

RESEARCH, DEVELOPMENT, AND
TECHNOLOGY TRANSFER GUIDELINES
FOR THE MONTANA DEPARTMENT OF
TRANSPORTATION

FHWA/MT-11-001/8010

Guidelines

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

in cooperation with
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

March 2011

prepared by

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Montana Department of Transportation



RESEARCH PROGRAMS



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16. Abstract The Montana Department of Transportation (MDT) conducts research to discover, develop, or extend knowledge needed to operate, maintain and improve the statewide multimodal transportation system. Specific goals include: evaluation and advancement of new technologies, materials and methods; development of design and analysis techniques; and study of current transportation challenges. The purpose of this manual is to provide guidance for the development and management of effective MDT Research Programs. Through the identification of the various research related functions and operational procedures of MDT, this manual will produce a model of a research management system. The programs, projects, and products generated by the Research Programs, using the management system, are provided for the ultimate benefit of MDT's customers.			
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ALTERNATIVE FORMATS

MDT attempts to provide accommodations for any known disability that may interfere with a person participating in any service, program, or activity of the Department. Alternative accessible formats of this information will be provided upon request. For further information, call (406) 444-7693, TTY (800) 335-7592, or Montana Relay at 711.

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SUMMARY

MDT conducts research to serve the public by supporting a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality, and sensitivity to the environment. Specific goals include: evaluation and advancement of new technologies, materials and methods; development of design and analysis techniques; and study of current transportation challenges.

The purpose of this manual is to provide guidance for the development and management of effective MDT Research Programs. Through the identification of the various research related functions and operational procedures of MDT, this manual will produce a model of a research management system. The programs, projects, and products generated by the Research Programs, using the management system, are provided for the ultimate benefit of MDT's customers.

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CHAPTER 1

PURPOSE AND CONTEXT OF MANUAL

1.1 Purpose

The primary purpose of this manual is to provide guidance for the development and management of effective MDT Research Programs. Through the identification of the various research related functions and operational procedures of MDT, this manual will produce a model of a research management system. The programs, projects, and products generated by the Research Programs, using the management system, are provided for the ultimate benefit of MDT's customers.

To ensure the effectiveness of MDT's research processes and programs, several key objectives are presented in this manual:

- ★ Determining the usefulness and implementation potential of the research conducted by or through MDT;
- ★ Ensuring research results are implemented;
- ★ Assessing research using project and program accomplishments; and
- ★ Improving research through the coordination of several disciplines.

1.2 Overview

This manual covers the Research Programs from program development through evaluation, including technology transfer and the management requirements needed to maintain effective Research Programs.

This chapter (Purpose and Context of Manual) defines the need for and provides a brief overview of the contents of this manual.

Chapter 2, Customer Involvement, details the processes used to increase the interactive nature of MDT's Research Programs. It also explains the purpose and structure of research committees.

Chapter 3, Work Program Development, details the process for the development of the work program. It includes the solicitation and prioritization process, from developing a topic statement request to the screening effort conducted by the Research staff and committees. A review and prioritization of the research topic statements leads to the formation of the work program.

Chapter 4, Experimental Projects, explains the Experimental Projects Process, including the incorporation of experimental features into construction and maintenance projects and the evaluation of these projects.

Chapter 5, *Technology Transfer*, gives an overview of one of the most important activities in the research process by defining the research partners, project tracking issues, and outreach techniques. This includes library services and the input of projects to the Transportation Research Board's (TRB) Research in Progress (RiP) database and Transportation Research International Documentation (TRID) database, and the use of RiP and TRID for program development.

Chapter 6, *Program Evaluation*, lists the elements that give a measure of accomplishment of the Research Programs. These elements include the status of each project, the techniques for evaluating the entire Research Programs and the details of the peer exchange process.

Appendix A, *Model Calendar*, contains a calendar of research events.

Appendix B, *Research Topic Statement*, is the form used to submit research project ideas.

Appendix C, *Technical Panel Roles and Responsibilities*

Appendix D, *Research Project Statement*, is the form used to develop a scope of work.

Appendix E, *Preparation and Submission of Proposals*, contains guidance on proposal writing.

Appendix F, *Report Distribution*, lists the entities to which research reports are distributed.

CHAPTER 2 CUSTOMER INVOLVEMENT

2.1 Research Partners' Support Development

As previously stated, the programs, projects, and products of MDT's Research Programs are for the ultimate benefit of MDT's customers. Attaining this objective requires the support of our research partners. Their support can best be achieved by involving them in the process of developing the programs and generating the products. This assures their needs are considered at all times and facilitates the implementation of research products.

The transportation community is broad and multimodal. Research partners come from the ranks of MDT, universities, transportation-related companies (trucking firms, suppliers, contractors, etc.), transit authorities, tribal authorities, consultants, local governments, regional agencies, other states, FHWA, and the public. The partners involved and their level of involvement varies depending on the specific process.

Potential partners are solicited for research topics. Solicitations are given the widest possible circulation and exposure to enhance the possibility of receiving a large variety of suggested research topics. Section 3.1, Topic Solicitation, defines this process.

Partners are represented on specific research projects program's committees, as described in section 2.2, Research Committees Structure. The committee serves as the most formal of the interactive techniques and provides non-MDT institutions the forum to affect policy. Partners also help to guide the Experimental and Technology Transfer Programs, as described in Chapters 4 and 5, respectively.

MDT sponsored research seminars introduce broader issues with researchers, users, and other experts in a specific field. These seminars offer presentations and discussions directed to improve the understanding of issues and promote research efforts for MDT. Principal investigators conduct a seminar upon the completion of their research projects. Other seminars are conducted on an as needed basis.

The success of MDT's Research Programs hinges on our ability to develop strong and lasting interactive relationships with all the beneficiaries of research. The outreach partners and their forums will assist with program development, consensus building, implementation, technical input, and the strengthening of partnerships.

2.2 Research Committees Structure

Researchers seek to effect quality improvement by studying ways to enhance the processes, methods, or materials presently in use. The change inherent in an enhancement may come easier to the practitioner who is currently doing an effective job

with a concerted effort to elicit their input and support. Of the many activities delineated to develop and maintain research partners' support under Section 2.1, Research Partners' Support Development, the committee structure is perhaps the most important.

Through committees, Research Programs staff will formally maintain contact with the operating units of MDT and outside institutions. Meetings are often more effective than a phone call or office visit in that they expose non-Research members of the committees to a formal interactive process and show a concerted effort is being made to elicit their support.

When they are properly functioning, committees are useful in providing input for the solicitation of research topics, setting priorities for projects, developing the work program, giving advice and general guidance, and serving as important conduits for the implementation and transfer of research results.

2.2.1 Research Review Committee (RRC)

The RRC oversees MDT's Research Projects Program. Its responsibilities include:

- ★ Advising the Research Programs;
- ★ Prioritizing Research Topic Statements (Research Project Topic Statement form, Appendix B, <http://www.mdt.mt.gov/research/unique/solicit.shtml>) along with the District Administrators;
- ★ Approving new projects;
- ★ Approving funding for new projects and participation in pooled-fund studies;
- ★ Bolstering the implementation efforts of the technical panels (section 2.2.2); and
- ★ Approving the annual work program (section 3.6).

The committee's membership is broad and includes most MDT Divisions, as follows:

- ★ Administration Division Administrator;
- ★ Aeronautics Division Administrator;
- ★ Chief Administrative Officer;
- ★ Chief Human Resources Officer;
- ★ Chief Operations Officer;
- ★ Deputy Director;
- ★ Director;
- ★ District Representative;
- ★ Highways and Engineering Division Administrator;
- ★ Information Services Division Administrator;
- ★ Maintenance Division Administrator;
- ★ Motor Carrier Services Division Administrator;
- ★ Planning and Research Engineer, Montana Division, Federal Highway Administration;
- ★ Rail, Transit, and Planning Division Administrator;
- ★ Research Programs Manager; and
- ★ Western Transportation Institute Research Director

The Research Programs Manager chairs the committee and serves as its secretary. This committee conducts open meetings as often as monthly in Helena.

2.2.2 Technical Panels

Technical panels are formed to follow research projects from inception through implementation. Technical panels are typically composed of three to ten people with knowledge or expertise, and interest in the specific area of research. Panel members are drawn from MDT's Division and District offices, as well as from outside the Department. They are also balanced with respect to rank and viewpoint.

Technical Panel membership is chosen by the technical panel chairperson, in conjunction with the Research Project Manager, with input from other MDT personnel, and includes at least one Research staff member, who serves as the technical panel secretary prior to contracting and project manager for the duration of the project. Technical panels conduct open meetings as often as needed to perform their tasks in a timely fashion. Meeting locations accommodate the membership.

The technical panel's responsibility (see Technical Panel Roles and Responsibilities, Appendix C) begins with a review of the literature to determine the need for research, if any, and continues with the development of the Research Topic Statement (Appendix B) into a viable research plan. This plan should be formulated using the Research Project Statement form (Appendix D).

