CONNECTICUT DEPARTMENT OF TRANSPORTATION
RESEARCH HANDBOOK

2016

Prepared by:
Bureau of Policy and Planning
Roadway Information Systems Research Section

ACRONYMS

AASHTO: American Association of State Highway and Transportation Officials
AASHTO-RAC: AASHTO – Research Advisory Committee
AASHTO-SCOR: AASHTO – Standing Committee on Research
AASHTO-TRAC: AASHTO - Transportation and Civil Engineering
APEL: Approved Product List
CASE: Connecticut Academy of Science and Engineering
CCTRP: Connecticut's Cooperative Transportation Research Program
CTI: Connecticut Transportation Institute
FAST Act: Fixing America's Surface Transportation Act
FHWA: Federal Highway Administration
HITEC: Highway Innovative Technology Exchange Center
HVR: High Value Research
LTAP: Local Technical Assistance Program
MG: Minimum guarantee funds
MOU: Memorandum of Understanding
NCHRP: National Cooperative Highway Research Program
NETC: New England Transportation Consortium
NHS: National Highway System funds
NTL: National Transportation Library
NTPEP: National Transportation Product Evaluation Program
PL: Metropolitan Planning (PL) funds
RD&T: Research, Development and Technology
RiP: Research-in-Progress
RPM: Research Performance Measures
SHRP2: Strategic Highway Research Program 2
SP&R: State Planning and Research
STBP: Surface Transportation Block Grant Program
STP: Surface Transportation Program funds
T2 Center: Technology Transfer Center
TCRP: Transit Cooperative Research Program
TIG: Technology Implementation Group
TPF: Transportation Pooled Fund
TRB: Transportation Research Board
TRID: Transport Research International Documentation

PREFACE

Fixing America's Surface Transportation (FAST) Act, signed into law in December 2015, provides for State Planning and Research (SP&R) funding as a 2 percent set-aside of five Federal-aid programs including Surface Transportation Block Grant Program (STBP), the Highway Safety Improvement Program (HSIP), the National Highway Performance Program (NHPP), Congestion Mitigation and Air Quality Improvement Program (CMAQ) and National Highway Freight Program (NHFP). As stated in Title 23 of United States Code, Section 505: State Planning and Research, a minimum of 25 percent of the SP&R funds are to be expended by the State for research, development and technology transfer activities. The Federal Highway Administration (FHWA), an agency within the U.S. Department of Transportation, supports State and Local governments in the planning, design, construction, and maintenance of the Nation's highway system (Federal-Aid Highway Program). The Connecticut Federal Highway Administration office oversees State of Connecticut Department of Transportation (CTDOT) research and technology program, according to guidelines established in Title 23 - Code of Federal Regulations, Chapter 1, Subchapter E, Part 420 - Planning and Research Program Administration, Subpart A - Administration of FHWA Planning and Research Funds and Subpart B - Research, Development and Technology Transfer Program Management.

In accordance with the federal regulations, 23 CFR 420.209, administration of FHWA Planning and Research funds requires that State DOT's Research, Development and Technology (RD&T) program, maintain documentation that describes the State DOT's management process and the procedures for selecting and implementing RD&T activities must be developed by the State DOT and submitted to the FHWA Division office for approval. Therefore, this handbook contains organizational and functional information about the CTDOT Research Section. The State DOT's transportation research is executed by the Bureau of Policy and Planning, Roadway Information Systems Research Section. By identifying the various functions of the Department's Roadway Information Systems Research Section and giving procedural information about research operations, this handbook will produce a general model of the Department's research-management system. The programs, projects and products generated using this management system, are provided for the benefit of the Department, its employees and other transportation agencies and users. To ensure the effectiveness of the research process and program, several key objectives are followed in the manual: determining the usefulness and implementation potential of the research; determining the continuation potential of a research project based on a periodic review of its progress; ensuring that research results are disseminated and utilized; assessing research using project accomplishments and program metrics; and, improving research through the coordination of other technical disciplines when required to address transportation problems.

