Michigan Department of Transportation

State Planning and Research
Part II Program

Research and Implementation Manual

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Bureau of Field Services
Michigan Department of Transportation
RESEARCH Administration

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Research and Implementation Manual Updates
Revision #8

1. Updated broken web links
2. Updated appendix 3.1 to 3.1a
3. Added the following appendices: 3.1b

ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
Ad Board	Administrative Board
CFR	U.S. Code of Federal Regulations
CSD	Contract Services Division
DOT	Department of Transportation
EAP	Estimated Accounts Payable
FAM	Focus Area Manager. The staff member who oversees research program development in a focus area, and advises the Research Advisory Committee about research related to that focus area.
FHWA	Federal Highway Administration
FOD	Financial Operations Division
FY	Fiscal Year
IAPP	Implementation Action Plan Proposal. A technical report (10 pages or less) written by the principal investigator that explains how MDOT can best use the results of a study. The report is submitted for approval at the end of a project and can be included as a section of the final report.
IM	Implementation Manager
MDOT	Michigan Department of Transportation
NCHRP	National Cooperative Highway Research Program
OCA	Office of Commission Audit
PFPM	Pooled Fund Program Manager
PI	Principal Investigator. The lead researcher of a project.
PM	Project Manager. The MDOT staff member who manages the technical aspects of each research project.
RAC	Research Advisory Committee. An advisory-level committee for SPR, Part II, Program research management at MDOT. The RAC, composed of focus area managers and chaired by a bureau head, advises the Research Executive Committee.
RAP	Research Advisory Panel. A project management-level committee of MDOT staff that oversees a research project.
RD&T	research, development and technology transfer.
REC	Research Executive Committee. The senior Executive Committee that sets strategic priorities for the research program and approves the annual program prior to submittal to FHWA.
RFP	Request for Proposals
RiP	Research in Progress. A database with more than 8,400 current or recently completed transportation research projects. Most of the RiP records are projects funded by federal and state departments of transportation.

RITA	Research and Innovative Technology Administration
RM	Research Manager. The Research Administration staff member who performs the administrative duties and tasks of each research project.
ROW	Right of Way
SEP-14	Special Experimental Project No. 14
SPR	State Planning and Research Program
TAC	Technical Advisory Committee. The pooled fund advisory committee.
TPF	Transportation Pooled Fund Program
TRB	Transportation Research Board
TRID	Transportation Research Information Database. The world's largest and most comprehensive bibliographic resource on transportation research information. It is produced and maintained by the Transportation Research Board.
UTC	University Transportation Center

EXECUTIVE SUMMARY

The Research and Implementation Manual describes the administrative processes used by Research Administration to develop and implement the Michigan Department of Transportation (MDOT) research program. Contents of this manual include a discussion of program development, project administration, implementation and federal funding requirements, along with a list of abbreviations and acronyms used in the manual and appendices that supplement each chapter.

MDOT develops and manages its research program using a three-tiered structure: Research Executive Committee (REC), Research Advisory Committee (RAC) and Research Advisory Panel (RAP). The REC sets the strategic direction for research while the RACs develop program recommendations to the REC. Subsequent to program approval, RAPs are assigned to each project to assist the project manager (PM). Research Administration assigns a research manager (RM) to each project based on the project's focus area.

The Engineer of Research oversees the Research Administration Section. The MDOT Research Administration Web site, www.michigan.gov/mdotresearch, provides a wealth of information, including research publications, links to Research Administration e-mail distribution lists and national research Web sites, and program development/project management information. Library services plays a key role in supporting the research program by maintaining a repository of research reports and providing access to research document databases.

Most of the MDOT research program is supported with federal funding from the State Planning and Research (SPR) Program. According to program requirements, at least 25 percent of the annual federal SPR apportionment is dedicated to research (Part II). A portion of SPR, Part II, funds also supports the national Transportation Pooled Fund (TPF) Program. This program provides a means for state departments of transportation (DOTs), Federal Highway Administration (FHWA) program offices and private organizations to combine their resources and achieve common research goals. The FHWA Michigan Division Office works closely with Research Administration staff to ensure that all federal funding requirements are met.

Program Development

The research program is composed of individual projects and pooled fund studies. A slate of individual projects is developed every other year using a rolling three-year planning process. Supplemental individual projects can be added to the program at any time if the need arises. Pooled fund studies are initiated on an as-needed basis.

Every summer Research Administration prepares a summary of the next year's projects for REC and FHWA approval. This annual program approval process requires both MDOT and FHWA approval. If program modifications are needed during the year, amendments are submitted to FHWA for review and approval.

The three-year planning and program approval process is executed through many steps, with the first step beginning approximately one year before the first planned project is posted in a Request for Proposals (RFP). The planning and program approval process has three phases:

- Phase 1: Research idea development.
- Phase 2: Problem statement development.
- Phase 3: Program approval and RFP.

A timeline illustrating the three-phase process is shown in the figure on page 5. This timeline represents the Fiscal Year 2014 (FY 2014) planning process for proposed FY 2015, FY 2016 and FY 2017 projects.

In addition to these individual projects, external stakeholders or MDOT staff can submit projects to Research Administration that supplement the formal three-year planning at any time. Approved pooled fund projects, where MDOT participates either in a lead agency role or as a participant, also are included in the program.

Project Administration

Project administration tasks and level of effort vary depending on the type of research project being administered: individual research projects that are either outsourced or conducted in-house, or pooled fund studies where Michigan is either the lead state or a participating state.

Michigan individual research projects are typically contracted to universities or consultants with MDOT managing the project. A RAP is formed during the project planning phase that includes a focus area manager (FAM), PM, RM, principal investigator (PI) and additional technical experts. Project administration of an individual project begins with the development of a problem statement and concludes at project closeout. Project administration typically includes the following:

- Request for job number and obligating funds.
- Initiation and securing a contract or authorization.
- Kickoff meeting.

- Regular progress meetings.
- Quarterly and annual reporting.
- Invoice review and payment.
- Changes to the contract or authorization.
- Review of intermediate and final project deliverables.
- Project closeout.

MDOT-led pooled fund studies require that MDOT assume the project administration role, which includes drafting a problem statement, identifying the research need, soliciting interest from other states, contracting to do the research and managing the project. If MDOT is a participating state in a pooled fund study, MDOT technical experts serve on a Technical Advisory Committee (TAC) but are not responsible for project administration.

Implementation

Implementation of new innovations, best practices and research findings occur regularly throughout MDOT. The assessment and utilization of new technologies, methods and procedures enable the Department to "provide the highest quality integrated transportation services for economic benefit and improved quality of life." New innovations are the result of many different efforts both in Michigan and nationally. Programs such as the Cooperative Research Programs (highway, transit, rail, air), Transportation Research Board and federally sponsored transportation research all contribute to developing and identifying new innovations in transportation. In Michigan, the MDOT SPR, Part II research program and state funded Centers of Excellence also contribute to the development and identification of new technologies.

Historically, MDOT has implemented new innovations including research findings through the annual construction program. Formal funding for the construction of new innovations has been funded from standard project budgets and not separately. In addition, no implementation funding has been allocated to monitor the construction and long-term performance of new technologies that were incorporated into "standard" construction projects. This has resulted in inadequate monitoring and evaluation of past innovations after initial pilot construction.

Chapter 4 further addresses the steps required to develop an implementation project concept, conduct demonstration projects and deploy new innovations, which may result in updated MDOT standards, procedures and/or guidelines.

Federal Requirements

The federal government supports surface transportation research in many ways. The SPR Program provides federal funding to support state DOT research programs. FHWA encourages state DOTs to develop, establish and implement a research, development and technology transfer (RD&T) program to create a safer, more cost-effective transportation system. State DOTs also are encouraged to share research results through peer exchanges and national research databases to increase the benefits of transportation research at the local, regional and national levels.

The FHWA is responsible for reviewing the annual MDOT research program for funding eligibility. MDOT is granted the authority to manage a research program meeting federal reporting and administrative requirements.

CHAPTER 1
INTRODUCTION

The Michigan Department of Transportation (MDOT) conducts research to help fulfill its mission of "providing the highest quality integrated transportation services for economic benefit and improved quality of life." The goal of the research program is to initiate and implement research that supports the MDOT mission.

This manual describes the administrative processes used to develop and implement the MDOT research program. Organization of the manual is based on three key processes that drive the research program: program development, project administration and implementation/technology transfer. Because most of the research program receives funding from both federal and state sources, a separate chapter in the manual addresses federal funding requirements.

Each chapter in the manual includes appendices that further explain the material covered in the chapter. Research Advisories are published periodically and posted on the MDOT research Web site, www.michigan.gov/mdotresearch, to keep our contracted research partners informed. As an addendum to the manual, these advisories provide additional details, clarify processes, and/or update procedures.

1.1 Organizational Support

1.1.1 MDOT Research Program Committee Structure

In 2010, MDOT performed a complete assessment of the research program, followed by a second assessment in late 2011. One key recommendation resulting from these reviews was to further involve internal and external stakeholders in research program development. Internal stakeholders include staff from all levels and work areas within MDOT; external stakeholders include universities, consultants, Federal Highway Administration (FHWA) and local governments.

The MDOT research program supports all functional areas of the department, including highway engineering, planning, finance and multi-modal. The department's organization, which is made up of bureaus, regions, divisions and offices, does not always effectively support research program development. The diversity of the program requires an organizational structure that is cross-functional and engages all levels of the organization in addition to external stakeholders.

In response to this need, MDOT developed a Research Program Committee Structure to ensure that all MDOT technical experts, technical managers, region staff and executives are involved in

research program development. External stakeholders (primarily universities and consultants) also are involved in the early stages of the program development process when research ideas are being solicited and developed. A culmination of the research idea phase occurs at the Program Development Meetings, where external and internal stakeholders participate in working sessions to discuss and refine research ideas before possible inclusion in the proposed research program. Various research committees then use the information from these meetings to finalize new projects for the research program.

MDOT develops and manages the research program using a three-tiered structure: Research Executive Committee (REC), Research Advisory Committee (RAC) and Research Advisory Panel (RAP). This tiered approach is illustrated in Figure 1.1.

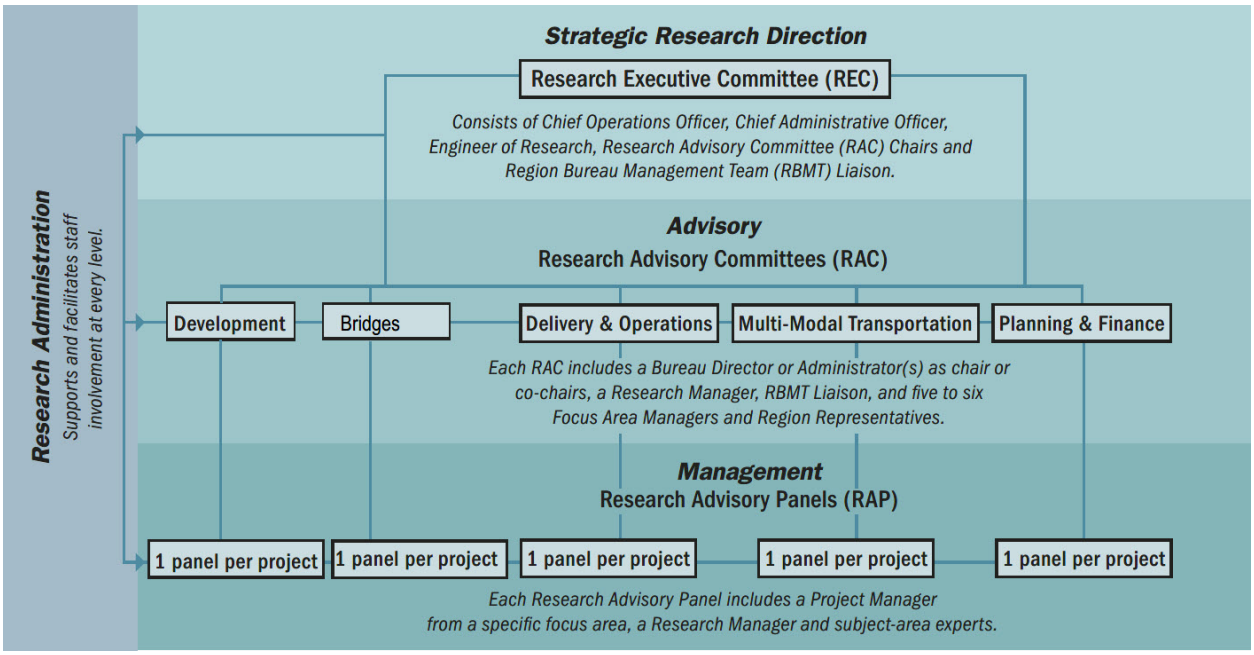

Figure 1.1 Overview of the MDOT Research Program Committee Structure

The REC sets the strategic direction for research while the RACs develop and coordinate program recommendations to the REC. After program approval, RAPs are assigned to each project to assist the project manager (PM).

The REC is co-chaired by the Chief Operations Officer and the Chief Administrative Officer. Additional members include the Engineer of Research, a Region Engineer and all RAC chairs.

The RAC includes several specific focus areas, each led by a focus area manager (FAM). FAMs are critical to an effective research program. Their responsibilities include identifying the PM for

each research project and overseeing research program development for their respective focus area. FAMs also serve on a RAC and advise the RAC chair about research related to their respective focus area. Region representatives assist FAMs in maintaining a broad perspective relative to engineering development, delivery and operations. The RAC chairs all serve on the REC and are responsible for communicating the needs of their focus area at the REC meetings.

Additional information about the Research Program Committee Structure can be found in Appendix 1.1 and Appendix 1.2.

1.1.2 Research Administration

The Research Administration section has four core areas: executive, project administration, program management, and library services. The Engineer of Research oversees the section, which includes research managers (RMs) and engineers, administrative support, analysts, program specialists, and a librarian. Appendix 1.3 provides further information about Research Administration.

Section responsibilities include initiating, developing, managing and coordinating the MDOT research program, facilitating implementation, encouraging technology transfer, and identifying best practices. Research Administration staff also spends considerable time disseminating information related to research program activities, primarily through publications such as Research Updates and Research Spotlights. The MDOT research Web site, www.michigan.gov/mdotresearch, provides a wealth of information, including research publications, links to Research Administration e-mail distribution lists and national research Web sites, and program development/project management information.

Library services plays a key role in supporting research at the state and national levels. The library provides literature searches on proposed research problems, maintains up-to-date research project information in various national databases and accesses resources upon request for various customers throughout MDOT.

More information about Research Administration is available in Appendix 1.4 and Appendix 1.5.

1.1.3 Federal Highway Administration

The majority of the MDOT research program is supported with federal funding from the State Planning and Research (SPR) Program. FHWA Michigan Division Office has identified a research program coordinator who works closely with Research Administration staff to ensure that all federal funding requirements are met.

FHWA reviews and approves the annual MDOT research program submittal and assists MDOT with program development funding and scope eligibility inquiries. In addition, FHWA reviews and approves any modifications to the program that arise after initial program approval. FHWA generally limits its involvement to the overall program level although periodically it will become involved at the project level.

1.1.4 University and Consultant Stakeholders

The MDOT research program relies on external stakeholders for program success. Research activities are almost always outsourced to universities and consultants while MDOT staff performs project oversight responsibilities. Once a research project has been approved, MDOT selects a PM who then forms a RAP. Research Administration assigns an RM to each project based on the project's focus area (as shown in Appendix 1.2).

When soliciting principal investigators (PIs) for a new research project, MDOT typically submits a Request for Proposals (RFP) to Michigan universities. If none of these universities submits an acceptable proposal that addresses the specific research problem, MDOT submits a second RFP nationally to both consultants and universities. After a consultant or university research team is selected, the PI and supporting research team conduct the research at the direction of the PM, meeting all contract requirements unless contract modifications are approved.

1.2 Program Overview

1.2.1 SPR, Part II, Program

The SPR Program provides funding for surface transportation planning and research activities. SPR Program requirements stipulate that at least 25 percent of the annual federal SPR apportionment be dedicated to research (Part II); the remaining 75 percent (Part I) is dedicated to planning activities that are not addressed in this manual.

Federal requirements for the SPR, Part II, Program are outlined in the U.S. Code of Federal Regulations (CFR), Title 23 (Highways), Part 420 ("Planning and Research Program Administration"). Chapter 5 of this manual provides greater detail on these requirements.

SPR, Part II, funding rules require that individual research projects are funded with a mix of 80 percent federal and 20 percent state dollars. A portion of SPR, Part II, funds also support the national Transportation Pooled Fund (TPF) Program. Pooled fund studies can use 100 percent federal funds. More information about the TPF program is available in Chapter 2 of this manual.

MDOT has entered into a stewardship agreement with FHWA that defines the roles and responsibilities of each agency when delivering the Federal-aid Highway Program, which provides funding for the construction, maintenance and operations of state highway systems. The SPR, Part II, Program, which is part of the larger Federal-aid Highway Program, has specific project actions delegated to MDOT outlined in the stewardship and oversight agreement, which is available here.

The Program Operations Manual supplements the Stewardship Agreement by providing more detailed discussion and guidance on the delivery of individual programs. This information is provided for all major program areas to help ensure that the Federal-aid Highway Program is delivered in a manner consistent with laws, regulations, policies and good business practices. The Program Operations Manual is available here. One additional requirement that occurs periodically is an FHWA research program evaluation. The evaluation outlines some additional goals for the research program beyond those covered in the stewardship and oversight agreement.

1.2.2 Centers of Excellence

MDOT funds multiple Research Centers of Excellence located throughout the state. The centers provide expertise related to structures, pavements, materials and geotechnical matters. Each center has a director and an MDOT PM.

Center budgets are funded annually with 100 percent state dollars and are managed like an individual research project. An MDOT PM determines specific work tasks for the center to perform and the center reports on its accomplishments throughout the year. More information about Centers of Excellence is available in Appendix 1.6.

1.2.3 University Transportation Centers

Occasionally, MDOT has chosen to provide administrative and financial support to a Michigan university that is either a University Transportation Center (UTC) or a supporting university (consortium member) to a UTC. UTCs are located around the country and are focused on specific transportation topics.

When partnering with a UTC, MDOT provides technical advice, offers access to MDOT federal aid, assists with setting project focus and supplies the administrative support necessary to meet federal funding requirements. Two agencies within the U.S. Department of Transportation—FHWA and the Research and Innovative Technology Administration (RITA)—provide federal funding to UTCs.

More information about UTCs is available at http://utc.dot.gov/. In addition, the *University Transportation Center Administration Manual*, which outlines the administrative processes of the UTC program, is available at the MDOT research Web site, www.michigan.gov/mdotresearch.

CHAPTER 2
PROGRAM DEVELOPMENT

Program development involves both internal and external stakeholders. The process ensures that strategic priorities are directly linked to project selection and ultimately to the implementation of research results. Executives identify priorities; managers and technical experts lead program development efforts; and external stakeholders assist in developing initial research ideas. Research Administration leads the entire process to ensure that it is timely and effective, and that it conforms to all state and federal requirements.

This chapter explains the steps required to develop the annual research program, which is composed of individual projects and Transportation Pooled Fund (TPF) studies. Individual projects typically are developed using a rolling three-year planning process; however, supplemental projects can be added to the program at any time if the need arises. Pooled fund studies are initiated on an as-needed basis.

2.1 Project Planning and Program Approval

2.1.1 Three-Year Planning

Every two years, Research Administration leads a planning process throughout the department to develop and approve the upcoming three-year candidate program. For example, Research Administration began planning for Fiscal Year (FY) 2019, FY 2020 and FY 2021 in the fall of FY 2017. The next three-year planning process begins in the fall of FY 2019 for FY 2021, FY 2022 and FY 2023. Appendix 2.1 provides additional details about the activities involved in the process and illustrates the overlap of two previous successive three-year planning processes.

2.1.2 Annual Program

As mentioned earlier, the annual research program includes projects resulting from three separate processes:

- Individual projects selected from the three-year planning process.
- Supplemental projects (see Section 2.1.4).
- Approved TPF projects (see Section 2.2).

Every summer, Research Administration prepares a summary of the next year's projects for Michigan Department of Transportation's (MDOT's) Research Executive Committee (REC) and Federal Highway Administration (FHWA) approval. Periodically program amendments are submitted to FHWA for review and approval.

2.1.3 Planning and Approval Process

The three-year planning and program approval process is executed in many steps, beginning approximately one year before the first planned project is posted in a Request for Proposal (RFP). The process is divided into three phases:

- Phase 1: Research idea development.
- Phase 2: Problem statement development.
- Phase 3: Program approval and RFP.

The three-year planning process formally ends after Phase 2. Phase 3 is part of the annual program approval process. The timeline in Figure 2.1 on the next page illustrates the FY 2017 planning process for FY 2019, FY 2020 and FY 2021. Future programs will follow a similar timeline.

Figure 2.1 MDOT Three-Year Planning and Program Approval Timeline

			FY 2017			Fiscal Year 2018											Fiscal Year 2019												FY 2020			
			4th Qtr			1st Qtr			2nd Qtr			3rd Qtr			4th Qtr			1st Qtr			2nd Qtr			3rd Qtr			4th Qtr			1st Qtr			2nd
Phase	**Activity**	**Target Date**	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan
1	Research Idea Development	Aug. 2017 to May 2018																														
2	Problem Satement Development	May 2018 to July 2018																														
	FY 19-21 three-year planning complete	July 2018													☆																	
3	Approval of FY 2019 program	August 2018																														
	Post FY 2019 program RFP	October 2018																RFP														
	Post FY 2020 program RFP	January 2019																			RFP											
	Approval of FY 2020 program	August 2019																														
	Post FY 2021 program RFP	January 2020																														RFP
1	FY 21-23 three-year planning begins	August 2020																														

Supplemental projects can be amended into the program at any time. Allow six months for supplemental project approval, RFP and contracting. See Section 2.1.4 for details.

Phase 1: Research Idea Development

The first phase in the three-year planning process is research idea development. During this phase, MDOT determines its strategic priorities; then research ideas that address those priorities are submitted, selected and amended as needed. Research ideas are submitted on Form 5315, Research Idea Form (Appendix 2.2). The form allows stakeholders to provide a preliminary description of a problem and the research needed to address it.

MDOT follows a timeline for research idea development that outlines the steps of the process, including major tasks, due dates and the stakeholder responsible for each task. A sample timeline is given in Appendix 2.3 and summarized below with target dates and example dates for a three year planning process (FY 2019, FY 2020 and FY 2021):

Step 1.1 REC meets to determine strategic priorities for research.

Target date: 13-14 months before year one of the three year plan
Example date: August-September 2017

Step 1.2 Engineer of Research calls for research ideas from all stakeholders.

Target date: 12 months before year one of the three year plan
Example date: October 2017

Step 1.3 Stakeholders develop research ideas and submit them on Form 5315, Research Idea Form (Appendix 2.2).

Target date: 10-11 months before year one of the three year plan
Example date: November-December 2017

Step 1.4 Engineer of Research notifies stakeholders of Research Program Development Meetings to discuss MDOT's research needs, and to refine and develop research idea content.

Target date: 9 months before year one of the three year plan
Example date: January 2018

- Stakeholders include Research Administration staff, Research Advisory Committee (RAC) members, FHWA program specialists, project managers, Region representatives, university representatives, consultants and other agency representatives.

Step 1.5 Focus Area Managers (FAMs) get input from technical staff and Region representatives to rank research ideas and determine the project manager (PM) for each idea. The PM's and FAM's roles are defined in Section 3.1.1.

Target date: 9 months before year one of the three year plan
Example date: January 2018

Step 1.6 RAC chairs review the FAMs' rankings and PM assignments. The RAC meets to determine the final ranking to submit to the REC.

Target date: 8 months before year one of the three year plan
Example date: February 2018 (meeting)

Step 1.7 The REC meets, selects research ideas for the next three years (FY 2019 through FY 2021) and confirms selected PMs.

Target date: 7 months before year one of the three year plan
Example date: Early March 2018 (meeting)

Step 1.8 The Engineer of Research submits research ideas to FHWA for State Planning and Research (SPR), Part II funding eligibility review.

Target date: 7 months before year one of the three year plan
Example date: Late March 2018

Step 1.9 PMs and FAMs receive Program Development Meeting facilitator and problem statement development training in preparation for Research Program Development discussions.

Target date: 6 months before year one of the three year plan
Example date: April 2018

Step 1.10 Stakeholders discuss research needs during the Research Program Development Meeting.

Target date: 5 months before year one of the three year plan
Example date: Early May 2018 (meeting)

- Research Administration convenes the Research Program Development Meetings.
- Stakeholders review research ideas and provide input on how to improve them.

Phase 2: Problem Statement Development

During the second phase of planning, PMs convert research ideas into problem statements, and Research Administration compiles these statements into the three-year planning documents for RAC and REC approval. A problem statement clearly defines the objectives, tasks, schedule and budget for a research project. Problem statements are submitted on Form 5308 (Appendix 2.4). Information and resources for developing a problem statement are available in Chapter 3, Appendix 2.5, Appendix 2.6, Appendix 2.11 and Appendix 2.12.

MDOT follows a timeline for problem statement development that outlines the steps of the process, including major tasks, due dates and the stakeholder responsible for each task. A sample timeline is given in Appendix 2.7 and outlined below with target dates and example dates for a three year planning process (FY 2019, FY 2020 and FY2021):

Step 2.1 Research Administration provides direction and interim deadlines for the following tasks:

- The librarian conducts literature searches.
- PMs develop draft problem statements.
- PMs recommend the RAP members by submitting Form 5314, Research Advisory Panel (RAP) Nomination Form (Appendix 2.8), to the appropriate FAM.
- FAMs confirm PM and RAP members after verifying availability.
- FAM, RAP members, Research Manager (RM) review problem statements.

Target date: 5 months before year one of the three-year plan
Example date: Late May 2018

Step 2.2 PMs submit problem statements to RAC chairs, as follows:

- PMs complete and submit Form 5308, Problem Statement (Appendix 2.4), for 80 percent federally funded projects.
- PMs complete and submit Form 5302, Participating State Pooled Fund Summary & Funding Request (Appendix 2.9), or Form 5308, Problem Statement (Appendix 2.4), for pooled fund studies and other 100 percent federally funded projects that use multiple state funding to address national or regional needs.

Target date: 4 months before year one of the three year plan
Example date: June 2018

Step 2.3 The RACs meet to review problem statements presented by the PMs. RAC chairs provide comments about improving the problem statements. RAC chairs also recommend whether a project should be posted as a nationwide or Michigan-university-only RFP.

Target date: 4 months before year one of the three year plan
Example date: Late June 2018 (meeting)

Step 2.4 The REC meets to approve the upcoming FY research program and projects planned for the next three years (For example, the REC met to approve the FY 2019 research program and the projects planned for FY 2019, FY 2020 and FY2021). The REC also determines the solicitation method for each research project. After REC approval is obtained, Research Administration submits IT related problem statements to MDOT's IT staff for review and coordination.

Target date: 3 months before year one of the three year plan
Example date: July 2018 (meeting)

Phase 3: Program Approval and Requests for Proposals

Research Administration obtains annual program approval and issues RFPs during the final phase of the planning and approval process. Each summer, Research Administration submits the upcoming fiscal year program for approval and provides a list of projects for which proposals will be requested. A detailed timeline for this phase is shown in Appendix 2.10 and outlined below with target dates and example dates from a three year planning process (FY2019, FY 2020 and FY 2021):

Step 3.1 Engineer of Research submits the first fiscal year's program to FHWA.

Target date: 2 months before year one of the three year plan
Example: In early August 2018, the FY2019 program was submitted to FHWA.

Step 3.2 FHWA approves the first fiscal year's program for funding. MDOT Finance Division initiates a project agreement with FHWA that represents the submitted program.

Target date: 2 months before year one of the three year plan
Example: In late August 2018, the FY2019 program was approved for funding.

Step 3.3 Research Administration posts projects starting in the first fiscal year for a best-value-based selection process using an RFP. Research Administration also submits 2nd year projects to FHWA. The RFP process is described in detail in Section 3.1.2.

Target date: The October of the first year of the three year plan
Example: In October 2018, the FY2019 projects were posted for RFP and FY2020 projects were submitted to FHWA.

Step 3.4 Research Administration posts projects starting in the upcoming fiscal year for a best-value-based selection process using an RFP.

Target date: The January of the first year of the three year plan
Example: In January 2019 for projects starting in FY 2020 are posted for RFP.

Step 3.5 Engineer of Research compiles the second fiscal year's program for funding and the third fiscal year's projects for RFP.

Target date: The June of the first year of the three year plan
Example: In June 2019, the FY2020 program and FY2021 projects for RFP are compiled.

Step 3.6 REC meets to review and approve the second fiscal year's program for funding and the third fiscal year's projects for RFP.

Target date: The July of the first year of the three year plan
Example: July 2019 REC Meeting approval of FY2020 program and FY2021 RFP.

Step 3.7 Engineer of Research submits the second fiscal year's program for funding and the third fiscal year's projects for RFP to FHWA.

Target date: The August of the first year of the three year plan
Example date: In early August 2019, the FY2020 program and FY2021 projects for RFP are submitted to FHWA.

Step 3.8 FHWA approves the second fiscal year's program for funding. MDOT Finance Division initiates a project agreement with FHWA that represents the submitted program.

Target date: The August of the first year of the three year plan
Example date: Late August 2019, the FY2020 program approval for funding.

Step 3.9 Research Administration posts projects starting in the third fiscal year for a best-value-based selection process using an RFP.

Target date: The January of the second year of the three year plan
Example date: In January 2020, the FY2021 projects are posted for RFP.

2.1.4 Supplemental Projects

MDOT executives, mid-level managers and technical staff may identify a research need at a time that does not coincide with the program development steps of the three-year planning process. In addition, external stakeholders can identify a supplemental research need that MDOT supports. Both situations require a modified process to ensure that the specific research need is still addressed.

MDOT-Identified Research Need

Step 1 The MDOT stakeholder proposing the research is responsible for developing a problem statement using Form 5308 (Appendix 2.4). The Research Manager (RM) can help facilitate drafting of the problem statement. Guidance for developing a problem statement is also available in Appendix 2.5 and Appendix 2.6. Examples of completed problem statements are provided in Appendix 2.12. The PM or MDOT research proposer asks the MDOT librarian to perform a preliminary

MDOT research proposer asks the MDOT librarian to perform a preliminary literature search. An example of a completed annotated bibliography is provided in Appendix 2.11.

Step 2 The RM, research proposer and FAM consult and select a PM.

Step 3 The PM recommends a RAP using Form 5314 (Appendix 2.8) to oversee the research.

Step 4 The PM, with assistance from the RM, submits Forms 5308 and 5314 to the FAM for approval. If approved, the FAM will obtain from the RAC chair. The Engineer of Research will supply final approval after RAC chair approval. The RM should be copied on all correspondence in this step for project recordkeeping. Section 3.1.1 provides additional details about the roles and responsibilities of the RM, FAM, PM and RAP members.

Step 5 After receiving all MDOT approvals, the Engineer of Research submits the project to FHWA for approval as an amendment to the program. MDOT Finance Division amends the existing project agreement with FHWA.

Step 6 Once FHWA approval is granted, Research Administration, working with MDOT Contract Services Division, secures a contract vendor. It may take up to six months from the time the problem statement is developed to the time the project is contracted
and work begins.

External Stakeholder-Identified Research Need

Step 1 External stakeholders may propose a research idea to Research Administration at any time. Research ideas must be submitted on Form 5315 (available in Appendix 2.2 or at www.michigan.gov/mdotresearch and sent to mdot-research@michigan.gov.

Step 2 Research Administration forwards the idea to the appropriate FAM, who determines whether MDOT should support the idea. If support for the idea is recommended, the FAM requests approval from the RAC chair. This decision will determine whether the submitted idea will be further developed into a problem statement.

Step 3 After idea approval, the FAM names a PM, who may consult with the external proposer to develop a problem statement. The next steps are outlined above in "MDOT-Identified Research Need," beginning with Step 1.

2.2 Pooled Fund Program Approval

The national TPF Program provides a means for state departments of transportation (DOTs), FHWA program offices and private organizations to combine their resources and achieve common research goals.

Pooled fund projects are initiated by a state (lead state) or FHWA. Local and regional transportation agencies, private industry, foundations and colleges and universities may also participate in these projects. Each participating member of the pooled fund project is required to provide both financial and staff support.

Each state is responsible for posting its specific funding commitment and adding state-specific contact information to the TPF Web site. The lead state is responsible for posting both its specific funding commitment and staff information, along with that of all non-state DOT and non-FHWA members. FHWA approval is required prior to solicitation for a pooled fund project.

Because the lead state manages the project, it requires a larger staff commitment than does a participating state. A Technical Advisory Committee (TAC) oversees each pooled fund study. The committee includes a technical advisor from each participating agency and is chaired by the lead state representative. Additional information regarding project administration can be found in Chapter 3.

Participating states like MDOT are required to have an individual project agreement with FHWA for each pooled fund study. This is accomplished by adding the specific pooled fund to the annual SPR, Part II program. In addition, MDOT Finance Division will initiate a project agreement with FHWA.

Each year MDOT participates in 15 to 25 pooled fund projects, either in a lead agency role or as a participant. MDOT also contributes annually, using pooled funds, to several national efforts, including the Transportation Research Board (TRB), the National Cooperative Highway Research Program (NCHRP) and the American Association of State Highway and Transportation Officials (AASHTO) technical service programs.

The following sections outline the steps necessary for MDOT to program a pooled fund project, either as a lead state or as a participating state.

2.2.1 MDOT Role: Lead State

Step 1 The MDOT staff member who proposes a pooled fund research project develops a problem statement using Form 5308 (Appendix 2.4). The RM can help facilitate drafting the problem statement. Examples of completed problem statements are provided in Appendix 2.12. The MDOT librarian performs a preliminary literature search. An example of a completed annotated bibliography is provided in Appendix 2.11.

Step 2 The RM, research proposer and FAM consult and select a PM.

Step 3 The PM, with assistance from the RM, submits Form 5308 to the FAM who will obtain approval from the RAC chair and REC chair. The Engineer of Research will supply final approval after RAC chair and REC chair approval. The RM should be copied on all correspondence in this step for project recordkeeping. The PM also serves as the chair of the pooled fund project TAC. Section 3.3.1 provides additional details about the roles and responsibilities of the RM, FAM and PM.

Step 4 After receiving all MDOT approvals, Research Administration requests FHWA approval to add the pooled fund project to the annual program and to use 100 percent federal funding for the project. Form 5308, Problem Statement (Appendix 2.4), should be enclosed with the request letter.

Step 5 Once FHWA approval is granted for the program amendment, MDOT creates a solicitation on the TPF Web site seeking pooled fund participants. The solicitation will indicate a minimum budget amount needed to initiate the project.

Step 6 FHWA Michigan Division Office forwards a copy of the request to the FHWA Pooled Fund Program Manager (PFPM). The Division Office also sends a confirmation that FHWA Division has approved amending the program and confirmed the eligibility to use 100 percent federal funding for the project.

Step 7 Upon approval, the PFPM updates the TPF Web site to reflect federal approval. In addition, the PFPM formally notifies the FHWA Division Office who will in turn notify MDOT. An automated message of the approval is sent to the lead agency (MDOT) and all other organizations that are listed as pooled fund participants.

Step 8 MDOT, as the lead state, posts the acceptance memo to the TPF Web site and requests all participants to transfer their committed funds to MDOT. In addition, the FHWA Division Office sends a copy of the MDOT acceptance memo to the PFPM.

Step 9 Research Administration, working with MDOT Contract Services Division, secures a contract vendor. It may take up to six months from the time the problem statement is developed to the time the project is contracted and work begins.

2.2.2 MDOT Role: Participating State

Step 1 The MDOT technical advisor proposing to join a pooled fund solicitation completes Form 5302, Participating State Pooled Fund Summary & Funding Request (Appendix 2.9). The RM can help facilitate drafting the form. An example of a completed form is provided in Appendix 2.13.

Step 2 The MDOT technical advisor forwards the completed form to the appropriate FAM, who determines whether MDOT should support the proposed pooled fund. If support for the idea is recommended, the FAM requests approval from the RAC chair and REC chair. The Engineer of Research supplies final approval after RAC chair and REC chair approval. The RM should be copied on all correspondence in this step for project recordkeeping. Section 3.4.1 provides additional details about the roles and responsibilities of the RM, FAM, PM and RAP members.

Step 3 After receiving all MDOT approvals, Research Administration requests FHWA approval to add the pooled fund project to the annual program and to use 100 percent federal funding for the project. Form 5302, Participating State Pooled Fund Summary & Funding Request (Appendix 2.9), should be enclosed with the request letter.

Step 4 Once FHWA approval is granted for the program amendment, MDOT joins the proposed pooled fund project by means of the TPF Web site. The technical advisor will represent MDOT on the pooled fund project TAC.

CHAPTER 3
PROJECT ADMINISTRATION

Project administration varies depending on the type of research project being administered. In general, individual research projects require more attention and time to administer than pooled fund studies. Taking part in pooled fund studies as a lead state requires more attention and time than joining as a participating state.

Project administration begins with project development and concludes after the project has been completed and accepted. This chapter presents the necessary steps for project administration of two types of Michigan individual projects (outsourced and in-house) and two types of pooled fund studies (Michigan as a lead state and Michigan as a participating state).