During and following the research, the Research representative on each technical panel serves as MDT's project manager and liaison between the technical panel and the consultant. The technical panel monitors research progress by reviewing progress, task, final, and any other reports/deliverables produced by the principal investigator. Finally, the technical panel makes implementation recommendations to the appropriate MDT Administrator, through the RRC.

CHAPTER 3

WORK PROGRAM DEVELOPMENT

3.1 Research Idea Solicitation

Once a year, in March and April, the Research Programs Manager solicits research ideas from as wide a variety of individuals as possible. This open solicitation enhances the possibility of receiving a diverse sampling of research suggestions.

Suggestions for research are made on Research Topic Statement forms (Appendix B, <http://www.mdt.mt.gov/research/unique/solicit.shtml>). This form requires a topic title and statement, as well as information on the proposed research, information technology (IT) components (i.e., database development and software purchase or development), urgency and expected benefits of the proposed research, and implementation plan. These statements provide enough information to allow the RRC to appreciate the significance of the issue, but do not elaborate on details. Research Topic Statements can be submitted at any time; however, they may be considered only once a year, in May, following each solicitation. All submitters will receive an acknowledgment of receipt of their topic statement from Research Programs staff.

Before a topic statement can be prioritized, it must have a champion and a sponsor. A champion is internal to MDT, and is willing to support the topic statement to the RRC and serve as the technical panel chairperson should the topic statement move forward to this stage. In doing this, the champion asserts there is a research need and this need is important to MDT. A sponsor is a District/Division Administrator or higher who agrees the research is important to MDT and is willing to ensure implementation occurs. Only topic statements with both a champion and sponsor move forward to the technical panel stage. Topic statements without either a champion or sponsor may be submitted again for a future solicitation.

3.2 Project Prioritization and Selection

The champions for each topic statement present their topic to the RRC and District Administrators (DAs) at the May RRC meeting. After each presentation, the RRC and DAs vote whether to move the topic forward to the technical panel stage. These topics are chosen because they address actual concerns of and are a high priority to the Department rather than topics of specific interest to individual researchers. Research Programs staff will inform all submitters on the status of their topic. Topics not chosen to move forward may be resubmitted in a future solicitation. Following the selection of these high priority topics, Research Programs staff forms a technical panel (see section 2.2.2) for each topic.

3.3 Technical Panel Evaluation

Each technical panel is first responsible (see Technical Panel Roles and Responsibilities, Appendix C) for determining the need for research using the panel's collective knowledge and reviewing current and published research through a search of the Transportation Research Board's Research in Progress (RiP) and Transportation Research International Documentation (TRID) databases, at a minimum. If the information already exists or if current research will solve the issue, results are used as appropriate and no further research is warranted. If there is no information already available to solve the issue, the panel decides if there is a need for the research. If not, the panel recommends to the RRC the project be cancelled. If a need for research exists, the panel determines the scope of work, how much time and money should be expended, and who should conduct the research. Most importantly, because implementation is key to a successful project, the panel determines what products are needed for implementation, what barriers exist that might prevent implementation, and how to reduce or eliminate these barriers (see Research Project Statement form, Appendix D).

The panel may choose to give the work to another governmental agency, such as a Montana university. Typically, this route is taken for small projects (see below) or when there is a close fit between MDT's needs and the researcher's capabilities. Alternatively, the panel may choose to obtain proposals through the request for proposal (RFP) process. Either way, the panel recommends the best proposal to the RRC for funding approval.

The importance of the written proposal (Appendix F) cannot be overemphasized; it is the RRC's only means of selecting which studies to fund. The proposal must be concise, clear, and complete. Most importantly, it must convince the RRC that a sound research project will follow. The RRC approves research proposals until funding is depleted for the current federal fiscal year. Other research proposals deemed necessary will be delayed until the beginning of the next fiscal year.

The research projects process as detailed above is shown in Figure 1 below. In addition to the solicitation process (as described above), there are a number of other methods to initiate research projects: Montana Partnership for the Advancement of Research in Transportation (MPART Small Projects), Administration High Priority, and partnering projects (Figure 1).

MDT has contracts in place with Montana State University-Bozeman, The University of Montana-Missoula, and The University of Montana-Montana Tech for small projects (<\$35,000 and 1 year) under our MPART Small Projects agreement. The universities cost share 20% of the total project budget. If there is a need for a small project, such as a synthesis project, which includes a review of the literature and a survey of the state of the practice, similar to NCHRP synthesis projects, the below steps are followed:

- ★ Champion notifies research of need;
- ★ Technical panel is formed;
- ★ Proposal is obtained;

- ★ Technical panel recommends proposal for funding to RRC; and
- ★ RRC approves or denies funding request.

If MDT Administration identifies a research need that requires immediate attention, the Research Programs manager is informed, a technical panel is formed, and a proposal(s) is obtained and approved either by the RRC or Administration.

Finally, partnership projects can be pooled-funds studies or other projects where the cost of the research is shared by others. These projects may or may not involve shared oversight, through technical panels and/or shared SOW development.

RESEARCH PROJECT PROCESS

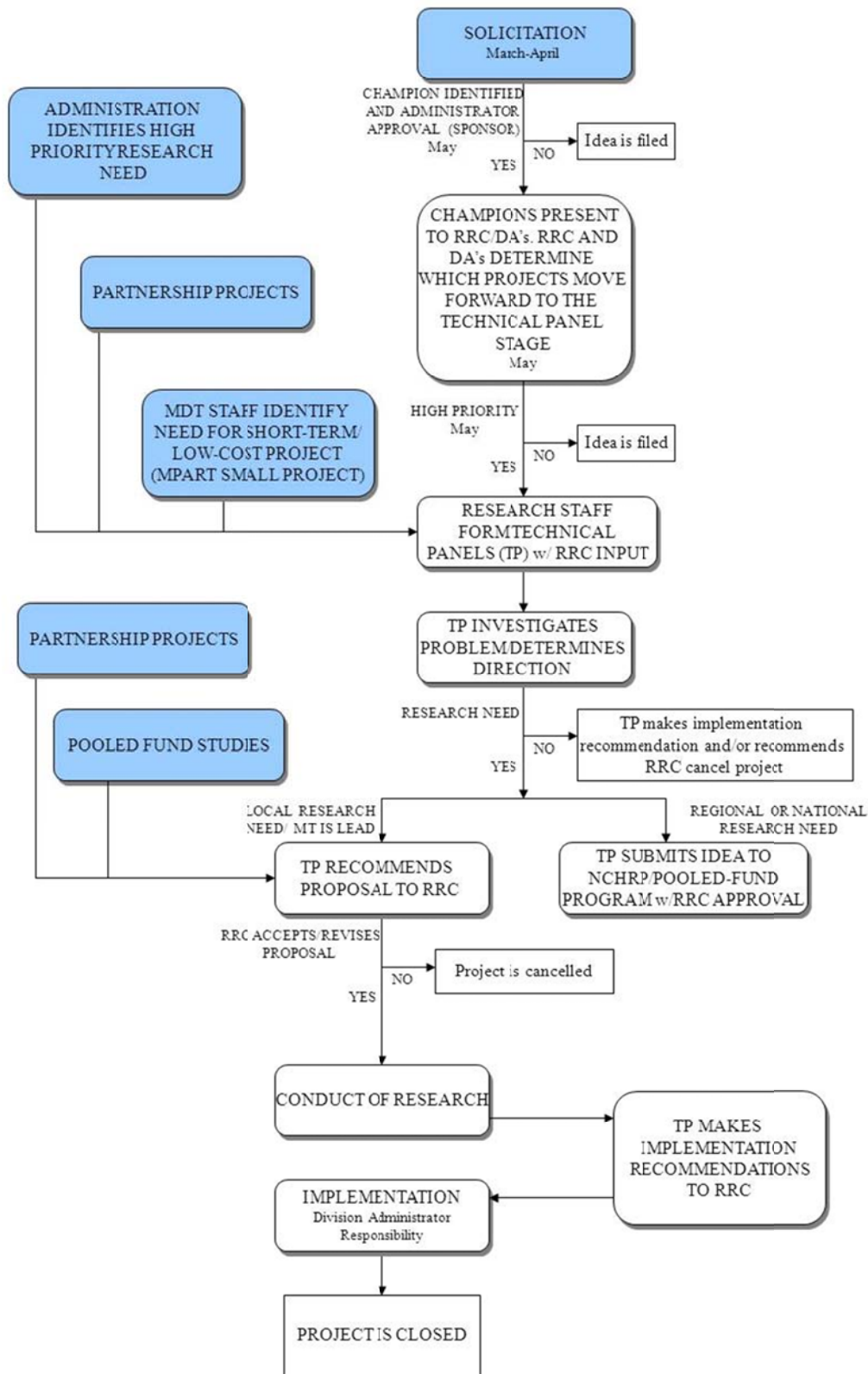


Figure 1: Research Projects Process

3.4 Conduct of Research and Implementation of Research Results

After a research proposal has been approved by the RRC, Research Programs staff executes a formal agreement for the work, which includes the researcher's proposal by attachment and sends a notice to proceed to the consultant. The researcher then conducts the research in accordance with the terms of the agreement.

