Bridge Elements:** Can we develop a matrix of design and maintenance applications for strengthening bridges and reducing corrosion using *innovative materials*? Can we develop and use *rapid bridge joint replacement* methods?
3. **Innovating Bridge Asset Management:** Can bridge inspection records be used to predict how and when to best invest in maintenance on different types of structures?
4. **Studying Health Monitoring of Bridges:** Can we advance the *bridge scour* action plan through monitoring? How will remote *bridge monitoring* be implemented after the first phase of research is completed in 2014? Can we reduce the truck types for legal *load evaluations*?

Traffic and Safety

5. **Advancement of Strategic Safety Areas:** What engineering improvements can we make for *older drivers* to drive safely? What locations are older drivers over-represented in crashes and what are the roadway features of each location?
6. **Development of Tools for Safety Design Decisions:** Can we develop Michigan safety performance functions so the *new Highway Safety Manual* can be applied to enhance safety decision-making for MDOT projects?
7. **Validation of Safety Practices:** After *rumble strips* have been in place for three years, can we study them to determine how much they reduce crashes? Do implementing modeled *signal timing* optimizations result in the predicted mobility increases? Can we validate the results?

Mobility and Systems Operations

8. **Evaluating all the Costs of Mobility Investments:** What are the short- and long-term lost opportunity costs of mobility investments in work zones? And what is the *acceptable level of mobility* to maintain customer satisfaction? (2013)
9. **Identify the Benefits and Outcomes of Intelligent Transportation Systems (ITS):** Can the societal costs and benefits of ITS be evaluated?

Design

10. **Developing Performance-Based Lighting Standards:** How will we develop performance-based roadway lighting standards for *Induction, LED, plasma, and other lights*? (2013)

Maintenance

11. **Improving Winter Maintenance:** What are good *performance measures for snow removal*, considering both mobility and safety? (2013) Do certain pavement materials or textures *absorb more deicing material* than others? Can we learn from our winter maintenance studies to help airport winter maintenance?

Pavements

12. **Defining the Best Use of Recycled Materials in Pavement:** Can we develop an existing research and state-of-the-practice synthesis on the use of recycled materials in pavement that gives clear direction to MDOT?

13. **Implementing the Improvement to Longitudinal Joints:** Can we study the implementation of longitudinal joint improvements recommended by existing research in a pilot project that also looks at warranties for the joints? (2013)
14. **Evaluating Pavement Markings:** How do we most effectively use pavement markings in Michigan? Can we learn from this research to improve both our highway and airport pavement markings?

Financial Management

15. **Setting the Balance between Cash and Accrual-Based Capital Management Programs:** What are the relative pros and cons of managing a capital program on a cash basis versus an accrual basis? What are the best practices used to effectively manage capital programs on either a cash basis or accrual basis?
16. **Developing Guidelines to Efficiently Manage the Consultant Procurement Process:** Review consultant procurement processes used by state departments of transportation. Identify best practices for prequalification, selection and evaluation that result in a cost effective way to acquire quality consultant services.
17. **Identify Consultant Compensation Methods:** What are the best compensation methods (i.e., actual costs, lump sum, hourly rates, overtime rates) for paying consultants, and how are these methods efficiently and effectively used in the procurement process?

Planning

18. **Maintaining Transportation Programs:** How are states maintaining steady programs in a time of financial uncertainty?
19. **Tracking Outcomes from the Governor's Infrastructure Message:** How do we research to address the governor's infrastructure message? By 2014 or 2015, can we research practices *before and after reforms* take place to determine the effectiveness of the reforms that are made?

Aeronautics

20. **Suppressing Airport Lighting Lightning Strikes:** How can airport lighting lightning strikes be suppressed?
21. **Measuring the Volume of Aircraft at Non-tower Visually Observed Sites:** The amount of volume is linked to funding. Can we develop counting techniques that are reliable?

Passenger Transportation

22. **Defining Best Practices for Bus Stop Programs:** Define how Michigan transit agencies decide on location and management of bus stops and shelters. Identify best practices (Michigan and other northern states), including partnerships/coordination with the road agency/owner of the right-of-way to improve pedestrian safety; enhance traffic flow and transit ridership and partnerships with private business in adopt-a-shelter programs.
23. **Determining the Effectiveness of "Transit in the Roadway" Decisions:** Analyze the state of practice and the results to-date of Michigan decisions regarding operation of transit within the road right-of-way. Include southeast Michigan in the area bound by Woodward Avenue, Gratiot Road, and M-59; Lansing along Michigan Avenue; Grand Rapids; and other areas. What have been the challenges and successes to-date?
24. **Measuring the Level of Service on the Passenger Transportation System:** Can MDOT define, measure, and track level of service of the passenger transportation system statewide? Can we develop a repeatable method that is Michigan-specific to determine the level of local services statewide and measure the level of public transportation (local and intercity) mobility statewide? Can we develop a transit mobility index? (2013)
25. **Evaluation of Transit Bus Technologies and Development of Bus Procurement Standards:** Evaluate pros and cons of MDOT playing a more aggressive role in transit bus technology. Should MDOT drive innovation in testing and bus safety? Review MDOT's role and other states' roles (in particular Florida DOT); what are the best practices? Is there an ongoing role for Michigan universities in assisting MDOT in evaluating bus technologies for inclusion in procurement specifications?

Approved Research Ideas

Appendix A

Appear in this order:

18-4-a-1	Maintaining Transportation Programs in a Time of Financial Uncertainty-Lessons from other States
19-4-a-1	Economic Benefits of Bus Rapid Transit
21-3-d-2	Evaluating Methods and Counting Aircraft Operations at Non-Towered Airports
New combine w/24-3-b-1 & 24-3-b-2	Determining Feasibility of Developing a Statewide Transit Mobility Measurement Tool
25-3-b-1	Use of University and/or Consultants in Transit Vehicle Specifications: A Synthesis of State DOT Practices
New combine w/9-2-d-1 & 9-2-d-2	Cost and Benefits of MDOT ITS Deployments
0-2-a-3	Research Effective Links Between Safety and Health Programs and Worker's Compensation Programs
New combine w/11-2-e-1 & 11-2-e-3	Development of Performance Measurers for Highway Winter Maintenance Operations
0-1-e-2	Evaluating the use of Toe Plows
12-2-c-2	Use of Recycled Concrete Fines for Sub-Grade Stabilization
12-2-c-12	Method to Assess the Role of Alternative Materials in Pavement Design, Construction, and Performance
12-2-c-1	Long Term Performance Evaluation of Sub-Grade Stabilization with Recycled Materials
0-2-c-3	Adequacy of Michigan Climatic Files for Mechanistic Pavement Design
8-2-b-1	Optimization Strategy for Highway Work Zone Mobility and Life-Cycle Cost
8-2-b-3	Evaluating all the Costs of Mobility Investments
0-2-b-1	Commercial Vehicle Enforcement Strategies
7-2-b-2	Assessing Mobility Impacts of Modeled Signal Timing Optimizations
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NEW Combine w/5-1-d-3, 5-1-d-5, 5-1-d-6, 5-1-d-7	Association of Michigan's Older Driver crashes with Roadway Features
NEW Combine w/5-1-d-1, 5-1-d-2	Evaluation of Michigan's Engineering Improvements for Older Drivers
NEW Combine w/6-1-d-1, 6-1-d-2, 6-1-d-3, 6-1-d-4, 6-1-d-5, 6-1-d-6	Michigan Local Agency Safety Performance Function (SPFs) Development and Support
NEW Combine w/6-1-d-1, 6-1-d-2, 6-1-d-3, 6-1-d-4, 6-1-d-5, 6-1-d-6	Michigan Rural Safety Performance Function (SPFs) Development and Support

NEW Combine w/6-1-d-1, 6-1-d-2, 6-1-d-3, 6-1-d-4, 6-1-d-5, 6-1-d-6	Michigan Urban Safety Performance Function (SPFs) Development and Support
NEW Combine w/7-1-d-1, 7-1-d-2, 7-1-d-3	Evaluation of Non-Freeway Rumble Strips (Phase II)
NEW Combine w/14-1-d-1, 14-1-d-2, 14-1-d-3	Evaluation of Pavement Marking Practices in Michigan
0-1-d-2	Comparison of the Efficacy and Cost Effectiveness of In-Street Signs used as a Gateway Treatment at Multilane Crossings
New combine w/1-1-a-3 & 1-1-a-4	Evaluation and Standardization of MDOT Highway Bridges Built using Accelerated Bridge Construction (ABC) and Prefabricated Bridge Element Systems (PBES)
2-1-a-2	Development, Characterization and Applications of a Non Proprietary Ultra High Performance Concrete for Highway Bridges
New combine w/3-1-a-1 & 3-1-a-2	Providing for wireless electronic display of bridge management data and wireless electronic data entry of bridge inspection information in the field to support MDOT's enterprise asset management system.
3-1-a-3	The Use of PONTIS in the Network Analysis of Big Bridge Decks
4-1-a-2	Examination of Michigan Legal Loads
4-1-a-12	Evaluate long term load carrying capacity of Carbon Fiber Reinforced Polymer prestressing strands subject to Michigan's highway environment, live loads, fire damage, and long term creep.
New combine w/4-1-a-10 & 4-1-a-9	Development of wireless, real-time, river flood event and bridge scour monitoring

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	18-4-a-1
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
18

 2. Research Idea Title:
Maintaining Transportation Programs in a Time of Financial Uncertainty-Lessons from other States

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
Similar to other state departments, the Michigan DOT faces financial uncertainty resulting from unforeseen economic changes as well as advances in technology such as increase in more fuel-efficient vehicles, which result into less fuel tax revenues. With financial uncertainty, long-range transportation planning becomes more challenging. Also, with unforeseen decrease in revenues, maintaining steady transportation programs is unpredictable. Paralleling the financial forecast with transportation program plans is an issue facing many transportation agencies. For planned projects, most agencies establish criteria for transportation programs on regular basis to decide whether each project listed is still a priority according to the financial outlook. If the project is not a priority, it is dropped from future plans. However, with steady transportation programs, adjustments that ensure continuation of a program, are needed. There is no consistent adjustments made by different states to maintain steady programs. The objective of this research is to collect information from other state transportation agencies on how to maintain steady programs in a time of financial uncertainty. The research team will conduct a survey of selected transportation agencies and compile results. Best approaches suitable to MDOT will be identified and recommended.

