The Mississippi Department of Transportation
Research Division

Research Manual

May 2020

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List of Abbreviations and Acronyms

80/20	80% federally funded/20% state funded (80/20-funded research study)
AASHTO	American Association of State Highway and Transportation Officials
CFR	Code of Federal Regulations
CSTS	Consultant Services Tracking System
CSU	Consultant Services Unit (MDOT's contracting division)
DOT	Department of transportation
FAST Act	Fixing America's Surface Transportation Act
FFY	Federal fiscal year
FHWA	Federal Highway Administration
FHWA-MS	Federal Highway Administration's Mississippi Division office
FMS	Financial Management System (MDOT)
FMIS	Fiscal Management Information System (FHWA)
FY	Fiscal year
IDIQ	Indefinite Delivery/Indefinite Quantity (contract type)
MAP-21	Moving Ahead for Progress in the 21st Century Act
MDOT	Mississippi Department of Transportation
NCHRP	National Cooperative Highway Research Program
NTP	Notice to proceed
PI	Principal investigator
QPR	Quarterly progress report
RFQ	Request for qualifications
RAC	Research Advisory Committee (MDOT and AASHTO)
RiP	Research in Progress
RMS	Research Management System
RNS	Research needs statement
RSC	Research study champion
SP&R	State Planning and Research (FHWA)
SRE	State Research Engineer
SME	Subject matter expert
TAC	Technical Advisory Committee
TSP	Technical Service Program (AASHTO)
TPF	Transportation Pooled Fund
TRB	Transportation Research Board
TRID	Transportation Research Information Database (TRB database)
USDOT	U.S. Department of Transportation
UTC	University Transportation Center

List of Supplements

The following supplementary item is referenced in this manual. This file is available on the Mississippi Department of Transportation (MDOT) Research Division website, along with other supplements and templates associated with Research Division manuals, using the static URLs provided in the links below. All links automatically point to the most current versions of these files.

Laws and Regulations

List of Templates

The following Microsoft Word file is made available as a resource for principal investigators to aid in preparation of documents required by the Research Division. This template, referenced in this manual, is also available on the Research Division website. All links automatically point to the most current versions of these files.

Final Report (Microsoft Word)

Statement of Nondiscrimination

The Mississippi Department of Transportation operates its programs and services without regard to race, color, national origin, sex, age or disability in accordance with Title VI of the Civil Rights Act of 1964, as amended, and related statutes and implementing authorities.

Mission Statements

Mississippi Department of Transportation

MDOT is responsible for providing a safe intermodal transportation network that is planned, designed, constructed and maintained in an effective, cost-efficient and environmentally sensitive manner.

MDOT Research Division

MDOT Research Division supports MDOT's mission by administering Mississippi's State Planning and Research Part II funds in an innovative, ethical, accountable and efficient manner, including selecting and monitoring research projects that solve agency problems, move MDOT forward and improve the network for the traveling public.

Overview of the Manual

The *MDOT Research Manual* examines the Research Division's research process, from project development through program evaluation, and describes MDOT's activities to meet the program management and oversight requirements described in the Code of Federal Regulations, Title 23, Part 420 (23 CFR 420).

This publication is one of three publications available from MDOT that together detail the contract research process. These are:

- **MDOT Research Manual** (*this publication*), available from the Research Division's web portal. This document explains all steps and key considerations of MDOT's research process.
- **MDOT Internal Research Manual**, available to MDOT staff. This document contains much of the same information as the *MDOT Research Manual* and also provides internal process information and guidance relevant only to MDOT staff.
- **MDOT Research Consultant Manual**, available from the Research Division's web portal. This document provides comprehensive guidance for all external researchers on conducting an MDOT research project.

An overview of each chapter of this publication is provided below.

Chapter 1, Introduction. Includes general information about the MDOT research program. Identifies the MDOT staff members and those outside MDOT who participate in the research program. Briefly discusses the laws and regulations governing MDOT's research work program.

Chapter 2, Annual Research Work Program. Describes MDOT's processes for identifying research needs and developing a research work program that addresses MDOT-specific issues.

Chapter 3, From Work Program to Contract. Describes what happens after new research projects are chosen, existing projects are continued into the new fiscal year and the annual research work program is approved.

Chapter 4, Research Project Management. Provides a high-level overview of the workflows and procedures associated with managing research projects and research-related activities.

Chapter 5, Financial Management of MDOT Research Funds. Includes information on federal, state and combined funding and financial controls policies developed to ensure proper payment, transfer and handling of research funds.

Chapter 6, Project Wrap-Up. Describes the primary activities associated with concluding a research project, including production and distribution of the final report, and the implications of submitting a final invoice. Also discusses the audit completed for all projects and the performance evaluation of researchers.

Chapter 7, Implementation and Performance Measures. Outlines the process for tracking implementation of beneficial findings and identifies the performance measures reported to Federal Highway Administration (FHWA) and tracked for internal use.

Chapter 8, State Planning and Research Part II Program Oversight. Describes the documents, activities and processes developed to meet the FHWA requirements associated with MDOT's use of State Planning and Research Part II funds.

1 Introduction

1.1 General

This chapter describes the key participants in the Mississippi Department of Transportation (MDOT) research program—both MDOT staff members and participants outside the agency—and provides a brief description of each participant's key duties. The chapter also includes a description of MDOT's participation in national research.

1.2 Key Participants in the MDOT Research Program

Below are brief descriptions of the roles and responsibilities of key participants in MDOT's research program:

- Research Division staff
- Research Advisory Committee (RAC)
- Technical Advisory Committee (TAC)
- Principal investigator (PI)
- Research study champion (RSC)
- Federal Highway Administration (FHWA)
- University Transportation Centers (UTCs)
- Mississippi Transportation Commission

1.2.1 Research Division Staff

Research Division staff members are responsible for:

- Generating the annual research work program
- Administering, marketing and implementing the research program
- Reviewing research proposals and assisting in the selection of researchers
- Working with the Consultant Services Unit (CSU), PIs and subject matter experts (SMEs) to develop research contracts
- Monitoring the general progress of projects, from development through final audit
- Facilitating the exchange of research information within MDOT and with other agencies, researchers, state departments of transportation (DOTs) and interested parties
- Coordinating the performance evaluation process for all completed research projects
- Formulating and monitoring strategies for implementing innovative technologies and procedures

A Research Division staff member is assigned to each study to serve as the TAC Chair. (The TAC Chair may also be described as the Assistant Project Manager to the State Research Engineer (SRE), who is considered the Project Manager for each study.)

1.2.2 Research Advisory Committee

The RAC is responsible for identifying the issues or problems that will be addressed through funded research studies. RAC members generate research needs and ideas, approve projects for the next annual research work program and any modifications to it, and appoint members of each research project's TAC based on participants' areas of expertise. The RAC is composed of the following members:

- State Research Engineer (chair)
- Deputy Executive Director/Chief Engineer
- Deputy Executive Director, Administration
- Assistant Chief Engineer, Operations
- Assistant Chief Engineer, Field Operations
- Assistant Chief Engineer, Pre-Construction
- Director, Office of Intermodal Planning
- District Engineer (rotating two-year term appointment)
- FHWA's Mississippi Division office (FHWA-MS) Research Engineer (nonvoting member; must approve the work program)

Each year a RAC meeting is held, generally in September, to review and approve the research work program for the upcoming federal fiscal year (FFY), which begins October 1. (A majority of RAC and FHWA members must approve each proposed research study before it is incorporated into the annual research work program.) If more ideas are needed, a second RAC meeting in October/November is held to begin reviewing research ideas for the next research cycle. The RAC also approves changes to contracts, such as extending the contract period or adding funds, for research projects in process. Typically, the review and approval of these changes are completed electronically and do not require in-person meetings.

1.2.3 Technical Advisory Committee

A TAC is formed for each research study included in MDOT's annual research work program. The TAC is tasked with providing oversight for a research study, beginning with the initial review of the research needs statement (RNS) provided by the Research Division through potential implementation of research findings.

Each TAC includes one staff member from MDOT Research Division who functions as the TAC's chair. The TAC Chair is assigned by the SRE, generally by consensus and depending on workload and interest in and/or knowledge of the subject. The TAC Chair:

- Provides contract development and administrative support
- Represents the interests of the Research Division when implementation of study results impacts division responsibilities
- Handles administrative tasks such as interacting with CSU regarding contract matters
- Serves as a liaison between SMEs and the PI

Other TAC members, typically SMEs within the field of knowledge addressed by the proposed study, are assigned by the RAC, a Division Director or District Engineer. TAC membership, depending on project need and scope, can be drawn from the following:

- Research Division staff (mandatory; serves as TAC Chair)
- Operating units of the agency most affected by project results
- FHWA staff members
- Individuals from nonagency organizations with expertise in the area of research

1.2.4 Principal Investigator

MDOT's research projects are conducted under MDOT contracts with public and private agencies. The individuals participating as PIs for MDOT research studies may be affiliated with in-state and out-of-state universities, UTCs or private consulting firms. The PI is the primary point of contact for the research group conducting a study.