3.1 Michigan Individual Projects: Outsourced

Individual research projects are usually contracted to universities or consultants with the Michigan Department of Transportation (MDOT) managing the project. MDOT technical experts assume the Project Manager (PM) role and oversee the project with primary assistance from Research Administration, Contract Services Division (CSD) and Financial Operations Division (FOD). Typically, these projects have budgets under $200,000 and last one to two years. These projects are funded with 80 percent federal dollars and 20 percent state dollars.

Project administration includes the following:

- Request for job number and obligating funds.
- Initiation and securing a contract or authorization.
- Kickoff meeting.
- Regular progress meetings.
- Quarterly and annual reporting.
- Invoice review and payment.
- Changes to the contract or authorization.
- Review of intermediate and final project deliverables.
- Project closeout.

3.1.1 Roles and Responsibilities

A Research Advisory Panel (RAP) is formed during the project planning phase as explained in Chapter 2. RAP members are involved in reviewing proposals and recommending project award to the successful proposer. After project award, the RAP is responsible for assuring proper execution of the research project, from project kickoff to final report acceptance.

RAP membership includes a Focus Area Manager (FAM), PM, Research Manager (RM), Principal Investigator (PI) and additional technical experts. The PM, along with other RAP members, provides initial project direction during the project development phase. In addition, the PM and RAP ensure that the research remains focused on project objectives, tasks and deliverables. The RM assists the PM to ensure that status meetings are held timely, reporting requirements are met, and project cost, schedule and scope issues are properly addressed.

Project Manager

The appropriate FAM recommends a PM for the research project. Typically, the PM is the subject area expert for the research topic. The PM takes the leadership role for the RAP, oversees technical aspects of the project and manages the following project tasks:

- Drafts the problem statement as defined in Chapter 2.
- Recommends the RAP, including completion of Form 5314, Research Advisory Panel Nomination Form (Appendix 2.8).
- Reviews proposals and leads the vendor (researcher) selection team.
- Initiates the contract (authorization) and subsequent modifications.
- Schedules RAP meetings (project kickoff and regular progress meetings) in coordination with the RM.
- Manages project costs, schedule and scope.
- Contacts region staff for approval to conduct any fieldwork in State right-of-way. Permits are required as defined in section 3.1.3 Permits.
- Determines if traffic control is necessary for any fieldwork.
- Reviews and coordinates RAP review and acceptance of project deliverables.

- Accepts and/or rejects invoices.
- Submits the annual report.
- Completes the PI evaluation.
- Recommends implementation measures.

Appendix 3.1a provides additional details about the PM's roles and responsibilities and Appendix 3.1b provides the approximate hours spent by a PM on a research project.

Research Manager

The RM is assigned based on the research project's focus area (as shown in Appendix 1.2). The RM provides the following administrative assistance for the research project:

- Assists the PM with problem statement development.
- Records the proposal review and vendor selection process, and tracks approval.
- Works with the PM to ensure essential documents are compiled for contract or authorization initiation, and tracks progress.
- Acts as Research Administration's liaison to the RAP when process questions arise.
- Coordinates meeting responsibilities with the PM to ensure tasks are completed.
- Ensures that all meeting discussions are documented (meeting minutes) by the PM or RM.
- Verifies that reports and deliverables are received.
- Reviews invoices.
- Works with Research Administration staff to ensure that evaluations are complete.

Appendix 3.1a provides additional details about the RM's roles and responsibilities.

Principal Investigator

The PI is the lead researcher (university or consultant) who is awarded the research contract. The PI conducts and manages day-to-day research tasks as defined in the project work plan, including:

- Provides regular progress reports.

- Manages budget, scope and schedule. Informs the PM immediately of any trends in project progress that suggest a future need for changes to project cost, scope or schedule.
- Maintains regular contact with the PM and other RAP members through meetings and other means such as e-mail or telephone.
- Submits project deliverables, responds to RAP review comments and makes changes as directed.
- Ensures that invoices and project deliverables are supplied on a timely basis.
- Leads the research team and provides other project researchers with clear direction.
- Maintains research team focus on project tasks, objectives and deliverables.

The PI, at his or her discretion, may also include co-PIs, subconsultants and other research team members in RAP meetings.

Focus Area Manager

The FAM is the MDOT manager designated to coordinate research projects within a focus area as shown in Appendix 1.2. Not only is the FAM involved in selecting appropriate research topics and planning a project as defined in Chapter 2, but he or she also has a key role in vendor selection and project management:

- Recommends the PM for the project to the Research Advisory Committee (RAC) chair.
- Approves RAP members.
- Participates in the vendor selection process.
- Remains in contact with PMs, RMs and PIs throughout the project by attending RAP meetings.
- Reports the project status to the appropriate RAC chair shown in Appendix 1.2.
- Reviews and comments on draft deliverables.
- Provides guidance on research results implementation.

Other Research Advisory Panel Members

Additional RAP members may be needed to ensure project success. These include:

- MDOT staff responsible for implementing the research project's outcomes.
- MDOT staff who collect and organize data needed for the project.
- MDOT Region representative.
- Additional MDOT subject area experts.
- Local government staff, Federal Highway Administration (FHWA) representatives and consultants. (Their participation must be at no cost to the project.)

RAP membership should be carefully considered to ensure that the membership does not exceed six to eight members. Groups that are larger than eight members can sometimes slow project progress. For most projects, the PM will appoint a subgroup of the RAP (three to four members) to serve as the scoring team during the vendor (researcher) selection phase.

3.1.2 Project Development

Project development begins during the program planning phase as described in Chapter 2 and continues until the project kickoff meeting after project award. It commences with the development of the project problem statement but also includes RAP member selection as described above. The problem statement must be approved by the appropriate RAC and Research Executive Committee (REC) before soliciting proposals. The RAP membership must be approved by the appropriate FAM.

Problem Statement Development

The PM develops the problem statement using Form 5308 (Appendix 2.4) and includes the following:

- Problem to be addressed.
- Objectives and tasks.
- Deliverables.
- Timeline.

- DOT involvement.
- Potential investigator.
- Budget.

Additional guidance and resources for writing problem statements are available in Appendix 2.5 and Appendix 2.6. Examples of completed problem statements are provided in Appendix 2.12. An example of an annotated bibliography completed by the MDOT librarian is provided in Appendix 2.11.

Research Need

The problem statement explains the research need by addressing the following questions:

- What is the problem?
- How is this problem affecting MDOT operations?
- What information is needed to address the problem?
- How will having or not having the information impact MDOT?
- What specifically is MDOT trying to accomplish with the research?
- What is expected to result from the research?

The problem statement must address a research problem and not a project planning or process improvement. It should involve analysis and not just data collection. The research outcomes should result in broad application instead of addressing only one localized issue.

Objectives and Tasks

The objectives outline the expected results while the tasks indicate how the research team will get the results. Tasks can be very specific and still allow the researcher flexibility when developing a work plan. Successful research projects include the following general steps in project execution:

- Ensure Objectives are clear and concise, using 25 words or less.
- Document and learn from existing research.
- Gather new information and/or data.

- Analyze the new information and/or data.
- Report on the results of the analysis.

Deliverables

Deliverables must include a final report. Additional deliverables may include:

- PowerPoint presentation.
- Workshop.
- Excel spreadsheet.
- Training materials.
- Software.
- Equipment.
- Policy recommendations.
- Specifications.
- Procedures.
- Spotlight Template

The PM must give careful thought to what deliverables are required for a specific research project. Deliverables are often identified by understanding what is necessary to implement the findings of the research.

Schedule

The PM should consider how long the research will take and when the results are needed. Most projects take at least 18 to 24 months and start in October. It is important to define project milestones to ensure steady progress and timely intermediate project deliverables. The PM must allow three months at the end of the project for final deliverable review.

Data collection needs for the research can potentially affect project progress. The overall project schedule must account for seasonal restrictions that prevent year-round data collection. The PM must consider when data collection will occur based on the weather, resource availability and university staff availability.

Generally, universities can collect the most data during the summer months and are scheduled to begin work with graduate students in September, January or June.

MDOT Involvement

When completing a problem statement, the PM must also document MDOT's role in supporting a research project. Activities to consider include whether MDOT staff members will provide data and in what format, if they will facilitate access to a database or coordination with other organizations, and if they will select specific sites to study. MDOT staff may also be needed to provide fieldwork support, including traffic control or other assistance. This must be clearly defined in the problem statement.

Principal Investigator

The required qualifications of both the PI and the supporting research team should be defined in the problem statement. Additional needs beyond a research topic expert may include various specialty skills such as a statistician or communications expert. These should all be listed on the problem statement form for future use in determining the solicitation method.

Budget

The PM must estimate the project funding needs. Project budgets include three components: university/consultant costs, MDOT staff costs and MDOT fieldwork costs.

❖ University/Consultant Costs

The vendor budget for the university or consultant depends on the scope of work. Budget items such as staffing needs, data needs, laboratory testing requirements and field testing needs all affect the vendor budget.

Hours should be itemized per task to help with estimates. One rule of thumb is $100 per hour as a loaded hourly rate for project estimating. Research Administration can help PMs estimate costs based on similar past projects. The method of payment must be defined in the problem statement. Most university contracts are set up with actual costs as the method of payment, while consultant contracts may have milestones or loaded hourly rates as the method of payment.

Actual budgets will be set through the best-value proposal evaluation method described in the Request for Proposals section of this chapter. PMs will be responsible for tracking costs and approving payments for the project as described in the Invoicing section of this chapter.

❖ MDOT Staff Costs

MDOT staff time devoted to research projects is chargeable to research projects as of October 1, 2013. This includes project-related activities beginning at project kickoff and concluding at project closeout. These project-related activities include managing projects, collecting data, attending meetings, assisting the research team, participating in field reviews, assembling information for the research team and evaluating the research team.

The MDOT staff budget is determined by estimating the number of hours MDOT staff will work on the research project. RAP members and other MDOT staff performing work related to the project are eligible to charge to the project job number. The RM does not charge time to the project number and can add further clarification to what staff time is chargeable. The MDOT Research Project Budget Worksheet (Appendix 3.17) is completed by the PM to estimate MDOT project management and fieldwork costs.

❖ MDOT Fieldwork Costs

PMs need to budget for necessary fieldwork support including traffic control, materials, preparation and sampling costs. The PM assesses the need and estimates these costs when completing the problem statement.

Fieldwork funding requests should be made at or before the project start but no later than three months prior to the date required. The PI submits the request to the PM describing the assistance needed. The PM coordinates the work with MDOT field personnel and approves the use of the funds as needed. Permits are required as defined in section 3.1.3 Permits.

Project Accounting

Each project is assigned a Research Administration file number (OR #), a job number and a contract ID. The OR # is used to track project activities during the project development phase. After project award, a contract ID is assigned resulting from vendor contract authorization. A job number is also assigned either at the time of project advertisement or at project award. The job number is used to track project budgets for the vendor, MDOT staff costs and fieldwork costs. Research Administration staff works with the PM, Contract Services Division and Statewide Transportation Planning Division to establish job numbers and contract IDs.

Contracting

The contracting process includes four steps: Request for Proposals (RFPs), proposal selection, obligation of funds and contracts/authorizations. Contracting is the last process before the kickoff of the research project.

Request for Proposals

RFPs are issued winter and fall for projects recommended from the three- year planning process (Appendix 2.1 and Appendix 2.10). Additional RFPs can be issued throughout the year for supplemental projects. The RFP is advertised, and the guidelines are posted in the MDOT's MILogin: Request for Proposals, Web Site, http://www.michigan.gov/mdot/0,1607,7-151-9625_32842---,00.html.

The RFP contains a summary of the approved problem statement, a cost range, guidelines to follow when preparing the proposal and a proposal due date (four to six weeks after the posting). Proposers can receive RFP announcements by subscribing to "SPRII RFP Announcements" through MDOT's GovDelivery e-mail system at www.michigan.gov/mdotresearch.

Before a project RFP is posted, the REC determines the eligibility criteria of prospective bidders for each research project. The REC determines whether each RFP will be open to Michigan universities only or all consultants and universities nationwide.

When bidding is open to Michigan universities only, an RFP is posted to these institutions. If the proposal scoring team selects a vendor, Research Administration requests the Central Selection Review Team to confirm or reject the selection. If no Michigan university is selected, MDOT then opens bidding to all national consultants and universities.

However, if bidding is initially open to all consultants and universities nationwide, MDOT will request competitive proposals from these organizations, including Michigan universities, according to MDOT's procedures. If the proposal scoring team selects a vendor, Research Administration requests the Central Selection Review Team to confirm or reject the selection.

Proposal Selection

The PM, with input from the FAM, creates a scoring team to evaluate the responsive proposals. Team members usually include the FAM, PM, RM and a smaller subset of the RAP members. The scoring team uses MDOT's best-value selection criteria found in Part VII of the Consultant/Vendor Selection Guidelines for Research Service Contracts, available at MDOT's

The scoring team uses MDOT's best-value selection criteria found in Part VII of the Consultant/Vendor Selection Guidelines for Research Service Contracts, available the MDOT Research website https://www.michigan.gov/mdot/programs/research/participating-in-research The evaluation criteria are:

- Understanding of service: 40 points.
- Qualifications of team: 30 points.
- Past performance: 30 points.
- Quality assurance/quality control plan: 5 points.
- Location: 5 points.
- Cost: 40 points.
    - Cost score is based on the lowest cost proposed divided by the current proposer cost multiplied by 40. Lowest bid shall receive 40 points.
    - As part of the best-value selection process, the bid amount is a component of the total proposal score, but not the determining factor of the selection.

  Total Points: 150

Some RFPs have education and experience requirements for statistical staff that must be met to be considered a responsive proposal.

The scoring team's scores for each proposal are tabulated and reported to MDOT's approving body. If only one candidate responds to an RFP, that candidate may be selected if the proposal meets the requirements to complete the work.

After a proposal is selected, the Engineer of Research sends a letter to the preferred consultant stating MDOT's preference to contract with the consultant as the researcher for the project. The Engineer of Research also notifies other submitting proposers that were not selected; each proposer receives a copy of its score sheet along with the notification. If a proposer requests a post-proposal evaluation, a phone interview can be set up to discuss the results of the proposal scoring at the PM's discretion.

Obligation of Funds

Before MDOT can execute a project authorization, federal funding must be obligated. Every year Research Administration requests FHWA approval of each project as part of the annual program approval process. Once FHWA approval is received, Research

Administration informs MDOT's FOD to request federal fund obligation. FOD staff forwards the request with the federal project number and the federal item number to FHWA for approval and will work with FHWA to secure fund obligation prior to October 1. Additionally, new funding obligations are required for new projects throughout the program year. These are initiated through program amendments.

Contracts and Authorizations

After a proposal has been selected, the PM and RM work with the selected PI to finalize a project work plan. Once the PM accepts the work plan, the research project analyst completes Form 5301, Request for New Project Authorization or Contract (Appendix 3.2). The form includes contact information for the PM and PI, budget information as well as the project start and end date. After the PM, RM and Engineer of Research approve the form, it is sent to the Contract Services Division, along with the work plan, to initiate contract or authorization execution.

Consultants are granted new contracts for each project whereas universities are issued work authorizations from an existing Indefinite Delivery Services contract. Authorizations are issued using Form 5185, Acceptance of Priced Proposal & Authorization for University to Proceed (Appendix 3.3).

❖ Research Requirements

Proposals and final work plans follow the criteria given in the Consultant/Vendor Selection Guidelines for Research Service Contracts, available at MDOT's Requests for Proposals Web page https://www.michigan.gov/mdot/programs/research/participating-in-research under Research Proposal Guidelines. The following forms are required:

- Form 5100D, Request for Proposal Cover Sheet (Appendix 3.4).
- Form 5318, Schedule of Research Activities (Appendix 3.5).
- Form 5316, Deliverables Table (Appendix 3.6).
- Form 5100J, Consultant Data and Signature Sheet (Appendix 3.7).
  - » Form is only required for Consultants.
- Budget information:

» Universities: Form 5319, Research Proposal Budget Form Worksheet (Appendix 3.8).

» Consultants: Bid Sheet and Budget Exhibits required in Priced Proposal Guidelines

❖ Commission Audit Requirements

Contracts are sent to the Office of Commission Audit (OCA) if CSD determines it necessary. Contract Services Division submits the information to OCA staff, who reviews costs and supporting documentation such as labor rates, overhead, escalation, direct expenses and total costs to ensure they meet MDOT and state standards. Budget labor rates cannot escalate greater than 2 percent per year as indicated in Appendix 3.9.

❖ State Administrative Board Requirements

Contracts exceeding the MDOT threshold must be approved by the State Administrative Board (Ad Board) before MDOT's contract administrator and executive office can execute the contract or authorization. Contract Services Division uses Form 5301, Request for New Project Authorization or Contract (Appendix 3.2), to prepare the contract submittal package for State Ad Board review. The submittal package includes:

- Contract/amendment number or authorization/revision number.
- Vendor name.
- Brief description of the project and location.
- Purpose for amendments/revisions.
- Amount.
- Increase/decrease amount for amendments/revisions.
- Term.
- Funding source.

State Ad Board review and approval typically takes six to eight weeks after submittal.

According to State of Michigan policy, projects with budgets less than the MDOT threshold can be approved by the MDOT contract administrator and MDOT's executive office without State Ad Board approval. Contract Services Division typically obtains approval sooner for these contracts or authorizations, depending on how quickly the consultant or university contracting authority signs and returns the contract. Contract Services Division distributes the awarded authorization or

contract as follows:

- E-mail the authorization or contract to the consultant or university contracting authority.
- E-mail the authorization or contract to Research Administration. Research Administration forwards the authorization or contract to the RM, PM and PI.
- Mail original authorization or contract with the work plan to the consultant or university contracting authority.
- File one original authorization or contract in the Contract Services Division contract file.

❖ Subcontracting

Subcontracts exceeding $25,000 require that the university or consultant submit the subcontract to Research Administration for review and approval prior to initiating work. The research project analyst reviews the subcontract for completeness (Appendix 3.10) and communicates any needed changes to the PI. An approval letter is sent to the PI and a signature page is requested. An additional review by the OCA is required for subcontracts that exceed $100,000. The research project analyst communicates any OCA modifications to the PI. Once the PI makes the changes, an approval letter is sent, and a signature page is requested.

3.1.3 Project Management

Project management includes both execution and closeout. This phase begins at project kickoff and concludes when final project deliverables are accepted and closeout activities are completed. Project management tasks include leading meetings, reporting, revising contract documents, reviewing and accepting project deliverables, reviewing and approving invoices, evaluating PI performance and completing an internal audit.

Execution

Upon contract award, the PM becomes actively involved with guiding the research. Key tasks that occur after project award include RAP meetings, project reporting, invoice review, permits and possible project revisions.

Meeting Requirements

The initial project kickoff meeting and subsequent progress meetings are critical for project

success. These meetings are necessary to guide the project and provide opportunities for MDOT staff to assist the research team in maintaining focus on the project tasks and objectives.

❖ Kickoff Meeting

The PM schedules the first RAP meeting (kickoff meeting) soon after project authorization. At the kickoff meeting, the RAP reviews the work plan and project milestones. The PI and the research team also communicate project data needs at this meeting. Supplying data to the research team and scheduling fieldwork, including traffic control, early in the project schedule are crucial to avoid future delays. Right of Way (ROW) Permits are required as defined in section 3.1.3 Permits. The kickoff meeting is an appropriate time to provide MDOT documents for the literature review, provide input about the state-of-the-science surveys, identify survey distribution methods, and select a future date when researchers can meet with MDOT staff to understand policies and procedures related to the state of the practice. The RM takes meeting minutes and distributes them to all RAP members. A sample agenda is given in Appendix 3.11. Subsequent meetings follow a similar agenda.

❖ Progress Meetings

The RAP meets periodically to discuss the project's progress and address outstanding issues. To support the conduct of the study and assure research objectives are being met, the PM schedules meetings that coincide with the research tasks identified in the work plan. In this way, MDOT staff actively participates in the tasks such as:

- Reviewing existing related research.
- Surveying national experts on the state of the science.
- Collecting data.
- Analyzing data.
- Documenting findings and writing reports.
- Demonstrating prototypes.
- Conducting technology transfer.

Project meetings progress well if the PI provides a project status report and a list of outstanding issues or data needs before the meeting so MDOT staff can come prepared to provide input that advances the project.

Although most RAP meetings take place at MDOT, they can be held at data collection sites or in

laboratories where experiments are under way or specimens can be evaluated. These on-site research meetings allow the panel opportunities to identify deficiencies in the research approach or actively participate in data collection.

All RAP members are invited to each meeting. Additional people may need to be invited to meetings to provide input or additional expertise that is not represented on the panel. The RM and PM decide who will record meeting minutes.

❖ Final Meeting

At the final meeting of a project, RAP members discuss the final report recommendations and implementation opportunities. Panel members learn about the results of the research project and consider how MDOT can implement those results. RAP members also provide comments on deliverables so that final revisions can take place before the report is published. Another important objective of the final meeting is to review the list of deliverables found in the work plan.

At times it may be important to invite a larger audience to the final meeting to communicate the results of the project to MDOT staff, local agencies or other end users. Final presentations may also need to take place at conferences or group meetings to reach a larger audience than the RAP. In the past, final presentations have taken place at meetings of the MDOT Bridge Committee, Governor's Traffic and Safety Advisory Commission, Michigan Transportation Asset Management Council and other groups.

Permits

As of August 1, 2014, all universities and consultants with research contracts will be required to obtain permits to perform work in MDOT ROW. Each university's contracting authority will contact MDOT's central office right-of-way permit agent, Joe Rios at 517-241-2103, to navigate through the permitting process. The contracting authority takes the necessary steps to obtain a permit for each IDS contract. The principal investigator follows up by submitting a notice of activity under the IDS permit for each right-of-way activity. Detailed instructions are available. Consultants obtain an annual statewide right-of-way entry permit for each year of a contract. The consultant is also required to submit a request to MDOT, termed a Notice of Activity, when work in the right-of-way is required.

Reporting Requirements

Quarterly reports and the annual report are essential in allowing the PI, PM and Research Administration to communicate and record progress throughout a project. These reports are used to track work completed and project future work.

❖ Quarterly Reports

At the end of each quarter, the PI submits a report (Form 5305, Appendix 3.12) and the Schedule of Research Activities (Form 5318, Appendix 3.5) to Research Administration about the work that was accomplished during that quarter. Below is the schedule for submitting quarterly reports:

- 1st FY quarter: October 1 – December 31; report due January 15.
- 2nd FY quarter: January 1 – March 31; report due April 15.
- 3rd FY quarter: April 1 – June 30; report due July 15.
- 4th FY quarter: July 1 – September 30; report due October 15.

Research Administration forwards the report to the PM for review. If the PM is satisfied with the report, he or she informs Research Administration of their approval. If the PM has a question or concern, he or she works with the PI to resolve the issue. The PM documents all concerns for the project files.

The PM is responsible for itemizing contracted and MDOT expenditures in comparison to expected expenditures. This should coincide with the submittal of each quarterly report submitted by the PI. The PM is responsible for identifying spending trends that may require budget adjustments.

The PM can retrieve project budget and expenditure information by utilizing MDOT's Phase Initiator system. Each project will have a single job number that tracks all project costs. MDOT expenses can be determined by subtracting the contract invoiced amount from the cost to date reported in Phase Initiator.

If the PI requests a modification to the terms of the authorization or contract, a formal request must be made directly to the PM rather than through the quarterly report. More information about project revisions is found in the Project Revisions section of this chapter.

❖ Annual Reports

At the end of each fiscal year, Research Administration works with PMs to develop a summary report of the research performed throughout the year. Each PM writes a summary of each project using Form 5312, the MDOT Research Project Annual Report – Fiscal Year 20-- (Appendix 3.13), and submits it to Research Administration. The form is due in late October to early November. Research Administration compiles a report containing all these forms and project expenditure summaries and submits a copy to FHWA by January 1. Annual reports are available at www.michigan.gov/mdotresearch.

The PM is also responsible for providing annual project budget updates to Research Administration in the spring of each year. This information is needed to develop the annual fiscal year research program, which is finalized in the summer and submitted to FHWA for approval in August. The MDOT Research Project Budget Worksheet (Appendix 3.17) is completed by the PM to estimate MDOT project management and fieldwork costs.

Invoicing

Invoices may be sent monthly or based on milestone payments, depending on the method of payment. Once an invoice is submitted to Research Administration, the following steps are taken:

Step 1 The research project analyst reviews the invoice and then forwards it to the PM for approval, with a copy to the RM.

Step 2 The PM works with the PI to resolve concerns or questions. The PM approves or rejects the invoice and returns it to the research project analyst.

Step 3 The research project analyst requests that payment be issued.

At the end of the fiscal year (September 30), each vendor (university or consultant) estimates the outstanding invoice amounts remaining for the ending fiscal year. This estimate, referred to as Estimated Account Payable (EAP), is used to set aside previous fiscal year funds to pay the unpaid invoices when they are received. Research Administration must receive the estimates by the first week of October. Actual due dates will be announced each fiscal year. Prior fiscal year invoices must be submitted to MDOT by November 15.

Project Revisions

A revision in cost, scope, duration and/or staff may be proposed during the contract period using the following process:

Step 1 Initially, the PI submits written communication to the PM explaining the requested changes and providing justification. The PI also submits any supporting documentation related to the changes as described in the following sections. Forms found in Appendix 3.5, Appendix 3.6 and Appendix 3.8 or at the Research Administration Web site (www.michigan.gov/mdotresearch) are used to document these modifications.

Step 2 The PM presents the proposed change along with necessary documentation to the RM for review and concurrence. If the submission is complete, the PM and the research project analyst complete Form 5306, Project Change Request (Appendix 3.14).

Step 3 The research project analyst electronically obtains final approval of the Project Change Request from the PM, RM and Engineer of Research.

Step 4 The research project analyst submits the approved form and documentation to the CSD and/or places them in the project file (as required in the sections below).

On average, CSD requires three to four weeks to process a revision. If the revision must be approved by the State Ad Board, it may take six to eight weeks to process. CSD sends a revised authorization or contract to the university or consultant contracting office for concurrence. MDOT's contract administrator and executive office execute the revised contract by signing the authorization or contract amendment.

❖ Scope

For revisions in scope, the PM will work with the research project analyst to submit Form 5306, Project Change Request (Appendix 3.14). Attachments should include a scope of work description, and a new deliverables table. The project analyst will then process the request through CSD. FHWA approval may be required for a scope of work change, as determined by the RM.

❖ Staff

If staff changes occur on a project, the PM submits Form 5306, Project Change Request (Appendix 3.14). The research project analyst will process the change and notify CSD.

❖ Subcontract Work Assignment

These revisions may include work assignment shifts from one subcontractor to another subcontractor, from the subcontractor to the prime contractor or from the prime contractor to the subcontractor. For work assignment revisions, the PM submits Form 5306, Project Change Request (Appendix 3.14), along with an updated budget, a scope of work change description. The research project analyst will process the change through CSD.

❖ Schedule

To request a schedule revision, the PM submits Form 5306, Project Change Request (Appendix 3.14) with an updated schedule (Appendix 3.5); and deliverables table (Appendix 3.6). The research project analyst will process the request through CSD.

❖ Budget

A budget decrease follows the same process as a schedule change except budget tables (Appendix 3.8) must also be submitted.

A budget increase involves several more steps and may extend the approval period to six to eight weeks, or longer if State Ad Board approval is needed. The PM must get approval for budget increases from the RAC chair before working with the research project analyst to submit Form 5306, Project Change Request (Appendix 3.14). Research Administration must also gain FHWA approval using the program amendment process outlined in Chapter 2. As approvals are obtained, CSD must process the contract budget increases.

The additional steps required must be taken to execute a budget increase include:

Step 1 The PI submits written communication to the PM explaining the requested changes and justification. Any supporting documentation that pertains to the budget increase should be attached, including:

- New budget tables (Appendix 3.8).
- Description of the scope of work that corresponds with the additional funding.
- Updated deliverables table (Appendix 3.6) and timeline (Appendix 3.5) if these items are changed.

Step 2 The PM presents the proposed change to the RM and discusses its justification. If the PM and RM agree that the change is justified and the essential documentation is complete, the PM, with research project analyst assistance, prepares Form 5306, Project Change Request (Appendix 3.14). The PM adds the revision information and justification for the change to the form, and supplies the following supporting documentation:

- New budget tables.
- Description of the scope of work that corresponds with the additional funding.
- Updated deliverables table and timeline if these items are changed.
- Documentation of the RAC chair's funding increase approval.

Step 3 The research project analyst electronically obtains final approval of the Project Change Request from the PM, RM and Engineer of Research.

Step 4 The research project analyst submits the approved form and documentation to CSD.

Step 5 MDOT's contract administrator sends an authorization or contract amendment to the university or consultant contracting office for approval.

Step 6 If the revision causes the total budget to exceed the MDOT threshold for the first time or if cumulative increases exceed the increase threshold, the State Ad Board must approve the change before MDOT's contract administrator and director's office can execute a new authorization/contract. Projects with budgets less the thresholds, can be approved by MDOT's contract administrator and executive office without State Ad Board approval.

Closeout

Project closeout includes reviewing and accepting project deliverables, paying the final invoice, evaluating PI performance and completing an internal audit.

Project Deliverables

The PM is responsible for reviewing and approving all project deliverables and providing feedback on drafts and revisions. Project deliverables will include a final report, implementation plan and technology transfer materials. Additional deliverables may include software products,

guidance documents, equipment, presentations, training manuals, training events or demonstrations.

❖ Final Report

Federal regulations require a final report for every research project (23 CFR 420.209.a.6). The report documents the methods used, data collected, analyses performed, conclusions and recommendations. Formatting requirements are shown in Appendix 3.15. This final report must also comply with federal standards within Section 508 of the Rehabilitation Act of 1973 as amended, which requires electronic document accessibility for individuals with disabilities that may require a screen reader or other assistive device.

➢ *Review and Acceptance Procedures*

The PM leads the review and approval of final deliverables. Enough time needs to be built into the review process for meaningful revisions. Once the PM accepts the final deliverables, final payments can be made. The PM communicates the final report deliverable expectations according to the following 90-day review process:

Step 1 **Draft report.** The PI submits the draft final report to the PM. The PM reviews the report findings with the FAM to determine whether Engineering Operations Committee approval is required.

Due date: At least 90 days before the authorized final project deliverable date.

Step 2 **MDOT review.** The PM requests comments from the RAP, compiles the comments and communicates the needed revisions to the PI. The RAP makes comments based on the following standards:

- Completeness: The report contains all necessary content.
- Technical merit: The research is well-documented and the findings are scientifically founded.
- Format and style: The report meets high standards of writing and presentation must pass accessibility review found within Microsoft Word or PDF editing software.

Due date: Within 30 days of receipt of the report.

Step 3 **Resubmittal.** The PI modifies the draft final report and resubmits the report to the PM.

Due date: Within 45 days of receiving the comments from the PM.

Step 4 **Revisions.** The PM checks the needed revisions and works with the PI until all revisions are made and the final project report is initially accepted by the PM. In some cases, the FAM will determine that the report should be reviewed and approved by the Engineering Operations Committee.

Due date: Before the final deliverable date indicated in the contract or authorization.

Step 5 **Delivery.** Following the report's initial acceptance, the PI submits the final report in digital format according to the following specifications:

- At least two searchable PDF files, including the Spotlight Template and Research Report as separate files, submitted electronically through ProjectWise.

Due date: Deliverable date indicated in the contract or authorization work plan.

Step 6 **Final acceptance.** The PM is responsible for accepting the final project deliverables unless the FAM determines that the Engineering Operations Committee should be consulted prior to approval.

Due date: The later of the following:

- After final deliverables have been received and approved as indicated in Step 5.
- After the final invoice has been received and approved as indicated in the Invoicing section of this chapter.

➢ *Publishing Prior to Project Completion*

Report publishing prior to MDOT final acceptance is prohibited without special approval from the MDOT RAC Chair. The required approval process is provided in Appendix 3.16. All early published documents resulting from MDOT approval will be provided with the final project deliverables.

❖ Implementation Plan

The PI writes and submits an Implementation Action Plan Proposal (IAPP), which is a technical report of 10 pages or less that explains how MDOT could best use the result(s) of the study. The report should note the recommended implementation steps, the estimated cost of implementation and the benefits of adopting the implementation plan. The PM determines if this implementation plan can be included as part of the final report recommendations or developed as a stand-alone document.

❖ Outreach Plan

If a project requires outreach to a larger audience than the RAP, a component of the implementation plan should include an outreach plan that at a minimum indicates the message(s), the audience(s) and the medium(s).

The project deliverables may also include the following summaries of the research project to promote broader awareness of the research results within MDOT and to external audiences:

- **Research Spotlight:** All PIs are required to complete a spotlight template, found in Appendix 2.14, for a possible Research Spotlight publication. Research Spotlights include a project-related image, project summary information, a PM quote and contact information for the PI and PM. The spotlight template includes all necessary information to satisfy this deliverable requirement.

  Research Spotlights are posted on Research Administration's Web site at https://www.michigan.gov/mdot/programs/research/research-projects/recently-completed-projects

❖ Software Products

If software is developed as part of a contracted project, the PI provides the source code to MDOT as one of the final deliverables. MDOT has the right to use the software in accordance with the rights authorized in the following paragraph:

> For all services that result in software development for governmental purposes, the consultant will provide MDOT with a worldwide, irrevocable, nonexclusive, fully paid and royalty-free license to use the source code(s) for the software developed in digital format and/or as specified in the scope of work.

❖ Patents and Copyrights

Some projects result in patent applications and copyrights. In these cases, the consultant or university will grant a license not only to MDOT, but also to all Michigan state and local governmental agencies and the U.S. government. These conditions and additional requirements are explained in the following paragraph:

> The consultant will notify the PM of any patent applications and copyrights resulting from work performed under an MDOT authorization. The consultant will grant to all Michigan state and local government agencies and the U.S. government worldwide, irrevocable, nonexclusive, fully paid and royalty-free license to reproduce, publish or otherwise use and to authorize others to use the work for governmental purposes, whether or not a patent or copyright is obtained.

Chapter 5 of this manual provides more information about copyrights and patents.

❖ Equipment

In accordance with 2 CFR 200, property will continue to be used by MDOT at the end of a research project. MDOT shall have possession of equipment purchased by research funds in accordance with the following conditions outlined in Appendix 3.18:

1. At the sole discretion of MDOT, equipment will be delivered to MDOT for its possession at the end of each project.
2. At the sole discretion of MDOT, equipment may be the possession of a public institution if it costs less than $5,000 at the end of each project.
3. All equipment costing greater than $5,000 shall be transferred to MDOT's possession.
4. All equipment purchased by a private vendor shall be transferred to MDOT's possession.

Administrative Requirements

Research Administration works with the PM to complete various administrative requirements as part of the project closeout process. These requirements include reviewing and paying the final invoice, completing vendor evaluations and completing an internal audit of project billings and payments.

❖ Final Invoice

When the final invoice arrives, the research project analyst works with the PM to determine the status of the final deliverables. Fifteen percent of the total budget is retained until the PM receives and approves the final deliverables. Once the final deliverables are approved, the research project analyst requests release of the final payment.

❖ Consultant Evaluation

When the research project analyst requests release of the final payment, the PM is reminded to complete a consultant evaluation in MDOT's C-TRAK system. The PM gives a signed original of the evaluation to the research project analyst, who sends a cover letter and a copy of the evaluation to the PI.

The evaluation is placed in the project file. Evaluations are used in future proposal selections to determine past performance scores.

❖ Internal Audit

After a project expires and final payment is released, Research Administration reviews project expenditures to ensure that all payments were processed accurately. OCA must review all projects with a contract value exceeding $100,000. Contracts that are valued at $100,000 or less may also be reviewed by OCA at the request of Research Administration. Once the audit is complete, a letter is sent to the university or consultant seeking concurrence with the results of
the audit.

3.2 Michigan Individual Projects: In-House

Although MDOT technical experts rarely conduct individual research projects in-house because of staffing constraints, these projects can be funded with State Planning and Research (SPR), Part II research funds when requested. Funding is 80 percent federal dollars and 20 percent state dollars.

3.2.1 Roles and Responsibilities

Roles and responsibilities are like those outlined in Section 3.1. However, the MDOT PM assumes both the PI and PM roles.

3.2.2 Project Development

Project development includes problem statement development, work plan development, job number establishment and federal funding obligation.

- **Problem statement:** A problem statement is developed as outlined in Section 3.1.2 and approved as outlined in Chapter 2.
- **RAP:** The PM recommends a RAP and the Focus Area Manager (FAM) approves members as indicated in Chapter 2.
- **Work plan:** The PM develops a work plan that is approved by the Engineer of Research and RAP, and contains the following:
    - Scope of work describing in a narrative form the way the tasks outlined in the problem statement will be addressed. Itemized budget identifying hours, the staff and their hourly rates, and equipment costs.
    - List of deliverables, including a final report, using Form 5316, Deliverables Table (Appendix 3.6).
    - Timeline, on Form 5318, Schedule of Research Activities (Appendix 3.5).
- Obligation of funding: Research Administration secures a job number and obligates funds before work can begin.