 4. What research do you propose to solve the problem?
To accomplish the objectives of this research will conduct a survey of state and local transportation agencies to learn adjustments made to maintain steady transportation programs in a time of financial uncertainty. Specifically, the following tasks will be conducted:
Task 1: Critical literature review of documented state financial planning and expenditure.
Task 2: Selecting agencies to participate in the survey.
Task 3: Designing the survey tool.
Task 4: Conducting the survey.
Task 5: Analyzing the survey results.
Task 6: Prepare final report documenting the findings as well as recommendations.

 5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
Upon completion of the research, it is anticipated that MDOT will identify the best adjustments made by other states to maintain steady transportation programs in a time of financial uncertainty. The research will identify the best approaches recommended for adoption by MDOT.

 6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
The project is urgent because maintaining steady programs in a time of financial uncertainty impacts transportation planning. Surveying other transportation agencies could reveal the best approaches to
-

handling financial uncertainty while maintaining steady programs.

7. Submitted by (name)	Valerian Kwigizile, Ph. D., P. E
Title	Assistant Professor
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Date submitted	January 31, 2012

Please submit to: Mr. Steven C. Bower, P.E.
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Phone: 517-241-4667
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E-mail: mdot-research@michigan.gov

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	19-4-a-1
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
19
-
2. Research Idea Title:
Economic Benefits of Bus Rapid Transit
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
Need a better understanding of the benefits of regional transit to the economy, particularly in Southeast Michigan. Would like to measure the impact of this aspect of the Governor's infrastructure message.
-
4. What research do you propose to solve the problem?
Develop a framework for evaluation to determine the benefits of regional transit on the economy. Using the existing literature, case studies from other areas and input from state and local transportation and economic development officials, determine the specific factors that will be measured over time to determine impact and develop a "framework for evaluation." Collect the baseline data for each measure in the framework and establish a data base to serve as an economic baseline for the area of the proposed (or newly created) BRT in Southeast Michigan. Subsequent research will provide for ongoing data collection at various intervals (such as at the one year, five year and ten year mark) and will use the framework and the baseline data established under this project to measure the changes in that economic baseline as a result of the BRT overtime. The framework could also include measures regarding the BRTs impact on regional mobility, access to employment and land use.
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
The initial research will lay the groundwork for the department to make a better case for transit in urban areas and for transportation's contribution to the state economy and improved transportation access.
-
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
The baseline data and framework for evaluation should be developed just before or as soon as the BRT gets underway— probably sometime in 2014. .
-
- | | |
|----------------------------------|--|
| 7. Submitted by (name) | Polly Kent (Stu Lindsay to serve as project lead) |
| Title | Administrator, Intermodal Policy |
| Bureau/Region or Agency | BTP |
| Office/TSC or Address | Lansing |
| Section/Unit or City, State, Zip | |
| Phone | 517-335-2905 |
| E-mail | kentp@michigan.gov |
| Date submitted | 3/20/12 |
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	21-3-d-2
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1. Please list the MDOT strategic research priority number for this idea:
21

2. Research Idea Title:
Evaluating methods for counting aircraft operations at Non-towered airports

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
How to detect and count aircraft operations at non-towered airports, for planning and resource allocation purposes.

4. What research do you propose to solve the problem?
The system will consist of a combination of active (with a light source) and passive (visual and acoustic) sensors, a communications system to allow sensors to communicate, and a processing system to record, analyze and report activity. A test system would be tested at a local airstrip, with student pilots landing, taking off, and performing "touch and go" maneuvers. The system will be fully automated, day/night capable, and be able to both count aircraft as well as logging tail numbers.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
Knowing the activity at unattended airports would allow accurate assessment of resources needed to maintain or upgrade the runway. Further, knowing all tail numbers of the aircraft would allow charging for certain activities on an automated basis.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Not urgent

7.

Submitted by (name)	Christopher Roussi
Title	Senior Scientist
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Date submitted	1/27/12

Please submit to: Mr. Steven C. Bower, P.E.
Engineer of Research
Research Administration
425 West Ottawa Street
P.O. Box 30050

Phone: 517-241-4667
Fax: 517-241-2833
E-mail: mdot-research@michigan.gov

Michigan Department
Of Transportation
5315 (12/11)

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	24-3-b-1
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Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
#24 – Measuring the level of service on the Passenger Transportation System

 2. Research Idea Title:
Determining Feasibility of Developing a Statewide Transit Mobility Measurement Tool

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*

Current methodologies for determining transit Level of Service (LOS) focus on LOS at the individual system level. In particular, the TRB's Transit Capacity and Quality of Service Manual, [LOS] sets forth service measures in two main categories: (1) availability and (2) comfort and convenience. "Availability" measures address the spatial and temporal availability of transit service. "Comfort and convenience" measures evaluate a user's perception of the quality of his or her transit experience. For fixed route, "availability" is measured in terms of frequency, hours of service and service coverage. "Comfort and convenience" measures include passenger loads, reliability and transit vs. auto travel times. For demand response, "availability" is measured in terms of response time and service coverage and "comfort and convenience" measures are on-time performance, trips not served and transit vs. auto travel times. The level of data collection and analysis that would be needed to use this methodology for each transit system in the Michigan and then roll up the results for a statewide LOS is well beyond the level of effort MDOT could undertake. MDOT is seeking a simpler method/model that has some of the same functionality of the TRB manual but lends itself to generating statewide results and , if feasible does not require highly trained staff to use.

Currently, on a statewide basis, MDOT uses very rudimentary measures to assess and report the existing level of local and intercity transit services. Current measures include:

- 1) Is there some level of local transit in all 83 counties? This is a simple yes/no measurement. If there is an agency in a county that receives operating assistance from the MDOT under one of two programs, the answer is yes. http://www.michigan.gov/documents/mdot/MDOT-Performance_Measures_Report_289930_7.pdf
 - 2) Level of service indicators of annual transit ridership, annual transit miles and annual transit hours for all transit agencies in the state. These measures simply to show if there is an upward or downward trend for each indicator, with the stated objective of having no downward trend.
http://www.michigan.gov/documents/mdot/MDOT-Performance_Measures_Report_289930_7.pdf
 - 3) Percent of rural population within 25 miles of a rural intercity bus stop, based on the methodologies used by USDOT/BTS
http://www.bts.gov/publications/scheduled_intercity_transportation_and_the_us_rural_population/2010/html/entire.html
-

4) Also under consideration is percent of rural population that has rural transit access

MDOT is interested in the feasibility of having a more robust methodology that will better reflect the actual level of local, regional and statewide mobility that is available to Michigan residents by the existing bus and rail passenger transportation network and changes to that level of mobility over time. The results would be used in MDOT's long range transportation planning.

4. What research do you propose to solve the problem?

Phase 1: Determine the feasibility of developing a methodology MDOT can use to define and measure the current level of local, regional (intrastate) and statewide mobility that is available to Michigan residents as a result of the existing network of local transit services. Research should include an evaluation of existing methodologies/models, such as the aforementioned TRB manual and a determination if those models/methodologies could be modified and simplified for use at the state level. Feasibility should include a consideration of the data that would be needed, the need for MDOT to set standards (i.e., create definitions of mobility) to make use of the methodology, how meaningful the results are when rolled up at the state level, the ability of the methodology to be used for a specific region within the state, and overall ease of development and use. The research should determine if the same model/method can be used to determine LOS for rural, demand-response services as for urban, fixed route services and if different models/methods are needed, how the results would be rolled up for a statewide LOS. The research might also determine if a the same model/method could be used to define and measure statewide LOS as a roll-up of both: 1) local transit mobility (using the local transit system for daily transportation needs within a community for commuting, groceries, school, etc,) and 2) regional transit mobility (using multiple local transit systems to regional transit mobility (such as frequent, but not daily travel for business or to regional medical or shopping centers that would likely require transferring between local systems). This phase of the research should result in a final recommendation as to whether development of a methodology is feasible and if so, suggestions on one or more possible models/methodologies that should be developed.

Phase 2: If Phase 1 results in one or more promising methodologies, develop the model/methodology. Development shall include testing of the methodology by collecting and analyzing data and generating current statewide LOS. A final report will document the process used to make use of the selected methodology, identify the hurdles in implementation and evaluate the pros and cons of the selected methodology based on the ease of use and quality of the results.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

The results would be used in MDOT's long range transportation planning and would also be used in MDOT's performance management venues (dashboards and scorecards) to report level of service to policy-makers and the public. The methodology would be used over time to calculate and report changes in level of service.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
 For next State Long Range Planning process, would need methodology to be developed in FY13. If that is not possible, the results can be used in the subsequent state long range planning process.