The project's technical panel monitors the research throughout its duration, with the Research Programs staff member serving as the MDT Research Project Manager and liaison between the consultant and the technical panel. Technical panel members review progress, task, and interim reports required by the contract and submitted by the researcher, as well as any other reports specifically required by the agreement. The panel may also visit the research site and interact with the principal investigator as needed. It is the panel's responsibility to ensure the researcher fulfills the terms of the agreement and the research objectives are met. Prior to the conclusion of the research, the panel reviews the draft final report and draft project summary and advises the researcher through the MDT Research Project Manager of any changes that are required.

Upon completion of the study, the research and implementation recommendations will be presented by the principal investigator both in written (final report and project summary) and oral (research seminar) format. The technical panel is responsible for evaluating the validity of the research and implementation recommendations and reporting its findings. These reports will be made to MDT Administrators, through the RRC (Figure 2). Following completion of the implementation, the Technical Panel is dissolved.

With the exception of emergency research needs, the Department will follow the process described above and illustrated in Figures 1 and 2.

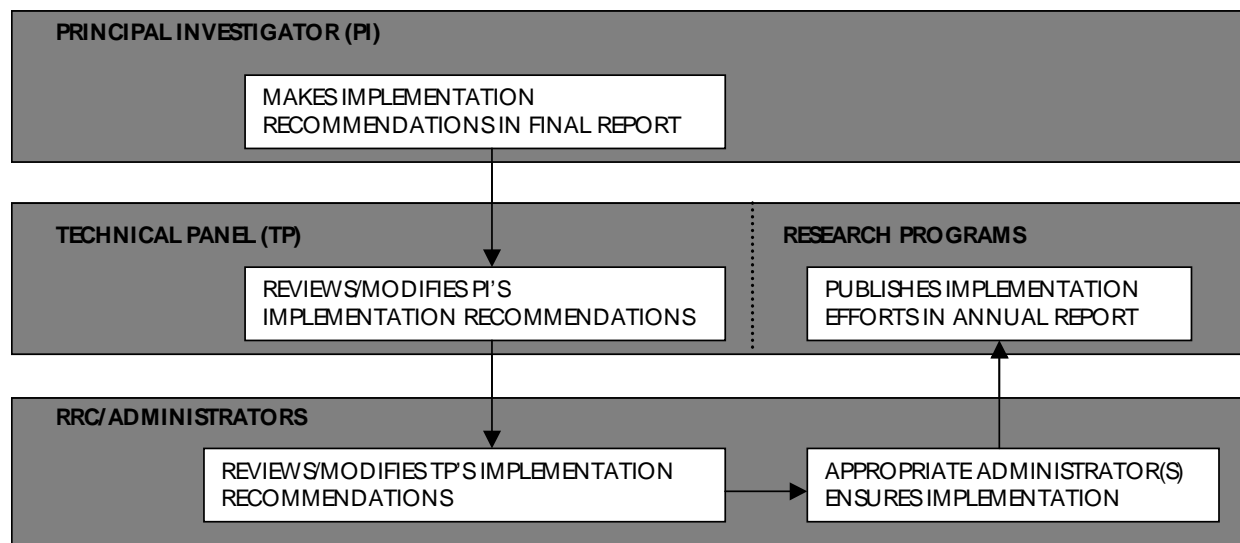


Figure 2: Implementation Process

3.5 Funding

Federal fuel tax monies made available to the State of Montana under Title 23, U.S.C., with appropriate state matching funds are currently the main source of funding for the MDT Research Programs. Since ISTEA (1991) 2% of the total annual transportation disbursement has been allocated to each state for "State Planning and Research" (SPR) activities with a minimum of 25% of these funds reserved for state transportation Research, Development, and Technology Transfer (RDT) efforts.

3.6 Annual Program and Budget

The activities of the Research Programs are concisely and completely described in a single document – the work program. The elements of the work program describe the technical and financial responsibilities on an annual basis.

In addition to research projects initiated as described in Sections 3.1 to 3.4, MDT supports national research through TRB's Core Services Program, the National Cooperative Highway Research Program (NCHRP), and MDT staff may recommend support of various pooled-fund projects to the RRC.

Setting priorities for the research topics received in the solicitation process (section 3.1), small projects, administration projects, and through shared funding arrangements (e.g., pooled-fund and partnering projects) and partially supported institutions (e.g., NCHRP and TRB) allow Research Programs staff to develop a work program within its financial limits. The Research work program is submitted prior to the beginning of each federal fiscal year (October 1 - September 30) and therefore typically contains a sizeable line item for "Contingency and New Research", since the precise program configuration is not known definitively at this point in the year.

This process ensures MDT's most important research issues will be addressed and advanced for consideration.

The Research Programs' work program includes:

- ★ Summary listing of the major items and a cost estimate for each item;
- ★ Description of each activity or individual research project to be accomplished during the federal fiscal year (October 1 - September 30);
- ★ Description of any cooperatively funded studies, including pooled-fund studies and NCHRP contributions; and
- ★ Financial summaries showing the funding levels and share (Federal, State and other sources) for R, D&T activities.

The work program is submitted to the Federal Highway Administration (FHWA) Division office for approval and authorization.

CHAPTER 4 EXPERIMENTAL PROJECTS

The incorporation of experimental features into construction and maintenance projects allows for a vital field evaluation of new materials and methods. This evaluation, if performed well and scientifically based, allows MDT to determine the implementation value of these new materials and methods.

The Experimental Project Manager (ExPM) of the Research Programs staff should be involved throughout this process, from the very first discussions indicating the construction of an experimental feature through the final evaluation and reporting to the FHWA as well as the implementation process. ExPM involvement ensures the: need exists to test specific materials or methods through a RiP and TRID search, at a minimum; appropriate design of experimental features, including appropriate controls; proper construction of experimental features and controls through on-site visits; valid evaluation of performance, based on precise, accurate, and objective measurements; timely annual and final reporting as required by the FHWA; and appropriate implementation of those experimental features that performed well and were cost effective.

Following the formal evaluation period, the Research Programs staff will present the findings including implementation options to MDT management. If it is determined further performance information may be useful, Research Programs staff may continue to evaluate experimental projects, as informal experimental projects, following the completion of their formal evaluation period.

Field Research Coordinators (FRCs) from each District serve as liaisons between the ExPM and the Districts. The FRCs are responsible for informing the ExPM of any planned experimental features, the dates of construction of these features, and any project meetings. They also are responsible for assisting with technology transfer in the Districts.

4.1 Work Plan

Prior to construction of an experimental feature, the ExPM writes and submits a formal work plan to the FHWA for their approval. This work plan should include the following information:

- ★ Location of project;
- ★ Construction project number;
- ★ Title (type) of project;
- ★ Principal investigator;
- ★ Statement of objectives;
- ★ Experimental design;
- ★ Estimated quantities and costs;
- ★ Evaluation schedule; and
- ★ Reporting requirements.

This work plan is important as it formalizes the project with FHWA, which yields three additional benefits:

- ★ If the project should fail prematurely, FHWA will participate in the repair at the same percent as is the original construction;
- ★ 100% federal funds can be used, if MDT so desires; and
- ★ Proprietary features may be specified.

4.2 Construction Report

Following the construction of an experimental feature, the ExPM is required to submit a construction report for statewide distribution through the Research Programs. This report should be written within thirty days of completed construction of the project and should include:

- ★ Location of project;
- ★ Construction project number;
- ★ Title (type) of project;
- ★ Principal investigator;
- ★ Statement of objectives;
- ★ Date construction of experimental feature was completed;
- ★ Summary of materials and methods;
- ★ Quantity and cost of experimental feature;
- ★ Construction Details; and
- ★ Construction problems and a statement of how these problems might have been alleviated.

4.3 Progress and Final Reports

Progress and final reports are required by the FHWA throughout the formal evaluation period as stated in the work plan and should be completed within 30 days of the performance evaluation. Reports consist of a performance summary of the experimental feature to date. The final performance summary should contain information on the experimental feature as specified in the work plan, including implementation options. Implementation options should also be presented to MDT management. The final evaluation report is due by the end of the federal fiscal year in which the formal evaluation is completed, as specified in the work plan.

4.4 Product

Adherence to these procedures ensures useable and accurate information, including appropriate implementation options are obtained through the incorporation and evaluation of experimental features in construction and maintenance projects.