3.2.3 Project Management

Project management processes are similar to those described in Section 3.1. The PM:

- Holds a kickoff meeting and periodic RAP meetings to organize the work report on progress and obtain panel input.
- Submits quarterly and annual reports to the FAM.
- Reviews job number expenditures and project spending trends, and adapts work assignments to stay within budget.
- Presents any changes to the work plan for FAM and RAP approval.
- Writes the final report and submits it to the Engineer of Research, FAM and RAP for review and approval.

3.3 Pooled Fund Studies: Michigan as the Lead State

MDOT-led pooled fund studies require that MDOT assume the lead role in both the project development and project management phases. The lead state assumes the project administration role, which includes drafting a problem statement, identifying the research need, soliciting interest from other states, contracting to do the research and managing the project. This section explains how MDOT-led pooled fund studies are developed and managed.

3.3.1 Roles and Responsibilities

Each partner state in a Transportation Pooled Fund (TPF) research project appoints a technical expert to serve on the project's Technical Advisory Committee (TAC). Committee members may assist the MDOT PM in developing a problem statement, participate in proposal review and participate in vendor selection. After project award, the TAC is responsible for assuring proper execution of the research project, from project kickoff to final report acceptance.

More information about the role and duties of the TAC are available in Chapter 13 of the Transportation Pooled Fund Program Procedures Manual.

Project Manager

The appropriate FAM recommends a PM for a research project. Typically, the PM is the subject area expert for the research topic. The PM takes the leadership role for the TAC, oversees technical aspects of the project and manages the following project tasks:

- Drafts the problem statement as outlined in Phase 2: Problem Statement Development in Section 2.1.3. TAC members also may be asked to assist.
- Determines the need for a RAP and recommends RAP members.
- Reviews proposals and leads the vendor (researcher) selection team.
- Initiates the contract (authorization) and subsequent modifications.
- Schedules TAC meetings (project kickoff and regular progress meetings) in coordination with the TAC members.
- Manages project costs, schedule and scope.
- Works with Research Administration and Finance to secure fund transfer requests from the partner states.
- Reviews and coordinates TAC review and acceptance of project deliverables.
- Accepts or rejects invoices.
- Review project expenditures and track expense trends.
- On a calendar quarter basis, provides project status and progress reports. All progress report information must be posted to the TPF Web site (www.pooledfund.org) within 30 days of the end of the reporting period according to federal regulations (23 CFR 420.117(c)). More information about the required report content is available in Chapter 12 of the Transportation Pooled Fund Program Procedures Manual.
- Ensures that project partners receive all project reports and deliverables.
- Completes the PI evaluation.
- Recommends implementation measures as defined in Chapter 4.

Research Manager

The MDOT SPR, Part II Program Manager is the RM for all pooled fund studies. The RM provides the following administrative assistance for a project:

- Initiates the amendment request with FHWA to add the pooled fund study to the annual work plan.
- Assists the PM with problem statement development.
- Records the proposal review and vendor selection process, and tracks approval.
- Works with the PM to ensure the essential documents are compiled for contract or authorization initiation, and tracks progress.
- Acts as Research Administration's liaison to the TAC when process questions arise.
- Coordinates meeting responsibilities with the PM to ensure completion of tasks.
- Ensures that all meeting discussions are documented by the PM or the RM.
- Verifies reports and deliverables are received.
- Reviews invoices.
- Works with the PM to ensure PI evaluations are complete.
- Maintains detailed financial records of project funding allocations from partner states.

Principal Investigator

The PI is the researcher awarded the research contract. The PI conducts and manages day-to-day research tasks as defined in the project work plan, including:

- Provides regular progress reports.
- Manages budget, scope and schedule. Informs the lead state's PM immediately of any trends in project progress that suggest a future need for changes to project cost, scope or schedule.
- Maintains regular contact with the PM and other TAC members through meetings and other informal means such as e-mail or telephone.

- Submits project deliverables, responds to TAC review comments and makes changes as directed.
- Ensures that invoices and project deliverables are supplied on a timely basis.
- Leads the research team and provides other project researchers with clear direction.
- Maintains research team focus on project tasks, objectives and deliverables.

The PI, at his or her discretion, may also include co-PIs, subconsultants and other research team members in TAC meetings.

Focus Area Manager

The FAM provides the following assistance:

- Recommends the PM for the project.
- Recommends initiation of an MDOT-led pooled fund to the RAC.
- May assist in vendor selection and project management.
- Approves RAP membership.
- Remains in contact with the MDOT SPR, Part II Program Manager throughout the project and may attend TAC meetings.
- May review and provide comments on draft deliverables.
- Provides guidance to the PM and TAC on appropriate next steps to implementation as defined in Chapter 4.

3.3.2 Project Development

Project development of an MDOT-led pooled fund study begins either during the program planning phase as described in Section 2.1.3 or as a supplemental research project as described in Section 2.1.4. In both cases, the project development steps described in Section 3.1.2 apply, except for the proposal selection team members defined in the Proposal Selection section. The proposal selection team for a pooled fund project is composed of TAC members and additional MDOT technical experts.

Tasks for project development begin with completing a problem statement and conclude with a study kickoff meeting. Chapter 5 of the Transportation Pooled Fund Program Procedures Manual provides additional details for establishing a pooled fund project. A summary of the process follows:

- **Problem statement:** A problem statement is developed as outlined in Phase 2: Problem Statement Development in Section 2.1.3. After all necessary MDOT approvals are received, the problem statement is submitted to FHWA for review and approval.
- **RAP:** If necessary, a RAP is assembled to bring additional expertise that augments that of the TAC.
- **Work plan:** Research Administration submits a request to the FHWA Michigan Division Office to add the proposed project to the annual work plan. The submittal may include a request to waive matching funds.
- **Funding:** The PM, with assistance from the RM, posts a project solicitation to the TPF Web site (www.pooledfund.org). The solicitation will indicate a total dollar commitment amount required for the study and will ask interested study members to make minimum funding commitments to participate. A deadline date will also be posted for the study. The PM contacts other state DOTs and requests their participation. If the total dollar commitment amount is not achieved by the deadline date, the study will be terminated, extended or deferred.
- **Federal study number:** If minimum funding commitments are secured, the PM, with assistance from the RM, requests a federal study number from the FHWA Division TPF funding coordinator. Upon assignment of a federal study number, the PM secures and posts the names of the partner states' TAC members to the TPF Web site (www.pooledfund.org).
- **Vendor selection:** The PM and the TAC review proposals and select a vendor (researcher) for the project.
- **Study award:** The study is authorized and awarded.

3.3.3 Project Management

Project management of an MDOT-led pooled fund study is like that of an individual research project. It commences with the project kickoff meeting and concludes with final acceptance. All steps described in Section 3.1.3 apply with one exception: TPF quarterly reports

are issued on a calendar quarter basis. Chapter 12 of the Transportation Pooled Fund Program Procedures Manual provides specific details for project management of a pooled fund project. A sequential summary of the project manager's role in the process follows:

- Holds a kickoff meeting and periodic TAC meetings to organize the work, report on progress and obtain committee member input.
- Posts quarterly (calendar) reports to the TPF Web site (www.pooledfund.org) and secures a copy for the MDOT project file. Provides periodic project status updates to the FAM.
- Asks TAC members to review and provide comments on progress reports and preliminary findings from the PI.
- Reviews project expenditures and project spending trends, and adapts work assignments to stay within budget.
- Reviews any changes to the work plan for FAM and TAC approval.
- Obtains TAC review and approval of the final report submitted by the PI.
- Identifies implementation opportunities.
- Accepts or rejects study deliverables, including the final report.

At the end of the project, the RM follows the project closeout procedures as defined in Chapter 17 of the Transportation Pooled Fund Program Procedures Manual. This includes preparation of a separate fund transfer request on Form FHWA-1576 to return any remaining funds to the partner states.

3.4 Pooled Fund Studies: Michigan as a Participating State

Pooled fund studies where MDOT is only a participant require much less attention from MDOT than when the state is acting in the lead role. When participating only, MDOT technical experts serve on a TAC but are not responsible for project administration responsibilities.

3.4.1 Roles and Responsibilities

The TAC's role is as described in Section 3.3.1.

Technical Advisor

The appropriate RAC chair assigns a technical advisor to the project's TAC. In this role, the technical advisor:

- May participate in the vendor selection process.
- Participates in project progress meetings.
- Reviews preliminary and final project deliverables.
- Approves or rejects invoices.
- Reviews and approves final accounting of project expenditures charged to MDOT.
- Assesses and recommends any implementation strategies resulting from the research.
- Provides guidance to the lead agency PM and other TAC members about appropriate next steps to implementation as defined in Chapter 4.
- Works with the RM to initiate fund transfers to the lead agency.
- Works with the RM to prepare annual reports as described in the Reporting Requirements section of this chapter.
- Works with the RM to ensure final study deliverables, including the final report, are received and acceptable.

Research Manager

The MDOT SPR, Part II Program Manager is the RM on all pooled fund studies. The RM provides the following administrative assistance for the project:

- Initiates fund transfers to the lead agency.
- Initiates the amendment request with FHWA to add the pooled fund study to the annual work plan.

- Assists the technical advisor with review and approval of the final accounting of project expenditures charged to MDOT.
- Assists the technical advisor with the TPF Web site (www.pooledfund.org).
- Assists the technical advisor with the preparation of annual reports as described in the Reporting Requirements section of this chapter.
- Works with the technical advisor to ensure final reports and deliverables are received.
- Ensures that the project is closed out according to the federal requirements.

Focus Area Manager

The FAM provides the following assistance:

- Recommends the technical advisor for the project.
- Recommends pooled fund participation to the RAC.
- Provides guidance to the technical advisor about appropriate next steps to implementation as defined in Chapter 4.

3.4.2 Project Development

Project development of a pooled fund study when Michigan is a participating state is minimal. Most of the tasks involved in this phase are addressed by the lead state. The following activities are required:

- **Work plan:** Research Administration submits a request to the FHWA Michigan Division Office to add the proposed project to the annual work plan. The submittal may include a request to waive matching funds.
- **Fund transfers:** The PM and the RM work with the Finance Division and FHWA to initiate fund transfers to the lead agency.
- **Participation:** The PM, working with the RM, posts MDOT's expressed interest on the TPF Web site (www.pooledfund.org).

3.4.3 Project Management

A summary of the project management process when Michigan is a participating state follows. During this process, the technical advisor:

- Along with other TAC members reviews and approves quarterly report documents before posting to the TPF Web site (www.pooledfund.org).
- Provides periodic updates to the FAM.
- Performs reviews and provides comments on progress reports and preliminary findings from the PI.
- Assists the TAC with the review of project expenditures, tracking expense trends and adapting work assignments to stay within budget.
- Assists the TAC with review and approval of the final report submitted by the PI.
- Works with the RM to prepare annual reports as described in the Reporting Requirements section of this chapter.

CHAPTER 4
IMPLEMENTATION

Implementation of innovative technologies, best practices and research outcomes occur regularly throughout the Michigan Department of Transportation (MDOT). The assessment and utilization of new technologies, methods and procedures enable the department to achieve its mission of "providing the highest quality integrated transportation services for economic benefit and improved quality of life." Innovation is the result of many different efforts, both in Michigan and nationally. Programs such as Transportation Research Board sponsored Cooperative Research Programs (highway, transit, rail, and air), federally sponsored transportation research, Every-Day Counts, the State Transportation Innovation Council, and state sponsored transportation research all contribute to innovation in transportation. In Michigan, the MDOT State Planning and Research (SPR), Part II research program and state-funded Research Centers of Excellence also contribute to the development and identification of new transportation innovations.

This chapter outlines the process used by MDOT to implement research findings and recommendations resulting from both state and national research. Appendices 4.1, 4.2, and 4.3 provide an overview of the process.

4.1 Implementation Approval

4.1.1 Research Project Completion and Implementation

Every year Research Administration produces an annual report that summarizes the project status for all projects that makeup the research program. Typically, ten research projects are completed within a one-year period. After research project completion, MDOT leadership and technical staff must decide whether specific research findings and recommendations should be implemented or not within the organization.

4.1.2 RAC Research Implementation Meetings (Typically March/April)

MDOT Research Advisory Committees (RAC) meets every two years to review implementation opportunities resulting from research. Individual projects and Transportation Pooled Fund (TPF) studies are typically discussed in separate meetings, but these reviews will be run concurrently. Prior to the RAC meetings Research Administration provides direction and training to assist PMs with implementation planning.

Individual Project Review Meeting – Individual research projects, completed in the last two fiscal years, are reviewed to determine if implementation will be requested. Meeting attendees include RAC members with recently completed research projects (Focus Area Managers, Research Managers, Region Representatives and the RAC Chair). The Engineer of Research and Project Managers also attend. The Project Manager will prepare a draft preliminary implementation plan, prior to the meeting, including objectives, tasks, cost, scope, and timeline for projects being submitted to RAC. Project Managers will present implementation recommendations to the RAC for approval. The RAC makes the determination on whether implementation will proceed and whether an informative presentation will be provided to the Research Executive Committee (REC) for their concurrence. For all implementation plans, funding sources for implementation will be identified and an Implementation Manger (IM) will be assigned. Typically, the IM is the person with the resources and authority to champion the implementation efforts. The IM takes the leadership role for implementation tasks, and reports on progress on the implementation plan going forward. Appendix 4.1 schematically shows the steps leading up to and following RAC approval. Appendix 4.2 provides more detailed descriptions of the process. Appendix 4.3 provides a worksheet outlining steps to develop draft preliminary implementation plans.

Pooled Fund Study Review Meeting – All active TPF Studies are reviewed for implementation opportunities. Meeting attendees include RAC members responsible for technical areas related to active TPF's (Focus Area Managers, Research Managers, Region Representatives and the RAC Chair). The Engineer of Research and the Technical Advisory Committee (TAC) member of each TPF study also attend. The TAC member will prepare a draft preliminary implementation plan, prior to the meeting, including objectives, tasks, cost, scope, and timeline for projects being submitted to RAC. TAC members will present implementation recommendations to the RAC for approval. The RAC makes the determination on whether implementation will proceed and whether an informative presentation will be provided to the Research Executive Committee (REC) for their concurrence. For all implementation plans, funding sources for implementation will be identified and an Implementation Manger (IM) will be assigned. The IM takes the leadership role for implementation tasks, and reports on progress on the implementation plan going forward.

4.1.3 REC Research Implementation Meeting (Typically May)

The Project Managers, Implementation Managers, RAC chair, or TAC members present their respective implementation plans(s) to the REC chairs. The REC may make a final determination with the RAC on whether implementation will proceed; however, this meeting will largely be an informational presentation for the REC. This REC Research Implementation Meeting takes place

prior to the July program approval meeting where additional implementation funding could be included in the annual program approval.

4.2 Implementation Plan

The IM will finalize the preliminary implementation plan developed by the Project Manager. In addition to objectives and tasks, the final implementation plan will outline cost, scope, and schedule to initiate the new innovation. The plan will also detail any project pilot locations along with evaluation procedures and timelines. Implementation will not begin until RAC has concurred with the implementation plan.

4.3 Implementation Reporting & Completion

The IM will be responsible for ensuring that the approved implementation plan is followed and updated as needed throughout the implementation phase. The RAC chair and Research Administration will be updated by the IM, on an as-needed basis, as to the progress of implementation and when implementation completion is expected. Research Administration will track the status of implementation and provide periodic reports to the RAC chair.

CHAPTER 5
FEDERAL REQUIREMENTS

The federal government supports surface transportation research in many ways. The State Planning and Research (SPR) Program, as described in 23 CFR 420, is a federal program designed to assist state Departments of Transportation (DOTs) with funding a surface transportation research program.

SPR Program requirements stipulate that at least 25 percent of the annual federal SPR apportionment (23 CFR 420.107) be dedicated to research (Part II). SPR, Part II, funding rules also require that individual research projects be funded with a mix of 80 percent federal dollars and 20 percent state dollars (23 U.S.C. 505). SPR, Part II, dollars also support the national Transportation Pooled Fund (TPF) Program (www.pooledfund.org/). Pooled fund studies can use 100 percent federal funds as outlined in 23 CFR 420.119(d).

The Federal Highway Administration (FHWA) encourages state DOTs to develop, establish and implement a research, development, and technology transfer (RD&T) program. The goal of a RD&T program is to improve processes, designs, materials, construction methods, maintenance practices and technologies that result in a safer and more cost-effective surface transportation system. This program uses federal and state funding to conduct and implement research.

State DOTs are also encouraged to share research results with others to increase the benefits of transportation research at the local, regional and national levels. One mechanism used to share research successes and best practices is through research peer exchanges. Other tools used to communicate research include national research databases such as the Transportation Research Information Database (TRID) and the Research in Progress (RiP) database.

5.1 Program Eligibility Requirements

23 CFR 420.113 outlines what activities are eligible for SPR, Part II, dollars. Eligible RD&T activities are described in the following sections.

5.1.1 Research

Research activities related to a research study that are eligible for SPR, Part II, funds include:

- Studies where the purpose is to gain knowledge or understanding of a subject related to surface transportation. This includes individual research studies or projects as well as

pooled fund studies. Research activities included in the study scope and project management functions related to the research study are eligible for SPR, Part II, funding.

- Project management functions include all Michigan Department of Transportation (MDOT) staff efforts that contribute to meeting the study objectives. These typically begin at the time of the kickoff meeting and conclude with final closeout of the research study. Program administration charges are not eligible for SPR, Part II, funding.
- Data collection that is necessary for a research project. Subsequent data collection required to maintain systems developed with SPR, Part II, funds are not eligible expenses.
- Evaluation of new processes, products, equipment and/or materials.
- Pilot or laboratory studies required to evaluate or validate research findings.
- Research activities at University Transportation Centers (UTCs).
- University graduate student internships that are funded by a research study.
- Evaluation of experimental approaches used in construction projects. This includes projects approved using the Special Experimental Projects No. 14 (SEP-14) process.

5.1.2 Development (Implementation)

Implementation plans, communication plans and demonstration projects are all eligible costs when related to the findings and conclusions of a research study (individual and pooled fund). These state or nationally supported studies may be sponsored by MDOT, another state DOT, FHWA, the National Cooperative Highway Research Program (NCHRP) and/or Transportation Research Board (TRB). The following activities are eligible:

- Implementation plans and communication strategies, including:
    - Draft and initiate revised or new standards or specifications.
    - Identify and schedule demonstration projects (field trials).
    - Draft and initiate new or revised policies.
    - Draft and initiate new or revised internal processes or procedures.

- Demonstration projects:
    - Research findings and conclusions may require the demonstration of new technologies, including new equipment, new materials and/or new construction techniques. New technology must be evaluated both during and after construction to determine the effectiveness of the technology. SPR, Part II, funds can be used to evaluate these new technologies.
    - Other eligible charges include evaluation of design, testing or construction protocols, information sharing, initial and long-term data collection, data analysis and reporting. Project management costs are eligible for funding when the activity or activities contribute to the accomplishment of demonstration project objectives.
    - The cost to construct demonstration projects typically is funded using construction program dollars. However, SPR, Part II, funds may be used to fund the cost of specific contract items that directly relate to project demonstration elements. Research Administration, consulting with the FHWA Michigan Division Office, will determine eligibility on a case-by-case basis.

5.1.3 Technology Transfer

Technology transfer activities are eligible for SPR, Part II, funding when the technology is a result of state, nationally or internationally recognized transportation research and technology. The following activities are eligible:

- Develop communication materials such as printed materials, electronic materials and video productions.
- Prepare educational or training materials.
- Conduct training sessions.
- Develop and conduct informational seminars related to new technologies.
- Develop and make presentations.
- Deploy previous research or implementation products (Strategic Highway Research Program II, pooled fund studies, research studies performed by other states and the federal government).
- Conduct open houses for projects using new technology.

- Facilitate best practices conferences such as the Research Summit.
- Organize and lead technology transfer efforts.

5.2 Program Management

State DOTs, including MDOT, are granted the authority to administer, manage and direct their RD&T program activities according to 23 CFR 420, Subparts A and B of the federal regulations. FHWA involvement in the SPR, Part II, Program is primarily at the overall program level. However, FHWA staff members occasionally participate on project RAPs and research peer exchanges.

5.2.1 Annual Report

FHWA requires that states report, on an annual basis, the deliverables that resulted from the previous program year (23 CFR 420.117). The annual report must include a detailed summary of costs and accomplishments resulting from the past year's work plan (research program). The report is due to the FHWA Michigan Division Office within 90 days of the fiscal year-end (December 31). A sample annual report is posted on Research Administration's Web site (www.michigan.gov/mdotresearch).

The annual report includes project information for both individual projects and pooled fund studies. It is important that states, including MDOT, reconcile all pooled fund study budgets at the end of each reporting year (fiscal year). This ensures that MDOT pays all committed funds to lead states when MDOT is a participant state and that all participating states pay their annual commitments to MDOT when MDOT is the lead state.

5.2.2 Annual Work Plan

Federal regulations require MDOT to submit the SPR, Part II, funded work plan to the FHWA Michigan Division Office in August of each year (23 CFR 420.111). The work plan consists of individual research projects; pooled funds studies; UTC commitments; and ongoing financial commitments to NCHRP, TRB and the American Association of State Highway and Transportation Officials (AASHTO) Technical Service programs. Chapter 2 of this manual provides additional detail about the work plan development process.

An annual certification statement is also included as required by 23 CFR 420.209(c). Appendix 5.1 provides a sample transmittal letter, and Appendix 5.2 is a sample certification statement.

Each project listed in the work plan must have a problem statement that includes a project title, scope of work, research objectives and tasks, project cost and schedule. Information describing how the future research will be implemented for each project should also be included. After

FHWA approves the work plan, Research Administration will process a fund obligation request for each project and work with MDOT Finance Division to initiate a project agreement with FHWA that is consistent with the requirements of 23 CFR 420.115.

5.2.3 Work Plan Amendments

Throughout the program year, revisions regularly occur in the approved work plan. Some modifications require that MDOT formally request approval from the FHWA Michigan Division Office before making the changes to the program (23 CFR 420.117). The following revisions require work plan amendments:

- Modifying an individual project scope.
- Adding a new project or deleting an existing project.
- Making a cost revision that requires an increase to the total work plan budget.

A sample amendment letter can be found in Appendix 5.3.

5.2.4 Policy and Procedures Manual (Research Manual)

Federal regulations require that state DOTs, including MDOT, develop and maintain a manual that documents management processes and procedures needed to administer the SPR, Part II, RD&T program. These requirements are further explained in 23 CFR 420.205(g) and 23 CFR 420.209(b).

5.3 Other Program Requirements

5.3.1 Copyrights and Patents

Federal regulations 23 CFR 420.121(b) and (i) provide guidance on the rights of state DOTs to copyrighted publications and patented inventions or discoveries resulting from the activities performed with FHWA planning and research funds. Any research vendor under contract with MDOT to perform research must notify MDOT of any discoveries and/or inventions resulting from activities performed under the contract. If the researcher copyrights a publication(s) and/or applies for a U.S. patent, he or she must notify MDOT. In addition, under federal regulations state DOTs may copyright any books, publications or other copyrightable materials developed in the course of an FHWA planning and research funded project.

State DOTs are subject to the provisions of 37 CFR 401 governing patents and inventions, and must include the standard patent rights clauses at 37 CFR 401.14. If a research vendor chooses to retain title of an invention, FHWA reserves, and state DOTs may also reserve, a royalty-free, nonexclusive and irrevocable right to reproduce, publish or otherwise use, and to authorize others to use, the work for government purposes.

For state-led pooled fund studies (see Section 2.2 of this manual), a license-free fee clause is recommended for the contract as well. The lead state DOT is responsible for securing the contract for research. The federal regulations encourage states to negotiate with the selected contractor to include a contract provision that provides all participating states in the study a license-free fee to use the invention for government purposes.

5.3.2 Equipment

Any acquisition, use and disposition of equipment purchased by state DOTs with FHWA planning and research funds must be in accordance with 2 CFR 200.313.

Additional details about equipment acquisition, use and disposition can be found in Chapter 3 of this manual.

5.3.3 Procurement

Each research project must be authorized and executed under an existing Indefinite Delivery Services contract for research services or contracted under a standalone contract. MDOT has a two-step process to solicit research proposals from potential researchers. According to federal regulation 23 CFR 420.121(n), the first step is to post an RFP to universities (in Michigan) only. If the proposal scoring team selects a vendor, Research Administration will process a recommendation to the Central Selection Review Team requesting award to the selected vendor.

If no proposal is received or no responsive Michigan university is selected, MDOT will go to the second step in the process. As described in federal regulation 23 CFR 420.121(j), MDOT will request competitive bids in accordance with MDOT procedures. This solicitation would invite proposals from both consultants and universities. Michigan consultants and universities can submit proposals in this second step as well. In addition, state DOT procurement of research services must be in accordance with 2 CFR 200.317

5.4 Program Review

Federal regulation 23 CFR 420.209 requires a periodic review or peer exchange of a state DOT's RD&T program, or portion thereof, by other state DOT representatives. FHWA, universities and other national transportation representatives such as TRB may also be asked to participate.

The Engineer of Research will assemble a peer exchange team and organize the meeting. The peer exchange can evaluate the entire SPR, Part II, research program or may concentrate on a portion of the program. A peer exchange may occur on-site or virtually using telecommunications technology. States may also decide to have a multi-state peer exchange that involves the review of several state programs at once. The DOT, such as MDOT, will decide what format is used and what topics will be covered.

The peer exchange team must prepare a written report summarizing the meeting findings and submit the report to the FHWA Michigan Division Office after the peer exchange is completed. Travel and other costs associated with a state DOT peer exchange may be identified as a line item in the annual work plan and are eligible for 100 percent federal funding.

MDOT has conducted two peer exchanges in recent years:

- Transforming a State DOT Research Program (December 3-6, 2007).
- Bridging the Gap: Implementing Research Results (December 7-9, 2010).

5.5 Reporting Requirements

Research Administration is required to provide the FHWA Michigan Division Office with the following reports:

- Annual program report.

  A sample annual report is posted on Research Administration's Web site (www.michigan.gov/mdotresearch).

  Due date: No later than December 31.

- Annual work plan (MDOT Research Program) approval.

  Sample annual SPR, Part II program budget tables are shown in Appendix 5.4. The full program document includes additional project information.

  Due date: Submitted in August.

- Annual certification statement for work plan.

  Appendix 5.1 provides a sample transmittal letter, and Appendix 5.2 is a sample certification statement.

  Due date: Submitted in August.

- Work plan (MDOT Research Program) amendments.

  A sample amendment letter is shown in Appendix 5.3.

  Due date: As needed during the fiscal year.

- Policy and procedures manual.

  Due date: Updated as required.

APPENDICES

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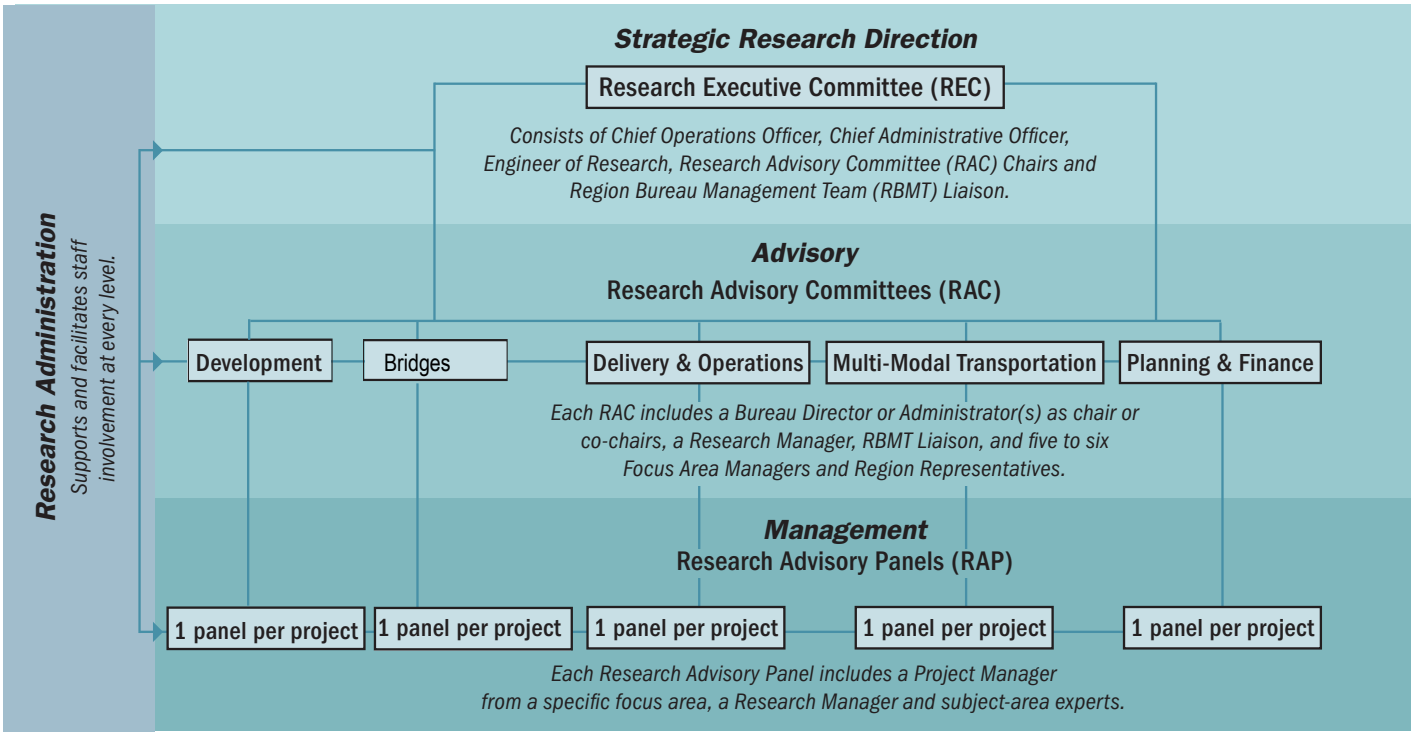
RESEARCH ADMINISTRATION
Bureau of Field Services
Michigan Department of Transportation

Effective Research Management

Working together to advance Michigan transportation

The Research Administration Section manages research within MDOT. This includes research funded with SPR, Part II federal research dollars and state-funded research. Federally funded pooled fund research is also managed by the Research Administration Section. To most effectively carry out this responsibility, Research Administration has developed a tiered approach to identifying, prioritizing and managing research. This process ensures that department executives provide the strategic direction for research, while engaging managers and subject-area experts in the development and refinement of research ideas and problem statements. A tiered approach also involves focus area managers and subject-area experts in the management of specific research projects, which maintains alignment with strategic research priorities. Below is a listing of key staff and their responsibilities in this process.



Strategic Direction

The REC identifies strategic priorities for the biennial research program, prioritizes research ideas, approves problem statements, approves research projects and reviews research findings for implementation opportunities. The REC sets the tone for effective research management throughout MDOT.

Advisory

RACs prioritize and recommend specific research ideas for REC consideration. RACs also help develop problem statements and project recommendations.

RAC members include Focus Area Managers (FAMs) who are key in all aspects of research program development and implementation. They lay the foundation for implementation by outlining the expected outcomes and benefits, ensuring a clear scope of work, and supporting strong project managers. FAMS work closely with region representatives in the Development and Delivery RACs to ensure alignment with strategic research priorities.

Management

Research Advisory Panels (RAPs) manage the nitty gritty details of funded research projects, from vendor selection to progress reporting to deliverable review and approval. RAPs ensure that the projects run smoothly, meet the needs identified by the RACs and the REC and produce results that MDOT can consider for implementation. RAP membership typically consists of five to seven subject-area experts. The project manager for a RAP is either a FAM or a designee of the FAM.

APPENDIX 1.2

Research Program Committee Structure

Research Executive Committee (REC)

REC Co-Chairs
Engineer of Research: Carol Aldrich
Region Bureau Management Team (RBMT) Liaison to Research
Research Advisory Committee (RAC) Chairs and Co-Chairs

Research Advisory Committee (RAC) *Highways Development*

RAC Chair
Focus Area Managers (FAMs)
Research Manager: Michael Townley

- **Environment & Water Resources** — FAM, Region Rep
- **Innovative Contracting** — FAM, Region Rep
- **Real Estate & Permits** — FAM, Region Rep
- **Project Development** — FAM, Region Rep
- **Surveys & Automated Design** — FAM, Region Rep

Research Advisory Committee (RAC) *Highways Bridges & Structures*

RAC Chair
Focus Area Managers (FAMs)
Research Manager: Michael Townley

- **Bridge & Structure Design & Construction** — FAM, Region Rep
- **Bridge & Structure Preservation & Management** — FAM, Region Rep
- **Geotechnical & Foundation Design** — FAM, Region Rep

Research Advisory Committee (RAC) *Highways Delivery & Operations*

RAC Chair
Focus Area Managers (FAMs)
Research Manager: Andre Clover

- **Construction** — FAM, Region Rep
- **Intelligent Transportation Systems & Signals** — FAM, Region Rep
- **Fleet/Facility Management & Operations** — FAM, Region Rep
- **Roadway & Roadside Maintenance** — FAM, Region Rep
- **Mobility & Traffic Incidents** — FAM, Region Rep
- **Pavements & Materials** — FAM, Region Rep
- **Transportation Safety** — FAM, Region Rep
- **Worker/Facility Safety & Security Emergency Management** — FAM, Region Rep

Research Advisory Committee (RAC) *Multi-Modal Transportation*

RAC Co-Chairs
Focus Area Managers (FAMs)
Research Manager: Mary Hoffmeyer

- **Aviation** — FAM
- **Freight Logistics & Maritime** — FAM
- **Passenger & Freight Rail** — FAM
- **Local Transit** — FAM: Janet Geissler
- **Intercity Bus & Private/For Hire Passenger Carriers** — FAM
- **Contract Administration** — FAM
- **Finance** — FAM

Research Advisory Committee (RAC) *Planning and Finance*

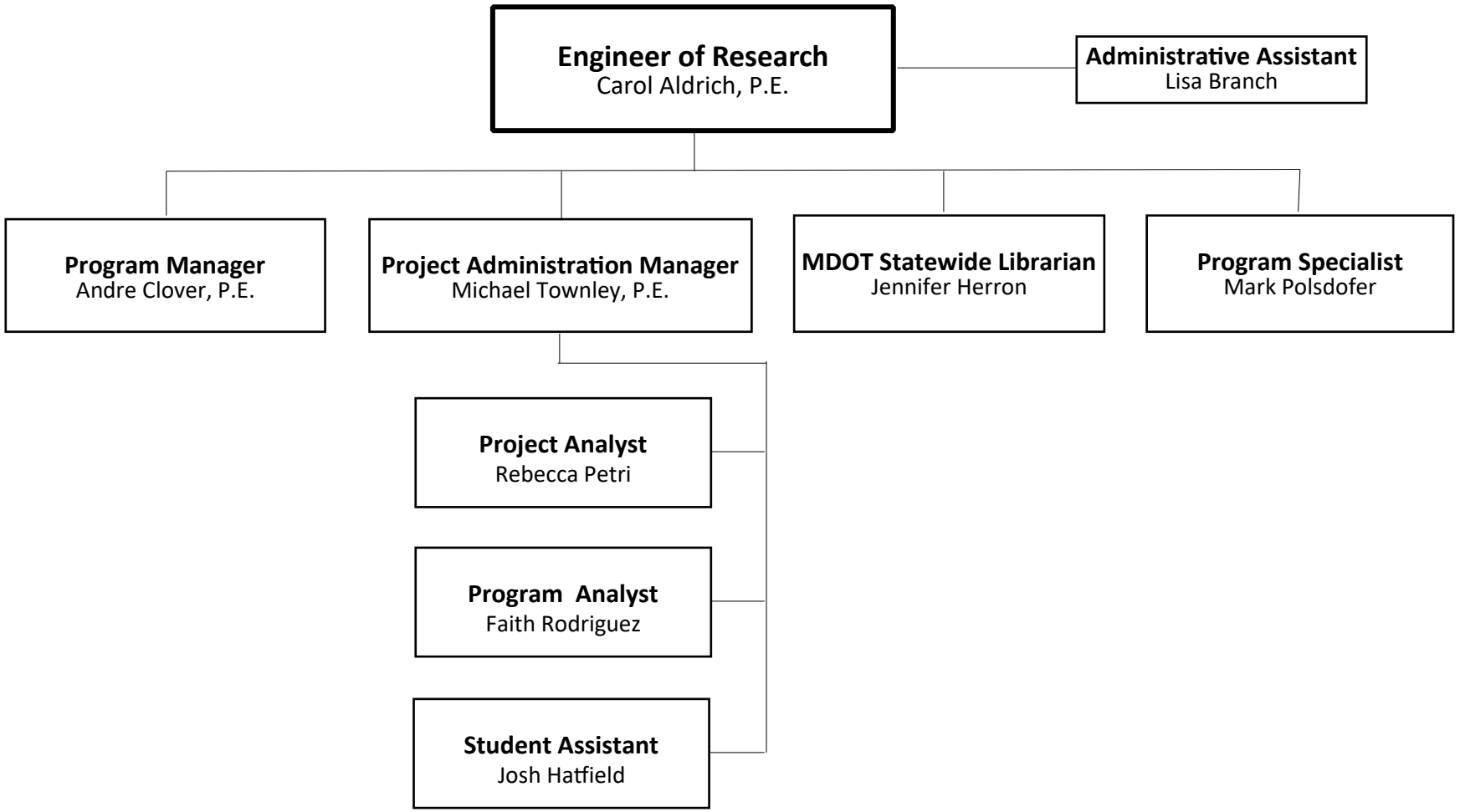
RAC Co-Chairs
Focus Area Managers (FAMs)
Research Manager: Mary Hoffmeyer

- **Data Inventory & Integration** — FAM
- **Non-Motorized Planning & Development** — FAM
- **Program Development** — FAM
- **Asset Management & Policy** — FAM
- **Travel Demand Forecasting** — FAM
- **Workforce Development & Organizational Effectiveness** — FAM

Michigan Department of Transportation

APPENDIX 1.3

Bureau of Field Services
Research Administration
Organizational Chart



Michigan Department of Transportation
Research Administration
Bureau of Field Services

Who We Are

The Research Administration Section includes engineers, research analysts, librarians, library assistants, specialists and administrative support staff. Research staff team with MDOT subject area experts, university researchers, private research firms, industry experts, and local government to conduct transportation related research.