7. Submitted by (name)	Sharon Edgar
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Date submitted	

Michigan Department
Of Transportation
5315 (12/11)

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	25-3-b-1
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
#3 – Evaluation of Public Transit Vehicle Technologies

 2. Research Idea Title:
Use of University and/or Consultants in Transit Vehicle Specifications: A Synthesis of State DOT Practices

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*

MDOT establishes specifications for transit agency vehicles for contracts that are released by the Department of Technology, Management and Budget. At this time, eight state contracts have been issued for the following vehicle types: minivans with ramp, full-size mobility/conversion vans, light-duty small buses, small buses, hybrid small buses, and medium buses. Some vehicle types have multiple awards to various dealers.

Since the vehicles will be used by transit agencies, not MDOT, MDOT works with a group of transit agency advisors to establish the specifications. This advisory group has good knowledge on their needs; they are less knowledgeable on the best technologies available to meet those needs. In addition, this group may come to the table with preconceptions of certain technologies based on past (outdated) experience and/or “urban myth.” MDOT and the group lack sufficient expertise to research and evaluate certain technical issues that may arise, such as the most effective specifications for vehicle heating and air conditioning, sidewall/roof materials, seating fabric, safety features, vehicle reliability or for alternative fuel vehicles for use in rural areas. As a result MDOT and the group are too dependent on information provided by vehicle manufacturers and suppliers regarding what new technologies and how they can be incorporated into vehicle specifications.

Some states bring in additional expertise by using universities and/or consultants to assist them in the specifications process. MDOT would like to understand what methods are being used in other states and which of them could be applicable in Michigan.

-
4. What research do you propose to solve the problem?

This research as two related, but separate components:

- 1) Inventory, assess, and synthesize the methods being used in other State DOTs to establish transit vehicle specifications, including the methods used to evaluate new technologies. Identify, assess, and synthesize methods being used in other states that include the use of university or consultant expertise; determine how the State DOT developed and implements the partnership and assess pros and cons of the various approaches. Make recommendations on methodologies being used in other states that could be adopted by Michigan DOT. Include an assessment of how universities and/or consultants are also being used in an “as-needed” basis to research specific technical issues that arise. Also include an assessment of how universities and/or consultants are being used in the vehicle procurement process, including vendor oversight.

2) Conduct a side-by-side assessment of key specifications currently being used by MDOT in comparison to specifications being used in other states. Assess, synthesize, and make recommendations on which specifications being used in other states should be adopted by Michigan or researched further. Recommend approaches for MDOT to conduct such assessment on a routine basis in the future.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

Will provide MDOT with an assessment of possible options for improving its vehicle specifications and procurement process based best practices being used in other states. Based on best practices in other states, MDOT may issue an RFP for university or consultant services to assist in its vehicle specification and procurement program. MDOT will also make use of specifications being used in other states to update its specifications as appropriate.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

MDOT develops vehicle specifications for one or more vehicles every calendar year. These results can be used as soon as they become available. However, MDOT can continue to use its current approach indefinitely.

7. Submitted by (name)	Sharon Edgar
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	9-2-d-1 & 9-2-d-2 NEW combined
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
9
-
2. Research Idea Title:
Cost and Benefits of MDOT ITS Deployments
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
MDOT has invested significantly in ITS deployments across the state over the last six years. The department believes this program and associated strategies is an effective way to use available technology to manage traffic and reduce motorist delays on the state trunkline network. ITS projects and deployments also tend to be high-profile, and accessible by the motoring public. Frequent requests are made by public and legislators alike inquiring on the costs, and associated benefits, of our ITS deployments.
-
4. What research do you propose to solve the problem?
1. Review and summarize national literature on the benefits of ITS projects and deployments, including that of the Traffic Management Pooled Fund Study, which MDOT is part of.
 2. Review and summarize the benefits and costs of previous implementations of ITS technologies in other regions that are similar to the State of Michigan
 3. Conduct a user perception survey of the benefits of ITS deployments.
 4. Quantify the benefits of individual ITS devices in Michigan in relation to safety and mobility savings.
 5. Measure and quantify the benefits of previous MDOT ITS deployments.
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
This research project will result in benefit-to-cost information that can be used to:
- 1) Demonstrate effectiveness of projects and strategies implemented
 - 2) Develop and plan implementation strategies
 - 3) Select appropriate ITS projects
-
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
This project is urgent, and one of the top priorities of MDOT's ITS programs. The information developed as part of this project will be used to ensure that we are applying our limited financial resources to the appropriate ITS solutions.
-
7. Submitted by (name) | Matt Smith
-

Title	ITS Program Manager
Bureau/Region or Agency	Michigan Department of Transportation/ITS Program
Office/TSC or Address	Construction Field Services
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Date submitted	March 22, 2012

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	0-2-a-3
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

1. Please list the MDOT strategic research priority number for this idea:

2. Research Idea Title:
Research effective links between Safety and Health programs and Worker's Compensation programs.

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
Worker safety and health injury illness data is managed in MDOT Safety and Security Administration. Worker's compensation is managed by a third party administrator through OHR / MI Civil Service Commission. If the two were linked, then a more complete review of data, based on worker's compensation dollars spent, could be done to determine trends, issues, etc.

4. What research do you propose to solve the problem?
The research of a new or existing type of data review would allow for another way of setting priorities for safety and health efforts (topic development, procedures, etc.) .

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
By having an effective link, it is hoped that worker's compensation costs in the future will be reduced.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
In a time of fiscal constraints, a reduction in costs will be valuable so it correlates with the timing of the research

7.

Submitted by (name)	Eileen M. Phifer
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Date submitted	January 30, 2012

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Lansing, MI 48909

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E-mail: mdot-research@michigan.gov

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	11-2-e-3 combined with 11-2-e-1 NEW
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
11

 2. Research Idea Title:
Development of Performance Measurers for Highway Winter Maintenance Operations

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
The main objective of winter maintenance is to provide a reasonable level of service (LOS) during and after a winter storm event while being as efficient as possible with the limited resources available for maintaining roads. Measuring the performance of highway winter maintenance operations is important for any highway agency working to develop an efficient and effective winter operations program. NCHRP Research Results Digest 335 lists three types of performance measures for winter maintenance operations namely, inputs, outputs and outcomes. Inputs include resources used to perform winter maintenance activities including fuel, labor, equipment and materials. Output measures include lane miles plowed, lane miles treated with deicing materials etc. Outcome measures include bare pavement regain time, monitoring average traffic speed during and after the winter storm and customer satisfaction. Outcome measures generally asses the effectiveness of winter maintenance activities and are the most useful to an agency trying to measure performance of their winter operations program. By identifying and creating an MDOT specific outcome-based performance measure for winter maintenance operations, the department could become more effective and allocate resources more efficiently and report successes of our winter maintenance operations consistently across the state.

 4. What research do you propose to solve the problem?
Task 1: Review current practices and technology used in Michigan and across the nation
Task 2: Recommend outcome based performance measure(s) for MDOT
Task 3: Develop a plan for implementing a performance measure for MDOT
Task 4: Develop an estimate of the cost and resources needed to create and maintain the performance measure
Task 5: Develop materials for training MDOT and contract agency staff in collecting and reporting data needed for performance measures
Task 6: Final report

 5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
By identifying and creating an MDOT specific outcome-based performance measure for winter maintenance operations, the department could become more effective and allocate resources more efficiently and report successes of our winter maintenance operations consistently across the state.

 6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Very Urgent. With declining budget and resources efficient winter maintenance operations is a high priority
-

7. Submitted by (name)	Nishantha Bandara
Title	Supervising Geotechnical Engineer
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IDEA CURRENTLY BEING DEVELOPED

Michigan Department
Of Transportation
5315 (4/12)

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	0-1-e-2
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

1. Please list the MDOT strategic research priority number for this idea:
n/a

2. Research Idea Title:
Evaluating the use of Tow Plows- IDEA currently being developed.

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*

4. What research do you propose to solve the problem?

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

7.

Submitted by (name)	
Title	
Bureau/Region or Agency	
Office/TSC or Address	
Section/Unit or City, State, Zip	
Phone	
E-mail	
Date submitted	

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	12-2-c-2
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

- | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|---------------------|--------------|-------|------------------------|-------------------------|--------------------------------------|-----------------------|--|----------------------------------|--|-------|--------------|--------|-----------------------|----------------|------------|
| 1. | Please list the MDOT strategic research priority number for this idea:
12 | | | | | | | | | | | | | | | | |
| 2. | Research Idea Title:
Use of recycled concrete fines for sub-grade stabilization | | | | | | | | | | | | | | | | |
| 3. | Problem to be addressed: <i>(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)</i>
Finding a beneficial use of 100% of available resources on construction projects. | | | | | | | | | | | | | | | | |
| 4. | What research do you propose to solve the problem?
Mix design research that measures unconfined compression, CBR, and PH properties. Follow protocol used for other sub-grade stabilization methods such as cement, cement kiln dust, and lime. | | | | | | | | | | | | | | | | |
| 5. | Anticipated Benefits: <i>(If this research is successfully completed, what benefits will the Department realize? What is their value?)</i>
Improved pavement performance | | | | | | | | | | | | | | | | |
| 6. | Urgency: <i>(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)</i>
High Priority, University Region has started the process of reconstructing the I-75 corridor in Monroe County. Recycling of the existing recycled concrete will generate a high percentage of fines that could be used for stabilization of the clay sub-grade, increasing sub-grade modulus. | | | | | | | | | | | | | | | | |
| 7. | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Submitted by (name)</td> <td>Andy Bennett</td> </tr> <tr> <td>Title</td> <td>CPM Scoping Specialist</td> </tr> <tr> <td>Bureau/Region or Agency</td> <td>Highways/Construction Field Services</td> </tr> <tr> <td>Office/TSC or Address</td> <td></td> </tr> <tr> <td>Section/Unit or City, State, Zip</td> <td>Materials Technology Unit
Lansing Secondary Complex</td> </tr> <tr> <td>Phone</td> <td>517-322-5043</td> </tr> <tr> <td>E-mail</td> <td>bennetta@michigan.gov</td> </tr> <tr> <td>Date submitted</td> <td>01/06/2012</td> </tr> </table> | Submitted by (name) | Andy Bennett | Title | CPM Scoping Specialist | Bureau/Region or Agency | Highways/Construction Field Services | Office/TSC or Address | | Section/Unit or City, State, Zip | Materials Technology Unit
Lansing Secondary Complex | Phone | 517-322-5043 | E-mail | bennetta@michigan.gov | Date submitted | 01/06/2012 |
| Submitted by (name) | Andy Bennett | | | | | | | | | | | | | | | | |
| Title | CPM Scoping Specialist | | | | | | | | | | | | | | | | |
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| Date submitted | 01/06/2012 | | | | | | | | | | | | | | | | |