State and federal regulations pertaining to transportation research and development change periodically. The research handbook should be considered a dynamic document that reflects the changes in federal regulations and department policies**.**

All employees in the Roadway Information Systems Research Section should be conversant with the contents of this document.

TABLE OF CONTENTS

Chapter 1

Overview of CTDOT
Roadway Information Systems Research Section

1.1 Purpose

The purpose of this handbook is to set forth policies, methods, procedures and detailed instructions, where possible, for the conduct and implementation of an effective program of research, development, and technology transfer (RD&T); required data acquisition; and, development and evaluation of new materials and equipment. An effective RD&T program is anticipated to result in an overall advancement of planning, design, construction, and maintenance of highways, public transportation and intermodal facilities.

1.2 Authority

The authority for a state to use federal funds for research and development is found in 23 U.S.C. 505(b). The authority for the state to administer the SP&R funds in their RD&T program is found in 23 CFR 420, Subpart B.

1.3 CTDOT Policy on Research

It is the policy of the Connecticut Department of Transportation to conduct all research under the general supervision of the Bureau of Policy and Planning; Roadway Information Systems Research Section. CTDOT Research policy is set forth in four Departmental Policy Statements; Connecticut Department of Transportation Policy Statement on 1) Research; 2) Product Evaluation; 3) Implementation of Research Results; and, 4) Dissemination of Research Findings. All four policy statements are included herein [1, 2, 3, and 4]. This handbook and the Department's Policy Statements are to be used as a guide by all Research personnel.

1.4 Invention and Discoveries by State Employees

Section 4-61a of the Connecticut General Statutes, Revision of 1958 and the 1959, 1961 and 1963 supplements thereto, provides that inventions and discoveries by State employees, where such inventions or discoveries result in whole or in part as a result of the employees' duties, remain the property of the State. Where outside parties are concerned, the employees' interest remains with the State.

It is the duty of the employee to disclose his invention fully and promptly to an authorized executive of the State. In the case of Research personnel, disclosure shall be to the Commissioner of Transportation through the Assistant Director of Policy and Planning.

1.5 Functions of Roadway Information Systems Research Section

The Research Section is headed by the Transportation Assistant Planning Director, and together with planning, engineering and clerical personnel, transportation research and operational activities are accomplished.

The Research personnel coordinate research efforts on all projects involving various Bureaus, Offices or Divisions of the Department, Universities, commercial laboratories, research

organizations, as well as coordinate CTDOT efforts associated with selected regional and national studies, such as the implementation of findings from: the Strategic Highway Research Program 2 (SHRP2); National Cooperative Highway Research Program studies (NCHRP); Transit Cooperative Research Program (TCRP); Connecticut's Cooperative Transportation Research Program (CCTRP); New England Transportation Consortium (NETC); Connecticut Academy of Science and Engineering (CASE) and, FHWA National and Regional Pooled-funds studies.

The Research personnel perform literature search, problem statement solicitation and selection, evaluate proposals for in-house or contractual research, plan and conduct projects, prepare contract documents, perform periodic reviews for progress and compliance with contract, maintain cost records, and review progress and final reports; maintain cost records for budget and project scheduling purposes on in-house research; coordinate research efforts to prevent duplication; make recommendations for departmental adoption and implementation of findings, evolving from contractual and in-house research projects and of findings derived from research by other states or agencies; review and evaluate new products, materials and processes to keep abreast with new and emerging technological progress in transportation and related fields; maintain files and records essential for the functions of the Research Section; advise higher-level administrators on procedures and policies relevant to these functions; participate in committees, sub-committees and/or research panels related to their areas of existing or developing expertise; and, represent as Department liaison with other research agencies (government and private). Research personnel also update the transportation research Internet web pages by reporting in-progress research studies and completed research projects to Research-in-Progress (RiP) and Transport Research International Documentation (TRID) database as well as National Transportation Library (NTL). Furthermore, Research personnel also provide advice and assistance to other units and for specialized testing services. On an annual basis, the Research Section submits a summary document to the FHWA detailing the activities performed during the fiscal year.