How We are Funded

Research projects are funded primarily by the State Planning and Research (SPR) Part II Program. Program administration is funded by state funds.

What We Do

Research Administration oversees the entire MDOT research program which includes both individual research projects and pooled fund studies with other states. Multiple transportation research "Centers of Excellence" are also managed by the Research Administration Section.

MDOT utilizes a tiered approach for program development and project administration. The approach engages senior executives, managers, subject area experts, and field staff. In addition, external research stakeholders ideas are solicited during the research idea development phase of program development to ensure their continued input into the development of the MDOT research program.

Expertise

Our office supports and facilitates research in Program/Project Development, Delivery and Operations, Multi-Modal Transportation, and Planning/Finance. Research projects are managed by experts from Bridges/Structures, Design, Safety, Environment, Workforce Development, Safety & Security, Mobility & System Operations, Pavements, Materials, Construction, Geotechnical, Intelligent Transportation Systems, Connected Vehicle Research, Maintenance, Freight, Passenger Transportation, Rail, Aeronautics, Maritime, Planning, Asset Management, Policy, Finance and Contract Services.

Contact Information

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Web Site: www.michigan.gov/mdotresearch

MDOT
Michigan Department of Transportation

APPENDIX 1.5

Bureau of Field Services
Research Administration
Roles and Responsibilities

RESEARCH ADMINISTRATION

· Serve in various roles/on committees, including EOC, Pavement Committee, Research Executive Committee, state TRB representative, AASHTO Research Advisory Committee, TRB coordinator.
· Provide strategic planning for long-term research needs.
· Establish section priorities/direct day-to-day operations.
· Oversee budget.
· Authorize purchases for procurement card and MAIN.
· Process internal financial controls (two years)

RESEARCH PROGRAM ADMINISTRATION

· Update and maintain Research Administration Manual.
· Ensure compliance with State Planning · &· Research (SPR), Part II, federal requirements.
· Manage biennial research program:
  - Individual projects.
  - University Transportation Centers (UTCs).
  - Research Centers of Excellence.
  - Transportation pooled funds.
· Develop and manage program budgets:
  - Research Centers of Excellence.
  - SPR, Part II, program.
· Maintain and support the research project database.
· Maintain records retention schedule for projects.
· Provide training to MDOT staff in project management and

Other program administrative roles.
· Maintain forms management process.
· Update Research Administration processes and procedures.
· Conduct/attend research peer exchanges.
· Oversee biennial program development process:
  - RAC/REC meetings.
  - Call for Ideas.
  - Program Development Meetings
  - Problem statement development.
  - RFP/vendor selection process.

RESEARCH PROJECT ADMINISTRATION

· Process contracts:
  - JobNet.
  - Phase Initiator
  - Subcontracts.
  - Contract changes.
· Create and maintain project file management systems (electronic).
· Create, publish and distribute annual report.
· Perform project closeouts.
· Administer project quarterly reporting.
· Process monthly invoices.
· Process SIGMA Financial entries for invoice payments.
· Administer end-of-year payables.
· Facilitate project meetings:
  - Create and distribute agendas and minutes.
· Transition from program development to project administration.
· Perform project-related activities to transportation pooled funds.
· Update/maintain project information in the research project database.

LIBRARY SERVICES

- Performs literature searches to support current MDOT Call for Research process
- Performs MDOT research project updates to federal research databases:
  - Transportation Research International Documentation (TRID)
  - Research in Progress (RiP)
- Provides lending materials for the PE exam and works with the Technical Training unit to support employees taking the PE exam
- Manages Web site updates for both the Library and Research Administration pages
- Assists with transportation-related reference questions from MDOT staff using library materials and online databases
- Manages publications:
  - Cataloging for Construction Field Services (CFS) library
  - Ordering
  - Maintains TRR access (federal publications)
  - AASHTO
  - TRB
- Assists with MDOT research report distribution:
- Assigns report numbers.
- Uploads to Research Admin website
- Disseminates announcements via Gov Delivery
- Participates in Midwest Transportation Knowledge Network (MTKN).
- Acts as a repository for MDOT historical documents and assists in donations to the archives
- Creates library promotional and marketing materials
- Provides Library Training as needed and on request
- Prepares budget recommendation for library expenditures
- Oversees the library's Interlibrary Loan service
- Serves on Department teams
- Coordinates staff involvement with the TRB and NCHRP
- Collects and organizes attendee "takeaways" from participating in the TRB annual meeting and follows up to identify implementation benefits. Produces report of summary of takeaways and employee presentations for MDOT leadership.
- Facilitates survey requests

IMPLEMENTATION/BEST PRACTICES

· Identify and communicate best practices.
· Assist with research project selection, management and implementation.
· Identify, track and report implementation success stories.

OUTREACH

· Encourage MDOT staff committee involvement:
  - State (universities, regions, pavement, bridge, contracts, etc.).
  - National (AASHTO, TRB, NCHRP).
  - Information sharing with other state DOTs.
· Facilitate NCHRP annual program ballot.
· Facilitate TRB site visits.
· Provide survey facilitation and retention:
  - AASHTO.
  - FHWA.
  - University.
  - State DOTs.
· Facilitate NCHRP annual problem statement submission.
· Facilitate NCHRP annual panel nominations.
· Conduct annual university and region site visits.
· Participate in MDOT conferences.
· Research staff committee participation.
· Publish newsletters, Research Spotlights, and other relevant research publications.
· Promote innovation in research.

TECHNICAL SUPPORT

· Provide consultation (data collection, modeling, quality assurance, quality control, experimentation).
· Offer workshop training.
· Provide survey support.
· Provide project management assistance.

Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Center for Sustainable Infrastructure & Structural Testing

Lawrence Technological University

Mission and Facilities

The Center for Sustainable Infrastructure & Structural Testing conducts research, education and technology transfer activities related to corrosion mitigation and increased durability of bridges and structures. Under the leadership of Dr. Nabil Grace, the center utilizes a range of specialized laboratory equipment and facilities to evaluate the strength of concrete bridges, identify the causes of deterioration in bridge decks, develop innovative, long-lasting materials, and identify structures that are at high risk for failure.

Lawrence Technological University has the largest structures laboratory in Michigan. This allows the center to conduct full-scale testing of bridges, slabs and structures under large loads and extreme weather conditions. The researchers at the center are able to fabricate bridges in-house and simulate traffic flow, fire conditions, blowing wind and freezing rain.

Rapid-Response Services for MDOT

The center is available to support MDOT staff by providing quick-turnaround evaluation of materials and design concepts. For example, MDOT recently asked the center to investigate the fatigue life of a splice of rebar under 2 million cycles of repeated loading. Another request involved investigating the impact of splice length between two rebars. MDOT staff use the results of these investigations to enhance design and construction work.

The center also focuses on economical and practical methods for evaluating the strength of concrete bridge decks. The center recently completed a project for MDOT in which researchers identified the causes of concrete deterioration in bridge decks and developed a performance-based threshold and procedure to help MDOT staff identify those decks at high risk for falling concrete.

Although Lawrence Tech researchers specialize in research on long-term bridge life, the center also assists MDOT by investigating and developing innovative materials for use in short-term bridge repairs. For example, the center has worked with MDOT to apply a fiber-reinforced polymer (FRP) wrap to temporarily support deteriorating columns. The fix is inexpensive, fast and effective.

Additional services available include examining samples collected in the field, developing guidelines and recommendations for using FRP materials, inspecting bridge components in use, and offering training sessions for MDOT engineers.

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Research Centers of Excellence

The Michigan Department of Transportation (MDOT) has established eight Research Centers of Excellence in partnership with five Michigan universities. These centers provide applied research, education and outreach activities that respond to the practical needs of MDOT staff, prepare future leaders in transportation, and promote innovative practices around the state. The centers provide expertise and facilities that complement MDOT resources in the areas of materials, pavements, structures and geotechnics.

Lawrence Tech Engineering

MDOT

Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Center for Structural Durability

Michigan Technological University

Mission and Facilities

The Center for Structural Durability (CSD) was established in 2000 to provide research, education and technology transfer services for MDOT related to bridge durability. CSD researchers have expertise in materials science and structural engineering. Led by director Dr. Tess Ahlborn, the CSD investigates the use of ultra-high-performance concrete in structures, explores rapid construction approaches for prestressed concrete bridges, and monitors long-term durability through nondestructive methods like remote sensing.

The CSD is located at Michigan Technological University (MTU) in the Upper Peninsula. It is a resource for MDOT as well as local agencies and consultants. The Benedict Laboratory at MTU provides an expansive space for testing large concrete structures and a room specifically for mixing ultra-high-performance concrete. The CSD team also accesses a number of additional facilities and equipment on campus for preparing concrete specimens and analyzing the characteristics and performance of all materials.

Rapid-Response Services for MDOT

The CSD is available to provide MDOT staff with a range of quick-turnaround services such as software analysis and modeling, accelerated load testing, lab testing of high-performance concrete, and information gathering. Below are two examples of short-term projects carried out for MDOT.

- MDOT contacted the CSD for help in assessing how spreadsheets developed by the Ohio Department of Transportation for performing load rating calculations for corrugated metal pipe culverts could be applied under Michigan conditions. The spreadsheets used both Load Factor Rating (LFR) and Load and Resistance Factor Rating (LRFR) methods. The CSD evaluated the spreadsheets for their adherence to reference guides and then modified them to function with Michigan truck loads (both legal and overweight). The resulting report is helping MDOT engineers better perform load ratings of culverts.
- The CSD helped MDOT create a nomination package to submit to the American Society of Civil Engineers to secure recognition of the Mackinac Bridge as a National Historic CivilEngineering Landmark. The CSD assisted in capturing the rich history of the bridge, from the design and construction of the structure to the individuals who were instrumental in pushing the project forward.

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Research Centers of Excellence

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Michigan Tech MDOT

Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Transportation Materials Research Center

Michigan Technological University

Mission and Facilities

Since 1998, the Transportation Materials Research Center (TMRC) at Michigan Technological University has provided MDOT with testing and analysis services related to concrete, asphalt, aggregates and soils. Dr. Lawrence Sutter manages the center, bringing years of experience in pavement materials. The TMRC utilizes a number of advanced laboratories and pieces of equipment when responding to testing requests, such as:

- A large, multistory concrete laboratory accredited by the AASHTO Materials Reference Laboratory and the Cement and Concrete Reference Laboratory for testing large concrete structures.
- A concrete petrology laboratory that facilitates sophisticated environmental scanning, electron microscopy and mineralogy to identify concrete distress problems.
- A complete geotechnical soils investigation laboratory that supports testing related to resilient modulus for base, subbase and subgrade materials.
- High-strain rate testing equipment for concrete, asphalt and aggregates.
- Two asphalt laboratories for conducting a range of tests related to both warm-mix and hot-mix asphalt, binders, and coarse and fine aggregate properties.

Rapid-Response Services for MDOT

The TMRC readily responds to a range of requests from MDOT staff. For example, MDOT staff asked the TMRC to investigate the accuracy and reliability of the Michigan Sand Cone Test, which is used to determine when a given soil will achieve its maximum dry density. MDOT also asked for help investigating the source of distress in pavement joints on M-14, analyzing the freeze-thaw properties of recycled concrete on I-75, studying the overall stability of the highway and slope of US-2 near Epoufette, and making recommendations on how best to stabilize an area experiencing erosion along M-25 in Sanilac County. The TMRC draws on the expertise of Michigan Tech faculty and graduate students to assist MDOT on an ongoing basis by:

- Conducting high-level analysis and microscopic examinations of pavement slab samples.
- Investigating slope failures resulting from erosion or blasting.
- Testing problematic materials in use on a construction project.
- Providing information about the geologic and geotechnical properties and aspects of construction sites.
- Investigating abandoned underground mines.
- Carrying out repetitive testing to validate MDOT's test methods.

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Research Centers of Excellence

The Michigan Department of Transportation (MDOT) has established eight Research Centers of Excellence in partnership with five Michigan universities. These centers provide applied research, education and outreach activities that respond to the practical needs of MDOT staff, prepare future leaders in transportation, and promote innovative practices around the state. The centers provide expertise and facilities that complement MDOT resources in the areas of materials, pavements, structures and geotechnics.

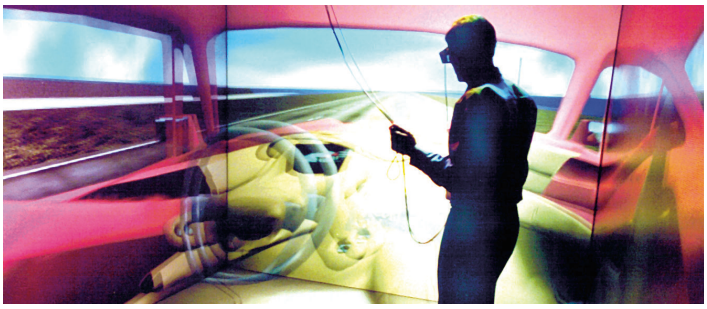
Michigan Tech MDOT

Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Bridges and Structures Research Center

University of Michigan



Mission and Facilities

The Bridges and Structures Research Center at the University of Michigan focuses on finding innovative, effective and practical solutions to problems related to bridges and structures. Under the direction of Dr. Sherif El-Tawil, the center evaluates new technologies developed by MDOT and supports the development of new materials, components and tools for advancing the preservation and safety of transportation infrastructure.

The center utilizes state-of-the-art facilities and equipment at the university, including a structural engineering laboratory for testing large-scale elements and a computational structural simulation laboratory that supports sophisticated modeling of how structural materials and components will behave under different conditions. The university also boasts one of only a few 3-D visualization laboratories in the country, which can be used for immersive visualizations of models involving intersections, construction sites and structures. The CAVE (Cave Automatic Virtual Environment) includes unrestricted navigation (walking, flying, looking), interaction with virtual objects, and directional sound.

Rapid-Response Services for MDOT

The center team met with MDOT staff to present the latest information about ultra-high-performance concrete (UHPC). This specially formulated concrete is capable of achieving high compressive and tensile strength, exceptional energy absorption and durability, and self-healing properties when properly developed and reinforced with steel fibers. The center developed the first non-proprietary UHPC in the United States.

The center also responds to MDOT requests for testing and simulation on an ongoing basis. For example, the center recently provided MDOT research staff with guidance on how to model the response of abutment walls with battered piles. Below are other ex-amples of the services available to MDOT staff through the center.

- Finite element modeling of structural components and systems.
- Evaluation and assessment of bridge systems and components.
- Assessment of the serviceability of structures.
- Assistance with implementation of research findings.
- Full-scale testing of bridge components or systems.
- High-fidelity finite element simulations.

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Research Centers of Excellence

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UNIVERSITY OF MICHIGAN MDOT

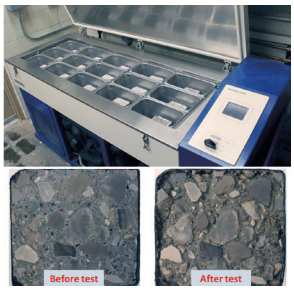
Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Concrete Pavement Performance Center

University of Michigan

Mission and Facilities



The Concrete Pavement Performance (CPP) Center at the University of Michigan (U of M) provides technical assistance to MDOT related to the performance of in-service concrete pavements. Under the leadership of Dr. Will Hansen, the CPP conducts forensic investigations of pavement performance, develops surface treatments that extend pavement life, and studies the impact of environmental distress on concrete.

The CPP uses state-of-the-art research equipment for carrying out testing, such as digital microscopes for determining the quality of the concrete, exposure systems for measuring deterioration from salt and frost, a mechanical tester for measuring the strength of concrete, a specialized dilatometer for measuring contraction and expansion of concrete during freeze-thaw cycles, and equipment for determining the resistance of concrete to cracking during heating and cooling.

Rapid-Response Services for MDOT

The CPP carries out both laboratory and field investigations for MDOT on an ongoing basis, such as:

- Conducting forensic investigations into the factors influencing performance of unbonded overlays and jointed plain concrete pavement.
- Developing procedures for finite element analysis and mechanistic-empirical pavement design.
- Studying air-void systems in concrete and their impact on durability.
- Using cryogenic dilation of concrete to measure expansion and contraction associated with freezing and thawing.
- Developing recommendations for combating premature deterioration and other impacts of environmental distress.

MDOT staff asked the CPP to investigate the impact ofa variety of surface treatments on concrete durability on M-14 using freeze-thaw salt-scaling tests. The MDOT/CPP team developed a poster on the study results for presentation to MDOT staff and U of M students. MDOT staff also asked the CPP to determine how varying cementitious blends and admixtures affect heat development at different temperatures. The CPP worked closely with MDOT staff to incorporate the results into pavement design practices.

In addition, the CPP has developed a new cementitious blend for rapid repair concrete applications by experimenting with different types of cements and admixtures. MDOT's goal is to make concrete repairs that are strong enough to withstand traffic within hours of application. The CPP also worked with MDOT engineers to investigate how to accelerate the curing of rapid repair concrete in colder temperatures when the summer heat is not available to aid the process.

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Research Centers of Excellence

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UNIVERSITY OF MICHIGAN MDOT

Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Center for Structural Durability

Western Michigan University

Mission and Facilities

The Center for Structural Durability at Western Michigan University (WMU) evaluates the materials, design, construction, repair and maintenance of highway structures to improve their durability and prolong service life. Led by Dr. Upul Attanayake, the center specializes in performing computer simulations and nondestructive evaluation (NDE) of bridge elements. Using a range of equipment, such as ground-penetrating radar, ultrasonic systems, laser trackers and laser scanners, the center team investigates how structures are performing without damaging them.

Rapid-Response Services for MDOT

The center responds to ongoing requests from MDOT staff to assist with evaluating the conditions of structures in the field. For example, MDOT staff contracted with the center for assistance in determining why certain concrete bridges were cracking. The team developed finely detailed computer models to demonstrate the range of scenarios that could be causing the problem, and MDOT used the results to develop a plan for addressing the damaged structures.

Beyond conducting field evaluations and computer simulation, the center provides guidance and support to MDOT staff involved in evaluating structural components or monitoring bridge health. The center is also available to assess approaches proposed by researchers for using NDE methods as part of new research projects.

The center has worked with MDOT to develop a process for implementing accelerated bridge construction (ABC), a bridge replacement method in which the bridge components are built off-site and assembled or moved into place. The process is appealing because it reduces road closure time from months to weeks. The center evaluates a range of materials used for connecting and sealing bridge components and recommends materials that will support long-term durability. The team also has the capability to review and evaluate plans submitted by contractors for ABC and provide site-specific implementation advice.

The center held a workshop on ABC design and lessons learned for bridge engineers, contractors and project manag-ers. Presenters at the workshop included, WMU faculty members, MDOT engineers and FHWA representatives. More than 50 people participated. Dr. Attanayake and his team are available to develop and lead additional seminars or workshops on bridge-related topics requested by MDOT.

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Research Centers of Excellence

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Michigan Department of Transportation

RESEARCH CENTERS OF EXCELLENCE

Center for Structural Durability

Wayne State University

Mission and Facilities

The Center for Structural Durability's central mission is to partner with MDOT for improving the condition and durability of highway structures in Michigan. Consequently, the objective of the Center is to focus on advanced research for design, construction, repair and maintenance of structures to decrease the frequency of maintenance cycles and prolong service life. Led by Dr. Haluk Aktan, the center specializes in performing computer simulations and nondestructive evaluation (NDE) of bridge elements. Strategically located, Wayne State University (WSU) in Detroit is within the proximity of the MDOT Metro Region offices and the state's largest bridge and road network maintained by MDOT. WSU is an educational resource for developing engineers with knowledge gained from working on projects sponsored by MDOT. The university can sponsor short courses and training for new techniques and applications developed for transportation structures.

Rapid-Response Services for MDOT

The center provides guidance and support to MDOT staff on innovations like the self-propelled modular transport (SPMT) bridge project on I-94. WSU contracted to provide services to monitor the movement of the structure on a multi-axle platform operating through a state-of-the-art computer-controlled system that is capable of pivoting 360 degrees as needed to lift, carry, and set a bridge from its offsite location to its service location. Because this arch bridge is located near WSU's campus, coordinating observation facilities for the SPMT were included in the contracted services.

In addition to new technology support, the center responds to requests from MDOT staff to assist with design training topics. For example, MDOT staff contracted with the center to develop prestressed beam design training materials. Design guides developed by WSU can be used by MDOT staff to better understand the design process through design examples. Design examples were submitted in the report form and presented in workshops for MDOT and consultant design professionals. The examples integrate MDOT policy, AASHTO requirements, and methodologies that improve design efficiency. Dr. Aktan and his team are available to develop and lead additional seminars or workshops on bridge related topics requested by MDOT.

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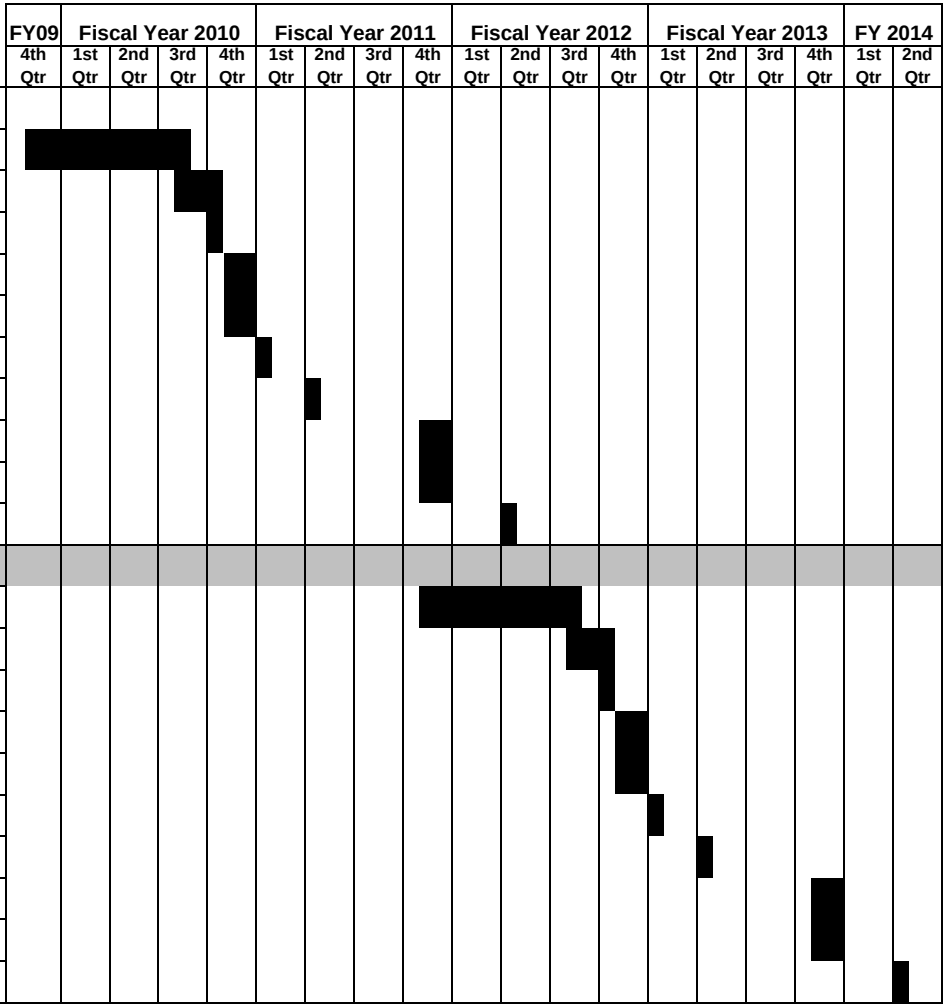
Research Centers of Excellence

The Michigan Department of Transportation (MDOT) has established eight Research Centers of Excellence in partnership with five Michigan universities. These centers provide applied research, education and outreach activities that respond to the practical needs of MDOT staff, prepare future leaders in transportation, and promote innovative practices around the state. The centers provide expertise and facilities that complement MDOT resources in the areas of materials, pavements, structures and geotechnics.

Appendix 2.1: MDOT Research Project Planning/Programming Process

Activity (Fiscal Year)	Target Date
Research Idea Development (11-13)	August/September 2009 - May 2010
Problem Statement Development (11-13)	May 2010 - July 2010
MDOT Program Approval	July-2010
FHWA Program Approval (11)	August 2010 - Sept 2010
FHWA Pre-Program Approval (12)	August 2010 - Sept 2010
Request For Proposals (11)	October 2010 (Program Year 2011)
Request For Proposals (12)	January 2011 (Program Year 2012)
FHWA Program Approval (12)	August 2011 - Sept 2011
FHWA Pre-Program Approval (13)	August 2011 - Sept 2011
Request For Proposals (13)	January 2012 (Program Year 2013)
Research Idea Development (13-15)	August/September 2011 - May 2012
Problem Statement Development (13-15)	May 2012 - July 2012
MDOT Program Approval	July-2012
FHWA Program Approval (13)	August 2012 - Sept 2012
FHWA Pre-Program Approval (14)	August 2012 - Sept 2012
Request For Proposals (13)	October 2012 (Program Year 2013)
Request For Proposals (14)	January 2013 (Program Year 2014)
FHWA Program Approval (14)	August 2013 - Sept 2013
FHWA Pre-Program Approval (15)	August 2013 - Sept 2013
Request For Proposals (15)	January 2014 (Program Year 2015)



Michigan Department
Of Transportation
5315 (8/17)

RESEARCH ADMINISTRATION
RESEARCH IDEA FORM

For Research staff use only	Research Idea No:	

If you have an idea that you would like to have considered as a future research project please complete and return this form to Research Administration, at mdot-research@michigan.gov.

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

1. Research Idea Title:

2. Focus Area:

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. Research Objectives:
   A.
   B.
   C.
   D.

5. Project Duration

   ☐ 6 Months ☐ 12 Months ☐ 18 Months ☐ 2 Years ☐ 3 Years

6. Implementation Benefits of Proposed Research: *(If this research is successfully completed, what benefits (qualitatively and quantitatively) will the Department realize?*
   A.
   B.
   C.
   D.

7. List at Least Five Key Search Phrases for Literature Search: *(The MDOT Librarian will use this information to identify previously completed research related to the research idea.)*

8.

Submitted by (name)	
Organization	
Phone	
E-mail	

Appendix 2.3 - Phase 1 Research Idea Development: MDOT Three-Year Planning and Program Approval Timeline

Illustrated for projects that begin in FY 2019 - FY 2021

				FY 2017			Fiscal Year 2018												Fiscal Year 2019											
				4th Qtr			1st Qtr			2nd Qtr			3rd Qtr			4th Qtr			1st Qtr			2nd Qtr			3rd Qtr			4th Qtr		
Phase	**Step**	**Target Date**	**Assigned to**	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Phase 1. Research Idea Development	1.1 Determine strategic priorities for MDOT	Aug - Sept 2017	REC		X																								
	1.2 Call for research ideas from all stakeholders	Oct 2017	Engr. Research				■																						
	1.3 Develop research ideas	Nov-Dec 2017	Stakeholders					■	■																				
	1.4 Notify stakeholders about the Program Development Meetings	Jan 2018	Engr. Research							■																			
	1.5 Collect input; rank research ideas and determine PMs	Jan 2018	FAMs							■																			
	1.6 Review FAM rankings and submit to the REC	Feb 2018	RACs								X																		
	1.7 Select research ideas; confirm PMs	Early March 2018	REC									X																	
	1.8 Send research ideas to FHWA for eligibility ruling	Late March 2018	Engr. Research									■																	
	1.9 Receive training and prepare for the Program Development Meetings	April 2018	PMs and FAMs										X																
	1.10 Discuss research needs during the Program Development Meetings	Early May 2018	Stakeholders											X															
Phase 2.	Problem Statement Development	May - July 2018											■	■	■														
Phase 3.	Approval of Annual Programs and RFPs	Aug 2018 - Jan 2020														■			■			■				■	■	■		

■ = Phased Work

X = Meeting

APPENDIX 2.4

RESEARCH ADMINISTRATION
PROBLEM STATEMENT

Choose an item.

PROPOSED RESEARCH PROJECT TITLE Title should be less than 15 words	
OR NUMBER or TPF STUDY NUMBER	MDOT PROJECT CATEGORY & STRATEGIC PRIORITY NO. Choose an item Choose an item Choose an item Choose an item

PROJECT MANAGER OR PROBLEM STATEMENT AUTHOR	
PROBLEM STATEMENT AUTHOR	DATE Click here to enter a date
TELEPHONE NO.	E-MAIL ADDRESS
BUREAU/REGION/OFFICE/SECTION/UNIT	PROJECT MANAGER'S NAME (IF DIFFERENT THAN PROBLEM STATEMENT AUTHOR)

PROBLEM TO ADDRESS

IN 200 WORDS OR LESS, BRIEFLY DESCRIBE THE PROBLEM TO BE ADDRESSED AND WHY IT IS AN ISSUE FOR MDOT

RESEARCH OBJECTIVES

IN 25 WORDS OR LESS, LIST THE RESEARCH OBJECTIVES TO BE ACCOMPLISHED

1. Each objective should be 10 words or less. Press enter for additional entries.

RESEARCH TASKS

LIST THE MAJOR TASKS TO ACCOMPLISH THE RESEARCH OBJECTIVES

1. Tasks should correlate with the estimated person hours on Page 3 of the worksheet. Press enter to add a new task.

TIMELINE

ENTER START DATE: Enter Project's Start Date ENTER END DATE: Enter Project's End Date

BUDGET

FROM THE WORKSHEET ON PAGE 3, ENTER THE FOLLOWING: 1.) VENDOR COSTS; 2.) PM/MDOT COSTS; 3.) TOTAL BUDGET

1.) VENDOR COSTS	2.) PM/MDOT COSTS	3.) TOTAL BUDGET
$ 0.00	$ 0.00	$ 0.00

DELIVERABLES

IN 50 WORDS OR LESS, LIST THE DELIVERABLES YOU WOULD RECEIVE AT THE END OF THIS PROJECT. CONSIDER DELIVERABLES SUCH AS 1) DESIGN METHOD, 2) TRAINING, 3) MANUAL OF PRACTICE, 4) PROCEDURE, 5) SPECIFICATION, 6) SOFTWARE AND 7) EQUIPMENT.

1. Deliverables should be 50 words or less. Press enter for additional entries.

IN 100 WORDS OR LESS, EXPLAIN MDOT INVOLVEMENT'S WITH DATA AND SERVICES.

IMPLEMENTATION

DESCRIBE HOW THIS PROJECT WILL BE IMPLEMENTED AT MDOT

EXPLAIN THE EXPECTED BENEFITS/RESULTS FROM THE IMPLEMENTATION OF THIS PROJECT AND POTENTIAL USERS

LITERATURE RESEARCH

SELECT A STATEMENT BELOW REGARDING YOUR REVIEW OF THE LITERATURE AND ADD A NOTE IF RESEARCH IS COMPLEMENTARY:

Choose an item.

NOTE:

POTENTIAL OBSTACLES

IN 25 WORDS OR LESS, WHAT RISKS OR OBSTACLES MAY MAKE CARRYING OUT THIS PROJECT DIFFICULT? WHAT STRATEGIES WILL YOU USE TO OVERCOME THEM?

OBSTACLES	STRATEGIES

❖ Obstacles should be 25 words or less. Press enter for additional entries.	❖ Strategies should be 25 words or less. Press enter for additional entries.

INVESTIGATOR(S)

DESIRED QUALIFICATIONS FOR RESEARCH TEAM:

SELECT THE REQUIRED STATISTICAL QUALIFICATIONS IN AN INVESTIGATOR(S) AND TEAM BELOW:
Choose an item
PRINCIPAL INVESTIGATOR'S NAME: TO BE DETERMINED THROUGH SOLICITATION
ORGANIZATION: TO BE DETERMINED THROUGH SOLICITATION

SEE WORKSHEET ON FOLLOWING PAGES FOR ADDITIONAL INFORMATION AND NOTES

RESEARCH ADMINISTRATION
PROBLEM STATEMENT
WORKSHEET

ESTIMATED PERSON HOURS FOR RESEARCH TASKS

FOR THE RESEARCH TASKS ON PAGE 1, PLEASE LIST THE ESTIMATED PERSON HOURS BELOW:

1.) List Estimated Person Hours for Research Task #1. Hit Enter for additional tasks.

TOTAL ESTIMATED PERSON HOURS CALCULATE TOTAL HOURS ENTERED IN THIS SECTION

ESTIMATED BUDGET

USE THE FOLLOWING EQUATIONS FOR ESTIMATING PROJECT COSTS.
(HOURLY RATES AND PERCENTAGES SHOWN FOR EXAMPLE ONLY.)

1.) CALCULATE VENDOR DIRECT LABOR WITH THIS EQUATION

Estimated Person Hours are the Labor Hours

Direct Labor: Labor Hours x Average pay rate
Example: Direct Labor = 2000 hrs x $45/hr = $90,000.00
Direct Labor: Enter the total estimated person hours from previous section X Average Pay Rate= Cost of Direct Labor

2.) CALCULATE TOTAL VENDOR COST

REQUIRED COSTS
DIRECT LABOR= $ Cost of Direct Labor
FRINGE BENEFITS= $ 10% of Direct Labor Costs
TRAVEL= $ 2% of Direct Labor Costs
SUPPLIES= $ 5% of Direct Labor Costs
OTHER EXPENSES= $ 15% of Direct Labor Costs; Include Student tuition fees
INDIRECT= $ 55% of Total Direct Labor, Fringe Benefits, Travel and Supplies Cost

Total Vendor Cost: Enter DIRECT LABOR Cost+ Enter FRINGE BENEFITS Cost+ Enter TRAVEL Costs+ Enter SUPPLIES Cost+ Enter OTHER EXPENSES Cost+ Enter INDIRECT Cost=$ CALCULATE TOTAL
This is your TOTAL VENDOR COST.
Note: Fill this in on the Vendor Cost section under ESTIMATED BUDGET.

With what accuracy have the vendor costs been estimated? Choose an item.

3.) Use MDOT PM BUDGET WORKSHEET to calculate your PM costs.
Enter PM Costs and any notes or calculations. $ Enter Total PM/MDOT Costs
Fill this total in on the PM/MDOT Costs section under ESTIMATED BUDGET

4.) Enter GRAND TOTAL for 2 and 3. $ Enter the totals for #2 and #3 in this section
Fill this total in on the TOTAL BUDGET section under ESTIMATED BUDGET

ANNUAL FINANCIAL BUDGET BREAKDOWN

FY1 $FY1 BUDGET	FY2 $FY2 BUDGET	FY3 $FY3 BUDGET	FY4 $FY4 BUDGET

METHOD OF PAYMENT

SELECT METHOD OF PAYMENT BELOW
Choose an item

INVESTIGATOR(S)

NAMES OF POSSIBLE INVESTIGATORS: Enter names of potential vendors

SELECT RECOMMENDED REQUEST FOR PROPOSAL SOLICITATION: Choose an item.

STAKEHOLDERS

SELECT THE PROJECT'S IMPLICATIONS:
Choose an item.

LIST ANY OTHER STATE, REGIONAL OR NATIONAL AGENCIES AND OTHER GROUPS MAY HAVE AN INTEREST IN SUPPORTING THIS STUDY

DO NOT WRITE BELOW THIS LINE

FOCUS AREA MANAGER APPROVAL*	ENGINEER OF RESEARCH APPROVAL*
Select Method of Approval Enter Date of Approval	Select Method of Approval Enter Date of Approval
RESEARCH ADVISORY COMMITTEE CHAIR APPROVAL*	**RESEARCH EXECUTIVE COMMITTEE CHAIR APPROVAL***
Select Method of Approval Enter Date of Approval	Select Method of Approval Enter Date of Approval

*Records of approval are saved in project file.

MDOT employees with questions should contact:
Carol Aldrich, P.E., Administrator, Research Administration
Phone: 517-636-7777, Fax: 517-322-1262, aldrichc@michigan.gov
Or review the Research and Implementation Manual

MDOT
Michigan Department of Transportation

MDOT Research Administration
Project Manager and Focus Area Manager Training
April 17 and 18, 2012

Resources for writing problem statements

1. **Research Idea form**
   This is your starting point. Every problem statement that gets developed has a Research Idea form that was submitted for consideration first. The Research Idea form contains much of the information needed for the full problem statement in abbreviated format. If you weren't the one to submit the Research Idea, talk to the person who did to understand the need driving the research.