CHAPTER 5 TECHNOLOGY TRANSFER

Research may be described as the careful, systematic study to advance knowledge in a specific field, but the crux of the program for the state is in the application of research results. Technology transfer in research goes beyond the use of the results of the research and experimental projects. Research Programs staff have acquired an expertise in a range of transportation fields. That expertise is continuously in demand by the operating units of MDT. Further, the field of transportation is dynamic, a fact that compels the research staff to keep the transportation community in Montana abreast of the latest developments.

Everyone benefits from the transportation system, and hence, from research into the system. In section 1.1, Purpose, the ultimate beneficiaries of research were stated to be the MDT's customers. The technology transfer activities of research are directed to the immediate customer, with the larger community in mind.

The partners of research, as defined in section 2.1, Research Partners' Support Development, are also the beneficiaries of research. Gaining the support of the beneficiaries of research was discussed in section 2.1. The partnerships formed with MDT operating units, universities, companies, transit authorities, tribal authorities, consultants, local governments, regional agencies, other states, FHWA, and the public will require constant renewing. The transfer of technology cannot be accomplished without the concurrence and assistance of these partners.

Research Programs staff will be active participants in technology transfer activities in the following ways:

- ★ Post research and experimental projects documents (proposal, reports, project summary, etc.) to both MDT's Intranet and Internet sites and keep these sites up-to-date;
- ★ Highlight Research Programs services and activities through brochures, newsletters, annual reports, etc.;
- ★ Offer training on various services and products;
- ★ Continuously examine progress of research and experimental projects to ensure the deliverables are amenable to implementation;
- ★ Advance results of research and experimental projects for implementation;
- ★ Avail expertise of Research Programs staff to the operating units of MDT for problem solving;
- ★ Maintain a library of transportation publications, searchable via the Intranet and Internet;
- ★ Make available results of promising research from other agencies and publications to MDT's operating units;
- ★ Disseminate information on FHWA Demonstration projects to MDT staff and

- analyze for potential workshop sessions;
- ★ Design, install, and analyze experimental features in construction;
- ★ Develop committees, institutional discussions, and seminars to involve potential partners in the research process; and
- ★ Attend important regional and national meetings, and disseminate the results to MDT.

All possible methods of collecting and disseminating information on transportation improvements will be pursued. The results of this activity fosters implementation, avails the Research Programs' partners of staff expertise, and keeps the transportation community apprised of the latest advances in the field.

5.1 Transportation Databases

The basis of research support is the information it provides its customers. Despite the expertise of the staff, there are many informational requests made of research that require a search of ongoing and published research. An analysis of topic statements, potential experimental projects, and informational requests must consider the literature defining the state of the art of the subject. The Transportation Research Board's RiP and TRID databases are the single most comprehensive files of active and completed research, respectively, on all subjects in the field of transportation. Research programs have access to hundreds of databases beyond RiP and TRID; these databases are searched as needed.

In addition to providing literature searches, training is provided on an as requested basis and covers searching various libraries catalogs and databases, including, but not limited to Montana Shared Catalog, which includes MDT's on-line catalog; other Montana library catalogs; transportation agency catalogs, such as the Northwestern University Transportation catalog and the UC-Berkeley transportation catalog; TRID; RiP; WorldCat; and the Transportation Libraries Catalog (TLCat).

As each new research project is funded and experimental project is initiated, Research Programs' staff enters project information into the RiP database. Likewise as each project is completed, Research Programs staff ensures the final report (and any other reports, as appropriate) is cataloged in TRID. When a report for each project is cataloged in TRID, the project is deleted from RiP. These databases are only as good as the data provided. Research Programs staff makes the commitment to keep MDT's information updated.

CHAPTER 6 PROGRAM EVALUATION

6.1 Project Level Reporting

As the research effort focuses on customer benefit, it is conducted with an eye toward implementation. The implementation process is dependent on the exchange of information, which begins with clear, concise, and complete project reports. These reports detail the progress and accomplishments of research and experimental projects, and are written with the customer in mind. The proper reporting of the projects enhances the evaluation of the entire research programs.

The principal investigator for all projects is responsible for writing progress, task, final, project summary, and interim research reports, and making any oral presentations as required by the research contract. Guidelines for writing these reports are posted on MDT's Research Programs' Intranet (http://mdtinfo.mdt.mt.gov/research/docs/report_guidelines.pdf) and Internet (http://www.mdt.mt.gov/research/docs/report_guidelines.pdf) sites. The Technical Panels are responsible for reviewing all reports resulting from their research.

Progress reports will include at least the following information:

- ★ Discussion of each of the major tasks outlined in the work plan and whether they have been completed or are still in progress;
- ★ Planned and actual time schedule for each of the tasks, including the overall percent complete using the expended versus planned budget;
- ★ Discussion of financial, staff, equipment, and technical problems as they affect the individual tasks, as well as their resolution or attempts at resolution;
- ★ Discussion of major accomplishments or discoveries and their significance especially with respect to implementation; and
- ★ Fiscal expenditures.

Final research reports will include at least the following information:

- ★ Credit reference to MDT and FHWA on the cover and title sheets;
- ★ Technical report documentation page;
- ★ Disclaimer statement;
- ★ Alternative format statement;
- ★ Table of contents;
- ★ Executive summary , including a brief description of the work and conclusions;
- ★ Introduction, including the problem, its background, and a concise history of research;
- ★ Work plan, including the experimental research plan, data collection, description of sites and activities, and an analysis of the data; all data should be expressed in metric units with English units following in parentheses;
- ★ Findings and conclusions;

- ★ Recommendations, based on the findings and conclusions;
- ★ Implementation plan, defining the procedure to introduce the results into practice, including suggestions for organizational responsibility and documenting the benefits; and
- ★ References or literature cited.

The Montana FHWA Division Office is given the opportunity to review all reports through technical panel membership. A Research Project Summary and research seminar presented at MDT by the principal investigator will accompany each final report. The Research Programs will be responsible for the distribution of all final reports (Appendix G).

Progress reports are used to monitor progress, and interim (if any) and final reports are the official documentation of the research and form the basis for discussion of the research and presentations to the transportation community. The output of this section is the technical and financial status of a project in cyclical and final report form that is the basis for the implementation effort.

6.2 Overall Program Performance

The expenditure of public funds is subject to careful scrutiny. The profit motive does not exist in the public arena; hence, the programs in the public arena that receive these funds must prove their value through periodic reviews and assessments. After carefully selecting topic statements (section 3.2) and developing the work program (section 3.6), the research effort must follow well-defined and scientifically based procedures that ensure unbiased and meaningful results. On an individual project basis, these results are very meaningful. On a program basis, the projects' results and implementation efforts should be aggregated to appreciate the cumulative effect of the program.

The work program is the sum of all activities planned for the year. These activities are primarily research and experimental projects, technology transfer efforts and technical assistance, seminars, and implementation efforts. Each funding source used for research has been programmed for the various activities in the work program. In addition, each activity has a specific budget. A record will be kept for both the project level and funding source expenditures. An Annual Research Programs Report documenting all Research Programs activities on an annual basis will be developed and distributed.

The individual projects are the most important activities as far as schedules are concerned. Most other activities can be planned throughout the year. The ability to adhere to the schedule for a project is contingent on many factors. The Research Programs' staff will be in frequent communication with the principal investigators to avert major slippage.

The documentation of successful performance of the research effort is important to continue to receive the management and financial support that it requires. Objective and quantifiable parameters can give the basis for this support. Overall program performance can be

measured by a combination of the achievement of implementation and milestones, and a qualified adherence to financial and scheduling limits.

6.3 Peer Exchange

6.3.1 Internal Exchange

A quality MDT Research Program depends upon its ability to implement effective and timely solutions to MDT's issues. It is the execution of the well-planned procedures and processes that ensures the attainment of this objective. One technique designed to improve the quality of the program is a peer exchange of the Research Programs' deliverables through this management system. The use of peer exchanges was established to provide State departments' of transportation (DOT) research, development, and technology (RD&T) programs with the opportunity to examine and evaluate their own programs through a collaborative team of peers, experts, and persons involved in the process, where the exchange of vision, ideas, and best practices could be fostered to benefit both their program and the program of the peer team participants; more information can be found at <http://research.transportation.org/Pages/PeerExchangeProgram.aspx>.

The exchange team may consist of representatives selected from FHWA, universities, Transportation Research Board (TRB), private sector, other agencies and the research units of other states. The cost of travel of the peer exchange team will be charged against the SPR program and is eligible for 100% federal funding.

The peer exchange team will spend at least two days with Research Programs staff. The scope of each peer exchange will vary due to the needs of MDT and requests of the exchange team, but may include:

- ★ Discussion of the Research Programs' management system, as described in this manual;
- ★ Scope of the Research Programs, including all the activities in the work program;
- ★ Examples of projects as they advance through the system, including the solicitation, selection, choice of researcher, project progress, and technology transfer activities;
- ★ Discussion with research partners;
- ★ Review of resources;
- ★ Review of staff training program;
- ★ Review of the contracting process;
- ★ Review of technology transfer efforts and implementation activities; and
- ★ Discussion of recommendations in the form of the processes of other states.