1.2.5 Research Study Champion

The RAC is responsible for identifying one or more MDOT staff members who will serve in an advocacy role as the RSC for the proposed study. This individual may not be an SME per se, but should be included on the TAC to facilitate consideration of implementation of research findings throughout the entire process of the research, beginning with the development of the proposal. A proposed study will not be considered for funding unless at least one MDOT staff member is identified as an RSC. (The PI identifies each RSC by name in the research proposal.)

The RSC will work closely with the PI to develop the research proposal, collaborate with the PI to develop an implementation plan and manage MDOT's efforts to carry out the Implementation Plan.

1.2.6 Federal Highway Administration

FHWA, part of the U.S. Department of Transportation (USDOT), provides much of MDOT's research funding and has oversight responsibility for MDOT's research program under a Stewardship and Oversight Agreement. FHWA approves MDOT's annual research work program and any changes to it during the year. FHWA also coordinates many national-level research efforts, such as the transportation pooled fund program, in which MDOT participates. FHWA-MS provides assistance with policy, compliance requirements and financial matters, and processes all federal program payments made by MDOT.

1.2.7 University Transportation Centers

The UTC program was established in 1987 with a mission of advancing U.S. expertise and technology transfer under the umbrella of the USDOT. Overseen by the Office of the Assistant Secretary for Research and Technology, formerly Research and Innovative Technology Administration, the UTC program includes more than 30 national, regional and Tier 1 UTCs that operate as a consortium of universities working on a common theme, such as intermodal transportation, safety, freight or sustainability. UTCs can match funds they receive, so partnering with them can result in cost savings to DOTs and provide workforce development opportunities for students. A state DOT can partner with a

UTC directly or via a pooled fund study if the UTC is out of state. UTCs must reapply as directed for USDOT funding in a competitive process.

1.2.8 Mississippi Transportation Commission

The three-member elected Mississippi Transportation Commission is vested with "the authority and responsibility for the supervision of all modes of transportation in the state dealing with aeronautics, highways, ports, public transit and railroads. In accordance with state law, the Commission is responsible for planning, developing and coordinating a comprehensive, balanced intermodal transportation policy for the state." The Commission's approval, required for payments and contracts, is described in other sections of this manual.

1.3 MDOT Participation in National Research

Research Division and other agency staff members may participate in a range of national-level research activities in national organizations such as the following:

- Transportation pooled funds (TPFs)
- National Cooperative Highway Research Program (NCHRP)
- Transportation Research Board (TRB)
- American Association of State Highway and Transportation Officials (AASHTO) RAC
- AASHTO Technical Service Programs (TSPs)

MDOT employees in all areas within the agency participate in TPFs, NCHRP panels, TRB committees and AASHTO TSPs. Participation in AASHTO RAC is at the discretion of the SRE, but generally includes the SRE and Assistant SRE.

The Assistant Chief Engineer of Operations, the Chief Engineer and Executive Director must also concur regarding RAC participation and/or official membership for Research Division personnel. For formal AASHTO RAC membership, the department's director must send a request letter to AASHTO's chief executive officer.

Participation on panels and TPFs must be approved by each staff member's Division Director or District Engineer, and by the Assistant Chief Engineer or other member of upper management. Any out-of-state travel associated with participation in these national research activities, even if at no cost to MDOT, must be approved through typical MDOT channels of preapproval for travel and final approval as reflected in MDOT's Financial Management System (FMS) via the staff member's travel coordinator.

1.4 Other Research Participants

Some research projects include entities in addition to those already mentioned. For example:

- A researcher investigating a new technology may hold a workshop that includes industry partners.
- Studies regarding intermodal projects may involve reaching out to stakeholders in rail, airports or ports.
- A project with potential effects on county or other local agencies will include MDOT engagement with those local agencies.

Thorough stakeholder engagement is essential to ensuring the best quality for MDOT research projects.

1.5 Laws and Regulations

Supplement: Laws and Regulations includes links to the sections of law, rules and regulations that relate to the conduct of MDOT's research-related activities. These include references to U.S. Code, the CFR and Mississippi Code.

2 Annual Research Work Program

2.1 General

MDOT's annual research work program is focused on identifying needs associated with Mississippi's transportation system. A strategic approach to MDOT's work program development helps ensure that:

- Applicable national research efforts are included
- Research is focused on Mississippi's transportation needs
- Both long- and short-term goals are identified
- Research is performed as near as possible to the time that a solution is needed
- Practical, implementable research is carried out
- Projects are sequenced in a logical manner

This chapter covers the development and approval of MDOT's annual research work program.

2.2 Research Work Program Components

There are three key components of MDOT's work program:

- Fully federally funded items:
    - NCHRP subscription
    - TRB subscription
    - AASHTO TSP subscriptions
    - TPFs
- Items funded with 80% federal/20% state funds (80/20):
    - Contracted state studies
    - In-house state studies
    - Support studies for division staff and district traffic control
- Fully state-funded items (rare):
    - Other divisions such as Materials will use state funds to study a topic.
    - Generally, these studies are not part of the MDOT work program. They are included in the program only if related to an 80/20 study.

Further details of each component follow.

2.2.1 Fully Federally Funded Items

The federally funded items identified above are subtracted from the appropriated amount before any matching of state funds. A brief explanation of each follows:

- *NCHRP subscription.* MDOT's annual NCHRP subscription helps to fund approximately 60 new and continuing NCHRP projects each year. TRB administers the NCHRP program; state DOT members of AASHTO in cooperation with FHWA sponsor the program and create RNSs. Individual projects are conducted by contractors with oversight from volunteer panels of transportation experts. NCHRP ballots for candidate studies are distributed in February to each state. Candidates for continued funding and new problem statements are ranked by the AASHTO RAC and the Standing Committee on Research and Innovation; projects are funded based on priority and available funds. Travel for MDOT staff members participating on NCHRP project panels is also paid for out of this subscription.
- *TRB subscription*. MDOT's annual TRB subscription provides MDOT staff with access to webinars, publications and travel to the TRB Annual Meeting.
- *AASHTO Technical Service Program subscriptions.* TSPs are created by a vote of the AASHTO board of directors to "fulfill specific needs and to pool resources to build a much stronger national program than any one DOT could create on its own." The TSPs cover such diverse areas as product evaluation, lab certification, maintenance and design. Funding varies for each TSP and is provided through voluntary contributions from participating state DOTs.
- *Transportation pooled funds*. The TPF Program brings together federal, state and local agencies and other organizations that combine resources to address shared transportation-related problems. Pooled funds are led by a state DOT or FHWA; FHWA administers the TPF Program. Typically, a TPF is funded for a finite time period (for example, four or five years), and each participating agency contributes a set amount for each year (for example, $30,000/year for four years). An SME from MDOT will participate on the TPF's TAC. The pooled fund generally pays for travel to TAC meetings.

2.2.2 80/20 Funded Items

State-specific research activities funded with 80% federal funds and 20% state funds include the following:

- *Contracted state studies.* MDOT contracts with universities and private consulting firms to investigate issues that range from design and construction to maintenance and multimodal travel.
- *In-house state studies.* Occasionally, MDOT staff members will conduct an in-house study that produces a final report. The need for these projects, which are included in MDOT's annual research work program, is identified by the Research Division or RAC. An example of this type of project is a full-depth reclamation pilot project that the agency wished to document in a final report. These projects are relatively uncommon.
- *Support studies for division staff and district traffic control.* Some state studies require MDOT staff time for items such as fieldwork and traffic control. At times, MDOT will include funds for these activities in the work program.

2.2.3 Fully State-Funded Items

Emergency or specialty projects may be initiated throughout the year and approved by the RAC and FHWA, depending on agency need and available funding. These projects must go through the same approval and contracting processes as studies identified during the annual work program development

and contracting processes. Research Division staff members also look for TPFs posted since the last work program.

2.3 From Idea Generation to Approval of the Work Program

MDOT's annual research development cycle begins with research ideas proffered by members of the RAC and concludes with the development, submission and approval of a research work program document (see Figure 2.1). This document describes the research activities planned for an annual research cycle that encompasses the period October 1 through September 30, which follows the FFY.

The full research cycle is summarized below:

- If research ideas need to be generated, the RAC meets in October or November following approval of the current FFY's work program to generate possible ideas for the next FFY's work program. Ideas can be generated by divisions, districts or outside entities, but the SME will need to push the idea up to his/her RAC member.
- In the weeks following the idea generation meeting or throughout the year, the RAC rates the generated ideas and decides which ideas will go forward.
    - Data associated with the research ideas generated by the RAC are entered into a web-based tracking system, the Research Management System (RMS).
    - The RAC selects members of the TAC for each of the approved ideas; the Research Division appoints a TAC Chair for each proposed study.
- In the months following the generation of ideas, Research Division staff members work with the TACs and other SMEs to develop RNSs and identify potential researchers, who will then submit research proposals for inclusion in the next FFY's annual research work program.
- The Research Liaison compiles the final selected research project briefs for both 80/20 state studies and TPFs in a research work program document and submits it to the RAC for final approval. This research work program document is reviewed during the RAC's annual work program review meeting or as needed if additional projects are selected and added to the research work program during the year.
- The RAC-approved research work program document is submitted to FHWA.
- FHWA approves the research work program or requests revisions.
    - If the work program is approved as submitted, MDOT notifies the researchers included in the work program, the PIs develop research proposals based on the RNSs, and the contracting process begins.
    - If the work program requires revisions, the Research Division makes the necessary changes and submits a revised work program to FHWA. If the changes are significant, the work program document may require review and approval by the RAC before resubmission to FHWA.
- After approval of the research work program by FHWA, MDOT's Programming and Financial Management divisions must obligate federal funds in FHWA's Fiscal Management Information System (FMIS) and enter data about each new project in MDOT's FMS.
- Projects that proceed into the contracting phase are handled according to CSU contracting procedures.