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	12-2-c-12
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

1. Please list the MDOT strategic research priority number for this idea:
12

2. Research Idea Title:
A Method to Assess the Role of Alternative Materials in Pavement Design, Construction, and Performance

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
The challenges of climate change have resented an opportunity for increased innovation in alternative low impact materials, and an increased use of recycled materials in pavement design. However, the long term impacts of using alternative materials in pavements- particularly on long term pavement durability and performance remain yet to be a thoroughly investigated. This research will help identify strategies to effectively use alternative materials in design with the goal of reducing pavement life cycle impacts.

4. What research do you propose to solve the problem?
The proposed research will use a combination of methods in Life Cycle Assessment and lab-based testing of pavement durability to identify the benefits- accounting for emission reduction, economic impact and long-term performance through all the life cycle phases.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
This research will identify pavement design and construction methods with relativity to lower life cycle emissions. Strategically, it will supprt DOT decision making relevant to pavement selection and maintenance scheduling.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Recently, California has legislatively mandated a reduction in emissions (CEPA 2006). At the federal level there has been similar efforts in the Green Highways Partnerships, and a recently funded effort by FHWA investigating sustainable pavements (FHWA 2011). In this climate, it is imperative that Michigan develop its own plan to reduce pavement life cycle emissions.

7.

Submitted by (name)	Amlan Mukherjee, Zhanping You
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Bureau/Region or Agency	Michigan Technological University
Office/TSC or Address	
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	12-2-c-1
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

1. Please list the MDOT strategic research priority number for this idea:
12

2. Research Idea Title:
Long term performance evaluation of subgrade stabilization with recycled materials

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
MDOT has used lime and cement kiln dust (CKD) for subgrade stabilization in few pavement reconstruction projects. Although these methods were used primarily for short term benefits (as a construction flat form), long term benefits or problems of using such materials need to be identified. A research is needed to quantify short term and long term benefits/problems of using recycled materials such as cement kiln dust (CKD), lime kiln dust (LKD) and fly-ash for pavement subgrade stabilization.

4. What research do you propose to solve the problem?
Use of laboratory and well as field performance evaluation of recycled materials (CKD, LKD, fly-ash) for pavement subgrade stabilization.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
Use of recycled materials for faster pavement construction

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Urgent. If potentials benefits or problems of using recycled materials for subgrade stabilization can be identified, it can be used for future project planning stage as a potential method/material.

7. Submitted by (name) | Nishantha Bandara

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Date submitted	01/27/2012

Please submit to: Mr. Steven C. Bower, P.E.
Engineer of Research
Research Administration
425 West Ottawa Street
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Phone: 517-241-4667
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	0-2-c-3
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

- | | | | | | | | |
|-------------------------|---|---------------------|----------------|-------|--------------------------|-------------------------|--------------------|
| 1. | Please list the MDOT strategic research priority number for this idea:
N/A | | | | | | |
| 2. | Research Idea Title:
Adequacy of Michigan Climatic Files for Mechanistic Pavement Design | | | | | | |
| 3. | <p>Problem to be addressed: <i>(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)</i></p> <p>The new mechanistic-empirical pavement design software comes embedded with climatic files from 19 weather stations in Michigan. The software uses this data in the Enhanced Integrated Climatic Model (EICM) to vary material properties according to seasonal variations. The EICM plays a critical role in the performance predictions of the software. Michigan needs to know that the existing data in the software is of sufficient quantity and quality that climatic effects are being accurately used in the performance analysis. Individual station data contains a maximum of 10 years of data (1996 to 2006) and in some cases, may be less. Geographically, a majority of the weather stations are concentrated in the lower half of the lower peninsula leaving some areas of the state less represented.</p> | | | | | | |
| 4. | <p>What research do you propose to solve the problem?</p> <p>It is proposed that the existing data in the software be examined to see the quantity for each station in terms of years/months, and the quality of that data be checked for missing data, errors, outliers, etc. A sensitivity analysis should be conducted to see if the existing quantity and quality affects pavement performance predictions. An investigation into the availability of additional data for those existing stations should be conducted as well as the availability of additional stations to fill in geographical gaps. If additional data is available, that data will need to be summarized and put into the format required by the software (*.hcd files). Lastly, the feasibility of MDOT purchasing, installing, and maintaining weather stations should be investigated.</p> | | | | | | |
| 5. | <p>Anticipated Benefits: <i>(If this research is successfully completed, what benefits will the Department realize? What is their value?)</i></p> <p>Knowledge of quantity and quality of existing climatic data in the mechanistic-empirical pavement design software, and a quantification of the sensitivity of that data. Increase in climatic data to reduce sensitivity to outlier weather conditions. A methodology for obtaining and adding data. And the feasibility of MDOT collecting its own weather data. The end result would be pavement performance predictions more accurately represented by expected weather conditions in Michigan.</p> | | | | | | |
| 6. | <p>Urgency: <i>(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)</i></p> <p>Ideally, completion of this project would be completed at the same time as the existing project "Preparation for Implementation of the Mechanistic-Empirical Pavement Design Guide in Michigan", which is March of 2014. However, October 2014 would be a sufficient back up date as MDOT will be in the beginning stages of production design with the new software, and will be able to incorporate the work of this project.</p> | | | | | | |
| 7. | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Submitted by (name)</td> <td>Michael Eacker</td> </tr> <tr> <td>Title</td> <td>Pavement Design Engineer</td> </tr> <tr> <td>Bureau/Region or Agency</td> <td>Bureau of Highways</td> </tr> </table> | Submitted by (name) | Michael Eacker | Title | Pavement Design Engineer | Bureau/Region or Agency | Bureau of Highways |
| Submitted by (name) | Michael Eacker | | | | | | |
| Title | Pavement Design Engineer | | | | | | |
| Bureau/Region or Agency | Bureau of Highways | | | | | | |

Office/TSC or Address	Construction Field Services
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Date submitted	Jan. 31, 2012

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	8-2-b-1
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
8
-
2. Research Idea Title:
Optimization Strategy for Highway Work Zone Mobility and Life-cycle Cost
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
Highway construction and maintenance work zones cause mobility and safety problems for the traveling public, businesses, highway workers, and transportation agencies, resulting in an overall loss in productivity and growing frustration. In recent times, capabilities in Intelligent Transportation Systems (ITS) have also been widely adopted to improve work zone mobility and safety. Accordingly, highway construction and rehabilitation activities involve various costs including agency costs, road user costs, environmental costs as well as traffic management costs. Even though the highway construction staging impacts all these cost elements as well as the construction duration and life-cycle costs, the typical practice is to develop such plans manually relying on practical experiences. While practical experience provides valuable insights, there is a need for developing an analysis procedure to determine the optimal staging plan in conjunction with work zone mobility investment and infrastructure life-cycle cost. The traffic management and construction staging plans may also be changed by the acceptable level of mobility for travelers. As traffic management plan also plays a key role in developing the staging plan for highway construction and rehabilitation projects, there is a need to develop an analysis framework/model to optimize construction plan and work zone mobility plan.
-
4. What research do you propose to solve the problem?
This study proposes to develop a decision support decision to make an optimal decision for both highway construction schedule and traffic management plan by taking all aspects of costs into consideration.
1. Review current practices and issues in highway/bridge construction staging
 2. Development of analysis framework and model for Michigan
 3. Elements of highway and bridge construction costs
 4. Analysis of traffic management costs
 5. Development of decision support tool
 6. Case examples for users
 7. Recommendations and Report
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
The model developed in this study will allow MDOT to make the optimal decision for both construction schedule and traffic management plan. By taking feasible construction options, acceptable level of mobility, and applicable traffic management strategies into analyses, the result of the model is expected to optimize the work zone decisions by saving short and long run costs and raising raise user satisfaction.
-
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
There are many highway work zones every year. This project is urgent as the result of this project can be
-

immediately implemented and is expected to help make optimal decisions for construction and traffic management plans.