The Research Programs staff will conduct a peer exchange at least once every five years. The peer exchange team will write a report on the visit that covers all aspects of the agenda items. The report will summarize the discussions, itemize the findings, and reiterate the recommendations discussed with the Research Programs Manager. Copies of the report will be filed with the Research Programs and the Division office of the FHWA.

The peer exchange is a vigorous effort conducted for the benefit of the Research Programs. It will be accomplished by peers to improve research management and processes. The recommendations of the team will be discussed with Research Programs staff and MDT management. Every effort will be made to incorporate those recommendations that can improve the quality of the Research Programs.

6.3.2 External Exchange

Staff of the Research Programs will be available and encouraged to serve as peer exchange team members. The staff will perform, in another state, the same exchange that was described above in Section 6.3, Peer Exchange. The state holding the peer exchange will be responsible for travel costs incurred by their reviewers.

6.3.3 Product

The peer exchange process is designed to encourage states to interact with other states on a formal exchange basis. Staff can both learn from and give guidance to other agencies on the research management and processes. This is an excellent opportunity to participate in and gain the benefits of a nonintrusive review of MDT's Research Programs.

APPENDIX A: MODEL CALENDAR

January

- ★ ACRP Synthesis Project request for topics issued
- ★ MDT RRC Meeting*
- ★ RAC/SCOR meet during TRB Annual Meeting
- ★ TCRP Project panel nominations due
- ★ TCRP Project request for topic issued
- ★ TRB Annual Meeting in Washington, D.C.

February

- ★ HMCRRP Project panel nominations due
- ★ MDT RRC Meeting *
- ★ NCHRP Project Ballot on new topic statements due
- ★ NCHRP Synthesis Project topics due
- ★ Obligation of NCHRP funding due (month may vary)

March

- ★ AASHTO TIG Project topics due
- ★ ACRP Synthesis Project topics due
- ★ ACRP Project topics due
- ★ MDT Research External/Internal solicitation for research topics
- ★ MDT RRC Meeting*
- ★ NCFRP Project panel nominations due
- ★ NCHRP Idea Project topics due
- ★ NCHRP summary of ballots distributed to SCOR , who selects projects
- ★ TCRP Synthesis Project topics due
- ★ TRB annual state visit schedule and guidance distributed
- ★ TRB Core program contributions due for states that contribute under Pooled Fund Program option
- ★ TRB Safety Idea Project topics due

April

- ★ HMCRRP Project request for topic issued
- ★ MDT RRC Meeting*
- ★ NCFRP Project request for topics issued
- ★ Preliminary NCHRP program announced

May

- ★ AASHTO TIG request for topics issued
- ★ MDT RRC Meeting – champion presentation of research topics*
- ★ NCHRP Synthesis Project topics selected
- ★ NCHRP Project panel member nominations due
- ★ TCRP Synthesis Project topics selected

June

- ★ MDT RRC Meeting*
- ★ NCHRP Idea Projects selected
- ★ NCHRP Synthesis Project panel nominations due
- ★ State CEO ballot on NCHRP program due
- ★ TCRP Project topics due
- ★ TRB Annual Meeting Call for Papers

July

- ★ AASHTO Research Advisory Committee (RAC) national meeting (month may vary)
- ★ ACRP Projects selected
- ★ CTBSS Project topics due
- ★ HMCRP Project topics due
- ★ MDT RRC Meeting*
- ★ NCFRP Project topics due
- ★ NCHRP Project solicitation for topics issued
- ★ Safety Idea Projects selected
- ★ TCRP Synthesis Project panel nominations due

August

- ★ CTBSS Projects selected
- ★ FHWA SP&R annual work plan due (month may vary depending on fiscal year calendar used by state)
- ★ LTAP National Meeting (month may vary)
- ★ MDT RRC Meeting*
- ★ State report to FHWA on SP&R funded accomplishments due
- ★ TRB Annual Meeting abstracts due Aug. 1

September

- ★ ACRP Project panel nominations due
- ★ AASHTO Annual Meeting (month may vary)
- ★ MDT RRC Meeting*
- ★ NCHRP Idea Project topics due
- ★ NCHRP Project topics due
- ★ TCRP Synthesis Project request for topics issued

October

- ★ HMCRP Projects selected
- ★ MDT RRC Meeting*
- ★ NCFRP Projects selected
- ★ TCRP Projects selected
- ★ TRB Annual Meeting preliminary announcement distributed

November

- ★ ACRP Synthesis Projects selected
- ★ MDT RRC Meeting*
- ★ NCHRP Idea Projects selected
- ★ NCHRP Project topic submitters' responses to evaluations due
- ★ NCHRP Synthesis Project request for topics issued

December

- ★ ACRP Project request for topics issued
- ★ ACRP Synthesis Project panel nominations due
- ★ CTBSS Project request for topics issued
- ★ NCHRP Ballot on new projects distributed to SCOR and RAC
- ★ MDT RRC Meeting*
- ★ NCHRP Idea Project request for topics issued
- ★ Safety Idea Project request for topics issued

*Occurs last Wednesday of every month, subject to change or cancellation.

Glossary of Abbreviations

- ★ AASHTO - American Association of State Highway and Transportation Officials
- ★ ACRP - Airport Cooperative Research Program
- ★ CEO - Chief Executive Officer (of state Department of Transportation)
- ★ CTBSS - Commercial Truck and Bus Safety Synthesis Program
- ★ FHWA - U.S. Federal Highway Administration
- ★ HMCRP - Hazardous Materials Cooperative Highway Research Program
- ★ LTAP - FHWA Local Transportation Assistance Program
- ★ MDT - Montana Department of Transportation
- ★ NCFRP - National Freight Cooperative Research Program
- ★ NCHRP - National Cooperative Highway Research Program
- ★ RRC - Research Review Committee
- ★ RAC - AASHTO Research Advisory Committee
- ★ SCOR - AASHTO Standing Committee on Research
- ★ SP&R - State Planning and Research Funds, a proportion of the Federal Aid funding
- ★ TCRP - Transit Cooperative Research Program
- ★ TIG - AASHTO Technology Implementation Group
- ★ TRB - Transportation Research Board

APPENDIX B: RESEARCH TOPIC STATEMENT



RESEARCH PROGRAMS

RESEARCH PROGRAMS USE ONLY
RESEARCH TOPIC STATEMENT NO:
DATE OF RECEIPT:

RESEARCH TOPIC STATEMENT

I. TITLE (required):

II. TOPIC STATEMENT (required):

III. BACKGROUND STATEMENT (required): Include a review of the literature which shows the research has not already been done (at a minimum TRID, must be searched) or is not currently being done (i.e., a search of the TRB Research in Progress database, <http://rip.trb.org/>).

IV. RESEARCH PROPOSED (required):

V. IT COMPONENT (required): Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc) or not. If so, describe IT component in as much detail as possible.

VI. URGENCY AND EXPECTED BENEFITS (required): This section must include a description of how this research will serve the public by providing a transportation system and services that emphasize quality, environment, safety, cost effectiveness, economic vitality (e.g., support economic development, provide new and/or higher paying jobs, foster a competitive marketplace).

VII. IMPLEMENTATION PLAN (required): Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.

VIII. SUBMITTED BY: (required)

NAME _____
TITLE _____
AFFILIATION _____
ADDRESS _____
PHONE NO. _____
E-MAIL _____

IX. CHAMPION: Must be internal to MDT, feel strongly the research will benefit the Department, and is willing to chair the technical panel.

NAME _____
TITLE _____
AFFILIATION _____
ADDRESS _____
PHONE NO. _____
E-MAIL _____

X. SPONSOR(S): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate.

NAME(S) _____
PHONE #(S) _____
E-MAIL(S) _____

Note: Submitter may attach continuation sheets if necessary. All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work resulting from any submitted research topic.

APPENDIX C: TECHNICAL PANEL ROLES AND RESPONSIBILITIES

GENERAL

Research Review Committee

The Research Review Committee (RRC) oversees the Research Projects Program. This committee:

- ★ Along with the District Administrators, determines which research topics, submitted during the annual research solicitation, move forward to the technical panel stage based on champion presentation;
- ★ Identifies need for and approves high priority research topics, partnership projects, and small projects;
- ★ Identifies technical panel members;
- ★ Reviews technical panel recommendations (e.g., cancel, fund, implement) for each research project;
- ★ Reviews and approves scopes of work for those research projects where an RFP is to be issued;
- ★ Approves funding for all MDT research projects based on the project proposal and technical panel recommendation;
- ★ Approves funding for pooled-fund studies, based on the scope of work and staff recommendation;
- ★ Reviews project progress, as desired; and
- ★ Reviews implementation recommendations.

The RRC consists of a FHWA and Western Transportation Institute (WTI) representative and MDT's:

- ★ Director,
- ★ Deputy Director,
- ★ Chief Officers,
- ★ Administrators, and
- ★ Research Manager.