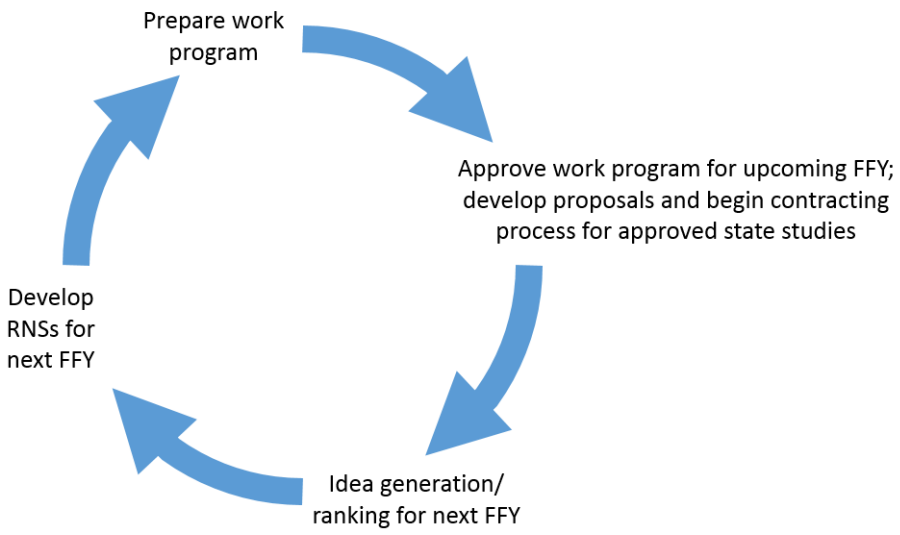

Figure 2.1: Annual Research Work Program Cycle

2.4 Research Management System

The Research Division uses RMS to manage data for each FFY's research work program. RMS can be viewed by any MDOT staff member; editing capabilities are available to the RMS administrator (Research Liaison), the SRE and the TAC Chair for each project.

The RMS database stores data on MDOT research studies funded through all available sources, MDOT participation in pooled funds and AASHTO TSPs, and MDOT's funding-related activities associated with NCHRP and TRB. RMS includes data on the following types of projects and payments:

- Active projects, including existing studies carried forward from the previous FFY that continue work into the upcoming FFY, as well as projects for the current FFY
- Studies completed in the previous FFY
- TPF studies evaluated by MDOT, whether MDOT participated or not
- Federal annual payments for NCHRP subscriptions, TRB subscriptions and AASHTO TSPs
- Deleted projects, which include project ideas that did not go forward

RMS tracks project attributes such as project name, number, PI, type of project, total study budget and dates for the notice to proceed (NTP) and contract expiration. Documents can be posted to and accessed from RMS, and users can generate customizable reports.

The annual research work program document submitted to FHWA for approval is automatically created by RMS upon demand using data stored in the RMS database. If new studies are added to an approved work program or changes are made to ongoing studies that require RAC and FHWA approval, RMS can automatically create a revised version of the work program document for FHWA approval of those additions or changes. RMS is also used for general tracking and informational purposes.

2.5 Developing a Research Needs Statement

Each year, Research Division staff members, in collaboration with the TAC members assigned to each project by the RAC, translate each issue or problem identified by the RAC into an RNS. When preparing RNSs, MDOT staff members describe the research statement's relationship to the existing body of knowledge, searching TRB's Transportation Research Information Database (TRID) to identify related research and referencing the most significant related studies by name.

MDOT staff members wishing to suggest research ideas for RAC consideration are advised to consult with the SRE. Generally, MDOT staff members discuss the idea with their RAC representative to ensure the idea will have support within the RAC before working with Research Division staff to develop the RNS.

2.5.1 Risk Identification and Mitigation

When preparing an RNS, MDOT staff will identify risks to the completion of the project and describe how they can be mitigated. These risks can include, but are not limited to, the following:

- *MDOT champion(s) leaving.* If one or more TAC members leave MDOT employment, can the rest of the TAC members oversee the study? Will implementation be adversely affected? MDOT will add text to an RNS to address this possibility.
- *Shifting priorities.* MDOT's upper management, FHWA and elected officials, including the elected three-member Mississippi Transportation Commission, have an impact on the priorities and focus of the RAC. As these department staff and elected officials change, priorities can change. Mitigating this risk can take the form of demonstrating research benefits, implementing research results and maintaining constant communication and transparency.

After identifying the risk(s), RNS developers should describe how the risks can be mitigated, which is most effectively done using the four "T's":

1. *Tolerate*. Accept the circumstances. Sometimes nothing can be done due to cost or staff constraints, but even if this route is chosen, the risk should be monitored for changes and mitigation strategies. This strategy is used fairly often in research projects, depending on the nature of the risk (for example, a deteriorating pavement may be an acceptable risk, whereas a bridge collapse is not). With research, there is also a risk that results will not be implemented. DOTs acknowledge that SMEs outside of the Research Division are ultimately responsible for implementation, and this implementation is often beyond the Research Division's control. Mitigation strategies could include keeping implementation in mind throughout the project, developing training as part of the project and engaging upper management.
2. *Treat*. Take actions to reduce the likelihood of risks occurring and/or their impact, if possible. For example, if the main PI leaves the university or consulting firm during the study, identify a co-PI who can complete the study.
3. *Transfer*. Plan ahead to reduce the impact of the risk. An example of risk transfer is obtaining insurance, but use of this method is rare in research studies.
4. *Terminate*. Carefully review practices and processes in the research project to see if the risk can be eliminated. Risk can rarely be totally eliminated in research projects, but many contracting mechanisms permit termination of a work assignment or project. A PI leaving the project with no successor to finish the work might be identified as a risk too great for the agency to bear and serve as a basis for termination.

Steps 1 and 2 will be more commonly used in research studies; Steps 3 and 4 can be considered depending on the circumstances.

2.6 Selecting a Researcher

After development of the RNS, the TAC identifies a researcher with appropriate expertise to conduct the study. There are two primary options:

- The TAC has a single researcher in mind with the appropriate expertise and background. The TAC Chair will discuss contracting mechanisms with the SRE or Assistant SRE in consultation with CSU management.
    - Determine if an Indefinite Delivery/Indefinite Quantity (IDIQ) Master Contract is in place for the researcher selected. The IDIQ Master Contract must be associated with the Research Division and generally is an IDIQ Master Contract for the Materials and Research divisions or Mississippi State University. Consult with CSU management, as needed.
    - If an IDIQ Master Contract has not been executed, work with CSU management to identify other options, which may include a small purchase contract or competitive selection process.
- The TAC is aware of several qualified PIs or it does not know of a PI with the appropriate expertise.
    - The TAC will work closely with CSU management to develop a request for qualifications (RFQ). CSU will distribute the RFQ to universities and PIs in the research community, directing interested researchers to submit a statement of qualifications and a short summary of their approach to the project.

The TAC Chair will notify the PI selected for a particular study according to CSU procedures.

2.7 Developing the Research Work Program

The research work program document developed by the Research Division concisely describes all the research activities undertaken by MDOT, including technical and financial details of the research efforts that will be undertaken in the coming FFY. The State Planning and Research (SP&R) Part II work program includes proposed projects and renewal statements for continuing projects that use Part II funds. The research work program also includes allocations for 80/20 state research projects, contributions to transportation pooled fund studies and AASHTO TSPs, contributions to NCHRP and TRB, and contingency funding for ongoing and emergency projects. Included in the work program are general descriptions of each project, including estimated costs, taken from the RNSs. While finalizing the annual research work program, multiyear projects are reviewed to determine whether they are progressing effectively and productively, and should continue as originally planned.

2.7.1 Research Work Program Review

The SRE chairs the RAC and calls the annual RAC meeting or assigns a staff member to do so. The primary focus of this meeting, typically held in September, is to approve the annual research work program for the upcoming FFY. Meeting arrangements and distribution of meeting information, including the research work program document, are the responsibility of the Research Division.