2. **Outcomes of Summit discussions**
   Many of the Research Ideas will be developed in more detail by the working groups at the Summit. The cross section of researchers and DOT practitioners in these groups will help you think through potential tasks for completing the project, what deliverables to ask for and what it will take to implement the results.

3. **Networking and connections from the Summit**
   The Summit is a wonderful opportunity to talk with internal and external transportation professionals about research in your focus area. Consider following up with these individuals after the Summit if you need help thinking through a portion of the problem statement.

4. **Literature searches completed by MDOT Library**
   A literature search is a list of citations of completed and in progress research that relates to your topic. MDOT's librarian is skilled in compiling these citations and will provide them to you as you begin to develop your full problem statement. It's critical that you review the results. There may be a completed project that duplicates the research you're proposing. Or a similar study may provide inspiration for the tasks you'll need for a Michigan-specific effort.

5. **Sample problem statements and proposals from past projects**
   Research Administration can provide sample problem statements from previous research projects required similar tasks to what you're proposing, such as laboratory testing and analysis or a survey and data gathering. Reviewing other problem statements can also help you develop the scope of your project, including the estimated person hours and cost.

6. **Problem statement form with guidance**
   Research Administration inserted guidance into a blank Problem Statement form to clarify what information you need to provide and how to present this information in the most compelling way.

7. **TRB Research Needs Statement database**
   This searchable database houses problem statements developed by the TRB technical committees on a wide range of transportation topics. Search this database for projects related to your topic that may help you in scoping your own problem statement.

8. **Research Administration Research Managers**
   Research Administration staff are available to answer your questions, to assist you in thinking through what's needed for a problem statement and to review what you have drafted.

MDOT Michigan Department of Transportation

MDOT Research Administration

Tips for writing strong problem statements

- You are writing a *problem* statement. Communicate the details of why the current situation is a problem and how the proposed research will help solve the problem.
- Write short, clear sentences that are linked to each other in a logical way. Begin at the beginning, end at the end.
- Avoid acronyms unless you have to use the term over and over and even then spell the acronym out the first time you use it: portland cement concrete (PCC).
- Use technical terms that are required to describe the problem, objectives and deliverables, but avoid jargon that could be replaced by an ordinary word that says the same thing.
- First capture your thoughts in the appropriate section of the form, then go back and rewrite what you've written to make it as clear and simple as possible. Ask someone not in your technical area to read the problem statement to see if they understand it.
- Keep in mind that several different kinds of people will be reviewing your problem statement: other technical people, MDOT managers, investigators, consultants. They will have a transportation background but may not be experts in your area. Make sure what you write is understandable to even those not intimately familiar with the topic.
- Spell check your document.

Plain Language (federal initiative)
http://www.plainlanguage.gov/
Plain language is "communication your audience can understand the first time they read or hear it." Initiated in the mid-1990s, this effort by the federal government emphasizes putting the reader's needs first. Although this initiative is geared toward making federal documents accessible to the public, its lessons translate to a more technical audience as well.

Online Dictionaries
http://dictionary.com
www.onelook.com

Appendix 2.7- Phase 2 Problem Statement Development: MDOT Three-Year Planning and Program Approval Timeline

Illustrated for projects that begin in FY 2019 - FY 2021

Phase	Step	Target Date	Assigned to	FY 2017			Fiscal Year 2018												Fiscal Year 2019											
				4th Qtr			1st Qtr			2nd Qtr			3rd Qtr			4th Qtr			1st Qtr			2nd Qtr			3rd Qtr			4th Qtr		
				July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Phase 1.	Research Idea Development	Aug 2017 - May 2018		■	■	■	■	■	■	■	■	■	■	■															
Phase 2. Problem Statement Development	2.1 Set lit review, RAP, & problem statement due dates	Late May 2018	RA											■															
	2.2 Submit problem statements to RAC chairs	June 2018	PMs												■														
	2.3 Meet to review problem statements	Late June 2018	RACs												X														
	2.4 Meet to approve projects planned for the next three years	July 2018	REC													X													
Phase 3.	Approval of Annual Program and RFPs	Aug 2018 to Jan 2020															■	■											

■ = Phased Work

X = Meeting

Michigan Department
Of Transportation
5314 (04/12)

RESEARCH ADMINISTRATION
RESEARCH ADVISORY PANEL NOMINATION FORM

PROJECT TITLE

PROJECT NO.	OR NO.

PROJECT MANAGER

PRINCIPAL INVESTIGATOR

RESEARCH/CONSULTANT AGENCY (If known)

RAP MEMBERS
The following group is recommended for consideration for the project Research Advisory Panel*

NAME	AREA OF EXPERTISE	DIVISION/REGION TSC	TELEPHONE NO.	E-MAIL ADDRESS

NOTES:

FOCUS AREA MANAGER SIGNATURE	DATE
ENGINEER OF RESEARCH SIGNATURE	DATE

cc: Bureau Director
Research Manager
Project File

Michigan Department
Of Transportation
5302

RESEARCH ADMINISTRATION
PARTICIPATING STATE POOLED FUND SUMMARY & FUNDING REQUEST

This form is intended for use when joining a national research effort led by another state or federal institution. The problem statement form 5308 is used when developing a MDOT led research project.

STUDY START DATE	STUDY END DATE	MDOT START DATE	MDOT END DATE

STUDY TITLE

LEAD AGENCY	TPF STUDY NUMBER / OR #

LEAD AGENCY CONTACT NAME

MDOT TECHNICAL ADVISOR

BUDGET INFORMATION

TOTAL BUDGET (BY FY)	FY1	FY2	FY3	FY4	FY5

PROBLEM TO ADDRESS

OBJECTIVES

TASKS

PAYOFF POTENTIAL AND IMPLEMENTATION

How will MDOT be able to implement results from study?

PRODUCTS/DELIVERABLES

IS OUT OF STATE TRAVEL REQUIRED? ☐ YES ☐ NO	IF SO, WILL SPR, PART II FUNDS COVER TRAVEL EXPENSES? ☐ YES ☐ NO

OTHER CONSIDERATIONS AS APPLICABLE (WILL STATE FUNDS BE REQUIRED?).

DO NOT WRITE BELOW THIS LINE

FOCUS AREA MANAGER APPROVAL* ☐ EMAIL ☐ CONVERSATION RECORD ☐ MEETING NOTES	DATE
RESEARCH ADVISORY COMMITTEE CHAIR APPROVAL* ☐ EMAIL ☐ CONVERSATION RECORD ☐ MEETING NOTES	DATE
COO OR CAO APPROVAL* ☐ EMAIL ☐ CONVERSATION RECORD ☐ MEETING NOTES	DATE
RESEARCH MANAGER SIGNATURE	DATE

ENGINEER OF RESEARCH SIGNATURE	DATE

*Records of approvals are saved in project file

Appendix 2.10 - Phase 3 Program Approval and Requests for Proposals: MDOT Three-Year Planning and Program Approval Timeline

Illustrated for projects that begin in FY 2019 - FY 2021

Phase	Step	Target Date	Assigned to	FY 2017 4th Qtr			Fiscal Year 2018 1st Qtr			2nd Qtr			3rd Qtr			4th Qtr			Fiscal Year 2019 1st Qtr			2nd Qtr			3rd Qtr			4th Qtr			FY 2020 1st Qtr			2nd
				July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan
Phase 1.	Research Idea Development	Aug 2017 - May 2018																															
Phase 2.	Problem Statement Developmer	May - July 2018																															
Phase 3 Program Approval and Requests for Proposals	3.1 Submit FY 18 programs to FHWA.	Aug 2018	Engr. Research																														
	3.2 Approve FY 19 program	Late Aug 2018	FHWA																														
	3.3 Post Program FY 19 RFP and submite FY 20 projects to FHWA.	Oct 2018	Research Adminstration																'19 RFP						year 1 projects								
	3.4 Post Program FY 20 RFP	Jan 2019	Research Adminstration																			'20 RFP									year 2 projects		
	3.5 Compile FY 20 program	June 2019	Engr. Research																														
	3.6 Approve FY 20 projects and budget, and FY 21 RFPs	July - Aug 2019	REC																									X					
	3.7 Submit FY 20 program and FY 21 projects to FHWA	Aug 2019	Engr. Research																														
	3.8 Approve FY 20 program	Late Aug 2019	FHWA																														
	3.9 Post Program FY 21 RFP	Jan 2020	Research Adminstration																														'21 RFP

= Phased Work

X = Meeting

RFP =Request for Proposal

MDOT
Michigan Department of Transportation

Transportation Literature Search

Recruit and maintain/upgrade a high-tech workforce for emerging technologies

Prepared by MDOT Library

April 13, 2018

Topic/Problem Statement: The construction and operations of transportation-related infrastructure is poised to undergo a dramatic shift due to rapidly emerging technologies in the next 10 years. This shift will expose work force to these emerging technologies that are either already filtering in or will rapidly impact the industry in the near future. Upgraded training is necessary to ensure that the work force is ready for the technological shift such as civil integrated management (CIM) and automated systems. If the workforce recruitment and maintenance is not planned and not developed in view of the technological shift, there is expected to be serious void in the implementation and operation of various infrastructure projects. Some of these emerging technologies/developments include:

1. Construction:
- Sensors and connectivity of construction equipment, material and workers
- Access to design and construction information and conflicts dynamically
- Project progress monitoring via drones, especially in difficult terrain
- 3D Design, Building Information Modeling (BIM), and Civil Integrated Management (CIM)
- Data analytics and internet of things (IoT), etc.

2. Operations:
- Autonomous vehicles and technologies
- Electric vehicles
- Maintenance of sensors on roads and bridges
- Light Detection And Ranging (LiDAR)
- Smart Products, e.g., lighting
- Smart maintenance notifications, etc.

Keywords: Sensors and connectivity (LiDAR); Data analytics and Internet of things (IoT); Civil Integrated Management (CIM); Autonomous technologies; Smart infrastructure design and products

Databases searched: WorldCat, TRID Online, ROSA P, Transportation Research Record: Journal of the Transportation Research Board, TRB's Research in Progress (RIP) database, Research Needs Statements

Summary

A total of 28 citations were found with 20 being completed research, 5 citations from the Transportation Research Record, and 3 being Research in Progress.

Citations

Links to online copies of cited literature are provided when available. Contact the MDOT Library to obtain hard copies of citations.

Completed Research

Title:	**Innovative Solutions for Employee Recruitment and Retention**
Author(s):	Ramm, Dennis; Koerner, Sydney
Date:	2009-6
Performing Org.:	
Sponsor Org.:	
Source:	2009 American Public Transportation Association (APTA) Rail Conference
URL:	
Description:	3p
Abstract:	Even in the economy of the past year, recruiting for this industry continues to be one of STV's toughest challenges. Most good people are probably not actively looking for a new job (the authors call them passive job-seekers). You'll have to convince them that your company is a great place to work. Attracting and retaining the right people begins long before the first recruitment ad. It begins with your employment brand. Employer branding is reflected in a firm's strategy to intentionally create a specific perception of employment at the company. It is the projection of a certain image as an employer, and it is important for companies that need a competitive edge in recruitment and employee retention. Employment branding helps to define corporate culture, promote company values and strategically deliver an organization's message.

Title:	**A UNIQUE APPROACH TO ENHANCE WORKFORCE QUALITY**
Author(s):	Rahim, R N; Gupta, R; Mulani, M P; Sinha, R
Date:	2004-5
Performing Org.:	
Sponsor Org.:	
Source:	Bus and Paratransit & Bus Rapid Transit Conference
URL:	
Description:	8p
Abstract:	In today's world of rapid technological change, focusing on human resources from three perspectives, namely "people", "process" and "technology" enables one to gauge the efficacy of internal and external organizational interactions. This approach (PPT) has numerous tools, which are aimed at enhancing employee morale and satisfaction and improving the work environment by leveraging the existing political climate. Furthermore, these tools focus on identifying redundant activities and improvising processes to enhance employee efficiency. This approach also focuses on the utilization of technology to determine whether it is being used effectively as an enabler to ensure business continuity and enhancement. This paper discusses how these analytical tools provide information that facilitates decision-making by management. The primary intent of this assessment tool is to maximize the benefits of the human resources function, by leveraging strengths and mitigating weaknesses, thereby reducing costs. The tool estimates a myriad of tangible costs savings e.g. reduction in time spent by employees on redundant activities, and quantifies intangible parameters as well e.g. maximum utilization of technology resources. The tools discussed include, an individualized diagnostic for compensation, benefits, employee and labor relations, recruitment, and payroll; interviews with key officials of the organization to ensure that all processes are aligned with the organization's mission and vision; employee job-time studies to gauge employee effectiveness in conducting day-to-day activities; process mapping to identify non-value activities and the need for reallocation of resources; systems audit

	to ensure that technology is leveraged within the organization; and instilling performance measures within processes and human resources to strive for continuous improvement.

Title:	**LABOR AND TECHNOLOGY**
Author(s):	WALKER, R; Hollingsworth, R; Pentimonti, E; Spinosa, J; Belzer, M; Helmick, J
Date:	2001
Performing Org.:	
Sponsor Org.:	
Source:	Global Intermodal Freight: State of Readiness for the 21st Century
URL:	http://onlinepubs.trb.org/onlinepubs/security/cp25.pdf
Description:	p. 173-185
Abstract:	This conference panel session focuses on labor and technology in the U.S. transportation industry as it relates to global intermodal freight in the 21st century. R. Walker provides an overview. R. Hollingsworth questions whether the infrastructure in southern California can handle increased growth in traffic through the ports without adopting new technology and new processes, noting there are two kinds of infrastructure: physical infrastructure and people-process infrastructure. E. Pentimonti emphasizes the need for increased productivity and the importance of implementing technology as a way to increase productivity and take advantage of the investments made in the industry. J. Spinosa stresses the need to ensure there are jobs for labor and that labor is given an opportunity to be part of the solution instead of labeled as the cause of a problem. M. Belzer focuses on a number of issues facing the trucking industry, most notably the operating conditions and wages, as well as shortages and high turnover among drivers. J. Helmick comments on workforce needs assessments, workforce recruitment, and alternative education-training approaches.

Title:	**Building a Sustainable Workforce in the Public Transportation Industry---A Systems Approach**
Author(s):	2013
Date:	
Performing Org.:	
Sponsor Org.:	Federal Transit Administration
Source:	RiP
URL:	
Description:	
Abstract:	There is consensus on significant workforce challenges facing transit leaders across North America--retirement of baby-boom era employees, a generally tight labor market, increasing technological requirements across job functions, and growing diversity of the workforce. The transit industry faces a critical shortage of skilled and seasoned employment as thousands of workers from the baby-boom generation near retirement over the next 5 to 10 years. There have been recent studies conducted by the industry, including Leadership APTA program participants, on strategies for attracting Generation X, Y, and Millennium to jobs and careers in public transportation, particularly "green collar" jobs. The research has shown that having proactive and systematic approaches to address future workforce development needs is critical as the industry is faced with a competitive job seekers' market. Building on the success of implementing recommendations outlined in APTA's 2001 report, "Workforce Development: Public Transportation's Blue Print for the 21st Century," a 1-year blue ribbon panel was established

	on workforce development representing the public and private sectors of the transit industry, key stakeholders, and partners, including labor, academia and the next generation of leaders in the industry. The panel was charged with (1) reviewing the research and recommendations of the earlier workforce development initiative; (2) identifying gaps, new opportunities, programs, and services geared to helping to create and sustain a vibrant, efficient, and effective workforce; and (3) defining APTA's role in providing ongoing support to members and the industry on these issues. In 2008, APTA created a long-term vision of public transportation's role in the fabric of the nation's surface transportation system over the next several decades: "In 2050, America's energy efficient, multimodal, environmentally sustainable transportation system powers the greatest nation on earth." Across the North American continent, trends in population, urban growth, energy, environment, and economics all point favorably to a ripe, robust future for public transportation. As part of this vision, the public transportation industry has career appeal to a new, diverse population of the best and brightest. Growth challenges since 2009 have required an intense effort to attract, train, and develop a new workforce on the scale of the U.S. space program of the 1960s. The many individuals who want to work in "green collar" jobs will recognize public transportation as an "employer of choice." A unified work plan for the next 5 years was presented at APTA's October 2009 annual meeting, and development of the association's 2010-2014 Strategic Plan is underway. Recommendations of the blue ribbon panel will require implementation of activities emerging from the panel's strategic vision and plan. These projects may include new programs, projects, and services to address the following: image and branding; higher education issues, including the role of colleges, universities, community colleges and technical/vocational schools; youth outreach and awareness programs; partnerships and collaborations, including labor-management partnerships; development of performance metrics to determine the return on investment (ROI); and the impact of authorization of the federal public transportation law and other legislative proposals on workforce development. Moving forward toward implementation of these recommendations, there will be a need to conduct a comprehensive workforce development assessment for the public transportation industry. This assessment will provide a thorough overview of the evolving challenges and opportunities faced by the transit industry and the related implications for its workforce. The objectives of this research would be to (1) assess the current and future business environment of the public transportation industry as it relates to workforce development and human capital issues and resources; (2) develop industry models that could measure the ROI for training strategies and other human capital resources, and establish a framework for regular benchmarking; (3) identify "best practices" and new business models with respect to key issues recognized by the industry, including the impact of labor-management partnerships; and (4) assess the current perception of the public transportation industry as an "employer of choice," and identify how these perceptions might be addressed through image and branding strategies, including an emphasis on "green collar" jobs. The research would identify the complex influences that continue to present challenges that require the industry to adapt, innovate, and invest, particularly in relation to its human capital. The findings will assist in the development of a forward-thinking and sustainable human capital and resources strategy applicable to the next decade. One of the key deliverables would be a guide outlining a framework for workforce development planning for the decades ahead.

Title:	**Innovative Program Gives Job Seekers Virtual Experience in Highway Construction Careers**
Author(s):	Marotte, Emily B
Date:	2014-7
Performing Org.:	
Sponsor Org.:	
Source:	Constructor – Vol 96, No 4
URL:	
Description:	pp 82-85
Abstract:	Traditional recruiting programs for construction workers are not longer working. This article discusses how the Construction Association of Western Pennsylvania (CAWP) developed the Future Road Builders program. This program is a computer-based virtual pre-apprenticeship that introduces participants to highway construction careers using different types of simulations. The CAWP hired a next generation contractor who is revolutionizing the way employee learning and practice is delivered to organizations using game-based software. The article describes how the CAWP is the process of rolling the program out to area career and technical high schools and community centers.

Title:	**Railroad Industry Modal Profile: An Outline of the Railroad Industry Workforce Trends, Challenges, and Opportunities - Update**
Author(s):	Stewart, Monique; Parker, Lloyd
Date:	2016-4
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	http://www.fra.dot.gov/Elib/Document/15714
Description:	41p
Abstract:	In 2011, the Federal Railroad Administration (FRA) Office of Research, Development, and Technology (RD&T) published the first edition of the "Railroad Industry Modal Profile: An Outline of the Railroad Industry Workforce Trends, Challenges, and Opportunities" in response to the Department of Transportation (DOT) National Transportation Workforce Initiative. The profile provided a comprehensive assessment of the railroad workforce and identified six key workforce challenges facing the industry at that time. Since the initial publication, the profile has been widely used as a source of information and insight regarding railroad industry workforce development. Thus, the FRA Office of RD&T determined that it should be updated periodically to reflect the latest industry trends, issues, and best practices. Recently, the FRA Office of RD&T conducted another analysis to gauge the current and future state of the industry's workforce based on available quantitative employment data and industry stakeholder dialogs, which led to the identification of the following key workforce challenges. Although it is not the FRA's intent to solve these challenges, the FRA continues to foster industry collaboration to increase the visibility of key issues and innovative workforce development initiatives.

Title:	**STEM and Our Future Transportation Leaders**
Author(s):	Kennedy, Adjo Amekudzi; Sowah, Margaret Avis Akofio; Brodie, Stefanie; Xu, Yanzhi (Ann); Leous, Audrey; Curtis, Valerie
Date:	2016-2
Performing Org.:	
Sponsor Org.:	

Source:	
URL:	http://g92018.eos-intl.net/eLibSQL14_G92018_Documents/14-08.pdf
Description:	127p
Abstract:	Between 2012 to 2022, 40 to 50 percent of the transportation workforce is expected to retire taking valuable knowledge with them. State Departments of Transportation (DOT) are expected to play a significant role in replenishing the workforce pipeline by raising awareness about transportation careers, providing internship and apprenticeship opportunities, supporting workforce development programs and research, implementing mentoring programs for new workers and emerging leaders, and supporting partnerships with education and workforce organizations. Science, technology, engineering and mathematics (STEM) development is considered a critical priority in the state of Georgia and the nation at large to preserve science and technology efficacy and promote economic competitiveness. This report reviews state DOT involvement in transportation related STEM outreach programs and identifies opportunities to engage kindergarten through high school (K 12) students in STEM programs to enhance their interest in the transportation field. Both theory and empirical evidence show that STEM has academic and behavioral benefits, and that students exposed to STEM are more likely to choose a career in STEM. Information on DOT involvement in STEM programs was gathered from the literature, DOT and other websites; a targeted online survey administered to DOTs and University Transportation Centers that have hosted STEM outreach programs; and semi structured phone interviews conducted with selected survey respondents to gather additional information on their programs. Results show that over 40 percent of state DOTs are involved in K 12 STEM outreach programs: most commonly residential or non residential summer programs, teacher training and curriculum development programs, internship and shadow opportunities, one day STEM awareness events, and periodic employee visits to schools to present on transportation STEM. A business case analysis conducted shows that agencies will benefit from including both longer term and shorter term alternatives in their STEM programming to cultivate STEM efficacy and build long term relationships with a smaller percentage of students while increasing STEM awareness broadly among K 12 students. Such strategic programming will contribute to developing a pool of students for future recruitment to replenish the transportation workforce, while enhancing STEM culture within the agency.

Title:	**Workforce Development and Succession Planning to Prepare the Rural Transit Industry for the Future**
Author(s):	Peterson, Del; Rieck, Ted
Date:	2016-7
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	http://www.nctr.usf.edu/wp-content/uploads/2016/09/21177060-NCTR-NDSU07.pdf
Description:	36p
Abstract:	As America's transportation workforce continues to age, there is an increased need to invest in workforce development to combat the impending retirement tsunami. This is especially true within the small urban and rural transit industry. A literature review showed that 63 percent of U.S. transit workers are 45 years of age or older, and that significant job growth will occur during the next 10 years in both urban and rural communities. A national survey of rural transit managers was conducted to determine current workforce

	development practices as well as succession planning procedures. Viable responses were received from 160 agencies in 40 states. The majority of transit agency managers responding to the survey have been employed by their agency for more than 15 years while 75% of total respondents were 50 years of age or older. One-third of respondents indicated they plan to retire within the next 5 years while only 15% have any viable succession plan in place to combat such high management turnover. Details of succession plans varied considerably. Many respondents mentioned mentoring and one-on-one training as succession plan examples while others have current staff members designated to work with incoming management to familiarize them with agency rules and processes. Also concerning was that only 40% of respondents indicated having any type of employee recognition program in place. To improve employee morale and advancement opportunities from within, transit agencies must take the time to develop feasible succession plans and make an effort to reward employees for outstanding performance.

Title:	**The Aviation Workforce of Tomorrow: Where Are They Needed—and Where Will They Come From?**
Author(s):	Byers, David A
Date:	
Performing Org.:	
Sponsor Org.:	
Source:	TR News No 304
URL:	http://www.trb.org/Publications/Blurbs/175073.aspx
Description:	pp 6-12
Abstract:	With a rapidly growing demand for technologically savvy workers and a diminishing pool of people entering the labor market, the prospects for recruiting aviation professionals pose a new challenge that requires new approaches. This article takes a closer look at the demand for airline pilots, aircraft maintenance technicians, air traffic controllers, and airport operations personnel. By 2024 it is projected that 203,815 personnel will be needed to fill these positions. Approaches for attracting candidates include ab initio flight training, organizational outreach, and sponsored education. This article also talks about the Collegiate Training Initiative, the impact of opening the recruiting process to the general public, and the FAA Academy.

Title:	**Factors Affecting Recruitment Retention of Intermodal Transportation Workforce: Inclusion, Advancement, Vocational Interests & Selection**
Author(s):	Hedman, Briana; Garriott, Patton
Date:	2016-5
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	http://www.ncitec.msstate.edu/wp-content/uploads/2012-21FR.pdf
Description:	69p
Abstract:	This report summarizes two projects that were intended to explore the factors related to retaining and recruiting transportation workers, specifically through perceptions of workplace climate and likelihood of choosing a career in transportation. Project #1 was designed to develop the Inclusiveness Inventory, a measure of inclusiveness that was based on the integration of prior research and theory. Test construction consisted of conceptual item development, expert review, and editing by members of the participating organization to improve clarity. Survey items were administered to employees at a large, mid-western transit agency as part of a larger study on workplace

	climate. This paper explored the structure of the Inclusiveness Inventory by factor analysis. The hypothesized factors of the Inclusiveness Inventory included the dimensions of diversity climate, fairness, belongingness, uniqueness, and discrimination. Secondly, this study evaluated the reliability and relationship of the Inclusiveness Inventory to employee job satisfaction and intention to quit. The results suggested a three-factor model and higher scores were related to greater job satisfaction and lower intention to quit. The results were considered in relationship to the implications and suggested directions for future research. The purpose of Project #2 was to examine predictors of transportation career intentions across a sample of potential applications. A sample (N = 263) of students completed measures of: evaluative attitudes, social norms, anticipated sexism, perceived dissimilarity to individuals in the transportation field, and transportation career intentions. Results showed that males reported higher levels of perceived social norms and intentions for entering a transportation career compared to females. Conversely, females reported higher levels of anticipated sexism in transportation careers. A hierarchical regression analysis indicated that evaluative attitudes, social norms, and perceived dissimilarity to individuals in transportation predicted transportation career intentions. Mediation analyses revealed that social norms explained the relationship between gender and transportation career intentions. Results are discussed in terms of increasing and diversifying the transportation workforce pipeline.

Title:	**Research for AASHTO Standing Committee on Highways. Task 408. Transportation System Management and Operations (TSMO) Workforce: Skills, Positions, Recruitment, Retention, and Career Development**
Author(s):	
Date:	
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	
Description:	
Abstract:	The objective of this research is to build on prior and current activities of National Operations Center of Excellence (NOCoE), American Association of State Highway and Transportation Officials (AASHTO), and others to produce resources and guidance—for Departments of Transportation (DOTs) and others (such as educational institutions, consultants)—for development of transportation system management and operations (TSMO) capabilities in four specific areas: (1) model position descriptions (PDs) for describing DOT staff at entry-level and advanced levels of TSMO responsibilities, (2) Knowledge, skills and abilities (KSA) or professional technical qualifications (PTQ) statements characterizing TSMO entry-level and advanced technical and management positions, (3) guidance on effective and exemplary practices for recruitment of TSMO personnel, and (4) guidance on effective and exemplary practices for professional development and retention of TSMO staff. As envisioned for this project, guidance will consider likely technology, workforce, and transportation policy developments within the next 5 to 15 years. The guidance will helpful to agencies that employ TSMO professionals and to organizations that educate and train such professionals and support their career development, and will be adaptable to suit the variety of employment regimes (for example, union, right-to-work, and at-will employment; public- and private-sectors) that exist across the nation. The research will entail (1) review of educational programs and exemplary current practices for recruitment and career development, (2) preparation of model

	TSMO position descriptions, (3) preparation of KSA or PTQ statements for model TSMO positions, and (4) development of a strategic management framework for recruiting and retaining TSMO staff. The product will be a guidebook for DOTs and other employers and workforce producers to assist with TSMO workforce education, training, recruitment, retention, and development.

Title:	**Latent Talent**
Author(s):	Rubini, Jeffrey
Date:	2017-1
Performing Org.:	
Sponsor Org.:	
Source:	Coast Guard Journal of Safety & Security at Sea, Proceedings of the Marine Safety & Security Council – Vol 74, No 1
URL:	http://www.dco.uscg.mil/Portals/9/DCO%20Documents/Proceedings%20Magazine/Archive/2017/Vol74_No1_Jan-Apr2017.pdf?ver=2017-05-31-121003-980
Description:	pp 36-39
Abstract:	The post-millennial generation, those born after the year 2000 will enter the workforce in less than two years. They were born into a global war on terrorism, became fluent with mobile computing and social media as they came through their formative years, witness the repeal of “don’t ask/don’t tell” and the United States (U.S.) Supreme Court case ruling in favor of same-sex marriage. The post-millennial are perhaps the most diverse of all generations, and inclusion is simply a way of life for them. Speculation over what the new leaders of tomorrow, the post-millennials, will want from an employer. People are and always will be the greatest resource. No matter how clever or sophisticated the technology, no matter how pervasive the imminent automation of tasks, no matter how eloquent the algorithms and analytics are at predicting or influencing change and decisions, people will always remain the common denominator for how (and how well) companies achieve their objectives. Invest in people to help guide them toward achieving and sustaining mission excellence while leading American prosperity and security into the future.

Title:	**Job Needs and Priorities Report, Phase 2: Action Plans Northeast Region**
Author(s):	
Date:	2016-8
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	http://transctr.w3.uvm.edu/wp-content/uploads/2014/03/FHWA_Job-Needs-Phase-2-Report-Northeast-9-8-16.pdf
Description:	50p
Abstract:	As the nation moves forward in the 21st century, many challenges face the transportation industry; changing skill sets for current employees, large numbers of workers heading towards retirement, and the technological innovations that are changing the face of transportation itself will invariably cause gaps in the workforce pipeline. In January 2015, the Northeast Transportation Workforce Center (NETWC) started a two-phased Transportation Job Needs and Priorities Research effort, which was designed to assess these challenges and address the transportation workforce needs in

	the region. ‘Phase 1’ allowed the Northeast Center to identify priority jobs in the region and set the stage for meaningful regional workforce discussions and initiatives. In the findings, a broad summary of the region’s transportation workforce and industry is presented along with an analysis of Northeast labor market data. The purpose of this Phase 2 report is to describe the subsequent research and results, which involved assessing potential workforce programs and partnerships to address the workforce gaps identified in Phase 1, while also presenting strategic ‘action plans’ that will serve as the impetus to move related workforce development initiatives forward. NETWC’s five strategic action plans include: (Action Plan 1) Attracting Tomorrow’s Workforce Across the Northeast (Toolkit); (Action Plan 2) Advancing Transportation Career Paths to the Future; (Action Plan 3) Greener is Better: Promoting and Branding Transportation as a Green Career; (Action Plan 4) Implementing Succession Planning/Knowledge Management (KM) to Increase Organizational Resilience: Crafting strategies and a handbook; and (Action Plan 5) Upskilling Transportation’s Current Workforce to Meet Emerging Challenges and Opportunities. The research and full strategies supporting these action plans are described in the remainder of this report.

Title:	**Building America's Skilled Technical Workforce**
Author(s):	
Date:	2017
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	
Description:	259p
Abstract:	Skilled technical occupations—defined as occupations that require a high level of knowledge in a technical domain but do not require a bachelor’s degree for entry—are a key component of the U.S. economy. In response to globalization and advances in science and technology, American firms are demanding workers with greater proficiency in literacy and numeracy, as well as strong interpersonal, technical, and problem-solving skills. However, employer surveys and industry and government reports have raised concerns that the nation may not have an adequate supply of skilled technical workers to achieve its competitiveness and economic growth objectives. In response to the broader need for policy information and advice, this book examines the coverage, effectiveness, flexibility, and coordination of the policies and various programs that prepare Americans for skilled technical jobs. This report provides action-oriented recommendations for improving the American system of technical education, training, and certification.

Title:	**Building Skills from Solid Foundations**
Author(s):	Goldin, Pete
Date:	2012-7
Performing Org.:	
Sponsor Org.:	
Source:	ITE Journal – Vol 82, No 7
URL:	
Description:	pp 22-23
Abstract:	An educated workforce is an essential factor for the successful deployment of intelligent transportation system (ITS) technologies. Through its ITS Professional Capacity Building (PCB) program, the U.S. Department of Transportation is providing a portfolio of resources to help employees build

	essential skills to meet current and future ITS needs. The program is targeted to federal, state and regional transportation employees, as well as private sector consultants and contractors. The PCB program focuses on emerging technologies, current ITS research initiatives, existing ITS technologies with proven benefits, and foundation topics such as ITS architecture and standards. Most of the program materials are in electronic format, including online classes and webinars. Two new initiatives will expand the program in 2012: a second set of modules for ITS standards training and the development of an ePrimer for ITS. Almost all of the resources are provided at no cost to the user.

Title:	**Transportation Workforce Development at Community Colleges**
Author(s):	Glitman, Karen
Date:	2010-3
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	
Description:	35p
Abstract:	Community college participation and endorsement will be integral to the success of a National Transportation Workforce Development Strategy. The University of Vermont Transportation Research Center (TRC) analyzed the results of a survey conducted with the American Association of Community Colleges (AACC) that sought to quantify existing community colleges' programs, infrastructure and partnerships preparing students for careers in transportation. Building upon data from this survey, the TRC has analyzed what transportation training exists at community colleges today and how that curriculum is supported by both investments in specialized equipment and through strategic partnerships. As detailed in this report: 1) The majority of schools reported having programs that develop skills relevant to the transportation sector, especially general skills (finance, technologies, operations and maintenance) that are transferrable to non-transportation industries; 2) Where schools are planning to expand or initiate transportation curriculum, it is primarily in technical areas, such as engineering, where the skills may extend to sectors other than transportation; 3) Similarly, where schools indicated having specialized equipment, most of the investment was for tools that could be leveraged beyond transportation studies, and few schools reported owning or having access to transportation-specific equipment, such as training ships, rail cars, or airplane fuselages; and 4) The majority of schools reported having strategic partnerships with other schools; federal, state, and municipal government entities; and private companies – supporting their transportation-related efforts. Collectively, these data suggest that there is a solid foundation within community colleges to deliver transportation-related training, but that additional investment and coordination likely will be necessary to support future workforce needs. To that end, this report lays out both best practices for community colleges looking to increase their transportation programs and recommendations for how the U.S. Department of Transportation can best stimulate and support the evolution of community colleges as a key pillar in the transportation workforce development infrastructure.

Title:	**Building the 21st century workforce: creating a national strategy**
Author(s):	Benz, G; Bhat, C
Date:	2008-7
Performing Org.:	

Sponsor Org.:	
Source:	TR News – Issue 257
URL:	
Description:	p 3-6
Abstract:	

Title:	**Acting Now, Building for the Future**
Author(s):	Glenn, Vicki
Date:	2006-5
Performing Org.:	
Sponsor Org.:	
Source:	Public Roads – Vol 69, No 65
URL:	http://www.fhwa.dot.gov/publications/publicroads/06may/04.cfm
Description:	pp 20-25
Abstract:	For many years, a great number of men and women have provided the intellectual, technical, and physical expertise and ingenuity to construct, manage, and operate the U.S. transportation systems that move goods and people around the country. As many of these transportation industry workers are now reaching retirement age, an emerging challenge is to find, hire, and retain a workforce with the requisite skills and qualifications to ensure the continued successful operation of the system in the future. To help meet this challenge, the U.S. Congress incorporated a number of provisions related to workforce development into the recently enacted Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This article describes how the legislation provides resources to enable the Department of Transportation and its public/private sector partners to bolster existing activities and develop new ones to train and prepare a new generation of transportation professionals to enter the workforce.

Title:	**Powering the Revolution! The Industry Needs You**
Author(s):	
Date:	2012-7
Performing Org.:	
Sponsor Org.:	
Source:	Electric & Hybrid Vehicle Technology International
URL:	http://viewer.zmags.com/publication/0632a16d#/0632a16d/40
Description:	pp 39-43, 45-46
Abstract:	This article describes how automobile manufacturers and suppliers are desperate to recruit engineers who will help them accelerate their electric vehicle (EV) development programs. The problem these manufacturers and suppliers are facing is that there is a lack of skilled personnel in the workforce. The article shows how it is definitely an employees' market now, with the best engineers able to court a number of potential employers.

Title:	**Identifying and Evaluating Airport Workforce Requirements**
Author(s):	Cronin, Candace Blair; Alexander, Allison; Majumdar, Elora; Riches, Christopher; Jenkins, Jessica; Van Beek, Stephen; Bisker, Amy; Heinen, Beth; Lewis, Curt
Date:	2016-11
Performing Org.:	
Sponsor Org.:	
Source:	ACRP Web-Only Document – Issue No 28
URL:	http://www.trb.org/Main/Blurbs/175503.aspx
Description:	182p

Abstract:	Airports are vital assets to the local, regional, and national economies, requiring a well-trained and skilled workforce to provide necessary services; yet, many of the most experienced workers are eligible to retire in coming years. This trend toward increasing retirement of key personnel is compounding a situation where it may already be difficult to attract, hire, train, and retain a workforce with the skills required to meet the needs of a demanding and evolving industry. The fundamental problem was discussed in ACRP Synthesis 18: Aviation Workforce Development Practices, reporting, for example, that entry-level workforce is typically hired with little aviation-specific education or experience. The synthesis also indicated that coordinated workforce planning and development efforts that integrate best practices in recruitment, retention, on-the-job training, and succession planning rarely exist at airports. At best, airport workforce development is often performed primarily on an ad-hoc basis with a narrow focus that may only concentrate on a single human resource practice (e.g., training). What is often lacking is a comprehensive, sustainable workforce strategy that aligns existing and emerging business models with workforce development initiatives. Whether it is a function of the number and diversity of airport types (nearly 400 primary airports, 2,500+ general aviation), operating authorities (state and local government, private operators), service providers (airside, landside, concessions), and other stakeholders (FAA, unions, private industry), or the overwhelming push to fill current job openings as quickly as possible, the industry's lack of attention to strategic long-term workforce planning and development is at odds with an increased focus on safety and enterprise risk management (ACRP Report 74: Application of Enterprise Risk Management at Airports).