The RRC meets at most monthly (last Wednesday of the month from 9 am to 12 pm). Agenda items must be prepared and final approximately 2 weeks prior to each RRC meeting.

Technical Panels

Technical Panels (TP) oversee all MDT research projects. They are formed at the beginning of each project and members are chosen with careful consideration since the success of a project hinges on the Technical Panel and its oversight. **This is your project, not Research's; the project can only deliver the products the technical panel wants if there is appropriate technical panel oversight.** There is a different technical panel for each project, usually consisting of three to ten individuals from both inside and outside of MDT, with knowledge and a vested interest in the research topic, results, and implementation. FHWA and MDT

Research Staff are on all technical panels. Also, the Western Transportation Institute (WTI) at MSU-Bozeman may be represented on each panel, as determined by the WTI Research Director. Individuals on panels should adequately represent the breadth of the issue at hand and be balanced with respect to viewpoint and representation. Each panel member is chosen to represent the needs of their respective division, department, organization, and/or constituencies.

Roles

1. Technical Panel Member
2. MDT Research Project Manager
3. Technical Panel Chair

Responsibilities

Note: All tasks must be performed in a timely manner.

1. Technical Panel Members (includes Research staff and panel Chair, who is usually the project champion)
 - a. Determine if others need to participate on the technical panel.
 - b. Oversee project from inception through implementation. Implementation (i.e., products necessary, barriers, mitigation of barriers) should be considered from the very first panel meeting.
 - c. Determine if research need exists by a literature review and completing the research project statement form and, then, the best venue to proceed (cancel project; implement available results; or secure funding from local/MDT, regional, or national research programs).

Note: Items d. through i. pertain to projects funded at the local level.

- d. If determine project is necessary and should be funded at the local/MDT level, develop a scope of work (SOW). Otherwise, work within the appropriate venue to submit research topic. It is critical that a clear, complete, and concise SOW is developed, as the proposal, which is a part of the project contract, is developed from this SOW.
- e. Determine if RFP should be issued or a governmental agency would be the best entity to conduct research. Review proposal(s) and recommend one for funding. Proposals are based on the SOW.
- f. Meet with consultant in project kick-off meeting and other meetings, as determined by the project proposal and/or technical panel.
- g. Carefully review all project products for completeness and accuracy. It is especially critical for technical panel members to review the task reports. The task reports will provide detailed information on each task, including what was done, how it was done, and the results. The task reports can essentially be combined to form the final report.

- h. Make sure project stays on scope and delivers desired products by reviewing project deliverables (i.e., progress reports, task reports, other interim products, and final report and other final products) and communicating issues with consultant through the MDT Research Project Manager. This is critical for project success.
 - i. Keep supervisor(s), organizations, and/or constituencies informed of all progress and products of the project.
 - j. Make implementation recommendations for MDT.
2. MDT Research Project Manager
- a. Identifies technical panel members and forms technical panels.
 - b. The Research staff on each technical panel serves as the project manager.
 - c. The project manager is the direct liaison between the technical panel and consultant, communicating panel decisions to the consultant.
 - d. Schedules all technical panel meetings.
 - e. Serves as a conduit for all information flowing between the technical panel as a whole or individual technical panel members and the consultant.
 - f. Ensures project stays within scope, time, and budget, and issues are addressed in a timely fashion.
 - g. Takes meeting notes prior to contracting and for those meetings not attended by the consultant. Consultant takes meeting notes after contract is in place for those meetings consultant attends.
 - h. Manages contractual compliance.
3. Technical Panel Chair
- a. Identifies technical panel members and makes sure they have the time and are willing and able to serve on the technical panel.
 - b. Presents scope of work and business case information to RRC for approval-in-concept (approval of the scope is required before efforts are spent in the RFP process and may be recommended in other cases).
 - c. Presents business case for project and proposal technical panel recommends for funding to RRC for funding approval.
 - d. Chairs and moderates all technical panel meetings.
 - e. Encourages active participation by all panel members.
 - f. Helps the panel reach consensus.

Time Commitment

- 1. Scope and business case development – 2-4 hours.
- 2. Proposal review – 1-2 days if an RFP is issued; 2-4 hours if not.
- 3. Meetings and review of progress and interim products. – varies depending on length of project, about 1-2 hours per month.
- 4. Final Product Review – 1-2 days

Time commitment varies with each project.

APPENDIX D: RESEARCH PROJECT STATEMENT

Each panel should complete a project statement form cooperatively at its first meeting. Instructions are at the end of this form.

Title: _____

Problem Description: _____

Importance/Business Case:

Can the project wait? _____ What will happen if nothing is done or if the project is delayed? _____

What is the potential effect on MDT business? _____

What are the expected benefits, outputs, and outcomes? _____

Describe the audience for the project: _____

Literature Summary: _____

Are research results already available? _____ If so, how can MDT implement these results?

Summary:
Does research needs exist? _____ Explain: _____

Research Objectives:

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____

Research Tasks:

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____

Implementation:

Could results be implemented immediately? _____ Would MDT be responsible for implementation? _____ If not, who would be responsible? _____

What are the barriers to implementation and products necessary for implementation and, if any, how can these barriers be eliminated or reduced? _____

Budget Estimate: \$ _____

Study Duration: _____ months

MDT Involvement: _____

Recommendation:

_____ No Research _____ In-house Research _____ Contract
Research
_____ NCHRP _____ Pooled Fund _____ Other, please identify

Explain: _____

Technical Panel:

Instructions

These instructions are intended to help technical panels develop Research Project Statements. Be clear and concise with your answers.

Title

State the title of the research study as you think it should be stated. The title should be brief, but should convey the general idea of the study. You are free to modify the title listed on the original topic statement.

Problem Description

Describe the problem that appears to require research, include what problem will be solved, and/or need met. Identify the nature of the problem, what factors might contribute to the solution, what aspects of the problem may affect the result. Try to be as specific as knowledge permits.

Importance/Business Case

Capture the reasoning for the research project by showing its value and importance. Describe the importance of this study. Will the problem continue unless research is done? Can or should the research be postponed to another year? What real world costs are associated with the problem? Does future MDT activity depend upon this research? What savings in money or time might result from the research? What improvements could be made from the research (safety, efficiency, services)? Would the research be completed prior to a major implementation (timeliness)? Describe the audience that would benefit from this research project, is it MDT or elsewhere-be specific. Is MDT the correct lead for this project?

Literature Summary

Briefly summarize information available from previous research. Is this problem widespread? Do others consider it to be important? What work has been done to solve the problem? Would that research apply to our problem? How successful was it?

Results Already Available

If prior research is sufficient to provide a solution to the problem, recommend what MDT can do to adopt these results. Be specific. Identify what would have to be done, who would have to do it, how much it would cost, and what it would accomplish.

Research Need Evaluation

Recommend whether research is needed based upon your evaluation so far. Briefly explain your decision.

Research Objectives

Define the purpose of the research—that is, what it should accomplish. At this point, focus on the goals of the research, but not the details of how they will be achieved. Make sure the goals respond to the needs outlined in the problem description, so the research will actually produce a solution.

Research Tasks

In this section, list the specific tasks you think a researcher needs to perform to meet the objectives listed above. Be specific enough to ensure the work gets done, but not so specific that no room for innovation is left. The tasks should be clear, so a researcher can intelligently estimate how much effort they will entail. Example tasks might include:

1. Literature review
2. Surveys
3. Data collection and analysis
4. Product development

Anticipated Implementation

Describe how you think MDT could implement the results. Does MDT have the resources to implement the results (i.e. staff, budget, authority)? Who would be responsible for implementation? What products (e.g., specifications, detail drawings, training, manuals) are needed for implementation? Are specification changes anticipated? Procedural changes? Organizational changes? New designs or materials? Determine any barriers to implementation and how the barriers could be eliminated or reduced.

Budget Estimate

Estimate the cost of the proposed research and its duration. Consider only the cost of the research, not of associated construction. Your estimates will be somewhat arbitrary, but nonetheless will very likely become the actual project limits. Use your best judgment.

Federal Highway Statewide Planning and Research (SPR) funds will be used.

MDT Involvement

Identify any involvement in the research that will be necessary by the Department. Consider traffic control, materials sampling, heavy vehicles and crew, information/ data collection or anything else that might be required.

Recommendation

Recommend what action you feel appropriate. The alternatives and their criteria are listed below. Your recommendation will be the main factor in the Research Review Committee's consideration of the study. Whatever your recommendation, offer some explanation.