2.7.2 Adding New Projects or Changing Contracts

While most of the RAC's work to review and approve the work program is addressed during the September meeting, the addition of new projects to the work program or changes to contracts associated with projects in process also require RAC review and approval. The following are typical examples of the contract changes or other issues that require RAC approval (typically provided electronically):

- No-cost time extensions
- Extensions involving cost changes
- Significant scope changes
- Addition of research studies or pooled funds not presented and approved during the RAC's September meeting

Research contract changes are coordinated with MDOT's CSU and also require RAC, Mississippi Transportation Commission and FHWA approval. Addition of a new TPF is coordinated with the Programming Division, which oversees the Research Division's federal funding. New TPFs also require RAC, Mississippi Transportation Commission and FHWA approval. Any change requiring FHWA approval triggers the production of a revised work program document.

2.7.3 Final FHWA Approval

After the RAC approves the research work program document, the document is submitted to FHWA-MS for approval. The submission to FHWA includes transmittal and certification letters from the SRE. Annual work program documents are posted on MDOT's Research Division web portal.

2.7.4 Miscellaneous Post-Approval Duties

After the RAC and FHWA approve the annual work program, and as studies are added and approved during the year, the Research Liaison updates TRB's Research in Progress (RiP) website by entering the new studies as *Active* and checking the RiP site for completed studies. For completed studies, the Research Liaison changes the status of any study that was completed to *Complete* and adds the URL of the study's final report. The Research Liaison also enters completed projects and URLs into TRB's TRID.

Other activities include sending MDOT's Programming Division a copy of the FHWA-approved work program, along with a spreadsheet with all 80/20 salary line items (salaries for in-house and support studies) and any new state studies for the upcoming FFY after FHWA approval of the work program document.

3 From Work Program to Contract

3.1 General

This chapter focuses on what happens after the annual research work program is approved, including the preparations for and activities associated with moving from the approved work program to contracting for the selected research studies.

3.2 Developing a Research Proposal

Subsequent to receipt of FHWA approval of the annual work program or addition of a new study to the current work program, the Research Division TAC Chair advises the PI to begin developing a research proposal. The TAC Chair schedules an initial meeting between the PI and the TAC to review the RNS and ensure that the PI fully understands the objectives of the research. The PI is encouraged to provide feedback related to the proposed research, which may result in TAC-approved revisions to the RNS. The PI then proceeds with developing a research proposal based on the RNS in accordance with the direction provided in the MDOT Research Consultant Manual.

The TAC must review and approve a research proposal as drafted or request changes to it, as needed. The research proposal should be fully developed to the satisfaction of the TAC before the TAC Chair initiates CSU's contracting process for the given study.

3.2.1 Risk Identification and Mitigation

When preparing research proposals, MDOT and the PI will identify risks to the completion of the project and describe how they can be mitigated. These risks can include, but are not limited to, the following:

- *PI leaving.* Advise the PI to include a brief narrative in the proposal that outlines what happens if the PI leaves for another job, retires, becomes ill or otherwise cannot complete the project. Are there other team members who can continue with the project?
- *Not getting desired quality of final deliverables.* Ask the PI to prepare a draft report three months before the end of the study that the TAC will review and offer feedback. The PI can also submit report chapters once a task is complete. PIs may also hire a technical writer or, if a university, include a task in the proposal that allows for a university colleague with editing expertise to review any deliverables.

After identifying the risk(s), the PI developing the project proposal should include a description of how the risk(s) can be mitigated. Use of the four "T's" described in Section 2.5.1, Risk Identification and Mitigation, is again recommended.

3.3 Overview of the Contracting Process

After the proposal is completed, two parallel processes are initiated: one by the TAC Chair and one by the PI that ultimately result in a contract between MDOT and the researcher. Generally the TAC Chair initiates either form ADM 101 or form ADM 301 which must migrate through an approval process before CSU takes final receipt of the applicable ADM form.

3.4 Principal Investigator Development of Contract Elements

Once a state study project is approved by the RAC and included in the research work program, and the work program is approved by FHWA, each TAC meets with the PI(s) to develop a research proposal for the given study using the RNS as a beginning point.

Portions of the final TAC-approved version of the research proposal are subsequently incorporated into the study contract. In conjunction with CSU, the TAC Chair works with the PI to develop elements of the final contract, including the following:

- **Scope of work.** Section 3, Research Plan, included in all research proposals, is designed to be copied in its entirety and then pasted into the research study contract. CSU works closely with the TAC Chair to ensure that the original intent of the research plan is maintained in the contract scope of work. The language can change from the original research plan in the course of working with CSU though the general tasks should remain. The process among the Research Division, the PI(s) and CSU can be iterative to get the language finalized.
- **Progress schedule.** Section 5, Duration, included in all research proposals, provides a planned research study progress schedule in the form of a Gantt chart.
- **Cost estimate (state and non-state entities).** The PI prepares a cost estimate in connection with the research proposal that is tailored to the type of contract under which the research will be conducted. This cost estimate is submitted in a document that is separate from the proposal.

As preparations for these contractual elements proceed, the TAC Chair consults with CSU to ensure that any financial or contractual requirements are addressed as these documents are prepared.

3.5 Initiation of Project Contract and State Estimate

At the same time that the TAC Chair advises the PI to begin the process of developing a contract for the research study, the TAC Chair requests initiation of a project contract by completing the appropriate form and executing it through CSU's Consultant Services Tracking System (CSTS):

- **ADM 101, Consultant Services Request Form.** Completed when an IDIQ Master Contract is not applicable, most typically for small purchases and project-specific contracts that are advertised. (Small purchase contracts are limited to $250,000.) This form results in the execution of a Professional or Engineering Services Contract, to be determined by CSU.
- **ADM 301, Master Contract Work Assignment Request Form.** Used to generate work assignments associated with an IDIQ Master Contract. Federal law requires this new designation for what CSU refers to as "on-call" contracts. Master Contract work assignments are procured through CSU following all state and federal guidelines. Generally, each Master Contract covers a specific area, such as intermodal, research, planning or materials testing.

CSTS is used to route the ADM form and obtain approval from the following staff members:

- SRE (Project Manager)
- Programming Director
- Assistant Chief Engineer, Operations
- Chief Engineer/Deputy Executive Director
- Executive Director
- Civil Rights Director (if applicable)
- CSU Director

Each party listed above will receive email notifications indicating that his/her approval is required. The TAC Chair is responsible for tracking the ADM 101/ADM 301 approval process in CSTS and following up as needed to ensure timely approval.

- **State estimate.** The TAC Chair prepares a state estimate for both state (generally universities) and non-state (generally PIs) entities and submits same to CSU. This provides an estimate of the total number of hours for all tasks to be conducted by each labor classification within the study.
- **Negotiation Recap Form.** The TAC Chair also prepares a Negotiation Recap Form and submits it to CSU. This form documents review and negotiation activities related to project labor, schedule and cost.

3.6 Preparing and Executing the Contract

After obtaining agreement of all parties that the scope, cost fee breakdown and schedule are acceptable, CSU develops the official contract, following its internal process to acquire Mississippi Transportation Commission or FHWA approval, as required by a specific contract.

CSU forwards to and/or requests from the PI the appropriate number of originals of the official contract along with any additional documentation necessary for contract execution and administration. CSU obtains the appropriate number of signed originals of the official contract and follows its internal process to obtain the Executive Director's signature.

3.6.1 Notice to Proceed

Upon receipt of a fully executed contract, CSU drafts the NTP letter for the Assistant Chief Engineer's signature and forwards the signed NTP letter to the TAC Chair and/or the PI. The NTP letter includes an executed copy of the work assignment (for projects falling under IDIQ Master Contracts) or the contract (for other contracts).

3.7 Contract Templates

The CSU website offers a range of contracting templates, including:

- Engineering Services Contract
- Engineering Services IDIQ Master Contract
- Engineering-Surveying Services IDIQ Master Contract
- Institute for Trade and Transportation Studies (pooled fund study led by MDOT) Related Services IDIQ Master Contract
- Professional Services Contract
- Professional Services IDIQ Master Contract

3.8 Contracting Workflow

After all contractual elements have been reviewed and approved by all parties, the following tasks are completed by CSU:

- Develop the official contract.
- Obtain the necessary approval for each contract from the Mississippi Transportation Commission.

- Forward to and/or request from the PI the appropriate number of originals of the official contract along with any additional documentation.
- Receive the appropriate number of signed originals of the official contract from the PI and obtain the Executive Director's signature.
- Draft the NTP letter for the Assistant Chief Engineer to sign.
- Forward the signed NTP letter to the TAC Chair and/or the PI.

4 Research Project Management

4.1 General

This chapter examines the day-to-day administrative workflows and procedures to manage research projects and research-related activities.

4.2 Role of the TAC

TACs are instrumental in providing input to address MDOT's research needs, developing project scopes, setting priorities for projects selected for the research work program, giving advice and general guidance during the project, serving as important conduits for the transfer of research results and developing future champions of successful research products.