Each major research project, of the many and the varied disciplines represented within the Research Section, is assigned a research engineer, principal investigator and subject matter expert. In actual practice, one person may be the research engineer, principal investigator or subject matter expert for more than one project.

1.6 Legal services

In litigated matters, the legal representative of the Department of Transportation is the Attorney General of the State of Connecticut and his opinion and advice, or that of his designated assistants, is sought and followed on any question of law. The Roadway Information Systems Research Section has no legal section staffed with members of the Connecticut Bar. When legal services are required, they are secured from the Office of the Attorney General. The Roadway Information Systems Research Section, through the Transportation Assistant Planning

Director, furnishes technical information to the Office of the Attorney General and in response to court subpoenas on litigated matters, which may include current or prior research studies. Personnel from the Department may be required to testify in court cases as experts in their respective fields.

Chapter 2

Federal Highway Administration
Research, Development and Technology Transfer Program
Guidelines

The Connecticut Federal Highway Administration office oversees the Research and Technology program for the State of Connecticut. The established guidelines in its entirety are stated in Title 23 - Code of Federal Regulations, Chapter 1, Subchapter E, Part 420-Planning and Research Program Administration, Subpart A - Administration of FHWA Planning and Research Funds and Subpart B - Research, Development and Technology Transfer Program Management. The link to Code of Federal Regulations is included as reference [5]. Encompassed here are some of the *key sections* of Subpart A and B that introduces the FHWA requirements for the Research program as stated 23 CFR 420.

Subpart A—Administration of FHWA Planning and Research Funds

§420.117 What are the program monitoring and reporting requirements?

(a) In accordance with 2 CFR 200.328, the State DOT shall monitor all activities performed by its staff or by subrecipients with FHWA planning and research funds to assure that the work is being managed and performed satisfactorily and that time schedules are being met.

(b) (1) The State DOT must submit performance and expenditure reports, including a report from each subrecipient that contain as a minimum:
- (i) Comparison of actual performance with established goals;
- (ii) Progress in meeting schedules;
- (iii) Status of expenditures in a format compatible with the work program, including a comparison of budgeted (approved) amounts and actual costs incurred;
- (iv) Cost overruns or underruns;
- (v) Approved work program revisions; and
- (vi) Other pertinent supporting data.

(2) Additional information on reporting requirements for individual RD&T studies is contained in subpart B of this part.

(c) Reports required by paragraph (b) of this section shall be annual unless more frequent reporting is determined to be necessary by the FHWA Division Administrator. The FHWA may not require more frequent than quarterly reporting unless the criteria in 2 CFR 200.328(1), are met. Reports are due 90 days after the end of the reporting period for annual and final reports and no later than 30 days after the end of the reporting period for other reports.

(d) Events that have significant impact on the work must be reported as soon as they become known. The types of events or conditions that require reporting include: problems, delays, or adverse conditions that will materially affect the ability to attain program objectives. This disclosure must be accompanied by a statement of the action taken, or contemplated, and any Federal assistance needed to resolve the situation.

(e) Suitable reports that document the results of activities performed with FHWA planning and research funds must be prepared by the State DOT or subrecipient and submitted for approval by the FHWA Division Administrator prior to publication. The FHWA Division Administrator may waive this requirement for prior approval. The FHWA's approval of reports constitutes acceptance of such reports as evidence of work performed but does not imply endorsement of a report's findings or recommendations. Reports prepared for FHWA-funded work must include appropriate credit references and disclaimer statements.

§420.119 What are the fiscal requirements?