7. Submitted by (name)	Jun-Seok Oh
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	8-2-b-3
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- | | | |
|----|---|---|
| 1. | Please list the MDOT strategic research priority number for this idea: | 8 |
| 2. | Research Idea Title: | Evaluating all the costs of mobility investments |
| 3. | Problem to be addressed: <i>(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)</i> | <p>In order to properly evaluate the long term life cycle cost of a specific pavement selection, the costs associated with maintaining traffic and mobility must be taken into account. Because of the different equipment and work methods for different paving operations, the maintaining traffic schemes for the different pavement types can be quite different. Currently each project manager has to submit a prolonged argument as to why there's a different strategy, or else just say that the costs are equal (even if that may not turn out to be the case) in order to get through the pavement selection process.</p> |
| 4. | What research do you propose to solve the problem? | Establish a decision support system to determine the appropriate maintaining traffic scheme for specific roadway/traffic conditions and proposed work types |
| 5. | Anticipated Benefits: <i>(If this research is successfully completed, what benefits will the Department realize? What is their value?)</i> | <p>Establishing an approved decision support system will allow the project managers to make decisions, substantiated by research, regarding the appropriate maintaining traffic scheme for the proposed fix type. This will save numerous hours of staff time, both at the TSC/region as well as central office involved in justifying the MOT alternatives on a project by project basis. It will also save money in the long run by ensuring the proper pavement type is selected, taking into account all costs (actual and user delay) over the life of the pavement.</p> |
| 6. | Urgency: <i>(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)</i> | <p>The Pavement Design and Selection Manual and the Work Zone Safety and Mobility Manual are both being updated with new language this year. As part of the updates, this topic will be addressed in a general sense with the caveat that mobility issues be evaluated individually for each project. Having an actual decision support system in place will be an integral part of the determination process once it is developed. Every project that goes through the pavement selection process before this analysis is complete is a lost opportunity for maximizing our investments while taking into account system operations for the entire life of the pavement which can be 20 or 30 years.</p> |
| 7. | Submitted by (name) | Hilary Owen |
| | Title | System Operations Engineer |
| | Bureau/Region or Agency | Bureau of Field Services |
| | Office/TSC or Address | Maintenance/Operations Services |

Section/Unit or City, State, Zip	System Operations Section
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	0-2-b-1
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Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

1. Please list the MDOT strategic research priority number for this idea:

2. Research Idea Title:
Commercial vehicle enforcement strategies

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
Due to limited transportation revenues, MDOT and Michigan State Police (MSP) need to determine the effectiveness of existing fixed weigh stations and the use of alternative technologies. MDOT's investment to protect its road is extremely important in maximizing the life span of the road.

4. What research do you propose to solve the problem?
Define the benefits of each of the 15 fixed weigh stations in Michigan, the cost of upgrading and maintaining these weigh stations and the cost of using alternative solutions (Wireless Weigh in Motion, safe enforcement sites, permanent intermittent truck weigh stations (PITWS) etc.) in place of the fixed weigh station or as an enhancement to it.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
The results of this research will allow MDOT to maximize the limited funds available to protect MDOT's infrastructure. This research will benefit the entire state including every region by providing the most updated Weigh Station data. This will maximize the efforts of MSP to enforce the state laws and protect MDOT's investments. This will also minimize impact to the trucking industry as it will make weighing/inspecting vehicles more efficient and better target the violating operators.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
The existing funding for commercial vehicle enforcement is minimal and it requires the most efficient use of these funds. Currently there is no documented process to evaluate the economic values of the Weigh Stations It is requested this be completed as soon as possible as MDOT is selecting projects every year without the full understanding of the value of the various enforcement solutions.

7. Submitted by (name) Jason Firman
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	7-2-b-2
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:

7

-
2. Research Idea Title:

Assessing Mobility Impacts of Modeled Signal Timing Optimizations

-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*

The Michigan Department of Transportation has, on an ongoing basis, conducted regular optimization along its signalized intersection corridors. The activities undertaken as a part of these activities, as detailed in the *Michigan Signal Optimization Guidelines* and the *Michigan Timing Plan Preparation Guidelines*, require contractors to: (1) obtain current signal timing plans for the study corridor, as well as adjacent intersections; (2) develop optimized signal timing plans for the AM-, PM-, and noon-peak periods, as well as nighttime conditions; (3) conduct a safety analysis using a minimum of three years of crash data; (4) recommend adjustments to the system after implementation; and (5) evaluate effectiveness through a before-and-after study. Many signal optimization studies have been performed throughout the state and therefore, the project level benefits and costs are well document.

Research that provides a synthesis of results throughout the state as well as examines the effectiveness of MDOT's current signal optimization program would provide a valuable tool in guiding relevant MDOT policies and programs.

-
4. What research do you propose to solve the problem?

In order to validate the performance improvements yielded by traffic signal optimization, a careful field comparison is required between the results of the microsimulation study and real-world travel time and delay studies. Such a study would involve the following research activities:

- (1) Identify all signalized intersection corridors that have been optimized as a part of an MDOT formal signal optimization process within the last ten years. Put together a synthesis that documents the findings of these reports.
 - (2) Conduct a state-of-the-art literature review of traffic signal optimization strategies and practices currently in use by other states.
 - (3) Collect crash data for up to three years of post-optimization data and compare to the three year pre-optimization crash analysis documented in the signal optimization reports, in order to examine any changes in key crash types (e.g., rear-end collisions, red-light running) that occurred that could be related to the optimized signal timings.
 - (4) Provide recommendations on improvements to MDOT's signal optimization procedures, recommended frequency of signal optimization studies, and recommended staffing levels needed to maintain level of effort within the department.
-

(5) Prepare a final report documenting the study results and providing guidelines for subsequent implementation as a part of MDOT's continual traffic signal timing optimization program.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

This research will provide MDOT with critical information as to the adequacy of its existing traffic signal timing optimization program. Any recommended changes to current practices would provide immediate benefits to traffic operations and safety along those corridors under MDOT's jurisdiction. This guidance may also prove useful to local road agencies.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

Given that MDOT invests substantial resources in periodically optimizing its entire traffic signal system, this research would result in "practice-ready" solutions that could be implemented immediately. As such, this research is warranted to begin as soon as FY 2013.

7. Submitted by (name)	Peter T. Savolainen, Ph.D., P.E. (Revised by MDOT)
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	10-1-b-1
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

1. Please list the MDOT strategic research priority number for this idea:
10
2. Research Idea Title:
Developing Performance-Based Lighting Standards
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
We currently lack adequate standards and /or guides for the selection of appropriate lighting equipment for our various trunkline needs. We need to develop performance-based roadway lighting standards and a specification for Induction, LED, plasma, and other lighting systems.
4. What research do you propose to solve the problem?
Research should include the following tasks. 1) Conduct a literature search of the state of the science for uniform lighting standards. 2) Survey public utilities, communities, and other states to determine the current lighting state of the practice. 3) Investigate select roadway lighting sites to evaluate them in a pilot study. 4) Comparatively evaluated lighting products on the market through a matrix noting lighting performance such as visibility and intensity, along with life cycle costs. Research should include a comparison of the various available types of lighting equipment (initial costs, maintenance costs, life cycle costs, etc.) Comparisons should be made considering acceptable visibility for various MDOT's needs. 5) Based on the literature search, survey, pilot studies, and comparative analysis, recommend standards for Michigan roadways. These standards should not conflict with AASHTO requirements. 6) Write a special provision or specification for lighting. 7) summarize results in a research report.
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
Benefits may include, better lighting, reduced operation and maintenance costs, maintained roadway mobility with less maintenance lane closures, lower risk exposure to maintenance workers, and reduced energy consumption.
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Must be started by FY 2013.
7.

Submitted by (name)	Steve Urda
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Bureau/Region or Agency	Development/Design/B220
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Date submitted	01/30/2012

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	5-New
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
5. Advancement of Strategic Safety Areas

 2. Research Idea Title:
Association of Michigan's Older Adult Crashes with Roadway Features

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
By 2030, older adults, age 65 and above will represent about 20 percent of the population in Michigan and Nationally. As this population ages, the Older Driver segment has gotten more National attention and focus, and should be considered in the design of the infrastructure. Older drivers are prone to an increase risk of crash involvement per vehicle mile traveled and are more likely to be severely injured or killed as a result of a crash. Factors contributing to this issue include but are not limited to declines in vision, in particular at night, and cognitive abilities, as well as physical limitations such as arthritis and an inability to recover from injuries.

Michigan should look at locations where older drivers are over represented in crashes and identify specific roadway features of each location (roadway geometry, traffic volumes, and visual complexity) and causation.

 4. What research do you propose to solve the problem?

Conduct a review of crash data to identify locations in which older drivers are disproportionately involved in crashes.

Identify behavior and roadway geometric factors contributing to the overrepresentation of older drivers in crashes at these locations.

Identify alternative transportation options at these locations.

Evaluate the perspective of older drivers as it relates to identified roadway configurations of concern.

Determine engineering solutions for identified roadway configurations experiencing a disproportionate number of crashes involving older drivers and compare them to the latest version of the Older Driver Highway Design Handbook (due out in 2012).

Develop guidance in roadway design to address older drivers and prepare recommendations for revisions to MDOT Standards and Guides.

 5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
With this research MDOT should be able to determine roadway features that may be amenable to improvement based on the recommendations in the latest version of the Older Driver Highway Design Handbook (due out in 2012). This research could also lead to benefits for the older adult as it relates to
-

alternative forms of transportation, determining where to concentrate those limited resources.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

It would be valuable to have this research completed in the near future to prepare MDOT for the expected increase in the number of older drivers in determining the best locations to invest limited resources for improving roadway safety. It has been shown that what MDOT does to improve safety for the older driver, improves the safety for all drivers.