Each TAC performs the following duties:

- Works with the PI, the PI's staff and MDOT RSCs to develop the initial RNS and final research proposal
- Works with CSU to finalize the project scope of work and financial estimates
- Assesses project status by reviewing interim reports and participation in periodic TAC meetings
- Evaluates overall project progress
- Reviews the final report or other final deliverable
- Seeks to advance the technical aspects of the project and champions any implementation and follow-up activity once the study is complete

4.3 TAC Meetings

TAC meetings are held throughout the life cycle of a research study to monitor study progress. Typically, TAC meetings are held at least every six months or at milestone points in the study. These meetings may include the PI or be limited to only TAC participation. Meetings can be held in person or conducted via conference call or web conference.

4.4 First TAC Meeting (Kickoff Meeting)

Once an RNS is developed and a PI has been selected, the TAC Chair schedules an initial meeting of the TAC and the PI. During this meeting, the RNS is reviewed and the TAC Chair ensures the PI understands the focus of the proposed research. PI feedback may be incorporated into a TAC-approved revised RNS. The PI then proceeds with developing the research proposal.

4.4.1 Periodic TAC Meetings

The TAC Chair or PI may request a TAC meeting after the NTP has been issued and work begins on the project. These meetings are expected to focus on a review of study tasks and any changes proposed to the content of or funding for tasks in the project schedule. If the TAC does not come to a consensus on potential changes to the conduct of the study, the issue is resolved by TAC member vote of a simple

majority. If needed, the TAC Chair's vote prevails in the case of a tie. Upper management may also provide study guidance.

4.5 Progress Reports: Quarterly and Annual

PIs are required to submit progress reports quarterly and annually. These reports are submitted to the TAC Chair and the Research Liaison. The Research Liaison compiles the study-specific quarterly reports and associated study financial information sourced from Available Project Balance documents into a quarterly report that is a required submission to FHWA. The Research Liaison also compiles the study-specific annual reports into an annual report that is also a required submission to FHWA.

Study-specific quarterly progress reports (QPRs) contain information on funds spent during the quarter and to date, and work completed during the reporting period and planned for the next quarter. QPRs also contain demographic information on PIs for reporting to MDOT's Office of Civil Rights and FHWA. The TAC Chair distributes each QPR to the full TAC for review, asking that TAC members notify the TAC Chair of any concerns.

Study-specific annual progress reports are submitted to the TAC Chair and Research Liaison by August 15 each year. Information from these reports, which describe study progress for the current FFY and work planned for the next FFY (October 1 through September 30), is included in MDOT's research work program document to describe progress on each research study continuing into the next FFY. The Research Liaison compiles the study-specific annual reports and associated study financial information sourced from Available Project Balance documents into an annual report that is also a required submission to FHWA.

The TAC Chair follows up with the PI, as needed, to ensure timely delivery of progress reports. Failure to submit required progress reports can be reflected in the online performance evaluation completed by the TAC Chair at the end of each project.

4.6 Interim Reports

An interim report is an optional project deliverable that may be produced for some studies. For example, if a study involves the construction of a pavement test section and subsequent pavement/materials testing and analyses, an interim report may be developed to cover the construction of the test section; a final report will address the testing and analyses portions of the research. Interim reports are reviewed using a three-month review cycle.

4.7 Invoices

Throughout the project the PI will submit invoices for work performed. Invoices should be submitted at least quarterly. MDOT prefers that PIs submit quarterly invoices to coincide with submission of QPRs, though more frequent submissions are acceptable.

The first invoice for a research study should be submitted within nine months of the NTP date. Failure to submit an invoice within this time frame results in deobligation of the federal funds appropriated to the study and delays payment to the PI until those funds are reobligated.

PIs submit invoices electronically to CSU unless otherwise authorized by MDOT. The TAC Chair gauges reasonableness of the invoice in terms of tasks worked on and billed. The Research Liaison evaluates each invoice based on available funds, ensures the funds are charged to the correct project and detail numbers, and enters invoice data in the Research Division's invoice database app.

If the TAC Chair and Research Liaison concur with an approval recommendation, the invoice is routed to the SRE for final approval. If questionable charges appear on the invoice, the disputed invoice is routed back to CSU. The PI issuing the invoice is advised of the dispute reason and asked to explain or revise the invoice, as appropriate. Upon receipt of the PI's explanation or revision, the invoice is routed back through the invoice processing workflow with a notation from CSU indicating that the invoice is a revision.

4.8 Progress Schedule Changes

A progress schedule change is requested when a PI needs more time to complete a specific task but the overall contract can be completed before the contract expires. Changes to the content and ordering of tasks and subtasks or a reallocation of funds are permitted, subject to TAC approval, as long as the total amount of the study does not exceed the total amount indicated in the research work program.

Typically, requests for progress schedule extensions are addressed via email, with the PI providing adequate justification for the change. MDOT must obtain RAC and FHWA approval for this change; approval from the Mississippi Transportation Commission is required for all time extensions and/or supplemental agreements. Any changes to tasks and subtasks should be appropriately reflected in progress reports.

Occasionally, a research study cannot be completed within the original time frame set up in the contract and requires additional time to complete the study. In these cases, if no additional funds are required to complete the research, then the PI requests a no-cost time extension and provides adequate justification for the change.

4.9 Supplemental Agreement to an Existing Contract

On rare occasions, if additional funds are needed or project tasks are significantly rearranged, the Research Division will work with the PI and CSU to prepare a supplemental agreement to the existing research study contract. In conjunction with a revised scope of work, a time extension may be granted to the research contract via the supplemental agreement.

5 Financial Management of MDOT Research Funds

5.1 General

Research Division funding comes from SP&R Part II funds with some state matching funds. MDOT expenditures generally fall into one of three categories:

- 100% federally funded efforts such as NCHRP, TRB, AASHTO TSPs and TPFs
- 80/20 state studies (contracted state research projects)
- 80/20 internal line items (in-house and support studies)

On rare occasions non-SP&R Part II and/or 100% state funds have been contributed to a research project, generally from other divisions.

Federal and state financial systems are used to manage Research Division funding; financial information is obtained from MDOT's Research, Programming, Financial Management and Consultant Services divisions, as well as FHWA-MS. This chapter outlines the reports and information sources used to track MDOT's research-related funding.

5.2 Federal Versus State Fiscal Years

Research Division's funding is based on the FFY (October 1 through September 30); the state fiscal year (FY) covers the period July 1 through June 30. When budgeting for the Research Division, it is important to remember that there is a three-month period of overlap when a new state FY coincides with the previous FFY. Each year, July, August and September are in different state and FFY cycles.

5.3 Financial Management Software Systems

Research funding is tracked by MDOT and FHWA using their respective financial systems:

- *Financial Management System.* MDOT uses FMS to program and track parts of the Research Division's annual budget.
- *Fiscal Management Information System.* FHWA uses FMIS to manage federal apportionments to MDOT. TPFs and other 100% federally funded programs such as NCHRP and TRB are paid for through FMIS.

▶ **NOTE** The Research Division has no direct access to FMIS and must request FMIS information and reports from MDOT's Programming Division or FHWA-MS.

5.4 Definition of Terms

Project number. A unique FMS project number is assigned to each state study. This number stays with the study for its entire life cycle. All AASHTO TSPs receive the same unique project number; that number is updated each FFY. While TSPs are not state studies, MDOT pays TSP fees directly to AASHTO.

Other fully federally funded items such as pooled funds, NCHRP and TRB subscriptions are not assigned an FMS project number since they are paid using FHWA procedures.

Detail number. A single detail number—101000—is used as a placeholder and is common to all budget items with a project number. As with project numbers, 100% federally funded fees (except for AASHTO TSPs) are not programmed into FMS and therefore do not have a detail number.

Program code. This code is assigned to federal funds in FMIS based on authorization bills passed by Congress. Each new federal authorization gets a new code, though codes usually span more than one FFY. Program codes identify which "bank account" funds come from. A new "bank account" is created with each authorization bill issued by Congress. For example, the program code for the Moving Ahead for Progress in the 21st Century Act (MAP-21) authorization's SP&R Part II funds is *Z560*. MDOT's Programming Division and FHWA-MS advise the Research Division about program codes.

5.5 Summary of Expenditures for Work Program

Presented below are descriptions of the following types of work program expenditures:

- Summary totals
- Minor research studies
- State studies
- Pooled fund studies
- Pooled fund encumbered funds
- AASHTO TSPs
- NCHRP and TRB

5.5.1 Summary Totals

The FY revenue table is a top-level overview of incoming and outgoing research funds. This table shows carryover from the current FY as well as the anticipated appropriation amount for the upcoming FY. It also shows the cost of all anticipated research expenditures for the upcoming FY in both federal and state matching funds, where applicable. Any funds remaining after subtracting the total of expenditures from the total of available funds are shown as contingency funds that can be rolled forward into the next FY.

5.5.2 Minor Research Studies

This occasionally used category of expenditures applies to Research Division staff salary charges associated with work not covered under a research study with a specific project number. These can include fieldwork done by Research Division staff in support of a contracted study. Most salary charges are paid with 100% state funds and are not included in the annual research work program, which is developed primarily to account for the use of federal funds.

5.5.3 State Studies

The state studies table reflects the life span of all 80/20 state studies, including the beginning and ending dates, budgeted funds and expenditures. Rows are highlighted to show the new studies beginning in the upcoming FY.