Transportation Research Record

Title:	**Millennials in the Transportation Workforce**
Author(s):	
Date:	
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	
Description:	
Abstract:	Generational differences in the United States are of increasing concern to human resource professionals as they prepare to manage the rapid demographic shifts expected in the transportation workforce. As baby boomers retire and millennials increase their share of the workforce, transportation agencies are seeking better understanding of the workplace attributes that will be most successful in attracting and retaining millennials. This paper contextualizes challenges faced by state departments of transportation within the current research literature on generational differences to identify mutual concerns in addition to successful strategies that state agencies can employ to attract and retain young staff. A literature review was conducted in conjunction with focus group discussions. Six staff from human resource departments representing five state departments of transportation (Alaska, Minnesota, Montana, Oregon, and Wisconsin) participated. The study found that state departments of transportation offer many attributes attractive to the younger generation: job security, opportunities for personal and professional development, flexible schedules, and vacation and work expectations that allow for work–life balance. Shared

	issues of concern included the use of technology and social media, mentorship capacity, attrition, and public image. The authors identified a number of opportunities for collaboration among state departments of transportation to share information and leverage resources to meet collective challenges.

Title:	**Transportation Engineering Careers Strategies for Attracting Students to Transportation Professions**
Author(s):	
Date:	
Performing Org.:	
Sponsor Org.:	
Source:	
URL:	
Description:	
Abstract:	Critical to building an American workforce with 21st century skills is the recruitment and graduation of students in science, technology, engineering, and mathematics fields. However, a nationwide lack of student interest and preparation in these fields results in a shortage of workforce talent. The transportation field is not immune to this shortage and faces significant issues related to attracting and retaining transportation professionals. Thus, it is crucial to raise awareness of opportunities available through the transportation profession with precollege students. The Transportation Engineering Careers (TREC) program at the University of Memphis is designed to engage students in active challenge-based learning, to showcase the variety of transportation engineering career opportunities through visits from industry professionals, and to provide interaction with peer role models through a structured mentoring component. This paper presents a brief review of relevant literature, a description of the University of Memphis TREC program and its evolution since 2010, the evaluation results from four years of participants, and preliminary results from a longitudinal survey. Lessons learned from the program assessment in attracting students to transportation professions are also discussed.

Title:	**Building a millennial work force : younger, tech-savvy individuals are redefining the workplace environment**
Author(s):	
Date:	2016-8
Performing Org.:	
Sponsor Org.:	
Source:	Airport Revenue News
URL:	
Description:	pages 21-27
Abstract:	

Title:	**Workforce**
Author(s):	
Date:	2009-8
Performing Org.:	
Sponsor Org.:	
Source:	Aviation Week & Space Technology – Vol 171, No 8
URL:	
Description:	p. 44-63

Abstract:	Lessons learned : A&D leaders plan for tomorrpw's workforce, mindful of past mistakes / Carole Heddin. -- Pay day : A&D compensation of engineers stacks up well against other industries / Carole Heddin. -- The young and the restless : A&D companies rethink their retention strategies to accommodate the millennial generation / Madhu Unnikrishnan. -- Work to do : recession has done little to alter Europe's long-term need for skilled staff / Robert Wall. -- Testing Japan / Madhu Unnikrishnan. -- Hands-on : a long-time partnership pays off for University of Colorado students / Michael Mecham. -- A race to the bottom / Norman Augustine. -- Help wanted : finding the volume and quality of overseers the Pentagon needs might not be easy / John M. Doyle. -- Cleared to land? : maintaining seasoned controllers while training new hires will be a challenge / Frances Fiorino. -- Worker friendly : study identified companies where A&D professionals want to work / Carole Heddin.

Title:	**Back to school : Kerstin Sjobeck and Anna-Karin Sogndal of the Entry Point North ATS Academy discuss their approach to millennial training**
Author(s):	
Date:	2018
Performing Org.:	
Sponsor Org.:	
Source:	Air traffic management (London, England)
URL:	
Description:	pg 65
Abstract:	

Research In Progress

Title:	**Recruiting, Retaining, and Promoting for Construction Careers at Transportation Agencies**
Author(s):	Harper, Christofer; Bogus, Susan; Kommalapati, Raghava; Choe, Doeun
Date:	2018-11
Performing Org.:	Louisiana State University
Sponsor Org.:	Office of the Assistant Secretary for Research and Technology
Source:	
URL:	
Description:	
Abstract:	Construction is a labor intensive industry, meaning that employees are the most valuable resource to construction firms and organizations. Yet, challenges exist in today’s workforce in terms of recruiting and retaining quality employees as well as attracting individuals from minority and underrepresented groups. Currently, the aging workforce of the United States along with the acknowledgment that newer generations of potential transportation workers have many different ideals, beliefs, and expectations than previous generations, reveals that recruitment and retention issues should be a primary concern for public transportation organizations such as state departments of transportation (DOTs). Gone are the days that individuals are hired by one firm and that person works their entire career at that firm. Smart, ambitious, and highly motivated employees are difficult to find and even more difficult to keep, especially when considering individuals for technician positions such as DOT engineers, engineering technicians, maintenance personnel, and information technology professionals. These difficulties are not just a construction industry problem, but a more widespread issue for industries that require career technical education fields. Qualified personnel has to be compensated well and require work that develops their

	skills and matches their personal interests. Since engineering and technical employees require challenging and rewarding work, strategic hiring and retention plans must be employed to successfully recruit and retain each of these types of workers. Therefore, to manage the dynamics of meeting today and tomorrow's construction and maintenance demands with an ever shrinking and changing workforce, state DOTs need robust workforce management strategies and guidance that can effectively attract, train, and retain engineers, technicians, and workers needed to construct and maintain the U.S. highway infrastructure well into the 21st century. The strategies developed can then be used by state DOTs to gain and sustain valuable human resources from current as well as future generations of workers, including minority and underrepresented individuals within transportation agency careers.

Title:	**Assessing, Building, and Retaining Workforce Capacity in the Aviation Industry**
Author(s):	Goldstein, Lawrence
Date:	2014-11
Performing Org.:	
Sponsor Org.:	Federal Aviation Administration / Airport Cooperative Research Program
Source:	
URL:	http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3847
Description:	
Abstract:	Workforce development in the aviation industry has historically been limited in scope. The industry lacks focus on strategic long-term workforce planning and workforce development needs. In Airport Cooperative Research Program (ACRP) Synthesis 18, "Aviation Workforce Development Practices" airport operators and stakeholders noted that the entry-level workforce is typically hired with little aviation-specific education or experience. This study also found that coordinated workforce planning and development efforts that integrate best practices in recruitment, retention, on-the-job training, and succession planning rarely exist at airports. Whether the result of funding constraints, risk management efforts, retirement of seasoned industry talent, new technologies, or variability in airport types; the absence of strategic planning for attracting, educating, and developing the future airport workforce leaves the aviation industry in a precarious position. Thus, the industry needs to take action to prepare for the challenges of dramatic workforce changes, growing demand for services, rapid technological development, and ballooning costs across the industry. The objective of this research is to identify and begin an evaluation of current and future airport workforce capacity issues; evaluate existing education, training, and other workforce development resources; and outline effective strategies to meet future workforce capacity requirements.

Title:	**Developing Innovative Strategies for Aviation Education and Participation**
Author(s):	Ward, Stephanie
Date:	2018-6
Performing Org.:	Mead & Hunt, Incorporated
Sponsor Org.:	Airport Cooperative Research Program
Source:	RiP
URL:	
Description:	

Abstract:	The aviation industry is a vital sector of the U.S. economy, yet participation in aviation as a career, for business, extracurricular activity, sport, and recreation has declined over the last decade. There are many causes for the decline, including a reduced interest in aviation among younger populations and other demographics and a lack of industry promotion. State and local aviation agencies are in a unique position to support the industry, and while some states have established robust outreach and educational programs, others lack the resources necessary to promote this important transportation asset. Industry groups also engage in educational and promotional programs. Currently, there is no single-source report summarizing these efforts, nor is there guidance to help state and local agencies develop and implement such efforts. Research is needed to provide guidance and supporting material (e.g., checklists, datasheets of practices, templates for brochures and presentations) for state agencies and local airports to promote interest and participation in the aviation industry. The objective of this research is to prepare a guidebook and supporting material (e.g., checklists, datasheets of practices, templates for brochures and presentations) for state agencies and local airports to facilitate participation and education in aviation. The guidebook and supporting material should focus on reaching the 10- through 25-year-old age group and be geared toward helping develop and implement strategies for promoting aviation as a career, for business, extracurricular activity, sport, and recreation. The guidebook and supporting material should consider, at a minimum: (1) Emerging technologies and trends in aviation (e.g., airports, airspace, safety, and aircraft); and (2) Emerging technologies and trends in communication, education, and outreach (e.g., websites, mobile devices, social media, virtual classroom, simulation, standards-based education, project-based learning).

APPENDIX 2.12

RESEARCH ADMINISTRATION
PROBLEM STATEMENT

MDOT Research Project

PROPOSED RESEARCH PROJECT TITLE Recruit and maintain/upgrade a high-tech workforce for emerging technologies	
OR NUMBER or TPF STUDY NUMBER OR19-129	MDOT PROJECT CATEGORY & STRATEGIC PRIORITY NO. Intelligent Transportation Systems Choose an item Choose an item Choose an item

PROJECT MANAGER OR PROBLEM STATEMENT AUTHOR	
PROBLEM STATEMENT AUTHOR Elise Feldpausch	DATE 6/13/2018
TELEPHONE NO. 517-388-2371	E-MAIL ADDRESS Feldpausche1@michigan.gov
BUREAU/REGION/OFFICE/SECTION/UNIT Field Services / Statewide / C&T / Operations / ITS Program Office	PROJECT MANAGER'S NAME (IF DIFFERENT THAN PROBLEM STATEMENT AUTHOR)

PROBLEM TO ADDRESS

IN 200 WORDS OR LESS, BRIEFLY DESCRIBE THE PROBLEM TO BE ADDRESSED AND WHY IT IS AN ISSUE FOR MDOT

The construction and operations of transportation-related infrastructure is poised to undergo a dramatic shift due to rapidly emerging technologies in the next ten years. This shift will expose work force to these emerging technologies that are either already filtering in or will rapidly impact the industry soon. Upgraded training is necessary to ensure that the work force is ready for the technological shift. If the workforce recruitment and maintenance is not planned and not developed in view of the technological shift, there is expected to be serious void in the implementation and operation of various infrastructure projects. It will be critical to identify the attributes and impacts of emerging technologies that will require a differently trained work force for construction and operations of transportation-related infrastructure.

RESEARCH OBJECTIVES

IN 25 WORDS OR LESS, LIST THE RESEARCH OBJECTIVES TO BE ACCOMPLISHED

1. Identify the attributes of emerging technologies for construction and operations of transportation-related infrastructure.
2. Analyze the impacts of these attributes on the workforce.
3. Design work force development strategies to train new generation of workforce.
4. Design work force development strategies to maintain/upgrade the existing workforce.

RESEARCH TASKS

LIST THE MAJOR TASKS TO ACCOMPLISH THE RESEARCH OBJECTIVES

1. Identify current areas of practice within MDOT and the technical expertise needed to meet current standards.
2. Perform a state-of-the-practice review to identify emerging technologies relevant to the DOT infrastructure.
3. Identify where technical expertise is needed to fulfill the needs previously identified and evaluate if adjustments to the current MDOT structure are recommended.
4. Develop recruitment and training materials to maintain and upgrade the existing and proposed workforce.

TIMELINE

ENTER START DATE: 11/5/2018 ENTER END DATE: 5/30/2020

BUDGET

FROM THE WORKSHEET ON PAGE 3, ENTER THE FOLLOWING: 1.) VENDOR COSTS; 2.) PM/MDOT COSTS; 3.) TOTAL BUDGET

1.) VENDOR COSTS	2.) PM/MDOT COSTS	3.) TOTAL BUDGET
$ 315,000	$ 25,000	$ 340,000

DELIVERABLES

IN 50 WORDS OR LESS, LIST THE DELIVERABLES YOU WOULD RECEIVE AT THE END OF THIS PROJECT. CONSIDER DELIVERABLES SUCH AS 1) DESIGN METHOD, 2) TRAINING, 3) MANUAL OF PRACTICE, 4) PROCEDURE, 5) SPECIFICATION, 6) SOFTWARE AND 7) EQUIPMENT.

1. State of the practice review for transformative technologies
2. Recommendation for ideal core competencies and organizational structure.

3. Implementation strategy/plan.
4. Training Materials for current and future workforce.
5. Recruitment strategies for acquisition of necessary workforce.

IN 100 WORDS OR LESS, EXPLAIN MDOT INVOLVEMENT'S WITH DATA AND SERVICES.

MDOT will be crucial in assisting with the identification of current state if the practice.

IMPLEMENTATION

DESCRIBE HOW THIS PROJECT WILL BE IMPLEMENTED AT MDOT

Based on the results of this research MDOT would work to establish a potential realignment of structure to support MDOT's goals of delivering cutting edge systems and services.

EXPLAIN THE EXPECTED BENEFITS/RESULTS FROM THE IMPLEMENTATION OF THIS PROJECT AND POTENTIAL USERS

To position staff in a way to sooner adapt to emerging technologies and be better suited to effectively deliver a better product for our customers.

LITERATURE RESEARCH

SELECT A STATEMENT BELOW REGARDING YOUR REVIEW OF THE LITERATURE AND ADD A NOTE IF RESEARCH IS COMPLEMENTARY:

PROPOSED RESEARCH IS UNIQUE.

NOTE:

POTENTIAL OBSTACLES

IN 25 WORDS OR LESS, WHAT RISKS OR OBSTACLES MAY MAKE CARRYING OUT THIS PROJECT DIFFICULT? WHAT STRATEGIES WILL YOU USE TO OVERCOME THEM?

OBSTACLES	STRATEGIES
❖ Implementation of actionable plan.	❖ Demonstrate how transformational technologies require an agile workforce to take full advantage of the benefits available.

INVESTIGATOR(S)

DESIRED QUALIFICATIONS FOR RESEARCH TEAM:

Background of ITS analytical studies and MDOT ITS design within the past 5 years.

SELECT THE REQUIRED STATISTICAL QUALIFICATIONS IN AN INVESTIGATOR(S) AND TEAM BELOW:

There is no statistical qualification requirement for this proposal.

PRINCIPAL INVESTIGATOR'S NAME: TO BE DETERMINED THROUGH SOLICITATION

ORGANIZATION: TO BE DETERMINED THROUGH SOLICITATION

SEE WORKSHEET ON FOLLOWING PAGES FOR ADDITIONAL INFORMATION AND NOTES

RESEARCH ADMINISTRATION
PROBLEM STATEMENT
WORKSHEET

ESTIMATED PERSON HOURS FOR RESEARCH TASKS

FOR THE RESEARCH TASKS ON PAGE 1, PLEASE LIST THE ESTIMATED PERSON HOURS BELOW:

1.) 480
2.) 720
3.) 840
4.) 360

TOTAL ESTIMATED PERSON HOURS 2,400

ESTIMATED BUDGET

USE THE FOLLOWING EQUATIONS FOR ESTIMATING PROJECT COSTS.
(HOURLY RATES AND PERCENTAGES SHOWN FOR EXAMPLE ONLY.)

1.) CALCULATE VENDOR DIRECT LABOR WITH THIS EQUATION

Estimated Person Hours are the Labor Hours

Direct Labor: Labor Hours x Average pay rate
Example: Direct Labor = 2000 hrs x $45/hr = $90,000.00
Direct Labor: 2400 X $73= $175,200

2.) CALCULATE TOTAL VENDOR COST

REQUIRED COSTS
DIRECT LABOR= $ 175200 152
FRINGE BENEFITS= $ 17520
TRAVEL= $ 3504
SUPPLIES= $ 3504
OTHER EXPENSES= $ 3504
INDIRECT= $ 111,777.6

Total Vendor Cost: Enter DIRECT LABOR Cost+ Enter FRINGE BENEFITS Cost+ Enter TRAVEL Costs+ Enter SUPPLIES Cost+ Enter OTHER EXPENSES Cost+ Enter INDIRECT Cost=$ 315,009.6
This is your TOTAL VENDOR COST.
Note: Fill this in on the Vendor Cost section under ESTIMATED BUDGET.

With what accuracy have the vendor costs been estimated? +/- 10%

3.) Use MDOT PM BUDGET WORKSHEET to calculate your PM costs.
Enter PM Costs and any notes or calculations. $ 25,000
Fill this total in on the PM/MDOT Costs section under ESTIMATED BUDGET

4.) Enter GRAND TOTAL for 2 and 3. $ 340,000
Fill this total in on the TOTAL BUDGET section under ESTIMATED BUDGET

ANNUAL FINANCIAL BUDGET BREAKDOWN

FY1 $226,666.66	FY2 $113,333.33	FY3 $FY3 BUDGET	FY4 $FY4 BUDGET

METHOD OF PAYMENT

SELECT METHOD OF PAYMENT BELOW
LOADED HOURLY RATE

INVESTIGATOR(S)

NAMES OF POSSIBLE INVESTIGATORS: Enter names of potential vendors

SELECT RECOMMENDED REQUEST FOR PROPOSAL SOLICITATION: CONSULTANTS AND UNIVERSITIES NATIONWIDE

STAKEHOLDERS

SELECT THE PROJECT'S IMPLICATIONS:
MICHIGAN ONLY

LIST ANY OTHER STATE, REGIONAL OR NATIONAL AGENCIES AND OTHER GROUPS MAY HAVE AN INTEREST IN SUPPORTING THIS STUDY

DO NOT WRITE BELOW THIS LINE

FOCUS AREA MANAGER APPROVAL*	ENGINEER OF RESEARCH APPROVAL*
Select Method of Approval Enter Date of Approval	Select Method of Approval Enter Date of Approval
RESEARCH ADVISORY COMMITTEE CHAIR APPROVAL*	**RESEARCH EXECUTIVE COMMITTEE CHAIR APPROVAL***
Select Method of Approval Enter Date of Approval	Select Method of Approval Enter Date of Approval

*Records of approval are saved in project file.

MDOT employees with questions should contact:
Carol Aldrich, Administrator, Research Administration
Phone: 517-636-7777, Fax: 517-322-1262, aldrichc@michigan.gov
Or review the Research and Implementation Manual

RESEARCH ADMINISTRATION
PROBLEM STATEMENT
MDOT Research Project

PROPOSED RESEARCH PROJECT TITLE Evaluating Differential and Non-Differential Freeway Truck and Bus Speed Limits	
OR NUMBER or TPF STUDY NUMBER OR13-009	MDOT PROJECT CATEGORY & STRATEGIC PRIORITY NO. Mobility, Systems & Signal Operations N/A N/A N/A

PROJECT MANAGER OR PROBLEM STATEMENT AUTHOR

PROBLEM STATEMENT AUTHOR Jason Firman	DATE 2/22/2013
TELEPHONE NO. 517.636.4547	E-MAIL ADDRESS firmanj@michigan.gov
BUREAU/REGION/OFFICE/SECTION/UNIT Highway Field Services/Operations Field Services/Maintenance & Systems Operations/Systems Operations/Congestion and Mobility	PROJECT MANAGER'S NAME (IF DIFFERENT THAN PROBLEM STATEMENT AUTHOR)

PROBLEM TO ADDRESS

IN 200 WORDS OR LESS, BRIEFLY DESCRIBE THE PROBLEM TO BE ADDRESSED AND WHY IT IS AN ISSUE FOR MDOT

Michigan presently requires lower truck and bus speed limits on freeways with passenger car speed limits that are 65 mph or 70 mph. The purpose of the research is to determine the impacts of raising freeway truck and bus speed limits from the present 60 mph to 65 mph or 70 mph.

Michigan is one of only a handful of states that have a differential speed limit for passenger vehicles, trucks and buses; Many states have implemented different strategies to setting speed limits making it difficult to determine the effects of these strategies. An analysis shall be performed on whether there is a safety effect on having differential speed limits on freeways. This should include but not limited to frequency and rates for;

- total crash, truck crashes and bus crashes
- total fatalities and serious injuries, truck fatalities and serious injuries and bus fatalities and serious injuries

The analysis should be done on Michigan data and that of other states with and without a speed limit differential. This analysis needs to account for vehicle, truck and bus miles traveled. Emphasis should be made to states with similar weather and driving conditions.

The second part is to evaluate vehicle interactions with trucks and buses for states with and without a speed limit differential. What is the 85 percentile speeds of passenger vehicles, trucks and buses for various speed limits?

The third part is to determine what the economic impacts are for raising or maintaining the existing 60 mph truck speed limit on the State of Michigan and the commercial vehicle operators. The cost benefit analysis needs to include long term infrastructure impacts required to accommodate an increase in truck speed, safety impacts, and economic benefits to the trucking industry. Long term infrastructure impacts includes but are not limited to impacts on pavement conditions by raising the truck speeds.

RESEARCH OBJECTIVES

IN 25 WORDS OR LESS, LIST THE RESEARCH OBJECTIVES TO BE ACCOMPLISHED

1. Determine what safety and speed impacts could occur if Michigan truck and bus speed limits on freeways were increased to 65 mph or 70 mph.
2. Determine the safety and speed impacts that did occur in other states that increased their freeway speed limits including truck and bus speed limits.
3. Determine the safety and speed impacts of states including Michigan that only increased passenger vehicles leaving a speed differential with trucks and buses.
4. Determine the economic impacts to the state and the trucking industry that could occur if Michigan truck speed limits on freeways were increased to 65 mph or 70 mph.

RESEARCH TASKS

LIST THE MAJOR TASKS TO ACCOMPLISH THE RESEARCH OBJECTIVES

1. Literature review includes what speed limits are used for passenger vehicles, trucks and buses on freeways. The primary focus of the literature review will be safety impacts and a secondary focus will be long term infrastructure impacts, air quality, and greenhouse gas emissions and economic impacts.

2. Compile and report before and after safety impacts when other states increased freeway speed limits for trucks and buses.
3. Compile and report before and after effect of h ow passenger vehicle, truck and bus speeds change when speed limits were increased on freeways for passenger vehicles, trucks and buses and just for passenger vehicles.
4. Conduct a cost benefit analysis for long term infrastructure impacts including but not limited to infrastructure condition, safety impacts, greenhouse gas emissions, air quality impacts, and economic benefits to the trucking industry required to accommodate an increase in truck speed. For this task, infrastructure impact, greenhouse gas emission, air quality impacts and economic benefits to the trucking industry required to accommodate an increase in truck speed. For this task, infrastructure impact, greenhouse gas emission, and air quality impact factors should be based on findings of the literature review. Compile and report the findings of the analysis.
5. Final report presentation to MDOT leadership on findings.
6. Publish final report.

ESTIMATED TIMELINE

ENTER START DATE: 2/26/2013 ENTER END DATE: 5/1/2014

ESTIMATED BUDGET

FROM THE WORKSHEET ON PAGE 3, ENTER THE FOLLOWING: 1.) VENDOR COSTS; 2.) PM/MDOT COSTS; 3.) TOTAL BUDGET

1.) VENDOR COSTS	2.) PM/MDOT COSTS	3.) TOTAL BUDGET
$ 177,000	$ 10,500	$ 187,500

DELIVERABLES

IN 50 WORDS OR LESS, LIST THE DELIVERABLES YOU WOULD RECEIVE AT THE END OF THIS PROJECT. CONSIDER DELIVERABLES SUCH AS 1) DESIGN METHOD, 2) TRAINING, 3) MANUAL OF PRACTICE, 4) PROCEDURE, 5) SPECIFICATION, 6) SOFTWARE AND 7) EQUIPMENT.

Final report will provide usable data to recommend if Michigan truck and bus speed limits should be increased to 65 mph or 70 mph and what would be the expected outcomes if this change is made.

IN 100 WORDS OR LESS, EXPLAIN MDOT INVOLVEMENT'S WITH DATA AND SERVICES.

Provide crash and speed data on MDOT freeways.

IMPLEMENTATION

DESCRIBE HOW THIS PROJECT WILL BE IMPLEMENTED AT MDOT

This will assist MDOT in recommending whether a truck and bus speed limit increase should be made on freeways posted 70 mph.

EXPLAIN THE EXPECTED BENEFITS/RESULTS FROM THE IMPLEMENTATION OF THIS PROJECT AND POTENTIAL USERS

This will allow MDOT to determine th safest and most prudent truck and bus speed limit that should be set on MDOT freeways posted 70 mph.

LITERATURE RESEARCH

SELECT A STATEMENT BELOW REGARDING YOUR REVIEW OF THE LITERATURE AND ADD A NOTE IF RESEARCH IS COMPLEMENTARY:

PROPOSED RESEARCH IS COMPLEMENTARY TO EXISTING RESEARCH.

NOTE:

POTENTIAL OBSTACLES

IN 25 WORDS OR LESS, WHAT RISKS OR OBSTACLES MAY MAKE CARRYING OUT THIS PROJECT DIFFICULT? WHAT STRATEGIES WILL YOU USE TO OVERCOME THEM?

OBSTACLES	STRATEGIES
❖ Gathering useful information from other states.	❖ Strategies should be 25 words or less. Press enter for additional entries.

INVESTIGATOR(S)

DESIRED QUALIFICATIONS FOR RESEARCH TEAM:

The proposed team should have extensive experience to Traffic & Safety research.

SELECT THE REQUIRED STATISTICAL QUALIFICATIONS IN AN INVESTIGATOR(S) AND TEAM BELOW:

At Least One (1) college series of statistics courses and working experience in statistical analyses

PRINCIPAL INVESTIGATOR'S NAME: Dr. Timothy Gates

ORGANIZATION: Wayne State University

SEE WORKSHEET ON FOLLOWING PAGES FOR ADDITIONAL INFORMATION AND NOTES

RESEARCH ADMINISTRATION
PROBLEM STATEMENT
WORKSHEET

ESTIMATED PERSON HOURS FOR RESEARCH TASKS

FOR THE RESEARCH TASKS ON PAGE 1, PLEASE LIST THE ESTIMATED PERSON HOURS BELOW:

1.) Task #1 – 300 hours
2.) Task #2 – 300 hours
3.) Task #3 – 1230 hours
4.) Task #4 – 840 hours
5.) Task #5 – 30 hours
6.) Task # 6 – 300 hours

TOTAL ESTIMATED PERSON HOURS 3000

ESTIMATED BUDGET

USE THE FOLLOWING EQUATIONS FOR ESTIMATING PROJECT COSTS.
(HOURLY RATES AND PERCENTAGES SHOWN FOR EXAMPLE ONLY.)

1.) CALCULATE VENDOR DIRECT LABOR WITH THIS EQUATION

Estimated Person Hours are the Labor Hours

Direct Labor: Labor Hours x Average pay rate
Example: Direct Labor = 2000 hrs x $45/hr = $90,000.00
Direct Labor: 3000 X $30= $90,000

2.) CALCULATE TOTAL VENDOR COST

REQUIRED COSTS
DIRECT LABOR= $ 90,000
FRINGE BENEFITS= $ 9,000
TRAVEL= $ 1,800
SUPPLIES= $ 4,500
OTHER EXPENSES= $ 13,500
INDIRECT= $ 57,900

Total Vendor Cost: $90,000 + $9,000 + $1,800 + $4,500 + $13,500 + $57,900 =$ 176,700 ($177,000)
This is your TOTAL VENDOR COST.
Note: Fill this in on the Vendor Cost section under ESTIMATED BUDGET.

3.) Use MDOT PM BUDGET WORKSHEET to calculate your PM costs.
Enter PM Costs and any notes or calculations. $ 10,500
Fill this total in on the PM/MDOT Costs section under ESTIMATED BUDGET

4.) Enter GRAND TOTAL for 2 and 3. $ 187,500
Fill this total in on the TOTAL BUDGET section under ESTIMATED BUDGET

ANNUAL FINANCIAL BUDGET BREAKDOWN

FY1 $93,750	FY2 $93,750	FY3 $FY3 BUDGET	FY4 $FY4 BUDGET

METHOD OF PAYMENT

SELECT METHOD OF PAYMENT BELOW
ACTUAL COSTS (UNIVERSITY CONTRACTS)

INVESTIGATOR(S)

NAMES OF POSSIBLE INVESTIGATORS: WSU, WMU, MTU and MSU

SELECT RECOMMENDED REQUEST FOR PROPOSAL SOLICITATION: MICHIGAN UNIVERSITIES ONLY

STAKEHOLDERS

SELECT THE PROJECT'S IMPLICATIONS:
NATIONAL

LIST ANY OTHER STATE, REGIONAL OR NATIONAL AGENCIES AND OTHER GROUPS MAY HAVE AN INTEREST IN SUPPORTING THIS STUDY
N/A

DO NOT WRITE BELOW THIS LINE

FOCUS AREA MANAGER APPROVAL*	ENGINEER OF RESEARCH APPROVAL*
EMAIL 5/10/2013	MEETING NOTES 6/12/2013
RESEARCH ADVISORY COMMITTEE CHAIR APPROVAL*	**RESEARCH EXECUTIVE COMMITTEE CHAIR APPROVAL***
MEETING NOTES 6/17/2013	CONVERSATION RECORD 7/24/2013

*Records of approval are saved in project file.

MDOT employees with questions should contact:
Carol Aldrich, P.E., Administrator, Research Administration
Phone: 517-636-7777, Fax: 517-322-1262, aldricha@michigan.gov
Or review the Research and Implementation Manual

Michigan Department
Of Transportation
5302

RESEARCH ADMINISTRATION
PARTICIPATING STATE POOLED FUND SUMMARY & FUNDING REQUEST

STUDY START DATE	STUDY END DATE	MDOT START DATE	MDOT END DATE
10/1/2009	9/30/2013	10/1/2009	9/30/2013

STUDY TITLE
Validation and Implementation of Hot-Poured Crack Sealant

LEAD AGENCY	TPF STUDY NUMBER
Virginia Department of Transportation	TPF-5(225)

LEAD AGENCY CONTACT NAME
Kevin McGhee,

MDOT TECHNICAL ADVISOR
Andy Bennett

BUDGET INFORMATION

TOTAL BUDGET (BY FY)	FY1	FY2	FY3	FY4	FY5
$100,000.00	$25,000.00	$25,000.00	$25,000.00	$25,000.00	

PROBLEM TO ADDRESS

Round robin tests at five to seven various laboratories will be conducted. As an outcome of the TPF-5(045) study preliminary threshold(s) for each test were established based on extensive laboratory testing and limited field data. Therefore, a comprehensive field study is urgently needed to validate and to fine-tune the threshold values.

OBJECTIVES

Eight test sections in various climatic regions (dry-freeze, dry-non-freeze, wet-freeze and wet-non-freeze) will be included in the study. Representative crack sealants will be installed in these field sections and monitored for three years. At least five field surveys will be conducted. The field surveys will include sealant inspection and data and sample collection. Collected samples will be used to validate the laboratory tests and the proposed parameter threshold values

TASKS

Task I : Laboratory Validation
Conduct round robin testing to establish test precision and bias for the recently developed six tests.
Develop training program that includes detailed testing procedures.
Task II: Field Validation
Construct eight test sections in the four environmental regions (Wet-Freeze, Wet-Non-freeze, Dry-Freeze, Dry-Non-freeze).
Install two sealant types at each test section.
Task III: Monitoring Test Section for Four Years
Conduct field inspection of crack sealant five times during the project duration. Collect sealant samples annually from the test sections to measure their theological properties and identify any changes. Monitor crack movement and temperature variation to provide insight into the selection of the current temperature shift used in the proposed guidelines.
Task IV: Threshold Value Fine-Tuning
Use field performance to fine-tune the testing parameter thresholds in the proposed guidelines.
Task V: Quantify the Cost Effectiveness of Utilizing Crack Sealants
Measure pavement condition annually, in accordance with SHRP Distress Manual, to examine the cost effectiveness of crack sealant.

PAYOFF POTENTIAL AND IMPLEMENTATION

How will MDOT be able to implement results from study?
Possible Implementation: Based on the field validation study at various test sites, performance thresholds will be updated for the laboratory tests designed for sealant grading. These thresholds were initially determined based on limited field data. The finalized grade system can be used by the states on the selection of sealants in their climatic region. Sealant field installation guidelines will also be available at the end of this project for the use of states.

PRODUCTS/DELIVERABLES

IS OUT OF STATE TRAVEL REQUIRED?	IF SO, WILL SPR, PART II FUNDS COVER TRAVEL EXPENSES?
☐ YES ☒ NO	☐ YES ☐ NO

OTHER CONSIDERATIONS AS APPLICABLE (WILL STATE FUNDS BE REQUIRED?).

DO NOT WRITE BELOW THIS LINE

FOCUS AREA MANAGER APPROVAL*	DATE
☐ EMAIL ☐ CONVERSATION RECORD ☐ MEETING NOTES	

RESEARCH ADVISORY COMMITTEE CHAIR APPROVAL* ☐ EMAIL ☐ CONVERSATION RECORD ☐MEETING NOTES	DATE
COO OR CAO APPROVAL* ☐ EMAIL ☐ CONVERSATION RECORD ☐ MEETING NOTES	DATE
RESEARCH MANAGER SIGNATURE	DATE
ENGINEER OF RESEARCH SIGNATURE	DATE

*Records of approvals are saved in project file

Research Project Spotlight Template

Principal Investigators – Research Spotlights are a required portion of the final report. Please fill out this form with the requested information and adhere to the word count. Click in the space to enter the requested information. Once completed, please send to your assigned Project Manager for their approval, along with the draft final report.

Research Project Information

Report Name: Click here to enter text.

Start Date: Click here to enter a date.

Report Date: Click here to enter a date.

Research Report Number: Click here to enter text.

Total Cost: Click here to enter text.

****

Title/Tagline- Please describe the project results in layman's terms using 10 words or less.

Title/Tagline: Click here to enter text.

Synopsis – Please explain in 100 words or less the context of the problem, a simple description of the research and how the results are being used in layman's terms.

Synopsis: Click here to enter text.

Problem – Please describe using 100 words or less the logical overview of how the problem came about in layman terms.

Problem: Click here to enter text.

Research – In 150-200 words, please provide a broad understanding of the method of research and at least two key findings resulting from it in layman's terms.

Research: Click here to enter text.

Results – Using 275-300 words, please explain in plain language the results of the research study as it relates to the end users at MDOT.

Results*:* Click here to enter text.

Value: Using 75-100 words, please explain the value of this research to the end users at MDOT.

Value: Click here to enter text.

Research Project Spotlight Template

Please include 2-3 pictures related to the project data collection, problem, or solution. Use a JPG file extension. Be sure to include a one sentence caption.

Principal Investigator

Name: Click here to enter text.

University/Contracting Agency: Click here to enter text.

Address: Click here to enter text.

PI's Email: Click here to enter text.

PI's Phone Number: Click here to enter text.

MDOT Project Manager

Name: Click here to enter text.

Title: Click here to enter text.

Research Project Spotlight Template

Division/Section: Click here to enter text.

Work Address: Click here to enter text.

Work Email: Click here to enter text.

Work Phone: Click here to enter text.

PM Quote: Click here to enter text.

Request a quote from the Project Manager that describes the value of the research project.

PM Picture

Request a photo from the Project Manager with a JPG file extension.

Research Manager and Project Manager Responsibilities
Project Administration and Management

Both the research manager and project manager are essential to the success of a research project. The project manager is the subject area expert and is responsible for managing the research project. The research manager is the research administration staff person that assists the project manager with administrative matters and helps facilitate project progress for a successful outcome. The roles of both the project manager and research manager are further defined in the following table:

Project Phase	**Research Managers (RM) Role**
Problem Statement Development	-Initiate a literature search. -Discuss literature search results with the PM and discuss any impacts on the project merits, cost, scope or schedule. -Assist the Project Manager (PM) with selecting RAP membership. -Assist the PM with development of a project cost, scope, schedule and deliverables. -Review problem statements authored by the PM for completeness. -Review scope; confirm SPR Part II funding eligibility and recommend necessary scope modifications if necessary. -Review traffic control needs and associated costs. -Assess the statistical need for the project. -Assist the PM in determining the solicitation method.
Contracting	-Work with the project analyst to initiate project advertisement (Request for Proposals) -Conduct scoring training for the project selection team. -Facilitate the scoring meetings. -Compile scoring meeting results for Central Selection Review Team review. -Notify the Principal Investigator (successful proposer) of project award. -Request work plan from the Principal Investigator (PI). -Review the work plan for compliance with MDOT requirements. -Facilitate subcontract review and submittal process. -Verify that subcontracts are in place. -Set up debriefing meetings with unsuccessful proposers on request.
Execution	-Record minutes and/or action items at the kickoff meeting. -Schedule subsequent project meetings in coordination with the PM. -Ensure that all project meetings have documented minutes and/ or action items. Coordinate this responsibility with the PM to ensure completion of the task. Ensure that administrative issues are addressed at project meetings. -Ensure that invoices, quarterly reports and annual reports are received in a timely manner. -Reviews invoices, quarterly reports and annual reports after PM reviews are complete. -Work with PM to process changes to cost, scope and schedule.
Project Closeout	-Ensure that the project deliverables reminder email is sent to the PM. -Facilitate the process of implementation planning with the PM and RAP.