(e) **NHS, STP, or MG funds used for eligible planning and RD&T purposes must be identified separately from SPR or PL funds in the work program(s) and must be administered and accounted for separately for fiscal purposes.** In accordance with the statewide and metropolitan planning process requirements for fiscally constrained transportation improvement program (TIPs) planning or RD&T activities funded with NHS, STP, or MG funds must be included in the Statewide and/or metropolitan TIP(s) unless the State DOT and MPO (for a metropolitan area) agree that they may be excluded from the TIP.

Subpart B—Research, Development and Technology Transfer Program Management

§420.207 What are the requirements for research, development, and technology transfer work programs?

(a) The State DOT's RD&T work program must, as a minimum, consist of a description of RD&T activities to be accomplished during the program period, estimated costs for each eligible activity, and a description of any cooperative activities including the State DOT's participation in any transportation pooled fund studies and the NCHRP. The State DOT's work program should include a list of the major items with a cost estimate for each item. The work program should also include any study funded under a previous work program until a final report has been completed for the study.

(b) The State DOT's RD&T work program must include financial summaries showing the funding levels and share (Federal, State, and other sources) for RD&T activities for the program year. State DOTs are encouraged to include any activity funded 100 percent with State or other funds for information purposes.

§420.209 What are the conditions for approval?

(a) As a condition for approval of FHWA planning and research funds for RD&T activities, a State DOT must develop, establish, and implement a management process that identifies and results in implementation of RD&T activities expected to address high priority transportation issues. The management process must include:

(1) An interactive process for identification and prioritization of RD&T activities for inclusion in an RD&T work program;

(2) Use of all FHWA planning and research funds set aside for RD&T activities, either internally or for participation in transportation pooled fund studies or other cooperative RD&T programs, to the maximum extent possible;

(3) Procedures for tracking program activities, schedules, accomplishments, and fiscal commitments;

(4) Support and use of the TRIS database for program development, reporting of active RD&T activities, and input of the final report information;

(5) Procedures to determine the effectiveness of the State DOT's management process in implementing the RD&T program, to determine the utilization of the State DOT's RD&T outputs, and to facilitate peer exchanges of its RD&T Program on a periodic basis;

(6) Procedures for documenting RD&T activities through the preparation of final reports. As a minimum, the documentation must include the data collected, analyses performed, conclusions, and recommendations. The State DOT must actively implement appropriate research findings and should document benefits; and

(7) Participation in peer exchanges of its RD&T management process and of other State DOT’s programs on a periodic basis. To assist peer exchange teams in conducting an effective exchange, the State DOT must provide to them the information and documentation required to be collected and maintained under this subpart. Travel and other costs associated with the State DOT's peer exchange may be identified as a line item in the State DOT's work program and will be eligible for 100 percent Federal funding. The peer exchange team must prepare a written report of the exchange.

(b) Documentation that describes the State DOT's management process and the procedures for selecting and implementing RD&T activities must be developed by the State DOT and submitted to the FHWA Division office for approval. Significant changes in the management process also must be submitted by the State DOT to the FHWA for approval. The State DOT must make the documentation available, as necessary, to facilitate peer exchanges.

(c) The State DOT must include a certification that it is in full compliance with the requirements of this subpart in each RD&T work program. If the State DOT is unable to certify full compliance, the FHWA Division Administrator may grant conditional approval of the State DOT's work program. A conditional approval must cite those areas of the State DOT's management process that are deficient and require that the deficiencies be corrected within 6 months of conditional approval. The certification must consist of a statement signed by the Administrator, or an official designated by the Administrator, of the State DOT certifying as follows: "I (name of certifying official), (position title), of the State (Commonwealth) of ____, do hereby certify that the State (Commonwealth) is in compliance with all requirements of 23 U.S.C. 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance."