7. Submitted by (name)	Kimberly Lariviere
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	New 5
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
5. Advancement of Strategic Safety Areas

 2. Research Idea Title:
Evaluation of Michigan's Engineering Improvements for Older Drivers

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
By 2030, older adults, age 65 and above will represent about 20 percent of the population in Michigan and Nationally. As this population ages, the Older Driver segment has gotten more National attention and focus, and should be considered in the design of the infrastructure. Since Michigan began considering this segment of the population in our highway design and safety in 2004, a number of engineering improvements recommended in the 2001 Highway Design Handbook for Older Drivers and Pedestrians have been installed. Of the 30 recommendations we have already adopted 15 of them, some of them before older drivers were an issue, as we felt they were safer alternatives prior to the publication of the book. None were adopted specifically as an older driver countermeasure. An example is roundabouts. In addition, MDOT has adopted some countermeasures, ie. Box span signal installation, pedestrian countdown signals, Clearview font guide signs, fluorescent yellow sheeting on warning signs, and lane arrow use signs that are not covered in the handbook

 4. What research do you propose to solve the problem?
The impact these improvements have had on the Older Driver and the general population should be evaluated. Have crashes decreased at Michigan locations where the improvements have been installed and how does this compare with national statistics? If there is a way to measure the older adults perception of the engineering improvements, that would also be valuable to determine.

 5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
With this research MDOT would be able to determine if continuing these engineering improvements have a safety benefit for older drivers, are cost effective, and have had an impact on the overall driving population. The results would have a direct impact on the level of funding and what infrastructure improvements should be continued and/or initiated.

 6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
It would be valuable to have this research completed in the near future to evaluate the effectiveness of the funding spent on infrastructure improvements for the older driver and to prepare MDOT for the expected increase in the number of older drivers. A large portion of the changes started in FY 2005 and have been in place for a few years such that before and after data would be available for the research.

 7. Submitted by (name) | Kimberly Lariviere
Title | Strategic Highway Safety Engineer
Bureau/Region or Agency | Highway Development/Design Division

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Date submitted	March 9, 2012

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	6-1-d-1,2,3,4,5,6 combined
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

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-
1. Please list the MDOT strategic research priority number for this idea:
6

 2. Research Idea Title:
Michigan Rural Safety Performance Function (SPFs) Development and Support

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
The Highways Safety Manual (HSM) is a document based on a decade of research utilizing information that has been collected from many states and countries from around the world. To have full functionality of the HSM for Michigan there is a need to develop safety performance functions (SPFs) tailored to segment, intersection and ramps of urban, rural and local agency facilities. SPFs will allow transportation professionals at all levels the ability to scientifically evaluate facilities prior to design for expected number of crashes, crash severities and crash types. There is a significant amount of data that needs to be collected to gain a full perspective for the development of SPFs for each site type in the HSM. Local agency locations function differently from urban and rural trunkline facility types. Gaining an understanding of information for the local agency facilities through the development of SPFs will improve safety for all users of the infrastructure. These SPFs will allow local agency facilities to function better, faster, smarter, safer, and cheaper from a safety perspective

 4. What research do you propose to solve the problem?
The development of Michigan specific SPFs will require collection of data from multiple sources and types along with the potential for manual data collection depending on facility type. Typical tasks would involve the following:
 1. Literature Review
 2. Collection of Data
 3. Development of Models
 4. Development of SPFs
 5. Validation
 6. Final report, conclusion and informative materials

 5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
SPFs developed with Michigan data for Michigan will allow road agencies investing in their infrastructure to be able to scientifically understand impacts of decisions. From planning to design of projects, users will have the option of prioritization along with knowing what is going to result in the best option for the customer based on facility type.

 6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Currently, there is a need to apply every dollar as efficiently as possible. The HSM once used completely with Michigan data and values will allow state, local and private users to make better informed scientific decisions that best use every dollar available. These decisions will be made with projects at all levels of
-

planning, development and network screening.

7. Submitted by (name)	Dean Kanitz
Title	Safety Analysis Engineer
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Office/TSC or Address	425 W. Ottawa St
Section/Unit or City, State, Zip	Traffic Operations - Lansing, MI 48909
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Date submitted	3/8/2012

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	6-1-d-1,2,3,4,5,6 combined
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
6

 2. Research Idea Title:
Michigan Urban Safety Performance Function (SPFs) Development and Support

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
The Highways Safety Manual (HSM) is a document based on a decade of research utilizing information that has been collected from many states and countries from around the world. To have full functionality of the HSM for Michigan there is a need to develop safety performance functions (SPFs) tailored to segment, intersection and ramps of urban, rural and local agency facilities. SPFs will allow transportation professionals at all levels the ability to scientifically evaluate facilities prior to design for expected number of crashes, crash severities and crash types. There is a significant amount of data that needs to be collected to gain a full perspective for the development of SPFs for each site type in the HSM. Local agency locations function differently from urban and rural trunkline facility types. Gaining an understanding of information for the local agency facilities through the development of SPFs will improve safety for all users of the infrastructure. These SPFs will allow local agency facilities to function better, faster, smarter, safer, and cheaper from a safety perspective

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-

planning, development and network screening.

7. Submitted by (name)	Dean Kanitz
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	6-1-d-1,2,3,4,5,6 combined
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-
1. Please list the MDOT strategic research priority number for this idea:
6
-
2. Research Idea Title:
Michigan Local Safety Performance Function (SPFs) Development and Support
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
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planning, development and network screening.

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	NEW Combine w/7-1-d-1, 7-1-d-2, 7-1-d-3
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

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1. Please list the MDOT strategic research priority number for this idea:

7 – Validation of Safety Practices

2. Research Idea Title:

Evaluation of Non-Freeway Rumble Strips (Phase II)

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*

MDOT's centerline and shoulder non-freeway rumble strip program was implemented to combat the large number of lane departure crashes. Nearly 40 percent of all fatal motor vehicle crashes involve a single vehicle leaving its travel lane. The initial program cost approximately 9 million dollars over 3 years (2008-2010). This initiative was the first of its kind in the country - no other state has taken such an aggressive approach to installing rumble strips. Michigan desires to see the results of their initiative, as do other states across the country.

MDOT needs to evaluate the effectiveness of this initiative in order to merit the continuance of such widespread use, gain public acceptance and pass knowledge to other states considering a system-wide installation of non-freeway rumble strips as a safety countermeasure.

Phase I had the research opportunity to gather 'before' driver behavior and non-motorized data from the field as the last group of candidate roads were milled in 2010. Phase I provided important evidence as to the influence of rumble strips on driver behavior.

Phase II will be required to collect 'after' crash data and determine the impact of the rumble strips installations including development of a Michigan specific crash modification factor (CMF) for the installation of non-freeway rumble strips.

4. What research do you propose to solve the problem?

Research proposed would consist of the following phases:

- Review and familiarize with Phase I data
- Collect and analyze 'after' data
- Perform a cost-benefit analysis
- Prepare final report with guidance or recommendations

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

MDOT will know the impact and effectiveness of the 9 million dollar investment, be able to provide important information

to other states and be able to use the predicted benefits for public acceptance. Nationally, this could lead to a systematic approach to installation of non-freeway rumble strips or allow agencies to make informed decisions on when/where to install them.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

This research should be completed by end of FY 2015. MDOT is continuing to spend money to maintain the rumble strip inventory as new road projects are being constructed. Positive results of this research will support the continuation of their installation, whereas less than favorable results would most likely impact MDOT's standard practice. This study will also provide MDOT with evidence as to any unexpected outcomes that may have occurred as a result of these rumble strips installations. Agencies throughout Michigan and the country will be provided important guidance.

7.

Submitted by (name)	Mark Bott
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Date submitted	March 9, 2012

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	NEW Combine w/14-1-d-1, 14-1-d-2, 14-1-d-3
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

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1. Please list the MDOT strategic research priority number for this idea:

14 – Evaluating Pavement Markings

2. Research Idea Title:

Evaluation of Pavement Marking Practices in Michigan

3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*

MDOT spends millions of dollars a year maintaining pavement markings and needs to use the appropriate materials on their roadways and airfields. There are many conditions that impact the material choice, such as pavement type, pavement surface texture, weather conditions, traffic volume and snowplow activity.

Because not all construction projects are currently required to install durable markings, the majority are striped with 1-year (maintenance) materials. Several neighboring states with the same snow plow conditions use only durable markings (non-recessed epoxy) in their construction projects and then restripe after a certain number of years with their own paint crews.

MDOT would like to investigate the service life for various types of markings (on different pavement materials), compare different practices between states and determine the cost/benefit of the different practices. Does the delivery of pavement markings (Contractors vs State forces) have an impact? What is the end service life for the various types of pavement markings on both roadways and airports? How does the retroreflectivity (the visual benefit for drivers at night) and presence of pavement markings in Michigan compare to other states after 1, 2, 5 years?

4. What research do you propose to solve the problem?

Research proposed would consist of the following phases:

- Comprehensive literature review about the available pavement marking materials for different pavement types.
- Survey the most commonly used pavement marking materials in Departments of Transportation of select neighboring states and evaluate pavement marking performance on both roadways and airfields.
- Compare current practices of in Departments of Transportation of select neighboring states and determine cost/benefit of different practices and cost effectiveness of various pavement marking materials through lab and field testing.

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

-
- System measures and implementable results - possible program changes in Michigan's annual pavement marking program, road program and bridge program.
 - Updated pavement marking material usage guide.

6. *Urgency: (How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

This research should be completed by the end of FY 2016. With the reduction of budgets statewide any changes that could result in a more favorable cost/benefit ratio would need to be implemented as soon as possible.