Research Manager and Project Manager Responsibilities
Project Administration and Management

Project Phase	Project Managers (PM) Role
Problem Statement Development	-Facilitate/lead the research idea work session at the Research Summit. -Develop the problem statement in collaboration with the RAP panel members and other research stakeholders. -Recommend research advisory panel (RAP) members for Focus Area Manager approval. Utilize the Research Advisory Panel Nomination Form (5314). -Identify and confirm necessary MDOT resource and data availability prior to project advertisement. -Determine project cost, scope, schedule and deliverables. -Identify traffic control needs and associated costs. -Recommend the solicitation method.
Contracting	-Receive scoring training as needed. -Review past performance of each proposer. -Chair the proposal scoring meeting. -Respond to proposers formally submitted questions. -Review the work plan of the successful proposer for completeness. -Complete the Request for New Project Authorization form (5301).
Execution	-Schedule the project kick-off meeting. -Copy RM on all communications between the PI and PM. -Schedule and organize all project meetings subsequent to kick-off meeting. - Ensure that all project meetings have documented minutes and/ or action items. Coordinate this responsibility with the RM to ensure completion of the task. -Obtain approval to conduct any fieldwork in State right-of-way. Permits are required. -Contact the PI to communicate technical project issues, meeting dates and deliverable deadlines. -Reviews quarterly reports; writes, completes and submits the annual report; reviews invoices. -Works with PI and RAP to manage technical aspects including follow-up on assigned action items to insure the project stays on time, on budget and in scope. -Recommend changes in cost, scope and schedule. Submit changes on the Project Change Request form (5306) along with necessary supporting documentation.
Project Closeout	-Develop implementation plan. -Identify an implementation coordinator. -Review final report and deliverables. -Complete the project evaluation form.

Approximate Project Management Hours for Research Project

APPENDIX 3.1b

Effort for each Project Manager per project (average 2.5 years):

4 Quarterly Meetings	• 2-4 hours each = 12 hours
Periodic Check in Meetings	• 6 -30 hours
Payment Approvals	• Average 8 per year = 4 hours
Annual Report Update	• 1 hour
Review of Draft Report	• 6-10 hours
Final Report and Close out of project	• 4-8 hours
Total =	• hours

Michigan Department
Of Transportation
5301 (04/12)

Research Administration
Request for New Project Authorization or Contract

PROJECT TITLE			
VENDOR/UNIVERSITY			
PRINCIPAL INVESTIGATOR'S NAME	EMAIL	PHONE NO.	FAX NO.
MDOT PROJECT MANAGER'S NAME	MAIL CODE	PHONE NO.	FAX NO.
RESEARCH MANAGER	MAIL CODE	PHONE NO.	FAX NO.

START DATE	ENDING DATE	WORK DURATION IN MONTHS	

TOTAL PROJECT COST	
AMOUNT TO BE SPENT BETWEEN 10/1/__ & 9/30/__	AMOUNT TO BE SPENT BETWEEN 10/1/__ & 9/30/__
AMOUNT TO BE SPENT BETWEEN 10/1/__ & 9/30/__	AMOUNT TO BE SPENT BETWEEN 10/1/__ & 9/30/__

Proposal Received – Verify the Following:

Personnel – all labor reported as % of effort (none included in direct expenses)
Sub consultants have submitted a derivation of cost (Sub contract will be required if greater than $25,000)
Special Equipment
- Verified equipment is necessary for the project
- Verified equipment is dedicated to the use of this project
- Verified equipment is prorated for the life of this project

Provide breakdown of direct expenses over $2,000. This includes but is not limited to: Lab supplies, Travel expenses, Phone, Fax, Copying, etc.
Proposed budget is broken down by MDOT fiscal year.

MDOT should be able to determine how expenses were developed from the breakdown provided (ex: Mail-250 letters @ $9/letter)
Please send and Email this completed form along with the proposal (work plan and budget) to Research Administration

PROJECT MANAGER'S SIGNATURE		DATE
ENGINEER OF RESEARCH	RESEARCH MANAGER INITIALS	DATE

FOR RESEARCH STAFF USE:

RESEARCH NO.	JOB NO.	PHASE NO.	PCA CODE	INDEX CODE	OBJECT CODE

Clear Form

Michigan Department
Of Transportation
5185 (09/13)

Contract Services Division

ACCEPTANCE OF PRICED PROPOSAL & AUTHORIZATION FOR UNIVERSITY TO PROCEED

FORM USE: *University Research*
COPY OF THIS SHEET ONLY: *Office of Commission Audits, Engineer of Research Administration*
FULL COPY: *MDOT Project Manager, University, Research Analyst (if applicable)*

CONTRACT NO.	AUTHORIZATION & REVISION NO.	IDS CONTRACT EFFECTIVE DATE	IDS CONTRACT EXPIRATION DATE

AUTHORIZED UNIVERSITY AND ADDRESS	UNIVERSITY ADMINISTRATOR
	ADDRESS MAIL TO THIS PERSON
	PHONE NO. / FAX NO.
	E-MAIL ADDRESS

PRINCIPLE INVESTIGATOR	ASSOCIATE RESEARCHERS
MDOT PROJECT MANAGER	REGION/TSC / MAIL CODE
PHONE NO. / FAX NO.	EMAIL ADDRESS

SERVICE DESCRIPTION & LOCATION / Page(s) (1 to_____)

RESEARCH NO.	CS NO.	JOB NO.	% FEDERAL %	PCA CODE	INDEX CODE	REPORTING

INVOICING LIMITATION
The University may only invoice up to 85% of the total authorization amount prior to the submission and subsequent approval of the final deliverables.

On December 1 each year, all prior fiscal year funds will be released from existing obligation. If invoices are submitted on or after November 15 for prior fiscal year work, payment will be delayed

MDOT PAYMENTS AREA TO SEND UNIVERSITY INVOICES

- ☐ Office of Research Administration (Research Admin. Assistant)
- ☐ Contract Services Division – Contract Support Unit
- ☐ Bureau of Transportation Planning

AUTHORIZATION EFFECTIVE DATE (START DATE)	AUTHORIZATION EXPIRATION DATE

COMMENTS

SUMMARY OF COST

FUNDING	FY JN	FY JN	FY JN	AMOUNT
University Share				
MDOT Funding				
Federal Funding				
Totals				
AUTHORIZATION AMOUNT				
Basis of Payment is:		TOTAL AUTHORIZED TO DATE		

UNIVERSITY ADMINISTRATOR	DATE SIGNED
MDOT CONTRACT ADMINISTRATOR	DATE REVIEWED
MDOT AUTHORIZATION BY	DATE EXECUTED

Reset Form

Michigan Department of Transportation 5100D (10/18)

APPENDIX 3.4

REQUEST FOR PROPOSAL COVER SHEET

Reset Form

PROJECT INFORMATION		
MDOT PROJECT MANAGER	JOB NUMBER	CONTROL SECTION (CS)
RFP DUE DATE	DBE % GOAL (If applicable)	MDOT REQUISITION NUMBER

PRIME CONSULTANT INFORMATION

PRIME FIRM NAME

ADDRESS

CITY	STATE	ZIP CODE
PHONE NO.	FAX NO.	
CONTACT PERSON	EMAIL	

☐ INDIVIDUAL OR SOLE PROPRIETORSHIP ☐ CORPORATION ☐ PARTNERSHIP

LICENSED TO OPERATE IN THE STATE OF MICHIGAN? (License required to contract with MDOT.) ☐ YES ☐ NO	CERTIFIED AS A DBE IN MICHIGAN? ☐ YES ☐ NO	DBE % OF SERVICE GOAL:

LIST APPLICABLE SERVICE PREQUALIFICATIONS AS LISTED IN RFP, (P) PRIMARY OR (S) SECONDARY, AND (DBE) IF DBE CERTIFIED:

eg. Roads and Streets (P) (DBE)	

Add SubConsultant

SUBCONSULTANT INFORMATION

SUBCONSULTANT FIRM NAME

ADDRESS

CITY	STATE	ZIP CODE
PHONE NO.	FAX NO.	
CONTACT PERSON	EMAIL	

☐ INDIVIDUAL OR SOLE PROPRIETORSHIP ☐ CORPORATION ☐ PARTNERSHIP

LICENSED TO OPERATE IN THE STATE OF MICHIGAN? (License required to contract with MDOT.) ☐ YES ☐ NO	CERTIFIED AS A DBE IN MICHIGAN? ☐ YES ☐ NO	DBE % OF SERVICE GOAL:

LIST APPLICABLE SERVICE PREQUALIFICATIONS AS LISTED IN RFP, (P) PRIMARY OR (S) SECONDARY, AND (DBE) IF DBE CERTIFIED:

eg. Roads and Streets (P) (DBE)	
	Delete SubConsultant

CONFLICT OF INTEREST STATEMENT

_____ (Consultant) certifies that it has read and understands the following:

The CONSULTANT and its Affiliates agree not to have any public or private interest, and shall not acquire directly or indirectly any such interest in connection with the project, that would conflict or appear to conflict in any manner with the performance of the services under this Contract. "Affiliate" means a corporate entity linked in the CONSULTANT through common ownership. The CONSULTANT and its Affiliates agree not to provide any services to a construction contractor or any entity that may have an adversarial interest in a project for which it has provided services to the DEPARTMENT. The CONSULTANT and its Affiliates agree to disclosed to the DEPARTMENT all other interests that the prime or sub consultants have or contemplate having during each phase of the project. The phases of the project include, but are not limited to, planning, scoping, early preliminary engineering, design, and construction. In all situations, the Department will decide if a conflict of interest exists. If the CONSULTANT and its Affiliates choose to retain the interest constituting the conflict, the DEPARTMENT may terminate the Contract for cause in accordance with the provisions stated in this Contract.

☐ Certification for Subject Project. Based on the foregoing, the Consultant certifies that no conflict exists with the subject project for it, its Affiliates, and any sub-consultants.

☐ Disclose of Conflict with Subject Project. Based on the foregoing, the Consultant certifies that the following conflict exists with the subject project for it, its Affiliates, and/or any sub-consultants.

CERTIFICATION OF AVAILABILITY OF KEY PERSONNEL

It is the consultant's responsibility to notify MDOT of any changes to the availability of key staff listed on this form throughout the entire contracting process. Notification of Changes to Key Personnel may be noted on form 5100G.

_____ (Consultant) certifies that the following key personnel are available and have sufficient time to provide the services as outlined in the Request for Proposal for the life of the above project. The following is an estimate of the average number of hours per week that the Consultant anticipates the key staff identified in this proposal will devote to the project throughout the life of the project. For key staff performing tasks that will not be performed consistently throughout the life of the project (i.e. surveying, geotechnical, etc.), the hours listed below are the anticipated average number of hours that will be devoted while these tasks are performed.

Add Row	NAME	TITLE	AVERAGE NUMBER OF HOURS PER WEEK ON PROJECT (LEAVE BLANK FOR AS-NEEDED SERVICE)	PHONE NUMBER
Delete Row				
Delete Row				

PRIME CONSULTANT SIGNATURE (SIGNER MUST HAVE CONTRACTING AUTHORITY)	DATE

APPENDIX 3.5

Michigan Department
Of Transportation
5318 (09/12)

SCHEDULE OF RESEARCH ACTIVITIES

An O, R, or X is used to indicate a month with activity.	"O" = Original Schedule	REVISION DATE	TITLE
	"X" = Work Completed		
	"R" = Revised Schedule		

Research Activity		Estimated % of Total Project Budget	FY 20_____												FY20_____												FY20_____											
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep
Task 1																																						
Task 2																																						
Task 3																																						
Task 4																																						
Task 5																																						
Task 6																																						
Task 7																																						
Task 8																																						
Task 9																																						
Task 10																																						
Total (should = 100%)																																						

Clear Form

DELIVERABLES TABLE

APPENDIX 3.6

PROJECT TITLE

NOTE: Deliverables on this table are not considered received by MDOT until submitted to Research Administration. See MDOT's Research and Implementation Manual for standards for the final report. The Principal Investigator is responsible for submitting deliverables.

Products: Examples of products typically most appropriate as stand-alone items include guidebooks, training materials, devices, instruction manuals, and brochures.

Add Row	**No.** (P1, P2, Etc.)	**Stand-Alone Product Description**	**Due Date** (due at or before project termination)	**Comments**
Delete Row				

No.	**Report Description** (Succinctly describe intended contents of each report.)	**Due Date**	**Comments**
R1	Quarterly Reports - Comprehensive and Detailed documentation of all work tasks and results	The 15th of January, April, July, and October while the authorization or contract is active.	Must be submitted to Research Administration on the quarterly report form number 5305.
R2	Draft summary of work performed, findings and conclusions		A draft final report is due 90 days before the final report.
R3	Spotlight Template		Must be submitted by the end of the project.
R4			
R5			
Final Report	Summary of work performed, findings and conclusions		See MDOT's Research and Implementation Manual for standards and submittal requirements for the final report.

Date:

Clear Form

Clear Form

Michigan Department of Transportation
5100J (12/17)

CONSULTANT DATA AND SIGNATURE SHEET

Required with Non-Prequalified Services Proposal

			DATE
INDIVIDUAL / FIRM	ASSUMED NAME		FED. I.D. NO.

CERTIFICATION AFFIDAVIT

The undersigned affirms that all information provided on this form is true and correct and includes information necessary to identify and explain the operations of _____. I understand that by signing below, I have/will use the E-verify system to verify that new employees are legally present and authorized to work in the United States. I agree to supply/receive information electronically and agree to utilize MDOT's current digital signature software as the legal equivalent of my hand-written signature on all required transactions.

PRINT OR TYPE NAME, SAME AS SIGNATURE BELOW	TITLE	
PHONE NO.	EMAIL	
AUTHORIZED SIGNATURE		DATE
NOTARY SEAL	SUBSCRIBED AND SWORN TO BEFORE ME THIS Date of 20	
	SIGNED	

Notary Public in and for the

NAME OF CORPORATION		
ADDRESS		
CITY	STATE	ZIP CODE
STATE IN WHICH INCORPORATED		

Has this company, its parents, subsidiary, principals, or any owner, officer, partner, or employee on the company ever been suspended or debarred from doing business by any State or the Federal government?

☐ No ☐ Yes If yes, please provide a detailed explanation below:

Please provide names of company principals below:

FULL NAME (Please print or type)

PERSONS AUTHORIZED TO EXECUTE CONTRACTS

All partners must sign contracts, unless a power of attorney modifying this is supplied. In case of a corporation, only those signatures listed below will be accepted. The following persons are duly authorized to sign contracts and related documents on behalf of _____.

NOTE: Beginning January 1, 2018, MDOT will execute all consultant contracts digitally. All persons authorized to execute contracts must be assigned an MDOT digital certificate. Please visit www.Michigan.gov/MDOT-eSign for more information and to apply for a MDOT digital signature user account.

NAME (Print or type – same as corresponding signature)	AUTHORIZED SIGNATURE	DATE

CERTIFICATE OF SECRETARY **

The undersigned, being the duly elected secretary of _____

a _____ corporation, hereby certifies that the following resolution was duly adopted by the Board of Directors of said corporation at a meeting held on _____, and that this resolution is in full force and effect.

“RESOLVED, that the following listed persons are hereby authorized to sign, for _____ any contract with the State of Michigan or other governmental entity.”

SIGNATURE OF SECRETARY	DATE

** NOTE: Only CORPORATIONS are required to complete the Certificate of Secretary listed above.

Michigan Department of Transportation 5319 (12/18)

RESEARCH PROPOSAL BUDGET FORM WORKSHEET

PROJECT TITLE	RESEARCH ORGANIZATION	DATE

SALARIES & WAGES – MUST COMPLY WITH 2 CFR 200 Specify number of hours to be worked and hourly rate for each individual below. Examples of role of individual are Principle Investigator, Technician, Grad Student, etc.

									FY1	FY2	FY3	FY4	TOTAL
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
NAME OF INDIVIDUAL									ROLE OF INDIVIDUAL				
Enter FY	FY1 rate	FY1 hrs	FY2 rate	FY2 hrs	FY3 rate	FY3 hrs	FY4 rate	FY4 hrs					
Rate & Hrs													
						SUB-TOTAL SALARY & WAGES							

FRINGE BENEFITS – MUST COMPLY WITH 2 CFR 200. Indicate employee, appropriate negotiated rate for each and description of who the rate applies to. (e.g. – Sam Smith, 25%, Summer Faculty. This rate is negotiated between the university and it's cognizant agency

									FY1	FY2	FY3	FY4	TOTAL
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
NAME OF INDIVIDUAL									RATE DESCRIPTION				
(% rate, enter as a decimal)	FY1		FY2		FY3		FY4						
								SUB-TOTAL FRINGE BENEFITS					

SUBCONTRACTOR – MUST COMPLY WITH 2 CFR 200. A copy of the subcontractor's budget must be attached. An MDOT approved subcontract is required for subcontractor costs in excess of $25,000 prior to payment of invoices that contain subcontractor work. List all subcontractors on a separate line.

SUBCONTRACTOR NAME & AMOUNT					
SUBCONTRACTOR NAME & AMOUNT					
SUB-TOTAL SUBCONTRACTOR					

TRAVEL – MUST COMPLY WITH 2 CFR 200. Must be in accordance with IDS contract requirements.

	FY1	FY2	FY3	FY4	TOTALS
In-State Travel (Destinations within Michigan) Provide destination, purpose, total mileage, total # of days, total # of meals, Total # trips, name of individual(s) traveling					
Out-of-State Travel (Prior approval required) Provide destination purpose, total mileage, total # of days, total # of meals, total # trips, name of individual(s) traveling.					
SUB-TOTAL TRAVEL					

SUPPLIES – MUST COMPLY WITH 2 CFR 200 (Few items not allowed are: computers, printers, monitors, fax machines, printer paper, toner cartridges, pens, pencils, legal pads, clips, rubber bands, post-it notes, books, notebooks, binders, folders, diskettes, postage stamps, chairs, office furniture, calendars, paper punches, business cards, staples, waste cans, etc.)
Provide details if cost exceeds $2,000. Individual line items in excess of $1,000 require a detailed explanation regardless of total cost.

DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
SUB-TOTAL SUPPLIES					

CAPITAL EQUIPMENT – MUST COMPLY WITH 2 CFR 200. Purchased specifically for this project. Provide detailed description of costs.

DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
SUB-TOTAL EQUIPMENT					

OTHER EXPENSES – MUST COMPLY WITH 2 CFR 200 (Few items not allowed are: memberships in professional & scientific organizations, local telephone lines, cell phones, etc).
Any project expense which does not fall into another category. Provide detailed explanation of the expense and applicable breakdown of costs (e.g., graduate student tuition).

	FY1	FY2	FY3	FY4	TOTAL
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
DESCRIPTION					
SUB-TOTAL OTHER EXPENSES					
TOTAL SUB-TOTALS					

INDIRECT COSTS – MUST COMPLY WITH 2 CFR 200. Indirect cost rates are negotiated between the university and it's cognizant agency. Indicate the type of negotiated indirect rate used and the percentage (e.g., On Campus Research, 52%).

TYPE	PERCENTAGE (%) ENTER AS A DECIMAL									
	FY1	**FY2**	**FY3**	**FY4**						
Enter $ Amt per FY										
TOTAL INDIRECT COSTS										
TOTAL PROJECT COSTS										
UNIVERSITY MATCHING FUNDS										
TOTAL MDOT PROJECT COSTS										

Contract Services Division

Consultant Advisory

Consultant Advisory

2009-4

April 16, 2009

Guidelines for Price Escalation Clauses in Consultants Priced Proposals

Many consultant contracts cover multiple years. Often, for multiple year contracts, the priced proposal includes an annual hourly rate escalation for consultant employees. The information below provides guidelines for the handling of price escalation in consultant contracts.

Any escalation rate proposed for labor will not be allowed by the Department until the contract extends beyond a twelve month period. (Regardless of when a pay raise is provided to employees.)

For example, a contract is proposed for the period March 1, 2009 to May 31, 2010. In this example an escalation rate will not be allowed for the first year which is March 1, 2009 through February 28, 2010. The Department will allow an escalation rate of two percent for the period of March 1, 2010 through February 28, 2011 and thereafter. If it is a multiple year contract, an escalation rate should be computed on a weighted average basis. The weighted average computation should use the allowable escalation rate which will be applied to the estimated percentage of work to be performed in that year.

MDOT, CSD, Consultant
Contracts Section
P.O. Box 30050
Lansing, MI 48909
Fax/517-355-7446
www.michigan.gov/mdot

Questions regarding this Consultant Advisory should be directed to:

Carol Rademacher
517-373-3382
rademacherc@michigan.gov

Subcontract Checklist and Payment Examples

The following items must be included in all subcontract agreements.
(Please note MDOT approval is not required for subcontracts for less than $25,000.)

1. MDOT/Prime contract number and authorization number (if applicable). All Exhibits must reference the MDOT Prime contract and authorization numbers as well.

2. Prime Consultant's name and description to be used throughout the subcontract (i.e., Engineer, Consultant, etc.).

3. Subconsultant's name and description to be used throughout the subcontract (i.e., Subconsultant, Consultant, etc.).

4. Description of work being performed by the subconsultant, as described in the scope of services. Include job number(s), control section(s),and structure number(s), if applicable.

5. The basis of payment, maximum contract amount, and fixed fee amount (if applicable) must be written into the **body of the** subcontract. A derivation of cost must accompany the subcontract. The derivation of cost can not be used in lieu of the written basis of payment and maximum dollar amount. Amendments, adding additional funds, will need to specify what the basis of payment is, the total amendment and fixed fee (if applicable) amounts, along with new total maximum not to exceed contract and fixed fee amounts.

   Following are basis of payment options and the recommended contract language.

   Actual Cost: compensation for the services will be on the basis of actual cost and will not exceed $ _____, as set forth in Exhibit _____.

   Actual Cost Plus Fixed Fee: compensation for the services will be on the basis of actual cost plus a fixed fee and will not exceed $ _____, which amount includes a fixed fee of $ _____, as set forth in Exhibit _____.

   Lump Sum: Compensation for the services will be on a lump sum basis in the amount of $ _____, as set forth in Exhibit _____.

   Milestone: Compensation for the services will be on a milestone basis in the amount of $_____, payable upon completion of defined milestones, as set forth in Exhibit ____.

   Fixed Hourly Rate – Compensation for the services will be on the basis of a fixed hourly rate plus actual direct expenses and will not exceed $ _____, as set forth in Exhibit _____.

   Unit Price: Compensation for the services will be on the basis of a set unit price and will not exceed $ _____, as set forth in Exhibit _____.

6. A statement must be included in the subcontract that the subcontract shall be governed by the laws of the State of Michigan, as set forth in the prime agreement.

7. A statement must be included that all terms and conditions included in the prime agreement are incorporated in the subcontract.

8. A statement must be included stating that in the event of a conflict between the terms and conditions of the subcontract and those of the prime agreement, the terms and conditions of the prime agreement shall prevail.

9. Per the prime agreement language, subcontracts should state that payment to the subconsultant will be made within (10) days of your receipt of payment from MDOT.

10. Subcontract effective and expiration dates (optional). If these dates are not provided in the original subcontract, the prime agreement's effective and expiration dates will be used. If there is a time extension for the prime agreement, the time extension will automatically carry over to the subagreements,

unless the original subcontract included an expiration date, in which case an amended subcontract will need to be submitted for review and approval.

11. Records are to be maintained for 3 years from final payment.

12. The following certification language must be included in all subcontracts. "The SUBCONSULTANT agrees that the costs reported to the PRIME CONSULTANT for this Contract will represent only those items that are properly chargeable in accordance with this Contract. The SUBCONSULTANT also certifies that it has read the Contract terms and has made itself aware of the applicable laws, regulations, and terms of this Contract that apply to the reporting of costs incurred under the terms of this Contract."

13. The subcontract needs to state: "Subconsultant further certifies that it agrees to use the E-Verify system to verify that all persons hired during the contract term by the Subconsultant are legally present and authorized work in the United States.

The subcontract must be submitted to the department for approval, prior to execution. Once department approval is obtained, an approval letter will be mailed to the prime consultant for execution. An original signed copy of the subcontract should be returned to MDOT for the contract file.

Rev. 12/20/12

MDOT
Michigan Department of Transportation

Kickoff Meeting Agenda
Statewide Planning and Research, Part II
Project Title
Contract and Authorization, Job Number, Research Number
Location
Date and Time

Facilitator:	Research Manager (RM)
Invitees:	Principal Investigator (PI), organization Project Manager (PM) Research Advisory Panel member (RAP), MDOT RAP, MDOT RAP, MDOT RAP, MDOT RAP, MDOT
Purpose:	Confirm schedule, deliverables, and program requirements

AGENDA TOPICS

1. Opening remarks and introductions – RM

2. Summary of research project and schedule as outlined in the contract – RM
   a. Summary
      i. Proposed Start: date
      ii. End Date: date
      iii. Funding: budget

   b. Schedule – Review Gantt Chart

   c. Deliverables – Review Deliverables Table

   d. Implementation Plan – Review Implementation Plan

3. Presentation of research project and schedule as outlined in the contract – PI

   Task 1:
   Task 2:
   Task 3:
   Task 4:
   Task 5:
   Task …….

4. Objectives and expectations for the research – PM
   a. Objectives:
      i. List objectives from work plan or request for proposal

b. Expectations:
   i. Starting the project well
   ii. Defining MDOT's and PI's role
   iii. Communication requirements
   iv. End results expectations

5. Consensus on expectations – RM, PI, PM

6. Summary of action items and person(s) responsible – RM

7. Schedule future meetings – RM
   a. List preliminary plan for future meetings
   b. Intermediate meeting – Month
   c. Intermediate meeting – Month
   d. Intermediate meeting – Month
   e. ……..
   f. Final meeting - Month

8. Research project process and outline of responsibilities and expectations - RM
   a. Reporting – Quarter Report (PI), Annual Report (PM)
   b. Invoicing –Invoice limitation at 85%, End of year requirements
   c. Meetings – Initial, Intermediate (PM to determine frequency), Final
   d. Subcontracts – List Subcontracts

Notes:

Michigan Department
Of Transportation
5305 (1/2020)

RESEARCH ADMINISTRATION QUARTERLY REPORT

REPORT FOR QUARTER ENDING	DATE SUBMITTED
PROJECT TITLE	
RESEARCH AGENCY	
PRINCIPAL INVESTIGATOR	
PROJECT MANAGER	
RESEARCH MANAGER	

CONTRACT/AUTHORIZATION NO.			PROJECT START DATE	
PROJECT/JOB NO.			PROJECT COMPLETION DATE (Original)	
OR NO.			PROJECT COMPLETION DATE (Revised)	
BUDGET STATUS				
CONTRACT FUNDS APPROVED			% PERCENT COMPLETE (By Budget)	
			% PERCENT COMPLETE (By Work)	
TOTAL FUNDS EXPENDED TO DATE			% PERCENT OF TIME EXPIRED:	

PLEASE LIST THE TECHNICAL LIAISONS AND OTHER INDIVIDUALS WHO SHOULD RECEIVE A COPY OF THIS REPORT

SUMMARY OF PROGRESS FOR THIS QUARTER

Attach a progress schedule consisting of graphical information depicting a schedule of research activities tied to **each task** defined in the proposal.

PROPOSED WORK FOR NEXT QUARTER

IMPLEMENTATION (if any)

PROBLEMS AND RECOMMENDED SOLUTIONS (if applicable)

Describe any problems encountered or anticipated that might affect the completion of the project within the time, scope, and fiscal constraints set forth in the contract. Describe recommended solutions. NOTING DIFFICULTIES IN THIS SECTION DOES NOT CONSTITUTE A REQUEST OR AUTHORITY TO MODIFY THE PROJECT. Any requests for additional time, money, or scope revisions must be submitted in a separate letter to the Engineer of Research.

EQUIPMENT PURCHASED (if any)

CONTACTS AND MEETINGS

(Describe any meetings or contact with MDOT technical liaisons and other pertinent individuals relative to this project.)

Michigan Department
Of Transportation
5312 (2014)

RESEARCH ADMINISTRATION
MDOT RESEARCH PROJECT
ANNUAL REPORT - FISCAL YEAR 20--

PROJECT TITLE:				
FUNDING SOURCE: ☒ SPR, Part II ☐ OTHER (*PLEASE EXPLAIN)*				
PROJECT MANAGER:				
CONTRACT/AUTHORIZATION NO.			PROJECT START DATE	
PROJECT NO.			COMPLETION DATE (Original)	
OR NO.			COMPLETION DATE (Revised)	
RESEARCH AGENCY				
PRINCIPAL INVESTIGATOR				

BUDGET STATUS

FY 20-- Budget			**Total Budget**	
Vendor Budget FY 20--			Total Vendor Budget	
MDOT Budget FY 20--			Total MDOT Budget	
Vendor FY 20-- Expenditures			Total Budget	
MDOT FY 20-- Expenditures			Total Expenditures	
			Total Amount Available	

PURPOSE AND SCOPE

FISCAL YEAR 20-- ACCOMPLISHMENTS

FISCAL YEAR 20-- PROPOSED ACTIVITES

JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))

SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)

Michigan Department
of Transportation
5306 (08/20)

APPENDIX 3.14

Clear Form

RESEARCH ADMINISTRATION
PROJECT CHANGE REQUEST

CHECK ALL THAT APPLY: ☐ DURATION CHANGE ☐ COST CHANGE ☐ SCOPE CHANGE ☐ STAFF CHANGE

PROJECT TITLE		
PROJECT MANAGER	PRINCIPAL INVESTIGATOR	E-MAIL
RESEARCH AGENCY	RESEARCH MANAGER	
CONTRACT / AUTHORIZATION NO.	PROJECT NO.	
OR NO.	APPROVED TOTAL COST	
PROJECT START DATE	APPROVED COMPLETION DATE	

CHANGE IN COMPLETION DATE

ORGINIAL COMPLETION DATE	NEW COMPLETION DATE REQUESTED
REASON / JUSTIFICATION FOR CHANGE	

CHANGE IN COST

COST INCREASE / DECREASE	NEW COST
REASON / JUSTIFICATION FOR CHANGE	

CHANGE IN SCOPE OF WORK

DESCRIPTION OF SCOPE CHANGE
REASON / JUSTIFICATION FOR CHANGE

CHANGE IN STAFF

ORIGINAL STAFF PERSON	POSITION TITLE	EFFECTIVE DATE OF CHANGE
NEW STAFF PERSON		
REASON / JUSTIFICATION FOR CHANGE		

RESEARCH STAFF USE:

FUNDING SOURCE	JOB NO.	FUND	UNIT	APPROP	DEPT OBJ	LOCATION	ACTIVITY

cc: Project File

Final Report Format

Research reports need to have a professional consistent format. The following specific sections should be included in a final report unless the project manager provides approval for a different outline unique to a particular research project.

i. Title Page
ii. Abstract Page (see attached)
iii. Acknowledgments and disclaimer (see attached)
iv. Table of Contents
v. List of Tables
vi. List of Figures
vii. Executive Summary
viii. Introduction
    1. Background
        a. Objectives
        b. Scope
    2. Statement of hypotheses
ix. Literature review (if applicable)
    1. Review of previous research
    2. Summary of state-of-the-art
x. Methodology
    1. Experimental design
    2. Equipment
    3. Procedures
xi. Findings
    1. Summary of data
    2. Method of analysis
    3. Presentation of results
xii. Discussion
    1. Validity of hypotheses
    2. Factors affecting the results
    3. Implications
xiii. Conclusions
    1. Conclusions from the study
    2. Recommendations for further research
    3. Recommendations for implementation (The Implementation Plan may be part of the final report or a separate document)
xiv. Bibliography
xv. Appendices
    1. Glossary (optional)
    2. List of Acronyms, Abbreviations and Symbols
    3. Other Appendices (as needed)
        a. Experimental data
        b. Analytical technique details
        c. User Manuals
        d. Other Deliverables

Final Report Format

Examples of completed research reports are available at the following link, www.michigan.gov/mdotresearch. These examples can be reviewed to see the content and format of a completed report.

A well-written report is clear and concise. It communicates all important aspects of the research project to the reader in an effective and professional manner. Format guidelines have been prepared with reference to the NCHRP 20-45 report, *Scientific Approaches for Transportation Research* available at http://onlinepubs.trb.org/onlinepubs/nchrp/cd-22/start.htm. Volume One of the report, *Research Methodologies*, provides useful information for planning, conducting, and reporting on research. “Chapter 5: Reports and Presentations” and “Appendix C: Writing and Format of Reports” provides guidelines for preparing reports.

As noted in MDOT’s *Consultant/Vendor Selection Guidelines for Research Service Contracts*, the consultant or university will provide a quality assurance and quality control plan with designated quality assurance staff to review the report.

While MDOT does not have a format or style guide for the final report, the following requirements must be followed:

- Pages of a final report will be numbered. Pages prior to the Introduction should be enumerated with lower case Roman numerals (i.e., i, ii, etc.). Beginning with the first page of the Introduction, Arabic numerals should be used.
- Text will be at least 12 point in size and in a common font (Times, Arial or an equivalent).
- Acronyms and abbreviations will be spelled out and noted in parentheses upon their first use in a report.
- Figures (including photographs) will be numbered and labeled.
- Tables will be numbered and labeled.
- Equations will be numbered.
- The final report must comply with federal standards within Section 508 of the Rehabilitation Act of 1973 as amended which require electronic document accessibility for individuals with disabilities that may require a screen reader or other assistive device. The report must pass an accessibility review found within Microsoft Word or in PDF editing software. Alt-Text (alternative text) is required for images, figures, equations, and other graphics. Its primary purpose is to describe graphics to

people who are unable to see them. Additional information about Accessibility requirements can be found at: https://section508.gov/

The research project analyst will provide a partially completed abstract page with the report number for the project manager and principal investigator about 4 months before the end of the project.

Final Report Format

Research Report Disclaimer

The following MDOT and FHWA disclaimer statements must be attached to all research reports and publications:

"This publication is disseminated in the interest of information exchange. The Michigan Department of Transportation (hereinafter referred to as MDOT) expressly disclaims any liability, of any kind, or for any reason, that might otherwise arise out of any use of this publication or the information or data provided in the publication. MDOT further disclaims any responsibility for typographical errors or accuracy of the information provided or contained within this information. MDOT makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy or timeliness of the information and data provided, or that the contents represent standards, specifications, or regulations."

"This material is based upon work supported by the Federal Highway Administration under SPR [insert work project]. Any opinions, findings and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Federal Highway Administration."

Final Report Format

<table>
<tr><td colspan="2">1. Report No.
RC-</td><td>2. Government Accession No.</td><td colspan="2">3. MDOT Project Manager</td></tr>
<tr><td colspan="3" rowspan="2">4. Title and Subtitle</td><td colspan="2">5. Report Date</td></tr>
<tr><td colspan="2">6. Performing Organization Code</td></tr>
<tr><td colspan="3">7. Author(s)</td><td colspan="2">8. Performing Org. Report No.</td></tr>
<tr><td colspan="3" rowspan="3">9. Performing Organization Name and Address</td><td colspan="2">10. Work Unit No. (TRAIS)</td></tr>
<tr><td colspan="2">11. Contract No.</td></tr>
<tr><td colspan="2">11(a). Authorization No.</td></tr>
<tr><td colspan="3" rowspan="2">12. Sponsoring Agency Name and Address
Michigan Department of Transportation
Research Administration
425 West Ottawa Street
Lansing MI 48933</td><td colspan="2">13. Type of Report & Period Covered
Final Report</td></tr>
<tr><td colspan="2">14. Sponsoring Agency Code</td></tr>
<tr><td colspan="5">15. Supplementary Notes</td></tr>
<tr><td colspan="5">16. Abstract</td></tr>
<tr><td colspan="3">17. Key Words</td><td colspan="2">18. Distribution Statement
No restrictions. This document is available to the public through the Michigan Department of Transportation.</td></tr>
<tr><td>19. Security Classification - report
Unclassified</td><td colspan="2">20. Security Classification - page
Unclassified</td><td>21. No. of Pages</td><td>22. Price</td></tr>
</table>

Early Release of Research Findings

Principal Investigators (PIs) occasionally request MDOT approval to release research findings prior to final acceptance of the project final report. The request, review, and notification procedures are as follows:

1. **PI Request to Publish**: The PI submits a signed letter requesting to publish, present, or share findings to third parties. The letter will outline who the audience is and proposed method used to share the information. A copy of the publication, slides, or other information must be included with the request. The letter is addressed to the MDOT Project Manager (PM).