1. No Research: You may recommend no research be done (even if a research need apparently exists) if:
 - ★ Insufficient need exists
 - ★ Cost outweighs benefits
 - ★ Success is unlikely
2. In-House Research: You may recommend the research be conducted in-house if a research need exists, the technical panel would like to proceed with research, and the effort is relatively small and can be addressed with current resources.
3. Contract Research: You may recommend the research be contracted to an outside entity if a research need exists, the technical panel would like to proceed with research, and the effort is more than can be conducted in-house. Most projects fall into this category.
4. NCHRP: You may recommend research as an NCHRP project if the research need is of national significance and the need is not immediate as the NCHRP process can be lengthy and competition is fierce.
5. Pooled fund: You may recommend research as a pooled-fund project if the need is of regional or national significance

Technical Panel

List the project technical panel members.

APPENDIX E: SCOPE OF WORK TIPS

A well-written scope of work can do more for the success of a contract than any other part of the contracting process. A good scope of work is clear, complete, concise, and logical enough to be understood by the consultant and the MDT project manager who will administer it. Because it describes the details of performance, the consultant's performance is measured against the yardstick.

A scope of work describes the work to be performed or the services to be provided. It describes tasks, directs methodologies, and sets forth the period of performance. It should contain only qualitative and quantitative design and performance requirements.

Scope of Work Process

- ★ **Objectives** - Precisely identify desired end objectives of the project.
- ★ **Tasks** - List specific tasks and subtasks to be accomplished by a consultant to satisfy the objectives, together with the required sequence of tasks in order of accomplishment.
- ★ **Acceptance** - Establish milestones or management control points in the sequence of tasks where to take actions for review, approval, acceptance, or rejection.
- ★ Establish relevant and well-defined baselines for consultant performance measurement. These baselines will serve at least four purposes. They will:
 - prevent a consultant from drifting into areas not pertinent to the effort;
 - measure the results of completed work;
 - assist in defining whether or not subsequent changes or redirection of effort falls within the original scope of work; and
 - assist the MDT project manager in monitoring the progress of work.
- ★ **Responsibilities** - Identify all combined MDT and consultant participation needed for the project, as well as the nature and extent of all task responsibilities.
- ★ **Schedule** - Generate a schedule for the sequence of tasks to be performed by a consultant.
- ★ **Deliverables** - Precisely identify consultant delivery requirements.
- ★ **Data Requirements** - Identify all technical data requirements, including the intended use for these data and data MDT will have to provide.
- ★ **Information Requirements** - Identify management information requirements a consultant must satisfy.
- ★ **Timeliness** - Add a timeliness statement to all SOWs: "Time is of the essence. The proposal must be submitted (original and revised), research conducted, and deliverables submitted in a timely fashion".

APPENDIX F: PREPARATION AND SUBMISSION OF PROPOSALS

The MDT Research Programs solicits research proposals from colleges, universities, research institutes, professional consultants, government agencies, and others who possess extensive, demonstrated capability, and experience in the subject areas. Research Programs procedures as detailed below are followed for contracts with all governmental agencies. MDT Purchasing and Consultant Design bureaus' procedures are followed for all other contracts. MDT's proposal template is also posted at <http://www.mdt.mt.gov/research/docs/proposal.pdf>.

Proposal Submission

Proposers must submit their proposals to the Research Programs to arrive on or before the time and date specified in the Request for Proposal (RFP), if applicable. Proposals arriving after the deadline may be considered in later time frames. The Research Programs will acknowledge receipt of proposals. All proposals submitted become the property of MDT. MDT reserves the right to use all information presented in any proposal, unless it is annotated as proprietary. Selection or rejection of a proposal does not affect this right. MDT reserves the right to reject any and all proposals submitted. It may, under certain conditions, negotiate with a proposer to address specific weaknesses in a submitted proposal. MDT is not responsible for any costs incurred by potential researchers, prior to the execution of a contract. Furthermore, costs of developing the proposal are not a reimbursable item to the successful research agency.

Proposal Organization

The research proposal should be a well-prepared document that defines the research problem and objectives, provides a detailed work plan for achieving the objectives, and indicates how the research findings are expected to be used. Proposals should provide a straightforward description of the researcher's ability to meet the requirements of the RFP, if applicable.

Proposals should contain the following sections: Title Page, Table of Contents, List of Tables, List of Figures, Problem Statement, Background Summary, Benefits and Business Case, Objectives, Research Plan, MDT Involvement, Products, Implementation, Time Schedule, Budget, Staffing, Facilities, and References. The following instructions are intended to help researchers prepare a proposal that will be accepted with a minimum of changes. Proposals must comply with these instructions to be considered. Failure to comply will seriously jeopardize the proposal's chances of selection.

Title Page

The proposal cover should include the following information: title, submitter information, submitted to, and date (month year).

Table of Contents

On a separate page, list the proposal's sections and page numbers.

List of Tables

List the table titles and page numbers. Table titles should be before each table.

List of Figures.

List figure titles and page numbers. Figure titles should be after each figure.

Problem Statement

Concisely express your understanding of the problem presented. If the proposal is in response to an RFP or Scope of Work, do not repeat the wording of the RFP or Scope of Work; rather, demonstrate your insight into the problem.

Background Summary

Include background information on the research topic. Summarize the findings of a preliminary literature search and state the relationship of the proposed study to prior research. [TRB's Transportation Research International Documentation database \(TRID\)](#) should be searched as a part of this preliminary literature search. The summary should reveal your understanding of underlying principles and should clearly indicate your appreciation of the problem. The importance of this part of the proposal should not be underestimated. A comprehensive background summary ensures all aspects of the research topic have been adequately considered so new research can build upon prior work rather than duplicate it.

Benefits and Business Case

Identify potential benefits expected from the research. Describe how the research results can be used, and by whom, to improve transportation practice. Possible benefits are:

- ★ Cost savings (both MDT and the affected public);
- ★ Increased safety;
- ★ Improved service; and
- ★ Improved procedures.

The business case for the scope of work must be included in the proposal. The business case is the reason for initiating this project, need for the results of this project, and description of the value and benefits of the project. The business case addresses such items as: will the problem continue unless research is done; can or should the research be postponed to another year; what real world costs are associated with the problem; does future State activity depend upon this research; what savings in money or time might result from the research; what improvements could be made from the research (safety, efficiency, services); would the research be completed prior to a major implementation (timeliness); who will benefit from this research project; and what area within the Department will benefit from or be affected by this research.

Objectives

State the technical objectives of the study. Explain and justify any deviations from the objectives listed in the RFP or Scope of Work, if applicable.

Research Plan

Describe how the objectives will be achieved through a complete, logical, and innovative plan. Use the task descriptions given in the RFP or Scope of Work, if applicable, as a basis for developing the research plan. Specifically identify the tasks that will be performed. Explain and justify any deviations from the tasks listed in the RFP or Scope of Work, if applicable.

To the extent possible, identify major operational activities and relate these activities to staffing requirements, time schedules, and cost estimates. Describe how the activities will be carried out. Research methodology shall be described in the greatest level of detail that the researcher's understanding of the problem permits and to permit evaluation of the probability of success in achieving the objectives.

The plan should also describe the technical basis of the research. Describe the following, as appropriate:

- ★ Principles of theories to be used;
- ★ Significant variables to be tested;
- ★ Analytical and statistical procedures;
- ★ Experimental and testing procedures;
- ★ Evaluation criteria;
- ★ Inspection and survey methods;
- ★ Controls to be used;
- ★ IT components; and
- ★ Material, procedure, or device development.

If appropriate, the research plan should include a cost/benefit analysis.

Ongoing communication between the research team and MDT staff and project QA/QC are critical to the success of the project. The proposal must include a description of the steps the research team will take to ensure QA/QC and regular communication occurs with MDT's Research Programs staff and the Technical Panel throughout the project.

The plan will include a kick-off meeting. The project kick-off meeting serves to ensure everyone involved in the research project is informed of the contractual obligations, scope of work, deliverables, project milestones, time table, and appropriate office policies and procedures. This meeting will also provide an opportunity to clarify technical issues or concerns with the project.

Also the plan should include a final presentation. An overview of the project will be provided with detailed discussions on the findings and recommendations. This presentation will possess strong technical components and in-depth discussions that focus primarily on the research and implementation.

Other meetings may be deemed necessary by MDT or the research team.

All meetings should be included in the proposal. The research team is responsible for preparing meeting materials and submitting these materials to the MDT Research Project Manager at least two weeks in advance of the meeting. Likewise, the research team is responsible for submitting meeting notes for technical panel review no later than two weeks following the meeting.

If test methods are to be developed as a part of this project and proposed as national standards, the order of submittal shall be first to American Association of State Highway and Transportation Officials (AASHTO), in cooperation with MDT. If the test method or specification is not adopted through the AASHTO process, the research team will be free to submit to the American Society for Testing and Materials (ASTM) or other national standard organizations.

Note: For any outreach, such as surveys or interviews, the Technical Panel must approve the approach and materials in advance.

MDT Involvement

Describe any assistance that may be required from MDT and the timeframe(s) in which this assistance is required. Include such items as:

- ★ Traffic control;
- ★ Construction;
- ★ Highway maintenance;
- ★ Drilling and sampling;

- ★ Access to transportation facilities, including such items as: MDT headquarters, MDT district offices, field locations;
- ★ Space at MDT headquarters or district offices, including such items as: office space, network access, computer equipment;
- ★ Information/Data request from MDT staff;
- ★ Access to written information or databases; and
- ★ Interviews.