7. Submitted by (name)	Mark Bott
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Section/Unit or City, State, Zip	Lansing, MI
Phone	48933
E-mail	bottm@michigan.gov
Date submitted	March 9, 2012

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	0-1-D-2
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
- 1 Please list the MDOT strategic research priority number for this idea:
-
- 2 Research Idea Title:
Comparison of the Efficacy and Cost Effectiveness of In-Street signs Used as a Gateway Treatment at Multilane Crossings
-
- 3 Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
There is a need for low cost countermeasures to increase yielding to pedestrians at crosswalks on multilane roads with moderate to high ADT. Current treatments include the RRFB which costs around \$20,000 per installation and the Hybrid Beacon or HAWK signal that costs \$100,000. the costs of these treatments limit their deployment.
-
- 4 What research do you propose to solve the problem?
Work carried out by Ron Van Houten at Western Michigan University has demonstrated that in-street signs used as a gateway treatment (the use of 3 signs for each two lane approach can produce yielding levels comparable to those produced by an RRFB or Hybrid Beacon at a fraction of the cost. The proposed study will determine the conditions that this treatment can be substituted for the more expensive RRFB and Hybrid Beacon treatments. The results of this research will assist MDOT in determining how to maximize pedestrian safety benefit with limited financial resources.
-
- 5 Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
This innovative use of multiple in-street sign could produce cost saving of an order of magnitude, permitting agencies to implement treatments at many more locations. One advantage of this treatment is that it does not require pedestrians to press a detector or require the use of passive detectors. Any pedestrian using the crosswalk will receive the benefit of the treatment.
-
- 6 Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Pedestrian safety has become a high priority in urban areas. The development of low cost interventions is particularly critical because of reductions in funds available.
-
- 7
- | | |
|----------------------------------|--|
| Submitted by (name) | Dr. Ron Van Houten |
| Title | Professor of Psychology, Human Factors |
| Bureau/Region or Agency | Western Michigan University |
| Office/TSC or Address | 3700 Wood Hall |
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| Phone | 269 929 2609 |
| E-mail | Ron.vanhouten@wmich.edu |
| Date submitted | Dec 21, 2011 |

**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

New 1-1-a-3 & 4 consolidated

For Research staff use only	Research Idea No:	
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-
1. Please list the MDOT strategic research priority number for this idea:
Priority 1: Advancing Accelerated Bridge Construction

 2. Research Idea Title:
Evaluation and Standardization of MDOT Highway Bridges Built using Accelerated Bridge Construction (ABC) and Prefabricated Bridge Element Systems (PBES)
Note – This research idea replaces Research Idea 1-1-a-3 and 1-1-a-4, in accordance with direction provided at the 3/19/2012 Research Advisory Committee meeting.

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
In accordance with the FHWA Every Day Counts objectives, MDOT has set goals to make Accelerated Bridge Construction (ABC) and Prefabricated Bridge Element Systems (PBES) common practice to build highway bridges.

MDOT has ongoing research to review ABC and PBES technologies, identify bridge structural systems suitable for Michigan using decision-making framework, evaluate performance of selected systems, identify potential challenges for construction and deconstruction, and develop recommendations to resolve weak links in structural system(s) and potential construction, deconstruction, and other implementation problems. This work is scheduled for completion September, 2012.

Development and implementation of ABC and PBES is a very large undertaking, and it involves systematic change in bridge design and construction practice including the following; design calculations, standardization of element details, development of standards and special provisions, fabrication of PBES elements, setting tolerances for manufacture and construction of PBES elements, lifting, transport, and placement methods including considering available equipment (cranes, self propelled Mobile Transporters (SPMT) and site considerations, construction staging, traffic control, construction inspection, and quality and control and quality assurance.

Continued research is needed to evaluate the ongoing use of ABC and PBES and where it is applied. Standardization is needed to make the design, fabrication, and construction process, of ABC/PBES systems as efficient and cost effective as possible.

 4. What research do you propose to solve the problem?
 1. Review and evaluate MDOT's ongoing demonstration projects.
 2. Review national literature for state of the art practice in standardization of ABC and PBES.
-

-
3. Review other state DOT ABC and PBES use guidelines, standards, special details, design guide, special provisions.
 4. Survey Michigan fabricators and contractors for lessons learned.
 5. Provide guidance into standardized fabrication, lifting, and tolerances needed to build ABC and PBES.
 6. Recommendations/Reporting
-

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
 1. Identify best practice in ABC/PBES
 2. Standardized bridge elements that fabricators may be able to stock pile
 3. Make bridge design more efficient and streamline the development process
-

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
 High. MDOT has set goals for implementation with the FHWA and Regions are very interested in this technology to implement bridge rehabilitation and replacement projects while adhering to MDOT's mobility policy. If possible, this research should start in 2013 as current project will be ending in 2012.
-

7.

Submitted by (name)	Dave Juntunen
Title	Bridge Development Engineer
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Section/Unit or City, State, Zip	Bridge Development
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	2-1-a-2 new
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-
1. Please list the MDOT strategic research priority number for this idea:
2
-
2. Research Idea Title:
Development, Characterization and Applications of a Non Proprietary Ultra High Performance Concrete for Highway Bridges
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
UHPC is a specially formulated concrete that is capable of achieving extremely high performance. When properly reinforced with steel fibers, the material is capable of achieving the following properties:
1. High compressive strength, approaching that of mild steel.
 2. High tensile strength, several times that of regular concrete.
 3. Pseudo-ductility, with tensile softening strains of up to an order of magnitude greater than that of regular concrete.
 4. Exceptional energy absorption prior to fracture.
 5. Extremely small crack widths, small enough to effectively eliminate ingress of chlorides.
 6. Exceptional durability, primarily enabled by the very small crack widths and the extremely high density of the material.
 7. Self-consolidating properties, which simplify construction.
 8. Autogenous self-healing properties, enabled by the very small crack widths.
- As of last year, the primary commercially available UHPC on the US market was available through LaFarge and marketed as Ductal. Ductal is a proprietary material that is much more expensive than regular concretes. Construction using Ductal and other similar materials available through European suppliers requires specially certified contractors and costly construction processes, such as pressure or heat treatment, which are impractical to achieve in the field. High material cost coupled with complicated and costly construction procedures have all but eliminated widespread adoption of UHPC in the US. An alternative UHPC developed at the University of Michigan has the potential for removing all obstacles preventing widespread use of UHPC in the State of Michigan and in the US. In addition to the basic 8 properties listed above, this new material has 3 new critical advantages:
9. Substantially greater pseudo-ductility, up to an order of magnitude greater than commercially available materials.
 10. It is nonproprietary and made up of components that are available on the US market.
 11. Does not require expensive heat or pressure treatment as Ductal and other commercial material do. In fact, it can be conveniently made, which reduces adoption costs dramatically and allows the material to be commercially made and delivered the same way as regular concrete. The material has currently broken world records in terms of energy absorption, but could be optimized for lower cost, albeit with slightly lower performance. The objective of this research is to optimize for cost using commercially available materials in the State of Michigan, characterize the mechanical properties of the new UHPC and explore applications, primarily focusing on exploiting the unique properties of the new material for accelerated bridge construction.
-
4. What research do you propose to solve the problem?
This research will be conducted in 2 phases with the following objectives:
Phase I: Material Development, Optimization and Characterization
- 1) Investigate whether the new UHPC material can be made using locally available components. Can the cost be reduced through optimization?
 - 2) Characterize the mechanical properties of any newly developed UHPC, focusing on tensile strength, compressive strength and modulus of elasticity.
-

-
- 3) Characterize the interaction between steel bars and the new matrix, focusing on the development length for commonly use steel bars.
 - 4) Survey and identify potential applications for UHPC, particularly in Precast Bridge Element System (PBES). Examples where the use of UHPC may be most beneficial include: roadway barriers, slabs, slab connections, PBES connections, and pavement joints.
 - 5) Two or three of the most promising applications will be identified in conjunction with MDOT researchers and their feasibility will be identified through the use of simulation technology.
 - 6) Select the most promising application and conduct limited tests to show proof of concept.
 - 7) Review maintenance and operational considerations of the UHPC chosen applications
-

5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*

With its unique properties, UHPC has drawn national and international attention in recent years as a material that has the potential for dramatically increasing the service life of bridges and other transportation infrastructure components. As such, deployment of UHPC in the state of Michigan can result in significant future savings in maintenance and replacement costs associated with MDOT's infrastructure. In other words, there is the potential for substantial direct and indirect savings in the long term.

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

UHPC is a new material with strong potential for building structures that are significantly more durable than is currently possible with conventional materials. Therefore, every structure built at the moment is an opportunity lost to start building a longer lasting infrastructure that is considerably cheaper to maintain in the long run. Therefore, this research is deemed urgent because of the expected long term cost reduction associated with its immediate deployment.

7.

Submitted by (name)	Dave Juntunen
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Date submitted	

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	3-1-a-1 & 2 NEW
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-
1. Please list the MDOT strategic research priority number for this idea:
Priority 3: Innovating Bridge Asset Management
-
2. Research Idea Title:
Providing for wireless electronic display of bridge management data and wireless electronic data entry of bridge inspection information in the field to support MDOT's enterprise asset management system.
Note – This research idea replaces Research Ideas 3-1-a-1 and 3-1-a-2, in accordance with direction provided at the 3/19/2012 Research Advisory Committee meeting.
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
MDOT is currently providing support to the US DOT Research and Innovation Technology Administration (RITA) research project, titled, "Bridge Condition Assessment Using Remote Sensors." This research is showing promising new technologies that could make bridge inspection more efficient and bridge management data more intuitive using commercially available technology.
- Currently, MDOT bridge inspectors take paper forms out into the field and they annotate them with updated information using pen or pencil. Some MDOT bridge inspectors have access to laptops, but these are only used within the field inspection vehicle as they are too delicate and bulky for use in the field. This leads to updated information having to be entered manually after it has first been recorded, and additional information cannot readily be accessed while out inspecting bridges. Some data, such as photos, as built plans, and structural inventory data are not available to the inspector when they are at the bridge site. NDE data is not currently incorporated into MDOT's BMS.
- MDOT collects data using the internet based system called; Michigan Bridge Inspection System (MBIS) and bridge management data is made available to all Michigan highway bridge owners through the Michigan Bridge Reporting System (MBRS). MDOT has identified desired enhancements to this system including Geographic Information System (GIS), incorporation of all activities done to the bridge including routine maintenance, location identified pictures, and incorporating this into a decision based tool
-
4. What research do you propose to solve the problem?
1. Review and evaluate ongoing and recently completed research in this topic area.
2. Review national literature for state of the art practice in wireless bridge data display and collection.
3. Develop and test a wireless bridge data display and collection system to meet MDOT's bridge inspection/management needs consistent with MDOT's development of an enterprise asset management system.
4. Recommendations/Reporting
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
-

6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

High. There is great potential for increased efficiency to MDOT's bridge inspection and a management system using commercially available technology.