(d) The FHWA Division Administrator shall periodically review the State DOT's management process to determine if the State is in compliance with the requirements of this subpart. If the Division Administrator determines that a State DOT is not complying with the requirements of this subpart, or is not performing in accordance with its RD&T management process, the FHWA Division Administrator shall issue a written notice of proposed determination of noncompliance to the State DOT. The notice will set forth the reasons for the proposed determination and inform the State DOT that it may reply in writing within 30 calendar days from the date of the notice. The State DOT's reply should address the deficiencies cited in the notice and provide documentation as necessary. If the State DOT and the Division Administrator cannot resolve the differences set forth in the determination of nonconformity, the State DOT may appeal to the Federal Highway Administrator whose action shall constitute the final decision of the FHWA. An adverse decision shall result in immediate withdrawal of approval of FHWA planning and research funds for the State DOT's RD&T activities until the State DOT is in full compliance.

Chapter 3

Connecticut Department of Transportation
Research, Development and Technology Transfer Program

3.1 Research Work Program and Financing

The Connecticut FHWA office oversees State of Connecticut Department of Transportation (CTDOT) research and technology program as well as the disbursement of federal apportioned funding.

According to 23 CFR 420.103, FHWA planning and research funds include: (1) State Planning and Research (SP&R) funds; (2) Metropolitan Planning (PL) funds; (3) National Highway System (NHS) funds; (4) Surface Transportation Program (STP) funds; and, (5) Minimum Guarantee (MG) funds. These funds are authorized to be used for specific transportation related activities as defined under title 23 U.S.C. In addition, programs and procedures are developed for a variety of purposes associated with each mode of transportation. The Department may make other funds available for specific research projects and activities, by applying for federal funds or grants, through requests that comply with established programs and procedures, such as SHRP2 Implementation Assistance Program User-Incentive funds. Likewise, the FHWA administers local Federal-aid program such as Every Day Counts Initiative (EDC). Generally, the modal unit requiring research will secure the required federal and state funds for the targeted work. FHWA requires that planning and research funds in the four categories stated above, must be documented by the State DOT's in separate programs, paired in various combinations, or brought together as a single work program.

As stated in 23 U.S.C. 505(b), a minimum of 25 percent of the SP&R funds are to be expended by the State for research, development and technology transfer activities. The Federal SP&R funds are apportioned to the respective states under prescribed formulae. The Connecticut FHWA office requires that the use of SP&R funds must be documented by the CTDOT in an approved work program, or other document that describes the work to be accomplished, that is acceptable to the FHWA Division Administrator. The Research Work Program is developed for a period of two fiscal years and comprises of description of RD&T work to be accomplished and cost estimates by activity or task. Each Work Program includes a budget spreadsheet that shows funding levels and share (Federal, State and other sources) for the program year. The RD&T work performed using SP&R funds consist of 80% Federal and 20% State share. Cooperative activities including NCHRP, Transportation Research Board (TRB) Core Services, NETC and the Transportation Pooled Fund (TPF) program are financed using 100% federal SP&R funds and are included in the Work Program. The SP&R funding is also used by CTDOT to support the Local Technical Assistance Program (LTAP) which has a 50% Federal share matched by 50% SP&R funds. In addition, 100% State funded activities and research including product evaluation and Connecticut Cooperative Transportation Research Program (CCTRP) are reported in the Work Program. Other Federal funds such as NHS, SHRP2 Implementation Assistance Program User-Incentive funds; or federal-aid projects such as EDC that do not require matching State share are also documented in the Work Program. The Research Work Program also includes any study funded under a previous work program, until a final report has

been completed for the study. A link to Research Work Program spreadsheet template is included as reference [19].

The State must first pay the total cost as the work progresses and may then be reimbursed for the federal share of the cost under prescribed procedure, which are set forth in Federal-Aid Policy Guide, 23 CFR 140 - REIMBURSEMENT. The Fiscal Administrative Office at the CTDOT handles the fiscal matters related to the Research Section.