5.5.4 Pooled Fund Studies

Three classifications of pooled fund studies make up the pooled fund category:

- Continuing pooled fund studies that were included in the previous year's work program
- Rejoined pooled fund studies that were not included in the previous year's work program but were part of a work program sometime in the past
- New pooled fund studies that were joined for the first time in the current FY

5.5.5 Pooled Fund Encumbered Funds

Encumbered funds are earmarked for a future purpose. Pooled funds continue for several years, and MDOT may commit to participate for several years into the future. To ensure funds are available to cover these future commitments, funds are encumbered from the outset of MDOT's participation in the pooled fund study.

5.5.6 AASHTO Technical Service Programs

AASHTO TSPs are invoiced twice each year, generally in July and November. Because the AASHTO FY (July 1 to June 30) does not coincide with the FFY (October 1 to September 30), invoices received in July are for the next AASHTO FY; invoices received in November are for the same FY (the upcoming FY at the time the work program is being prepared).

5.5.7 NCHRP and TRB

NCHRP and TRB subscriptions are accounted for with 100% federal funds.

5.6 Programming the Research Division Budget Into FMS

Once the annual research work program has been finalized and approved by the RAC, the Research Division will send an FHWA-approved copy of the research work program document, accompanied by a spreadsheet, to MDOT's Programming Division. The accompanying spreadsheet contains all 80/20 internal line items (in-house and support studies, excluding salary items funded by 100% state money), state studies and AASHTO programs to be programmed into FMS, noting whether each is a 100% federal or an 80/20 state match item.

The spreadsheet includes columns for the project number (referred to as the FMS # in the spreadsheet), FMIS number, project title/description, total amount for the FY, 80% federal amount and 20% state amount (except for AASHTO 100% federally funded items).

5.7 Payments for Other Expenditures

The following sections address payments made for participation in TPFs, subscriptions to NCHRP and TRB, and participation in AASHTO TSPs.

5.7.1 Transportation Pooled Fund Payments

Once the new FFY begins, MDOT's research work program has been approved by FHWA, and the federal apportionment has been placed in the Research Division's account, payments for MDOT's participation in pooled funds can be processed.

Approval for the TPF payments is obtained from the Mississippi Transportation Commission. Once Commission approval is obtained, the Research Division will receive a sealed copy of the signed Commission order from the office of the Secretary to the Commission; this order is included with the TPF payment. MDOT completes the appropriate FHWA funds transfer forms:

- Form 1575 for state-to-state transfers (if another state is leading the TPF)
- Form 1576 for state-to-FHWA transfers (if FHWA is the lead agency)

The transfer form is signed by the Programming Division Director and sent to FHWA-MS.

5.7.2 NCHRP and TRB Payments

Making NCHRP and TRB payments is similar to the TPF payment process and in fact uses the pooled fund payment mechanism. The RAC approves an estimate of NCHRP and TRB subscription payments at its annual meeting each September. Payment amounts are estimated using data from previous years. When these payments are ready to be made, TRB provides a letter to MDOT's Executive Director, typically copying the SRE, which specifies the exact amount of each payment and includes a space for the Executive Director's signature. This document, when signed by the Executive Director and sent to the SRE, constitutes an agreement between TRB and MDOT and is returned to TRB in connection with the payments.

5.7.3 AASHTO Technical Service Program Payments

TSPs, which include such AASHTO programs as the Innovation Initiative, Product Evaluation Listing and "re:source," are programmed using 100% federal funds after the annual research work program is approved. The Research Division pays AASHTO directly for TSPs through FMS. After receiving AASHTO's request for payment, the Research Division obtains Mississippi Transportation Commission approval, following the same approval practice used for pooled funds and NCHRP and TRB payments. The Research Division's office manager, who handles all state-funded purchases including office supplies, requisitions and purchase orders, enters TSP payment data into FMS.

5.8 Financial Controls Policies

To comply with state and federal financial regulations and procedures, including MDOT and state procurement procedures, and federal requirements specified in 2 CFR 200 and 2 CFR 220 for subrecipients, the Research Division has established the financial controls policy described below.

5.8.1 General Fiscal Procedures for Research Projects

Master agreements, work assignments and any other research project contracts will be reviewed for compliance. Additionally, during and after each project, close attention will be paid to fiscal procedures, including the following internal controls:

- Preparation of annual research work program according to federal regulations applying to SP&R Part II funding, to include RAC and FHWA approval.
- Compliance with state procurement policies and agency approval processes.

- Thorough review of research proposals and costs.
- Contract initiation (proposal process; ADM; work program; and RAC, FHWA, CSU and Mississippi Transportation Commission approvals).
- Preparation of state estimates.
- Coordination with Programming Division to get new projects programmed into FMS.
- Clarification of any equipment purchases associated with research: cost of the equipment, who receives the property once the project is done, oversight if the property resides elsewhere than MDOT (see Section 5.8.2, Nonexpendable Equipment Procedures, and Section 5.8.3, Oversight and Disposition of Equipment Bought Using Federal Funds, below for more information).
- Review of invoices to ensure reasonable expenditures and disputing of invoices that contain unacceptable items. Examples of unacceptable expenditures include, but are not limited to, snacks and sodas for a meeting, alcohol in any form, and travel or equipment not authorized by the SRE. Acceptable expenditures include, but are not limited to, labor, overhead, and equipment and travel authorized by the SRE. These will be included in the original contract budget and scope of work. MDOT will defer to the CFR if unsure of an expense's acceptability.
- Written approval by the SRE as required for travel or other direct costs (such as travel). Email approval is acceptable.
- RAC, FHWA and Mississippi Transportation Commission approval of any time and/or cost extensions, including justification and updated progress schedule.
- Approval of final invoice, completion of performance appraisal, and getting projects to final audit.
- Completion of FHWA transfer forms; obtaining Mississippi Transportation Commission approval; and routing to Programming Division for 100% federally funded transportation pooled fund studies, NCHRP and TRB payments. These are routed to the Programming Division Director for approval.
- Payment of invoice for AASHTO TSPs using 100% federal funding, including working with Programming Division to get these into FMS, obtaining RAC and Mississippi Transportation Commission approval, and working with agency personnel to see which of the TSPs they wish to subscribe to.

5.8.2 Nonexpendable Equipment Procedures

Since research spends federal SP&R Part II funds, 2 CFR 200 contains regulations for equipment purchased as part of a research project. The CFR defines equipment as:

> "… tangible personal property (including information technology systems) having a useful life of more than one year and a per-unit acquisition cost which equals or exceeds the lesser of the capitalization level established by the non-Federal entity for financial statement purposes, or $5,000."

The use of nonexpendable capital equipment is sometimes necessary for contract research studies and investigations. Procedures are to be followed in compliance with 2 CFR 200.313 provisions that address the use of capital equipment in federally funded programs. These procedures are a guide to the acquisition of nonexpendable research equipment with state and federal funds.

Occasionally, contracted research projects require purchases of nonexpendable equipment. 2 CFR 200.313 outlines procedures for dealing with equipment purchased as part of a research project, and MDOT will follow these. A summary follows below:

1. The default position is that MDOT will take possession of equipment at the end of the research project unless otherwise negotiated as part of a work assignment.
2. If the equipment costs less than $5,000, a public institution may take possession of the equipment at the discretion of the SRE and if negotiated as part of a work assignment.
3. Any equipment costing more than $5,000 will be transferred to MDOT, unless otherwise specified by the SRE and MDOT.
4. If the equipment costing more than $5,000 will physically reside at the public agency after the contract is over, the equipment must still be titled to MDOT. MDOT and the public agency must comply with the property records maintenance required in 2 CFR 200.313(d). When the property is at the end of its useful life, it must be disposed of in accordance with 2 CFR 200.313(e). See Section 5.8.3, Oversight and Disposition of Equipment Bought Using Federal Funds, below for more information.
5. Any equipment purchased by a PI will be transferred to MDOT.

The consultant or university may also choose to lease equipment rather than purchase, and this cost must be approved as part of the contract scope.

There may be instances where equipment is assembled by the university or agency. This will also involve major alteration of an existing piece of equipment to make it useable. This equipment purchase must be in the study budget and/or approved by the SRE for all components whose value exceeds $5,000. Rules referenced in Steps 1 through 5 above will apply in this case.

The above summary is the Research Division's interpretation of the CFR, and in the event of questions, the Research Division will contact FHWA for guidance.