2. **Project Manager (PM) Review and Recommendation:** The PM reviews the request. The PM may consult with the project Research Advisory Panel (RAP).

    a. The PM reviews the PI's past performance, and evaluates both the quality of the research findings and the potential for external sensitivities to the research conclusions. Questions to consider include,

        i. Do we expect to receive the final report to this project in a timely manner? Is the research project on schedule? Does this paper's content diverge from the research problem statement?

        ii. Is anything noted in the paper(s) contrary to MDOT's position on the subject? Is anything confidential released in this paper that should be held at this time? Is MDOT acknowledged appropriately in the paper(s)? The following MDOT disclaimer must be attached to the publication:

        "This publication is disseminated in the interest of information exchange. The Michigan Department of Transportation (hereinafter referred to as MDOT) expressly disclaims any liability, of any kind, or for any reason, that might otherwise arise out of any use of this publication or the information or data provided in the publication. MDOT further disclaims any responsibility for typographical errors or accuracy of the information provided or contained within this information. MDOT makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy or timeliness of the information and data provided, or that the contents represent standards, specifications, or regulations."

        iii. Are the research findings valid? Do the research results support the conclusion(s) drawn?

    b. The PM reviews the recommendation with the Research Manager. The PM provides a recommendation to approve or deny the request to the Focus Area Manager (FAM). (RM).

3. **Focus Area Manager (FAM) Review/ RAC Chair Approval:** The FAM considers the recommendation and works with the PM to make any necessary revisions to the recommendation. The FAM will consult with the appropriate RAC chairperson who will have the final authority for approval or denial of the request.

Early Release of Research Findings

4. **Notification:** The PM is responsible for notifying the PI whether the request is approved or denied by MDOT. The PM will provide a copy of the disclaimer that must be attached to the publication if the request is approved.

Research Administration
MDOT Research Project Budget Worksheet

Project Title:

Contract / Auth. #:

Project Manager:

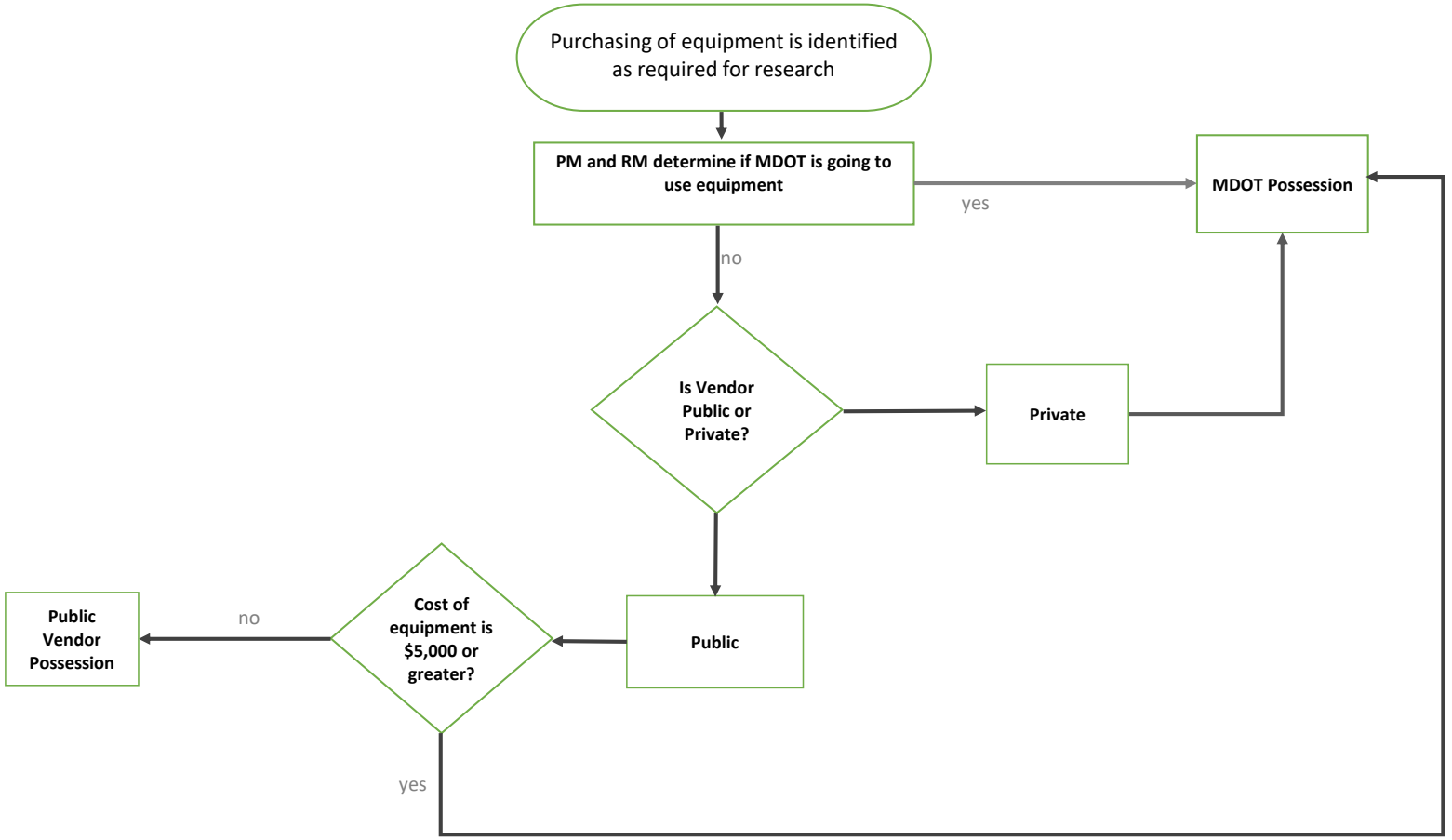
Date of Budget Estimate: 5/15/2013

Start Date: **End Date:**

		FY 20--	FY 20--	FY 20--	FY 20--	Total
MDOT Staff and Field Work Budget	*1) Staff Hourly Budget:*					$ -
	2) Staff Travel Budget:					$ -
	MDOT Staff Subtotal:	$ -	$ -	$ -	$ -	$ -
	3) Traffic Control Budget:					$ -
	4) Research Material Budget:					$ -
	5) Sampling and Preparation Budget:					$ -
	MDOT Field Work Subtotal:	$ -	$ -	$ -	$ -	$ -
	MDOT Staff and Field Work Budget:	$ -	$ -	$ -	$ -	$ -

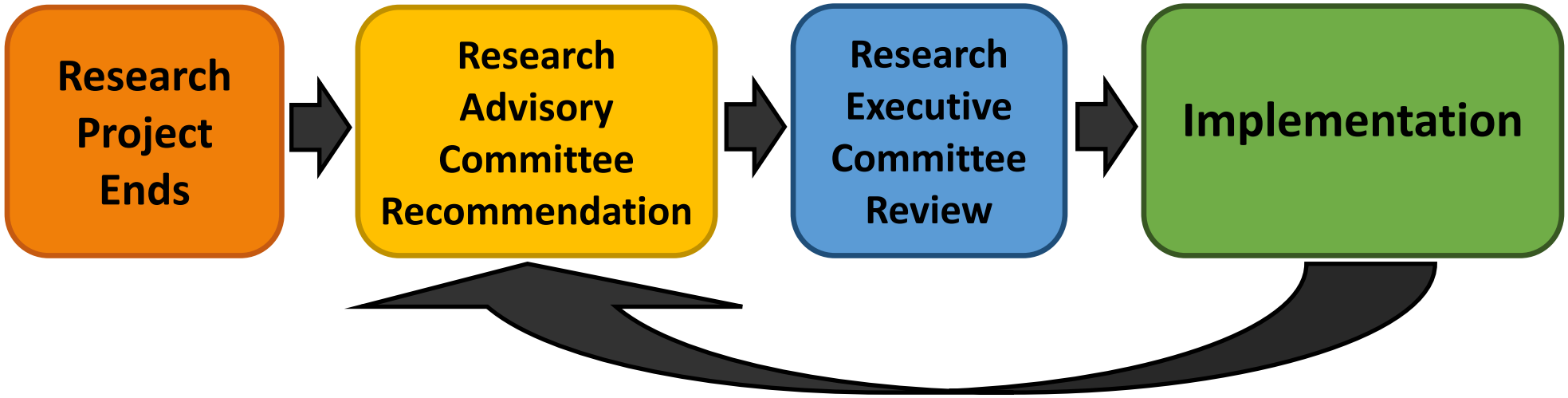
		FY 1	FY 2	FY 3	FY 4	Total
Total Budget	**MDOT Staff and Field Work Budget:**	$ -	$ -	$ -	$ -	$ -
	6) University/Consultant Budget:					$ -
	Total Budget:	$ -	$ -	$ -	$ -	$ -

POSSESSION OF EQUIPMENT PURCHASED WITH RESEARCH FUNDS



Michigan Department of Transportation RESEARCH Administration

MDOT Research Implementation Process



- Project Manager (PM) determines if Implementation of research results is recommended.
- PM Drafts Preliminary Implementation Plan (PIP).
- PIP should outline cost, scope and schedule, pilot locations, and evaluation procedures.
- Recommend an Implementation Manager (IM).

- PM presents their PIP at the Research Advisory Committee (RAC) meeting for approval.
- RAC will make recommendations toward implementation.
- RAC assigns an IM.
- Funding sources will be identified.

- IM may present an informational presentation of their Implementation Plans to the Research Executive Committee (REC).

- IM implements the innovation.
- IM will provide periodic updates to the RAC and Research Administration on implementation status until Implementation is completed.

Project Manager | **Implementation Manager**

MDOT Research Implementation Process

MDOT leadership and technical staff must decide if specific research findings should be implemented. The following process outlines how to provide funding, and track progress of implementation.

1.

- At the close of a research project the Project Manager (PM) should review research implementation recommendations and determine if findings should be executed.
- The PM will draft Preliminary Implementation Plan (PIP): This can summarize the implementation action plan completed during the research project. It should include objectives and tasks, scope, schedule, pilot locations (if applicable), estimated cost, and possible funding sources.
- The PM may recommend an Implementation Manager (IM).

2.

- The PM will present their PIP at the Research Advisory Committee (RAC) meeting:
  - Meeting attendees include RAC members with recently completed research projects (Focus Area Managers, Research Managers, Region Representatives and the RAC Chair). The Engineer of Research also attends.
  - Individual research projects, completed in the last fiscal year, are reviewed by the RAC to determine if implementation will be recommended.
  - The RAC will officially assign an IM for each approved implementation effort and with assistance from Research Administration identify funding sources for implementation.

3.

- The PM and recommended IMs present their respective study implementation recommendation(s) to the Research Executive Committee (REC) in an informative presentation. The REC may provide further guidance or determination on whether implementation will proceed.

4.

- The IM will finalize the preliminary implementation plan developed by the PM and initiate the innovation.
- Implementation will not begin until RAC has granted final approval of the implementation plan.
- IM will periodically report the status of implementation to RAC and Research Administration for tracking.
- IM will present to the RAC a final presentation of implementation once it is completed.

Project Manager:	Typically, the PM is the subject area expert for the research topic. The PM takes the leadership role for the research project, oversees technical aspects of the project, and manages project tasks.
Implementation Manager:	Typically, the IM is the person with the resources and authority to champion implementation efforts. The IM takes the leadership role for implementation tasks, and reports on progress.

Michigan Department of Transportation RESEARCH Administration

MDOT IMPLEMENTATION

Status Update Worksheet

DIRECTIONS: Please fill out appropriate sections of the form as noted below and return it to Research Administration in the Bureau of Field Services. If you have any questions, please contact your Research Manager or Research Administration via email at MDOT-Research@michigan.gov.

NOTE: This Implementation Planning Worksheet is to be considered an extension of the project workplan, please update it as outlined in the MDOT Research Implementation process document.:

- Section 1 and 2 can be updated after the project ends and as needed after meeting with your Research Advisory Committee Chair to recommend implementation steps.
- Section 3 can be updated before meeting with the Research Executive Committee, and
- Section 4 can be completed after meeting with the Research Executive Committee and updated throughout the implementation phase.

Section 1: General Project Information & Project Manager & Focus Area Manager Review

Project Manager:	**OR#:**
Research Title:	
Brief Description of Problem: *(Research Problem Statement)*	
Primary Discovery(s) from the Research: (*Please Be Brief*)	
Should Project Findings Be Implemented: (*Please check only one*) ☐ Yes ☐ No	
In No, Please Explain: (*Please Be Brief*)	

If implementation has already occurred or is recommended, please move on to Section 2 for RAC review

Section 2: Preliminary Implementation Plan & Research Advisory Committee Review

Identify the Goals/Accomplishments of Implementation for the Pilot/Statewide Project: *(Add more rows as needed)*

1.

2.

3.

Tasks, Assigned Responsibilities for Functional Areas, and a Time Schedule for Completion of Activities:

Task	Assigned Functional Area	Time Duration

Type of Implementation *: (*Please check all that apply)*

☐ Technology Transfer ☐ Policy/Procedure Change ☐ Equipment Change
☐ Design Change ☐ Software Use ☐ Material Change
☐ More Research ☐ Pilot Project ☐ Other *(explain below)*
☐ Special Provision/Specification Update

If 'Other', please explain:

Implementation Status **: (*Please check only one*)

☐ Nothing to Implement ☐ Not Started ☐ On Hold
☐ Ongoing ☐ Completed/Implemented ☐ Terminated

Estimated Budget

Itemize and Total the Amount of Funds Needed to Cover the Costs Associated with Implementation:

Dollar Amount	Expense
$	*Equipment*
$	*Upgrades*
$	*Staff Training*
$	*Other*
$	***Estimated Total***

Funding Sources

Type of Funding: (*Please check only one)*

☐ SPR II State Research Funds ^
☐ Other Funds ^^

Identify Source and Amount in the Table Below:

Dollar Amount	Funding Source
$	
$	
$	

RAC Assigned Implementation Manager: *(If different than PM)*

RAC Approval: *(MM/DD/YYYY)*

If implementation is recommended by RAC, for REC review

***** Identify a specific action that will result from this Implementation. These actions may include a new standard procedure that has been adopted, a change of materials used in projects, and/or information that is now shared with local governments, public transportation organizations or public safety advocates.
****** Implementation Status may be updated as needed throughout review process.
^ SPRII funds can be used for 1) the study of the effects of a pilot implementation or 2) training of staff in the use of new methods.
^^ Other sources of funding are needed for things like 1) capital investment in constructing or new equipment, 2) software upgrades, or 3) long term asset mapping.

Section 3: Research Executive Committee Review

REC Reviewed: *(MM/DD/YYYY)*

If implementation is concurred by REC, please complete Section 3

Section 4: Implementation Action Plan

Implementation Start Date: (*MM/DD/YYYY*)	**Implementation End Date ***:** (*MM/DD/YYYY*)
Project/Implementation Manager Comments****: (*Please Be Brief*)	

List all MDOT office(s) that may be impacted by this research implementation:	
Internal MDOT Office(s)	**Contact Name**
1.	
2.	
3.	
4.	

Explain the benefits that the implementation will have for each applicable assessment category below. If an assessment category does not apply or is not significant, please leave that section blank:	
Assessment Categories	**Explanation of Benefits** *(include explanation of the Quantitative Impact, if possible)*
Construction Savings *(materials, labor, equipment, time, quality)*	
Decrease Engr./Admin Costs *(planning, design costs, paperwork)*	
Decrease Lifecycle Costs	
Environmental Aspects *(pollution, hazardous waste, reduction recycling)*	
Impact on MDOT Policy	
Increase Lifecycle	
Operation & Maintenance Savings *(materials, labor, equipment, time)*	
Safety *(reduction on crash frequency and/or severity)*	
Technology *(technology transfer, new materials, new methods)*	
User benefits *(time, dollars)*	
Final REC Presentation: *(MM/DD/YYYY)*	

***Please input your projected end date for implementation. Implementation end date should not exceed 3 years from start date.
****Comments in this field should pertain to implementation status/specific examples of implementation action that have produced benefit. For ongoing projects, please provide a percentage of completion for implementation.

Research Administration Use Only

☐ Innovation ☐ High Value Research ☐ Publication

- Innovation: Implementation project has been identified as possible candidate for outside funding.
- High Value Research: Focus Area Managers have selected this project for national voting consideration.
- Publication: This implementation project has been recommended for some form of publication in addition to the standard research spotlight (newsletter, video, etc.).

Questions

Please contact your Research Manager or Research Administration via email at MDOT-Research@michigan.gov.

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF TRANSPORTATION
LANSING

KIRK T. STEUDLE
DIRECTOR

July 25, 2017

Mr. Andy Pickard
Senior Transportation Planner
Federal Highway Administration
315 West Allegan Street, Room 211
Lansing, Michigan 48933

Dear Mr. Pickard:

Enclosed for your review is the proposed State Planning and Research (SPR), Part II Fiscal Year (FY) 2018 Program, along with the FY 2018 SPR-II program certification statement. We request your approval to continue funding the FY 2018 continued research projects and to add funding for new projects scheduled to start during FY 2018. The Michigan Department of Transportation's (MDOT's) Research Executive Committee approved this proposed FY 2018 SPR-II annual work program on July 10, 2017. MDOT would like to begin the process of obligating program funds in mid-August; as such, we respectfully request your review/comments or approval by August 15, 2017.

The program includes both individual research projects and national federal Transportation Pooled Fund Program studies. Additionally, the program supports the National Cooperative Highway Research Program, Transportation Research Board (TRB) Core Services Program, three national University Transportation Center Projects, twelve American Association of State Highway Transportation Officials Technical Service Programs, and other various national research efforts through TRB. Please refer to the enclosed program document for more details.

The total FY 2018 program budget is $7,765,318.03. The federal share is $6,887,868.64, and the state's share is $877,449.39. The program contains a total of 66 projects: 31 federal and state funded continued projects, 6 federal and state funded new projects, and 29 100 percent federally funded projects.

We look forward to partnering with you to deliver another successful year of research. If you have any questions, please feel free to contact either me or Mr. Andre' Clover, Research Program Manager, at 517-636-6053.

Sincerely,

Steven C. Bower, P.E.
Engineer of Research

Enclosures

MDOT
Michigan Department of Transportation

Statewide Planning and Research (SPR), Part II
Annual Program for Fiscal Year 2018

Certification Statement

23 CFR 420.209(c) Certification Statement

I, Kirk T. Steudle, Director of the Michigan Department of Transportation, of the State of Michigan, do hereby certify that the State is in compliance with all requirements of 23 U.S.C. 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance.

Kirk T. Steudle, Director

7-10-17
Date

STATE OF MICHIGAN
DEPARTMENT OF TRANSPORTATION
LANSING

RICK SNYDER
GOVERNOR

KIRK T. STEUDLE
DIRECTOR

February 27, 2018

Mr. Andy Pickard
Senior Transportation Planner/Research Engineer
Federal Highway Administration
315 West Allegan Street, Room 211
Lansing, Michigan 48933

Dear Mr. Pickard:

The Michigan Department of Transportation (MDOT) is requesting approval of Amendment #1 to the Fiscal Year (FY) 2018 State Planning and Research (SPR), Part II Program's annual work plan. The amendment will add the Transportation Pooled Fund study TPF-5(372) along with supporting funds for the Transportation Research Board's (TRB's) "*Sponsorship of the TRB Roundtable on Preparing for Automated Vehicles and Shared Mobility Services*" initiative to the work plan.

Project Title- *TRB Roundtable/Forum on Preparing for AV and SMS Initiative*

FY 2018 Proposed Budget	**$**	**25,000.00**
FY 2019 Proposed Budget	$	25,000.00
Project Total Proposed Budget	$	50,000.00

Scope and Objectives:
The objective of this Forum is to bring together public, private and research organizational partners to discuss, identify, and facilitate fact-based research needed to deploy automated vehicles and shared mobility services in a manner and timeframe that informs policy to best meet long-term goals, and to share perspective on these issues. This project will be funded with 100% federal funds.

Project Title- *TPF-5(372) Building Information Modeling (BIM) for Bridges and Structures*

FY 2018 Proposed Budget	**$**	**20,000.00**
FY 2019 Proposed Budget	$	20,000.00
FY 2020 Proposed Budget	$	20,000.00
FY 2021 Proposed Budget	$	20,000.00
FY 2022 Proposed Budget	$	20,000.00
Project Total Proposed Budget	$	100,000.00

Scope and Objectives:
Building Information Modeling (BIM) is widely used in the commercial and vertical construction building sectors to manage projects from concept through design, fabrication, construction, and future maintenance. Its use for the transportation infrastructure has been very limited due to the lack of standardization. In order for state Departments of Transportation to take advantage of the efficiencies from the use of BIM in transportation bridge structures a comprehensive strategic plan by AASHTO Standing Committee on Bridge and Structures (SCOBS) is needed. This pooled fund study provides funding for the SCOBS T-19 technical committee to perform the duties of governance and stewardship of BIM for bridges and structures. This pooled fund study will be funded with 100% federal funds.

The 2018 fiscal year's SPR-II FHWA approved program total budget amount is $7,765,318.03 ($6,887,868.64 federal and $877,449.39 state). This amendment request will increase the current total budgeted federal funds by $45,000.00. The revised FY 2018 program total budget will be $7,810,318.03, with a federal share amount of $6,932,868.64 and state share amount of $877,449.39

Should you have any question, please feel free to contact either myself, or Mr. Andre' D. Clover, Research Program Manager, at 517-636-6053.

X
Signer 1

Sincerely,

Carol Aldrich
Engineer of Research

Enclosure(s)

Fiscal Year 2018 State Planning and Research (SPR), Part II Program

Research Administration
Bureau of Field Services

July 5, 2017

Table 1: FY 2018 State Planning and Research (SPR), Part II, Program Budget

Summary Page

NEW PROJECTS' BUDGET: 80% FEDERAL & 20% STATE MATCH (See Table 2a)	
Federal Share:	$147,234.40
State Match Share:	$36,808.60
New Projects Subtotal Amount:	$184,043.00
CONTINUED PROJECTS' BUDGET: 80% FEDERAL & 20% STATE MATCH (See Table 2b)	
Federal Share:	$3,362,563.14
State Match Share:	$840,640.79
Continued Projects Subtotal Amount:	$4,203,203.93
TOTAL PROJECTS' BUDGET: 80% FEDERAL & 20% STATE	
Total Federal Share:	$3,509,797.54
Total State Match Share:	$877,449.39
Budgeted Amount:	**$4,387,246.93**
NEW PROJECTS' BUDGET: 100% FEDERALLY FUNDED (See Table 2c)	
Budgeted Amount:	$50,000.00
CONTINUED PROJECTS' BUDGET: 100% FEDERALLY FUNDED (See Table 2d)	
Budgeted Amount:	$3,328,071.10
TOTAL PROJECTS' BUDGET: 100% FEDERALLY FUNDED	
Budgeted Amount:	**$3,378,071.10**
GRAND TOTAL BUDGET:	**$7,765,318.03**
Total Federal Share:	$6,887,868.64

Table 2a						
NEW PROJECTS' BUDGET: 80% FEDERAL & 20% MATCH						
RAC/Focus Area	**MDOT Research No.**	**MDOT Job No.**	**Title**	**FY2018 Budget Amount**	**Project Manager**	**Project Scheduled Completion Date**
Bridge & Structures	OR17-201	TBD	Effects of Concrete Cure Time on Epoxy Overlay and Sealant Performance	$35,731.00	Belcher, John	1/1/2020
Bridge & Structures	OR17-202	TBD	3D Bridge Deterioration Models	$16,625.00	Curtis, Beckie	6/30/2020
Bridge & Structures	OR17-203	TBD	Accelerated Bridge Preservation Techniques	$15,625.00	Curtis, Beckie	6/30/2020
Environment & Water Resources	OR17-205	TBD	Reduction of pH Levels from Underdrain Outlets	$26,812.00	Zweng, Hal	6/30/2020
Mobility, Systems & Signal Operations	OR18-011	TBD	Development of a Michigan Specific VISSIM Protocol for Submissions of VISSIM Modeling	$37,500	Engle, John	6/30/2020
Transportation Safety	OR17-204	TBD	Measure the Operational Cost and Benefit of Speed Feedback Signs	$51,750.00	Uzcategui, Alonso	6/30/2020
			TOTAL:	**$184,043.00**		

Table 2b CONTINUED PROJECTS' BUDGET: 80% FEDERAL & 20% STATE FUNDED MATCH							
RAC/Focus Area	**MDOT Research No.**	**MDOT Job NO.**	**Project Title**	**FY2018 Budget Amount**	**Project Manager**	**Vendor**	**Project Scheduled Completion Date**
Administration	OR15-001	129171	Research Program Services	$173,767.83	Polsdofer, Mark	CTC & Associates	9/30/2019
Asset Management	OR15-187	130975	An Evaluation of Michigan's Continuous Count Station (CCS) Distribution	$91,740.73	Krzeminski, Kevin	WMU	4/30/2018
Bridges & Structures	OR10-043	132975	Evaluation of Bridge Decks Using Non-Destructive Evaluation (NDE) at Near Highway Speeds for Effective Asset Management	$121,774.95	Boatman, Brandon	MTU	2/28/2018
Bridges & Structures	OR14-019	120482 128594	Evaluation and Standardization of Accelerated Bridge Construction (ABC) Techniques	0.00**	Rogers, Corey	WMU	9/30/2017
Bridges & Structures	OR14-023	129666	Developing Representative Michigan Truck Configurations for Bridge Load Rating	$65,144.00	McMunn, Creightyn	WSU	2/28/2018
Bridges & Structures	OR14-024	120241	Evaluating Long Term Capacity and Ductility of Carbon Fiber Reinforced Polymer prestressing and Post Tensioning Strands	$168,258.28	Chynoweth, Matt	LTU	9/30/2018
Bridges & Structures	OR14-029	121363	Bridge Design System Analysis and Modernization	$0.00*	Guerrazzi, Sam	MTU	9/30/2019
Bridges & Structures	OR14-039	128602 121365 120981	Statewide Overall Carbon Fiber Composite Cable Bridge Monitoring	$66,667.00	Chynoweth, Matt	LTU	9/30/2020
Bridges & Structures	OR15-114	131529	Asset Management of Retaining Walls	$296,284.02	Burns, Eric	UM	6/30/2018

RAC/Focus Area	MDOT Research No.	MDOT Job NO.	Project Title	FY2018 Budget Amount	Project Manager	Vendor	Project Scheduled Completion Date
Bridges & Structures	OR15-181	131389	Bridge Structural Analyses for Staged Construction and Constructability Reviews	$268,943.96	Jansson, Peter	WMU	6/30/2018
Bridges & Structures	OR15-182	129657	Evaluation of Cost/Benefits of Standardization of Secondary Route Bridges	$121,294.76	Cooper, Keith	WSU	3/31/2018
Bridges & Structures	OR15-191	129889	Development of 3D and 4D Bridge Models and Plans	$108,410.65	Belill, Talia	Parsons Brinckerhoff MI	3/31/2018
Bridges & Structures	OR15-192	131752	Applying Multi-Beam Sonar for Inspection for Bridge Scour and Performance of Bridge Scour Mitigation Methods	$234,460.18	Kathrens, Rich	Ayers Associates	12/31/2018
Bridges & Structures	OR16-005	132226	Bridge Scour Technology Transfer	$22,313.66	Curtis, Beckie	MTU	6/30/2018
Bridges & Structures	OR16-006	132227	Best Practices for Modernizing MDOT Bridge Design Manual, Guides, and Policy Documentation	$300,000.00	Wagner, Bradley	TBD	9/30/2018
Bridges & Structures	OR16-007	132225	Commercial Production of Non-Proprietary Ultra High Performance Concrete	$62,173.75	Kahl, Steve	UM	3/31/2018
Intelligent Transportation Systems	OR10-044	128608 121364 114533 112947	Advanced Applications of IntelliDrive Data Use Analysis and Processing 2 (DUAP2)	$770.94	Castle, Collin	Mixon Hill	12/31/2017
Intelligent Transportation Systems	OR14-053	128607 122203	Connected/Automated Vehicle and Infrastructure Research - Michigan Mobility Transportation Facility, MTF	$309,177.00	Ajegba, Paul	U of M	9/30/2019

RAC/Focus Area	MDOT Research No.	MDOT Job NO.	Project Title	FY2018 Budget Amount	Project Manager	Vendor	Project Scheduled Completion Date
Maintenance	OR16-009	132228	Develop and Implement a Freeze Thaw Model Based Seasonal Load Restriction Decision Support Tool	$133,188.20	Longworth, Melissa	MTU	3/31/2019
Maintenance	OR17-103	TBD	Evaluation/Report for Collision Avoidance & Mitigation System (CAMS) on Winter Maintenance Trucks (WMT)	$266,320.00	Cook, Steve	TBD	7/31/2018
Mobility, Systems & Signal Operations	OR15-139	131064	Implementation of Unmanned Aerial Vehicles (UAVs) for Assessment of Transportation Infrastructure - Phase II	$187,804.69	Cook, Steve	MTU	5/31/2018
Mobility, Systems & Signal Operations	OR15-144	130579	Further Assessment of Quick Clearance Strategies - Phase II	$38,086.46	Kremer, Angie	Gannett-Fleming of MI	12/31/2017
Mobility, Systems & Signal Operations	OR16-002	132229	Signal Performance Measures Pilot Implementation	$166,495.67	Adelman, Douglas	AECOM	12/31/2018
Non-Motorized	OR15-186	130572	Development of Differential Criteria for Determining Appropriateness of 'Side-Path' Applications for Bicycle Use	$54,773.31	DeBruyn, Josh	Toole Design Group	6/30/2018
Pavements & Materials	OR15-154	131585	Updated Analysis of Michigan Traffic Inputs for Pavement ME Design	$143,383.96	Schenkel, Justin	MSU	3/31/2018
Pavements & Materials	OR16-001	132223	Identify Best Practices in Pavement Design, Materials, Construction, and Maintenance in Wet Freeze Climates Similar to Michigan	$44,000.00	Bleech, Curtis	MTU	12/31/2017

RAC/Focus Area	MDOT Research No.	MDOT Job NO.	Project Title	FY2018 Budget Amount	Project Manager	Vendor	Project Scheduled Completion Date
Rest Areas, Utilities & Landscaping	OR16-008	132231	Slope Restoration on Urban Freeways	$201,450.71	Stonebrook, Bill	MSU	7/31/2019
Surveys & Automated Design	OR16-004	132232	3D Highway Design Model Cost Benefit Analysis	$170,997.35	Wilkerson, John	Parsons Brinckerhoff MI	7/15/2018
Transportation Safety	OR14-027	128651	Michigan Rural Segments Safety Performance Function (SPFs) Development and Support	0.00**	Kanitz, Dean	MSU	9/30/2017
Transportation Safety	OR15-178	129831	Evaluating the Impacts of Speed Limit Increases on Identified Case Studies	$129,739.55	Bott, Mark	WMU	12/31/2017
Transportation Safety	OR15-194	129832	Assessment of Michigan's Engineering Safety Program	$255,782.32	Shaughnessy, Stephen	MSU	8/15/2018
				TOTAL: $4,203,203.93			

* Funding from non-SPRII funding sources is provided for additional scope in FY 2018. Please see the problem statement for details.
**Previously obligated fiscal year 2017 funds may be needed in fiscal year 2018 if these projects are extended.

Table 2c						
NEW PROJECTS' BUDGET: 100% FEDERALLY FUNDED						
RAC/Focus Area	**Federal Project No.**	**Research No.**	**Research Project Description**	**FY2018 Budget Amount**	**Project Manager**	**Fed/State Agency**
Bridges & Structures	TPF-5(281)	OR18-012	Center for the Aging Infrastructure: Steel Bridge Research, Inspection, Training and Education Engineering Center - SBRITE	$50,000.00	Curtis, Beckie	Indiana DOT
				TOTAL: $50,000.00		

Table 2d CONTINUED PROJECTS' BUDGET: 100% FEDERALLY FUNDED						
RAC/Focus Area	**Federal Project No.**	**Research No.**	**Research Project Description**	**FY2018 Budget Amount**	**Project Manager**	**Fed./State Agency**
Administration	SPR1284(019)	OR15-503	AASHTO Engineering Technical Service Programs	$140,000.00	Clover, Andre	AASHTO/ FHWA
Administration	TPF-5(418)	OR18-007	National Cooperative Highway Research Program (NCHRP) for FY 2018	$1,200,000.00	Clover, Andre	FHWA
Administration	TBD	OR18-008	TRB Core Program Activities FFY 2018 (TRB FY 2019)	$185,000.00	Clover, Andre	AASHTO/ FHWA
Bridges & Structures	TPF-5(308)	OR14-022	The Use of Bridge Management Software in the Network Analysis of Big Bridges	$20,250.00	Curtis, Beckie	MDOT
Bridges & Structures	TPF-5(363)	OR15-541	Evaluation of 0.7 inch Diameter Carbon Fiber Reinforced Polymer (CFRP) Pretensioning Strands in Prestressed Beams	$36,000.00	Filcek, Matt	MDOT
Construction		OR16-003	AASHTO 3.01 - Construction/Materials Module Enhancement/Implementation and Staff Training	$884,200.00	Farr, Cliff	AASHTO
Intelligent Transportation Systems	TPF-5(206)	OR09-146	Research, Development, and Deployment of System Operations Applications of Vehicle Infrastructure Integration (VII)	$50,000.00	Castle, Colin	Virginia DOT
Intelligent Transportation Systems	TPF-5(359)	OR17-101	Evaluating New Technologies for Roads Program Initiatives in Safety and Efficiency (ENTERPRISE) – Phase 2	$45,000.00	Feldpausch, Elise	MDOT
Intelligent Transportation Systems	2016-0068 Z4	OR17-801	UTC - Identifying Potential Workzone Countermeasures Using Connected-Vehicle and Driving Data	$170,621.20	Gorman, Joseph	UMTRI
Maintenance	TPF-5(353)	OR13-015	Clear Roads Winter Highway Operations Pooled Fund	$25,000.00	Longworth, Melissa	Minnesota DOT
Maintenance	TPF-5(347)	OR14-034	Development of Maintenance Decision Support System	$25,000.00	Longworth, Melissa	AASHTO/ FHWA
Maintenance	TPF-5(290)	OR14-057	Aurora Program	$25,000.00	Gustafson, Dawn	Iowa DOT
Maintenance	TPF-5(330)	OR15-518	No Boundaries Roadway Maintenance Practices	$10,000.00	Longworth, Melissa	ODOT

RAC/Focus Area	Federal Project No.	Research No.	Research Project Description	FY2018 Budget Amount	Project Manager	Fed./State Agency
Mobility, Systems & Signal Operations	TPF-5(351)	OR15-530	Self De-icing LED signals	$20,000.00	Smalley, Erik	Kansas DOT
Mobility, Systems & Signal Operations	TPF-5(319)	OR15-534	Transportation Management Center (TMC) Pooled Fund Study	$25,000.00	Peplinski, Suzette	FHWA
Pavements & Materials	TPF-5(269)	OR14-036	Development of an Improved Design Procedure for Unbonded Concrete Overlays	$0.00*	Bleech, Curtis	Minnesota DOT
Pavements & Materials	TPF-5(297)	OR14-038	Improving Specifications to Resist Frost Damage in Modern Concrete Mixtures	$17,500.00	Stallard, Tim	OK DOT
Pavements & Materials	TPF-5(313)	OR15-002	Technology Transfer Concrete Consortium	$12,000.00	Staton, John	Iowa DOT
Pavements & Materials	TPF-5(267)	OR15-520	Accelerated Performance Testing for the NCAT Pavement Test Track	$0.00*	Bleech, Curtis	AL DOT
Pavements & Materials	TPF-5(320)	OR15-521	Base Funding for North Central Superpave Center	$25,000.00	Kennedy, Kevin	IN DOT
Pavements & Materials	TPF-5(341)	OR15-531	National Road Research Alliance	$150,000.00	Bleech, Curtis	Minnesota DOT
Pavements & Materials	2013-0066 Z11	OR17-102	UTC: Analyzing Aggregate Percent Embedment Limits to Improve Chip Seal Performance	$110,000.00	Green, Robert	MSU
Pavements & Materials	TPF-5(305)	OR18-006	Regional and National Implementation and Coordination of ME Design	$10,000.00	Eacker, Michael	FHWA
Pavements & Materials	TPF-5(368)	OR18-009	Performance Engineered Concrete Paving Mixtures	$15,000.00	Staton, John	Iowa DOT
Rest Areas, Utilities & Landscaping	TPF-5(346)	OR15-529	Regional Roadside Turfgrass Performance Testing Program (Solicitation 1412)	$20,000.00	Lynwood, Lynn	Minnesota DOT
Transportation Safety	2016-0068 Z1	OR15-189	UTC: Developing Michigan Pedestrian and Bicycle Safety Models	$37,499.90	McQuiston, Carissa	UMTRI
Transportation Safety	TPF-5(255)	OR15-527	Highway Safety Manual Implementation	$20,000.00	Shaughnessy, Steven	FHWA
Transportation Safety	TPF-5(343)	OR15-528	Roadside Safety and Research for MASH Implementation	$50,000.00	Torres, Carlos	Washington DOT
			TOTAL:	**$3,328,071.10**		

* This project is active and MDOT has fulfilled its pledge amount. The final deliverables are pending; thus, it will remain on the work plan until all deliverables are received.