3.2 Transportation Research Database(s)

Literature search is a significant component of any successful research program. Access to literature is vital to conduct an initial investigation of areas proposed as needing research to determine: 1) whether the subject has been previously researched and with what results; 2) should further research be conducted, 3) if so, by whom; 4) estimate of the cost, personnel and time required; 5) recommend or advise against further research; and, 6) keep abreast with the latest developments in the field of transportation. The Transport Research International Documentation (TRID) is the single most comprehensive database on all subjects in the field of transportation. In addition, Research-in-Progress (RiP) database and Google Scholar are also used to provide the necessary information. Internet access supports the Research personnel with the required literature search capabilities and provides financial support to the Department's Librarian for On-line Computer Library Catalog (OCLC). The TRID and RiP databases help present the CTDOT's research to national and international audience by reporting the in-progress research studies and completed research projects to RiP and TRID research Internet web pages, respectively. The Research personnel periodically update the RiP and TRID databases.

3.3 Research Project Management

The programs, projects and products of research are designed to identify and address priority transportation questions, challenges and technology to benefit the Department, its employees, other transportation agencies, and those that use the transportation infrastructure.

Problem Statement Solicitation: Problem Statement Solicitation is an important step towards identifying potential questions, or problems that can be remedied through research. The Department personnel at all levels are polled for suggestions and research needs annually via a Departmental solicitation process that includes printed and/or e-mail notices. Periodically, meetings are held with the various present and potential research partners, industries, NETC, university transportation centers, suppliers, contractors, transit authorities and local governments. These meetings are organized through associations, task forces, and others groups as needed, and provide an opportunity for the different outreach partners to give their input on specific issues, while coming to understand transportation issues and their interrelationships with other institutions. Involvement of Research personnel in meetings and

committees related to their areas of existing or developing expertise including American Association of State Highway and Transportation Officials (AASHTO) Committees, TRB Committees, NETC Committees, internal Departmental committees such as for information systems, HMA Task Forces, the Bridge Management System, geographic information systems; and, public/private committees such as for intelligent traffic systems or use of recycled products broadens the knowledge and experience of Research personnel while enabling them to better define new research need statements and proposals. Research personnel participate in events such as Research Showcases, make numerous presentations and demonstrations, provide website material, and host visitors, seminars, and workshops. All of these may be used to present research progress, accomplishments, and to introduce broader issues for consideration within and outside the Department. Seminar and workshop attendees may include legislators, the Commissioner, Deputy Commissioner and members of their Offices, Bureau Heads, and personnel of all Bureaus and Offices of the Department and other state and private agencies. Presenters may include the research supervisors, researchers, stakeholders, and other users and experts in specific field(s). These events offer informative exchanges and discussions directed to advance understanding of issues and promote effective research efforts for the Department. Research database's such as TRID and RiP as well as technical search engines such as Google Scholar, help the Research personnel stay abreast of the latest technological advances in the field of transportation that can be integrated into emerging research projects while avoiding duplication of effort and fostering further innovation.

Project Selection: Following the solicitation process, problem statements are ranked based on priority. The primary responsibility for approving project(s) for research rests with the Director of Policy and Planning. The areas needing research may be recommended by: (a) personnel of any Bureau or Office of the Department; (b) the Commissioner, Deputy Commissioner and any member of their Offices; (c) Bureau Heads or, (d) any person outside the Department.