Products

List the products that will be delivered during the research project. All products required for implementation must be included as project deliverables. Deliverables might include:

- ★ Reports,
- ★ IT Components,
- ★ Manuals,
- ★ Photographs,
- ★ Video or other audio/visual materials,
- ★ Training materials,
- ★ Specifications, and
- ★ Detail drawings.

Unless otherwise directed in the RFP or Scope of Work, if applicable, always include the following items as products:

- ★ Progress reports (generally quarterly, but also may be monthly or bimonthly, primarily speak to budget and schedule; quarterly progress reports are due by the end of the month following the reporting period; monthly or bimonthly are due by the 15th of the month following the reporting period);
- ★ Task reports (more oriented toward technical progress and accomplishments; these reports must be written with sufficient detail such that they could be a chapter in the final report; due by the end of the month following completion of the task);
- ★ Cover page photo (JPG format);
- ★ Final report, including an implementation plan and cost/benefit analysis, as applicable;
- ★ Project summary report; and
- ★ Final presentation.

Reports must be clear, concise, and submitted in MSWord and Adobe PDF format and follow the report writing requirements at http://www.mdt.mt.gov/research/docs/report_guidelines.pdf. Make sure the latest version is used.

Products are expected to be of exceptional quality. Draft deliverables are the research team's vision of the complete and final deliverables. All draft deliverables must be spell checked and reviewed by a person. All proposals must address deliverable quality and how quality will be guaranteed (i.e., use of editing staff and/or peer reviewer).

Implementation

MDT research projects are intended to produce results that will be applied. Describe how the research results can be applied by MDT. To the extent possible, include the following:

- ★ Describe the form in which the findings may be reported, such as a mathematical model, a laboratory test procedure, or a design technique. Describe these results in terms of the user (e.g., practicing engineer, administrator).
- ★ Identify who would logically be responsible for applying the research results, such as the American Association of State Highway and Transportation Officials (AASHTO), FHWA, MDT, or a particular office within MDT.
- ★ Identify specific standards or practices that might be affected by the research findings, such as AASHTO or MDT specifications, MDT policies and procedures, legislation, or fiscal requirements.
- ★ Submit an implementation plan tied to performance measures. If an IT component is part of the implementation submit a work plan for update and maintenance.
- ★ Describe activities necessary for successful implementation.
- ★ Describe the criteria for judging the progress and consequences of implementation.
- ★ Provide an estimate of the costs of implementation.
- ★ Identify the long-term implementation activities and costs.
- ★ To the extent possible, identify barriers of implementation and how these barriers might be reduced or eliminated.
- ★ If the findings of a study are not suitable for immediate application in practice, the proposal should specify additional steps that are needed before application can occur (e.g., additional research, field testing, changes in policy, etc.).

It is understood the actual research may produce unanticipated findings, making changes in the implementation plan necessary. This is acceptable. The proposal selection, however, will be greatly influenced by the practicality and direction of the implementation plan presented in the proposal.

These items should be included in more detail in the Implementation Section of the final report.

Schedule

Provide a graphical presentation illustrating the scheduling of the major research tasks on a monthly basis (Table 1). This chart should include all meetings and deliverables.

The MDT Research Review Committee (RRC) approves project funding. This committee meets at most the last Wednesday of each month. Check with MDT Research staff to ensure your start date is in sync with funding approval by the RRC or indicate time by months or quarters rather than dates (i.e., month 1, month 2 or quarter 1, quarter 2, etc.), as appropriate.

Always allow one month for MDT review of draft reports. All revised progress, task, or other interim reports must be submitted to MDT within two weeks after receipt of MDT comments. All future revisions must be submitted to MDT within one week of receipt of comments. The revised final and project summary reports must be submitted within one month of receipt of MDT comments. For all future revisions, the final and project summary reports must be submitted to MDT within two of receipt of comments.

Time is of the essence. The schedule must be realistic; do not anticipate any time extensions, barring unforeseen situations.

Table 1: Schedule

Activities	Month							
	1	2	3	4	5	6	7	8
Kick-Off Meeting								
Task A. Review of Current Ride Specification								
Task B. Literature Search								
Task C. Conduct State of Practice Survey	Develop Draft	MDT Review	Conduct Survey					
Task D. Recommendations								
Task E. Implementation Plan								
Draft Final Report							Submit	
Final Presentation								
Final Report								

*The schedule also contains monthly progress reports.

Budget

Show the detailed and **fully** itemized project cost for both the federal and state fiscal years by task. The federal fiscal year runs from October 1 to September 30 and the state fiscal year runs from July 1 to June 30. No budget amendments should be anticipated. Show all cost sharing, including in-kind. Payment is on a cost reimbursement basis, not to exceed the cost indicated in the proposal.

Include a table of key personnel with hourly pay rates and benefits itemized.

Meetings and deliverables (except progress, task, and final reports) must be itemized. If these meetings do not occur or the deliverables are deemed unnecessary, the budgeted amount will be deducted from the total contract amount.

Include a table with fully itemized by task.

Staffing

Include pertinent background information for each member of the research team, including subconsultants, significantly participating in the project. Describe how academic, professional, and research experiences relate to the project and their role in the project. Include a summary of past accomplishments in the same or closely related problem areas. Justify each research team members' participation.

Provide a table showing the number of person-hours that will be devoted to each task by research team members, as illustrated in Table 2. List the names of principal investigators and other key professionals who will be involved. Support personnel may be identified by classification.

Table 2: Project Staffing

Name of Principal, Professional, Employee, or Support Classification	Role in Study	Task						Percent of Time
		1	2	3	4	5	Total	
Professor A	Principal Investigator	60	60	60	60	60	300	14
Professor B	Co-Principal Investigator	15	25	20	20	0	80	4
Graduate Student 1	Field Testing	500	120	300	70	0	990	48
Graduate Student 2	Analysis	10	15	5	15	5	50	2
Editor	Report Preparation, editing, and review	5	10	5	10	20	50	2
TOTAL		585	230	390	175	85	1470	

List current commitments to other work in sufficient detail to permit assessment of the research team's ability to meet the proposal's commitments. List percentages of time committed to all projects, including the one described in this proposal, clearly showing the time is available for the project described in this proposal. Include a statement that the level of effort proposed for principal and professional members of the research team will not be changed without written consent of MDT.

Facilities

Describe the facilities available to accomplish the research. Indicate equipment that is necessary for completion of the research and specify any restrictions on its use. Specify any equipment that is necessary but not currently on-hand; it is preferred this equipment be leased or the work contracted to someone who has the equipment on hand and the expertise to obtain valid results. If additional equipment is to be purchased with project funds, identify and explain the need for it in the budget estimate. National or state laboratory and technician certifications for activities relevant to the research project should be provided in the proposal. In the instance the SOW, RFP, or the nature of the research requires laboratory and/or technician certification the proposer does not have at the time of submittal, the proposal will communicate the efforts that will be made to obtain certification or committee approval to conduct testing with the proposed technicians and laboratories. Nonexpendable supplies and equipment purchased with MDT funds are MDT property and will be delivered to MDT when the project is complete.

References

Cite references as per http://www.mdt.mt.gov/research/docs/report_guidelines.pdf.

APPENDIX G: REPORT DISTRIBUTION

INSTITUTION	# OF COPIES	ELECTRONIC (E)/HARDCOPY (H)
AASHTO RAC AASHTO_RAC@LSW.NAS.EDU	N/A	E
Federal Highway Administration Research Librarian Federal Highway Administration Research Library Federal Highway Administration, Rm A200 6300 Georgetown Pike McLean, VA 22101-2296 fhwalibrary@dot.gov	2	E and H
Field Research Coordinators (FRC)	As requested	E, H, or both
John Moulden Office of Corporate Research Technology and Innovation Management Federal Highway Administration, HRTM-2 Turner-Fairbank Highway Research Center, Room T-305 6300 Georgetown Pike McLean, VA 22101 John.moulden@dot.gov	5	E or H
Montana State Library Documents Section 1515 E. Sixth Ave. P.O. Box 201800 Helena, MT 59620-1800 http://msl.mt.gov/for_state_Employees/Submit_State_Publication/default.asp	4	E and H
National Technical Information Service, Room 303F 5285 Port Royal Road Springfield, Virginia 22161 input@ntis.gov (w/Orange Card)	10	E or H
National Transportation Library Digital Repository ntldigitalsubmissions@dot.gov	N/A	E

Roberto Sarmiento TRISNET Repository Transportation Library Northwestern University 1935 Sheridan Road Evanston, Illinois 60208	3	H
Principal Investigator	As requested	E, H, or both
Technical Panel	As requested	E, H, or both
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