5.8.3 Oversight and Disposition of Equipment Bought Using Federal Funds

In the event a public agency purchases equipment costing more than $5,000 as part of an MDOT-funded research contract, and that MDOT and the agency agree that the property will reside at the university, the Research Division will follow state property procedures by doing the following:

1. The item must be added to the Research Division's property inventory in FMS.
2. The equipment must be assigned a useful life in years based on the manufacturer's recommendations and/or empirical knowledge.
3. Research personnel will visually inspect the property annually, verifying its serial number and condition and taking a photograph. It is the responsibility of the contracting university to ensure the safekeeping, integrity and proper use of the nonexpendable equipment. If the Office of the State Auditor is auditing the Research Division in a given year, staff from the Office of the State Auditor must also inspect the property. During the property's useful life, in compliance with 2 CFR 200.313, the university will maintain property records that include the following:
    - A description of the property, including make, model and any other relevant information
    - Serial or other identification number

- The source of funding for the property
- Who holds title
- Acquisition date
- Percentage of federal participation in project costs for the federal award under which the property was acquired
- The location, use and condition of the property
- Any ultimate disposition data, including the date of disposal and sale price of the property

4. The record for each item shall also include the total cost, model identification, equipment request number, Research Project number and the kind of funds (federal, state, or grantee share) that are used under which the equipment was acquired. Copies of the record shall be furnished to the grantor annually or upon request.
5. Equipment must be made available upon request for inspection and/or verification of inventory.
6. The university must develop a control system to ensure adequate safeguards to prevent loss, damage or theft of the property. Any loss, damage or theft must be investigated. The university must also develop adequate maintenance procedures to keep the property in good condition.
7. Once the equipment reaches the end of its useful life, the university or public agency where it resides will contact the Research Division to plan the disposal of the property. If the property's fair market value does not exceed $5,000 and/or the Research Division does not wish to take the equipment back, the university may sell, retain or dispose of the property as it desires. If the fair market value exceeds $5,000, the university must contact the SRE to determine means of disposal. A complete record of the equipment is to be submitted to the SRE, which will include information on the condition of the equipment. Disposal will be done according to state property procedures.

6 Project Wrap-Up

6.1 General

This chapter addresses the efforts made by the TAC Chair to ensure each project can conclude as expected, the activities associated with production of the final report and other tasks required to wrap up a project (payment of the final invoice, completing a performance evaluation and a final audit). Timely completion of all project wrap-up activities is critical, especially at the end of a state FY or an FFY, so that any invoices can be paid and any funds remaining on a completed and closed-out project can be transferred and used in a subsequent FFY.

6.2 Preparing for the Project's Conclusion

Approximately four to six months before the contract for a research study expires, the TAC Chair will contact the PI to discuss whether the project can be completed according to the contract's schedule and to discuss production of the final report or other final deliverable required by the contract. If the PI advises that additional time is required to complete the study, then the TAC Chair should follow the guidance provided in Section 4.8, Progress Schedule Changes.

6.3 Final Report

For most MDOT research projects, the final report is the crucial deliverable provided to MDOT in exchange for payment of federal and state funds for the research. Very few projects have only test results, software, manuals or educational materials as a final deliverable. If a final deliverable will be something other than a research report, the project's proposal and contract will specify the alternative final product of research.

MDOT final research report guidelines in the MDOT Research Consultant Manual (Chapter 6. Interim and Final Reports) describe a final report's elements and organization, the workflow for developing and reviewing the report, style considerations, and directions for preparing and delivering the final report.

While MDOT provides a Final Report template in Microsoft Word that can be used to prepare a final report, use of the template is not required. However, PIs are encouraged to consider using the MDOT template to expedite production of the final report. The template contains all required elements of a final report, including the FHWA-required Technical Report Documentation page, a table of contents that can be updated throughout the report writing process and a brief description of the chapters typically included in a final report.

AASHTO's Special Committee on Research and Innovation offers additional guidance on report guidelines and requirements.

▶ **FOR MORE INFORMATION** See the Final Report template (Microsoft Word)

6.4 Technical Brief

Some studies produce deliverables that lend themselves well to the presentation of study findings using a Technical Brief. For these studies, a subtask can be added to the final report task to account for the PI's work on preparing the brief. The stand-alone Technical Brief will be reviewed and approved by the TAC and accompanies the final report.

Typically, Technical Briefs are approximately two pages in length, depending on subject matter, and include the following elements:

- A description of the issue requiring research
- Research methods
- Conclusions or recommendations for implementation
- Names of the TAC members and non-TAC participants providing services in support of the research
- Graphics illustrating key elements of the project

6.5 Final Invoice

The PI is expected to submit a final invoice around the same time the final report is submitted to the TAC Chair. This invoice should be marked with "Final Invoice" at the top of the page. This invoice is reviewed by the Research Division. Of particular importance to the TAC Chair regarding this invoice is that all project deliverables have been received and accepted by MDOT before forwarding the invoice to the Research Liaison for further processing of the payment.

PIs cannot bill for more than the contract's not-to-exceed amount. The overall dollar amount of the contract must remain the same unless an increase in study funding is approved by the RAC, Mississippi Transportation Commission and FHWA.

Unless the final invoice presents concerns, a few months after submission of the final invoice the Research Division is notified by the Audit Division that the audit has been completed and the final invoice is approved for payment. The TAC Chair, Research Liaison and State Research Engineer review and approve the post-audit final invoice before payment is provided to the PI.

6.6 Publishing Project Results

PIs are advised to obtain approval from the SRE before presenting or publishing results of an MDOT-funded research study in any publication or forum other than a final report or Technical Brief. For example, prior approval is required when submitting a paper for presentation at the TRB Annual Meeting or publication in a professional journal. MDOT reserves the right to review the final version of any presentation or paper prior to its submission and reject any or all of the PI's submission.

6.7 Performance Evaluation

An online performance evaluation, available in the CSTS, is completed by the TAC Chair and reviewed by the Project Manager (the SRE). CSTS sends an email prompt to the TAC Chair to complete the evaluation. Results of the evaluation are used by CSU to ensure MDOT is satisfied with project results and monitor PI-specific feedback that may affect future project selection.

The evaluation considers five performance types (weights are noted in parentheses):

- Management (25%)
- Prosecution and progress (25%)
- Quality of work (30%)

- Cooperation/coordination (10%)
- Adequacy/availability of workforce (10%)

Each performance type is rated using the rating scale of 1 (consistently falls below expectations) to 5 (consistently exceeds expectations). A total score is determined using the ratings applied by the reviewer and the percentage weights assigned to each performance type. A comment box is available for the reviewer to enter open-ended comments about each of the five performance types.

7 Implementation and Performance Measures

7.1 General

This chapter examines MDOT's practices for ensuring implementation is considered throughout the life cycle of research and assessing project impacts after the research concludes. TAC members and other SMEs provide critical departmental perspective that aids researchers in identifying how research results can benefit MDOT and the larger transportation community. A set of performance measures is described that meets FHWA reporting requirements and allows for additional internal assessment.

7.2 Implementation During Project Development

The research conducted for MDOT is expected to result in findings that can be implemented in some way, for example, through informing or changing current practices and procedures or as a tangible product. As part of their collaboration to develop a research proposal, the TAC members, RSCs and researchers develop an Implementation Plan that considers, as appropriate for the given study, activities to promote application of the study findings within MDOT. This plan (included in Section 6, Anticipated Research Results, of the research proposal) is expected to evolve as the research study unfolds.

While the Research Division does not employ an Implementation Plan form or template, the plans are expected to include:

- Identification of the MDOT divisions and/or districts that will utilize the product of the research
- Identification of the metrics that will be used to evaluate the benefit of implementation to MDOT, including a set of baseline data that can be used for comparison pre- and post-implementation
- Future activities necessary by MDOT for successful implementation
- Criteria for judging the progress and consequences of implementation
- Recommendations for use of analytical methods to quantify the potential benefits of the research product
- Estimation of the funding needed to implement research results and a cost/benefit analysis that assesses the research study's impact
- Consideration of impediments to successful implementation of the research results within MDOT

MDOT expects to produce implementable results from its research efforts, though it is possible that a study will not produce products or results that can implemented. These studies, however, may inform subsequent research that does result in an implementable product.

7.3 Implementation While the Project is Underway

Once a research proposal is included in the annual work program, a contract is executed and research begins, the researcher is encouraged to solicit input from the TAC Chair and other members of the TAC on the implementation potential of research results and the mechanisms needed to effect the implementation. Implementation of project results is addressed in the project kickoff meeting and in subsequent meetings of the TAC, focusing on the following ideas:

- Study outcome expectations
- Expected research result benefits
- Quantification and reporting of benefits
- Expected risks and obstacles to implementation
- Possible strategies for overcoming the risks and obstacles
- Measures that will be used to evaluate the project
- Who may be impacted by the results
- Key staff members participating in the implementation of study findings
- The expectation of the researcher's role in the implementation, if any
- Identification of the development of software and/or patentable products or processes

Opportunities, challenges and issues are discussed throughout the project. PIs are expected to identify obstacles on QPRs, at meetings and via correspondence during the life of the project. Close and frequent communication between the TAC members and the PI is essential.

7.4 Implementation After Project Completion

Six months after project completion, the TAC Chair will ask the SME(s) on the TAC to complete a follow-up questionnaire that includes the following questions:

- Have project results been implemented?
- If so, what benefits were obtained?
- If not:
    - Are there plans to implement project results?
    - What barriers exist to implementation?