Project Execution: Prior to the initiation of any project, a proposal for the project has to be approved by the FHWA. The proposal is comprised of details about the project such as the reasoning and/or the benefits of the proposed research, a work plan, work schedule, implementation potential of the research, description of the deliverables and the budget. A link to the reference Research Proposal Development Guide is included in this handbook [6]. If the research project is contracted out to another agency, a Memorandum of Understanding (MOU) is established between CTDOT and the outside agency [7] before initiation of the project. The MOU delineates the contractual terms such as the scope of the project, budget, invoices and payments, subcontracts, ownership of products of research and intellectual property, publication rights, amendments to the proposal or the scope of the project, policy on termination of the MOU etc. Amendments to the MOU may be made, as necessary. The MOUs can span fiscal years but are budgeted by fiscal year. Each funding source used for research has

been programmed for the various activities in the biennial Research Work Program. In addition, each activity has a specific budget. A record is kept for both the progress of the project and fund expenditures. Allowances are made for over expending on the individual State Planning and Research (SP&R) projects for the year, but the total program funds for SP&R or other funding sources cannot be exceeded. Project records will reflect the reasons for the individual project over or under runs. Approved programmed research projects are scheduled for initiation, taking into consideration priority, available personnel, effect on existing projects, and when applicable, any lead time necessary, such as for incorporation of proposed research items in new construction. Minor projects or non-programmed research activities may be undertaken by the Research Section without prior approval, provided personnel and funds are available. The research in-progress is reported through RiP and TRID databases by Research personnel to avoid duplication of efforts.

Project Deliverables: Project reports are the official documentation of the research. **Quarterly reports** are used to monitor progress. The Principal Investigator for each project prepares the report for each quarter of a given fiscal year. The reports describe the work accomplished on each of the major tasks, outlined in the work plan, both completed and in-progress. The reports also include the information about the total budget for the project, funds expended during the reporting period as well as the cumulative expenditures-to-date. Financial, personnel, equipment and technical problems are discussed, as they affect the individual tasks. Their resolutions, or attempts at resolution, are also stated. The Principal Investigator reports whether the work is on schedule. Problems affecting the schedule may be reported under "Problems Encountered." The planned and actual time schedule for each of the tasks is shown. The overall percent complete is reported in the context of work planned for the year, where 100% represents completing all tasks planned for the year. The percentage reported is calculated using the principal investigator's assessment of the work accomplished versus planned work tasks and milestones. The quarterly report submitted by the principal investigator is reviewed by the subject matter expert and the research engineer assigned to the project to ensure that it is consistent with the scope of the work. The quarterly reports for all the research projects are compiled by the Research Section and submitted each quarter to FHWA for approval. FHWA requires that reports must be submitted no later than 30 days after the end of the reporting period as stated in 23 CFR 420.117. **Interim reports** are required for projects that are expected to take more than two years to complete, or are expected to have a significant accomplishment during the course of the research. This report is expected to cover a significant part of the research, including implementation process; impediments to implementation, if any; and, suggestions for overcoming the impediments. The **final report** is the most lasting and complete document of the research and is carefully assembled to include at least the following information: 1) Summary, including a brief description of the work and conclusions; 2) Introduction, including the problem, its background and a concise history of research; 3) Work

Plan, including the experimental research plan, data collection, description of sites and activities and analysis of the data; 4) Findings and Conclusions; 5) Recommendations, based on the findings and conclusions; 6) Suggestions for additional research; and, 7) Implementation Plan, defining the procedure to introduce the results into practice, including suggestions for organizational responsibility. To ensure uniformity of structure for the final reports, the TRB style formatting is recommended [8]. The length of a report is not necessarily an indication of its value. Reports should be clear and concise, and contain all necessary supporting data, charts, graphs and photographs, as required. FHWA requires that the interim and final reports must be submitted for approval within 90 days after the end of the reporting period as stated in 23 CFR 420.117. **Executive summary** reports shall be prepared, as required. The summary, conclusions and recommendations, where applicable, shall be prepared as a standalone document for the convenience of legislators, administrators and others, who may not have the time to read a complete report. The executive summary shall be prepared based on data and information delineated in the interim or final report. At the option of the Assistant Director of Policy and Planning, an executive summary may be incorporated into an interim or final report. Project deliverables are not limited to reports and may also include specifications, devices or equipment, prototypes, software packages and user training etc.