7. Submitted by (name)	Dave Juntunen
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Bureau/Region or Agency	Development
Office/TSC or Address	Design
Section/Unit or City, State, Zip	Bridge Development
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Date submitted	

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	3-1-a-3
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
3
-
2. Research Idea Title:
The Use of PONTIS in the Network Analysis of Big Bridge Decks
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
Current financial outlay plans for big bridge deck replacement efforts are being scheduled for deck replacement as a whole, either in a single year or in a short series of years, without regard to deck conditions in localized contiguous settings. This is viewing deck condition as an entirety when it may make more sense fiscally to view contiguous simple spans or continuous spans as a series of interactive networks. The ability to predict accelerated deterioration and apply it to a span-by-span preservation/replacement matrix could optimize deck life and capital outlay planning.
-
4. What research do you propose to solve the problem?
PONTIS database software and mathematical modeling, currently in use on Michigan's smaller bridges, may be a means to analyze big bridges which are comprised of a series or network of small simple or continuous spans. Deterioration modeling and projection can be performed on a span-by-span basis through the input of deck deterioration data compiled during each year's inspection effort, with mathematical modeling then predicting when a span or series of spans will be in need of replacement.
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
The benefits which may be seen through this research are optimal capital outlay planning and timely replacement of deck segments in accordance with a preservation matrix which will allow for deck replacement by span or spans on an as-needed basis, as opposed to scheduling of a complete deck replacement when large segments of the deck may not meet replacement parameters for a span-by-span matrix.
-
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
Urgency: No scheduled dates for deck replacement in the immediate future at this time.
-
7. Submitted by (name) | Karl Hansen, P.E.
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	4-1-a-2 new
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1. Please list the MDOT strategic research priority number for this idea:
4
2. Research Idea Title:
Examination of Legal Loads
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)* Bridge load rating is required by Federal regulations to ensure each bridge is safe for use by traveling public. A key feature of Bridge Load Rating in Michigan is the inclusion of all Michigan legal loads, some of which are far exceed the federal limit of 80,000 lb. Currently there are twenty-eight truck types in Michigan legal loads. Although the number of trucks is an acknowledgement of the unique loading situation in Michigan, it greatly increased the level of detail in Michigan legal load rating. In addition, some of these truck types may not be an accurate representation of the recent traveling trucks in Michigan. An examination of all truck types in Michigan legal loads by comparing them with the field-collected truck data is necessary to calibrate and possibly reduce the truck types in the current Michigan legal loads.
4. What research do you propose to solve the problem?
 1. Review available literature and the Michigan Vehicle code to determine whether the existing set of 28 vehicles envelope all of the possible legal combinations.
 2. Review the existing available WIM data and determine if additional WIM stations or collection are warranted. Determine a process for determining whether data represents legal or permitted vehicles. Determine a process for determining whether data represents legal or permitted vehicles.
 3. WIM data statistical analysis
 4. Comparing data analysis results with the current Michigan legal loads and Michigan Vehicle code
 5. Recommendations/Reporting
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
 1. Identify how Michigan legal loads compare to current Michigan Vehicle Code
 2. Identify commercial industry trends that correspond to changing demands and innovative ways of shipping freight.
 3. Identify an analysis process to streamline and reduce computations required to perform legal load ratings on Michigan's bridges.
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*

MDOT is currently in the middle of an unprecedented effort to update the load ratings on a majority of Michigan's bridges. Expediting this research will allow possible changes to be incorporated into this effort.
7. Submitted by (name) | Brad Wagner

Title	
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Date submitted	

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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	4-1-a-12
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

Do not include ideas that are your intellectual property. The selected research ideas will be posted in a competitive request for proposal (RFP).

-
1. Please list the MDOT strategic research priority number for this idea:
Investigating the Durability of Bridge Elements

 2. Research Idea Title:
Evaluate long term load carrying capacity of CFRP prestressing strands subject to Michigan's highway environment, live loads, fire damage, and long term creep.

 3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
CRFP high strength cables are beginning to be used as longitudinal reinforcement for prestressed beams on highway bridges as demonstration projects, however, AASHTO has not published bridge design manuals or evaluation manuals for this material.

Excerpt from: ACI 440.1R-09, "Guide for the Design and Construction of Structural Concrete Reinforced with FRP Bars."

Page 440.1R-10

3.3.1 Creep rupture—FRP reinforcing bars subjected to a constant load over time can suddenly fail after a time period called the endurance time. This phenomenon is known as creep rupture (or static fatigue). Creep rupture is not an issue with steel bars in reinforced concrete except in extremely high temperatures, such as those encountered in a fire. As the ratio of the sustained tensile stress to the short-term strength of the FRP bar increases, endurance time decreases. The creep rupture endurance time can also irreversibly decrease under sufficiently adverse environmental conditions such as high temperature, ultraviolet radiation exposure, high alkalinity, wet and dry cycles, or freezing-and-thawing cycles. Literature on the effects of such environments exists, although the extraction of generalized design criteria is hindered by a lack of standard creep test methods and reporting and the diversity of constituents and processes used to make proprietary FRP products. In addition, little data are currently available for endurance times beyond 100 hours. These factors have resulted in design criteria judged to be conservative until more research has been done on this subject. Several representative examples of endurance times for bar and barlike materials follow. No creep strain data are available in these cases.

Page 440.1R-11

Of all types of current FRP composites for infrastructure applications, CFRP is generally thought to be the least prone to fatigue failure. On a plot of stress versus the logarithm of the number of cycles at failure (S-N curve), the average downward slope of CFRP data is usually about 5 to 8% of initial static strength per decade of logarithmic life. At 1 million cycles, the fatigue strength is generally between 50 and 70% of initial static strength and is relatively unaffected by realistic moisture and temperature exposures of concrete structures unless the resin or fiber/resin interface is substantially degraded by the environment. Some specific reports of data to 10 million cycles indicated a continued downward trend of 5 to 8% decade in the S-N curve (Curtis 1989).

Page 440.1R-2

The professional using this technology should exercise judgment as to the appropriate application of FRP reinforcement and be aware of its limitations as discussed in this guide. Currently, areas where there is limited knowledge of the performance of FRP reinforcement include fire resistance, durability in outdoor or severe exposure conditions, bond fatigue, and bond lengths for lap splices. Further research is needed to provide additional information in these areas.

-
4. What research do you propose to solve the problem?
Assure the safety of Michigan's highway bridges.
Lab and field tests and monitoring needs to be undertaken to ensure that creep rupture can not happen to the prestressing cables used to reinforce prestressed highway beams, and develop/confirm strength reduction factors that accurately account for this phenomenon. Long term durability of the CFRP/resin matrix and its effect on the fatigue strength of CFRP prestressing cables should also be tested, as well as effect of fire and high heat on prestressed beams reinforced with CFPR cables.
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
Assure the safety of Michigan's highway bridges.
-
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
High

7. Submitted by (name)	Dave Juntunen
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**RESEARCH ADMINISTRATION
STATE PLANNING AND RESEARCH, PART II, PROGRAM
RESEARCH IDEA**

For Research staff use only	Research Idea No:	4-1-a-9 & 10 New
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If you have an idea that you would like to have considered as a future research project for the Michigan Department of Transportation State Planning and Research (SPR), Part II, Program, please complete and return this form to Research Administration, at the address below, or e-mail to: mdot-research@michigan.gov.

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-
1. Please list the MDOT strategic research priority number for this idea:
Priority 4: Studying Health Monitoring of Bridges
-
2. Research Idea Title:
Development of wireless, real-time, river flood event and bridge scour monitoring.
-
3. Problem to be addressed: *(What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or service?)*
In the state of Michigan there are over 1300 scour critical highway bridges. In accordance with Federal regulations MDOT has developed a scour critical bridge Plan of Action (POA) for each of these bridges. POAs are part of MDOT's bridge web base Michigan Bridge Reporting System (MBRS), and thus they are available to bridge inspectors during flood events over the internet. Bridge inspectors must make decisions during flood events when to monitor the bridge and when to close the bridge when there is potential for scour that could make the bridge unstable.
-
4. What research do you propose to solve the problem?
 1. Review and evaluate ongoing and recently completed research in this topic area.
 2. Review national literature for state of the art practice in wireless bridge data display and collection.
 3. Develop and test commercial and emerging technology for monitoring bridge scour in real-time to support MDOTs Scour critical POA process.
 4. Recommendations/Reporting
-
5. Anticipated Benefits: *(If this research is successfully completed, what benefits will the Department realize? What is their value?)*
Meet compliance with Federal National Bridge Inspection Standards (NBIS) and keeping bridges safe during extreme flood events.
-
6. Urgency: *(How urgent is this research? Is it important that it be completed by a particular date? What date and why?)*
High. Federal regulations require MDOT to develop scour critical bridge POAs, which includes monitoring these bridges during extreme flood events.
-
7. Submitted by (name) Dave Juntunen
- | | |
|----------------------------------|-----------------------------|
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