The SRE uses these completed questionnaires to enter data into the Research Division's Implementation and Performance Measures database. This Microsoft Access database is used to track implementation results and performance measures (see Section 7.5, Performance Measures, for details of the performance measures tracked). Each project's implementation status is entered, using one of the following options:

- Implemented
- Plan to implement
- Not implemented
- Not applicable (generally applies to in-house support studies that track division staff work on contracted studies)
- Unknown

7.5 Performance Measures

MDOT began reporting on performance measures in connection with requirements under the 2012 MAP-21 authorization and continuing with the 2015 Fixing America's Surface Transportation Act (FAST Act). The Research Liaison gathers data for the three performance measures below and reports that data to FHWA quarterly:

- Percentage of research projects with a deliverable
- Percentage of research projects performed by universities
- Percentage of research projects receiving an extension of time and/or cost

Additional performance measures tracked by the Research Division and reported in the division's Implementation and Performance Measures database include:

- Cost savings
- Expedited project delivery
- Improved environment
- Improved practice
- Increased customer satisfaction
- Increased knowledge base
- Increased safety
- Lessons learned
- New policy/standard
- New specification
- Reduced crashes
- Saved lives
- Saved staff time
- Support study to larger study
- Technology transfer
- Validated current practice

The Research Division is considering the use of more formal processes to gather data, monitor performance measures and continue engagement with TAC members after projects conclude.

8 State Planning and Research Part II Program Oversight

8.1 General

This chapter addresses the documents and reporting MDOT prepares in connection with oversight of its SP&R Part II program, including:

- Annual research work program
- Work program amendments
- Annual program expenditure report
- QPRs
- Hosting and participation in research peer exchanges
- Support of TRID and RiP databases and final report distribution

8.2 Annual Research Work Program

As required by the CFR, the Research Division is tasked with development of the annual research work program. That process is outlined in detail in Chapter 2, Annual Research Work Program. According to 23 CFR 420(B) or 23 USC 505:

> A State work program may be either annual or biennial. As required under 23 CFR 420.115(a), the work program, at a minimum, must include:
>
> 1. Summary listing of the major items and a cost estimate for each item.
> 2. Description of each activity (project) or individual research study to be accomplished during the program period and the planned date of completion.
> 3. Description of any agreements, including identity of the office, subgrantee and/or contractor responsible for conducting the work.
> 4. Total costs for each activity, including previous expenditures, current work program costs and estimated future costs.
> 5. Financial summaries showing the funding levels and share (Federal, State and other sources) for RD&T [research, development and technology transfer] activities. The inclusion of 100% State-funded activities is encouraged.
> 6. Description of any cooperatively funded studies, including pooled fund studies and NCHRP contributions as required under 23 CFR 420.111 and 207.
>
> The work program must be submitted to the FHWA Division Office for approval and authorization as required under 23 CFR 420.115(a). Additional informational copies may be submitted in accordance with the Revised SPR Report Distribution Guidance found at the Federal Highway Policy and Guidance Center website.

DOTs are advised to look at all areas of transportation for research ideas. The text above is taken from FHWA's publication, State Planning and Research Program Research, Development, and Technology Transfer Program Management Guidance for Implementing 23 CFR Part 420, Subpart B. Section V of this guidance document outlines criteria for following financial requirements in 2 CFR 200, issued in 2014. The financial policies in Section V closely follow FHWA's guidance in the areas of performance

measurement, internal controls, sub-recipient monitoring, project closeout and cost principles. The work program is prepared and presented in September in anticipation of the new FFY, which begins October 1 each year.

8.3 Work Program Amendments

According to the FHWA guidance document referenced above, the following rules apply to changes to the annual research work program:

> **Work program changes.** Administrative requirements for grants and cooperative agreements to State and local governments are covered under 2 CFR Part 200 and 1201, which supersede 49 CFR Part 18.
>
> Except for requirements listed under 2 CFR 200.308(c)(1), or if multiple funding sources are under obligation, in accordance with 2 CFR 200.308(d) and (e), a State may make budget transfers among individual RD&T activities without FHWA's prior approval unless the total of such transfers over the period of the work program will, or is expected to, exceed the larger of the Simplified Acquisition Threshold under 2 CFR 200.88 ($150,000 as of August 5, 2017, but proposed to increase to $250,000 for Federal Fiscal Year 2018) or 10 percent of the total approved work program budget. For example, for an RD&T work program totaling $5,000,000, a State may transfer $500,000 among RD&T activities included in the work program and the prior FHWA approval requirement may be waived. No transfer shall be permitted that would cause the funding to be used for purposes inconsistent with the appropriation.
>
> A budget change that involves an increase in the total funds authorized for the work program still requires prior FHWA approval and authorization. Similarly, programmatic changes (such as adding a line item or contracting out) specified in 2 CFR 200.308 require prior FHWA approval.
>
> **Requirements for modifications to a SPR Subpart B research project per 2 CFR 200.308:**
>
> > Changes in principal investigator, project leader, project partner, or scope of effort must receive the prior written approval of the Federal awarding agency or pass-through entity.
> >
> > Recipients are required to report deviations from budget or project scope or objective, and request prior approvals from Federal awarding agencies for budget and program plan revisions, in accordance with this section.
> >
> > Change in the scope or the objective of the project or program (even if there is no associated budget revision requiring prior written approval).
> >
> > Change in a key person specified in the application or the Federal award.
> >
> > The disengagement from the project for more than three months, or a 25 percent reduction in time devoted to the project, by the approved project director or principal investigator.
>
> After approval and authorization of the work program, it is not necessary for a State to submit to FHWA, individual, detailed work statements or proposals for review and approval. A State, at its discretion, may wish to submit specialized or highly technical proposals or work statements to FHWA for comments or technical assistance. These requests may be forwarded through the Division Office to the Associate Administrator [AA] for Research, Development, and Technology. The AA will coordinate the review with the appropriate RD&T Division.

If questions arise regarding work program development or amendments, allowable expenditures, or specific project or proposal matters, the Research Division is obligated to work with FHWA-MS to

determine how to proceed. FHWA-MS may or may not choose to confer with FHWA headquarters, at its discretion.

8.4 Annual Program Expenditure Report

The Annual Program Expenditure Report is required by FHWA and is produced each January as it is due 90 days after the end of the previous FFY. This report consists of such elements as:

- A certification letter stating that the state DOT's research program complies with requirements of 23 U.S.C. 505
- Funding and reporting requirements
- Performance compared with goals, including funds paid to different universities
- Underruns or overruns on projects and explanations for these
- Completed deliverables during the previous FFY, including closed or terminated projects
- Continuing projects, including planned and previous progress or expenditures
- Pooled fund studies in which MDOT participates
- Any other information that MDOT or FHWA-MS deems relevant for inclusion

8.5 Quarterly Progress Reports

As noted previously in this manual, PIs are required to submit QPRs to the Research Liaison and TAC members. If the PI invoices quarterly, the QPR can be submitted with the invoice at the same time (together or separately). If the PI invoices more frequently, submission of the QPR is still required. See Chapter 4, Research Project Management, and the MDOT Research Consultant Manual for more detailed information. The Research Liaison compiles the QPRs and publishes them on MDOT's public-facing website.

8.6 Hosting and Participation in Research Peer Exchanges

MDOT has held peer exchanges since the requirement began approximately 20 years ago. The most recent one was held in October 2015. Additionally, MDOT has regularly participated in other DOTs' peer exchanges, most recently the Arizona DOT peer exchange in 2019. AASHTO RAC's website has excellent guidance on peer exchanges, including FHWA's guidance on peer exchanges.

A typical peer exchange involves four to five states with a focus on one DOT's program, though with web conferencing technology, multistate and virtual peer exchanges have been held. The hosting/focus state will choose one to three areas such as implementation, performance measures, strategic planning, final deliverables or aligning with agency goals, or might conduct a general peer exchange that examines the entire research program. MDOT works closely with FHWA-MS and MDOT upper management to identify area(s) of focus. Other participants such as academics, TRB staff, FHWA and MDOT upper management or other stakeholders may be invited, depending on the event's focus area(s). FHWA-MS must approve the peer exchange final report, and it will be published on MDOT's public-facing website as well as on AASHTO RAC's website.

8.7 Support of TRID and RiP Databases and Final Report Distribution

As outlined in Chapter 4, Research Project Management, and Chapter 6, Project Wrap-Up, and in AASHTO and FHWA guidance, MDOT distributes all final research reports and completes TRID records for TRB. The Research Liaison also enters an RiP record for research projects once they begin. Updates for TRID and RiP are entered as needed, generally two to four times a year. Final deliverables are also posted on MDOT's public-facing website, as well as MDOT@Work, MDOT's intranet site. The Research Division coordinates with MDOT's Information Systems Division to provide all posting instructions.

8.8 Conclusion

The Research Division strives to comply with all FHWA and MDOT upper management directives, as well as Mississippi state procurement laws, in the administration of the SP&R Part II program. Combining these requirements with performing practical, implementable and beneficial research for MDOT and the traveling public is the Research Division's goal. We will continue to try to meet the rapidly changing challenges of the present and future in support of MDOT's mission and FHWA's focus areas.