Distribution of Reports: The final reports form the basis for discussion of the research through the Department's Website, Internet and presentations to the transportation community via NTL and TRID. The CTDOT research process in accordance with the Departmental Policy on Dissemination of Research Findings [4] entails that the final reports, following approval of FHWA, be distributed electronically to the organizations listed below. An updated e-mail list of the contact personnel in each of these organizations, pertaining to the distribution of report, is maintained by the CTDOT research personnel.

1. Original hard copy to be retained by the Bureau of Policy and Planning; Roadway Information Systems Research Section.
2. Two hard copies and the Uniform Resource Locator (URL) link shall be provided to the State Library.
3. Two hard copies and the URL link shall be provided to the CTDOT Library.
4. The University of Connecticut CTI and T2 Center shall be provided with the URL link of the report, unless the CTI generated the final report.
5. The URL link shall be provided to AASHTO Region 1 and pertinent Bureaus, Offices, and Divisions within the Department. AASHTO Region 1 member states include Connecticut, New Hampshire, Massachusetts, Delaware, District of Columbia, Maine, Maryland, New Jersey, New York, Pennsylvania, Rhode Island and Vermont.
6. The FHWA Division Office shall be provided with the URL link and two hard copies.

The URL link shall be provided to the following libraries and repositories:

7. The Berkeley University TRISNET Repository.
8. The Northwestern University TRISNET Repository.
9. The Volpe National Transportation Systems Center TRISNET Repository.
10. The Transportation Research Board Library TRIS-TRID.
11. The National Technical Information Service (NTIS).
12. The National Transportation Library (NTL).
13. The FHWA Research Library.
14. The Office of Corporate Research, Technology and Innovation Management at the Turner-Fairbank Highway Research Center.

All final reports are documented in the TRID on-line database. Additionally, Legislative reports have special distribution requirements that must be determined and followed on a report by report basis.

Implementation of Research Results: The implementation process is aided by the exchange of information, which starts with clear, concise and complete project reports. The Research Section is responsible for comprehensive analysis of research results from studies conducted within the Department or other research agencies. The analysis shall be reported through channels to the appropriate Bureau, Office, or Division with recommendations for further tests, experimental installations, incorporation into Department policy, procedures, specifications, or such other action(s) as is deemed advisable.

Research Program Evaluation: The public expenditure of funds is subject to careful scrutiny. The programs receiving these funds are evaluated based on the benefits to the general public. After carefully selecting the research projects and developing the work program, the research efforts must follow defined procedures that ensure unbiased and meaningful results, both on an individual project basis and on a program basis. The work program is the sum of all activities planned for the year. These activities are primarily projects; technology transfer efforts and technical assistance; seminars; and, implementation efforts. Milestones are set for each of these activities such as installation designs or interim reports for projects; LTAP meetings or field inspection visits for technical assistance; public technical meetings; pooled fund meetings; implementation meetings; and, discussions and field visits for project problems, information dissemination and advancement. A record of each of these activities should be maintained for inclusion in the Work Program and any program summary. Each activity has a specific budget. A record is kept for both the project level and funding source expenditures. The projects are the most important activities as far as schedules are concerned. Most other activities are cyclical and are planned for throughout the year. The ability to adhere to the schedule for a project is contingent on many factors. The Principal Investigator and Research supervisor are in frequent communication with each other to prevent falling behind on project schedule. The quarterly report will reflect the percent complete for each project; the planned

and actual time schedules are also shown. The performance of the research program is difficult to assess in its entirety because of the diversity of activities. However, the quality of the program can be judged by observing the progress of some of the measurable parameters such as % projects implemented; % projects completed on time; % projects completed within budget; agency cost-saving products developed; as well as, projects with paybacks such as reduction in number of fatal or non-fatal vehicle crashes, lives saved and reduced environmental impact to name a few. In addition, Research Performance Measures (RPM) is a tracking system for state transportation agencies provided by FHWA and AASHTO to aid in measuring performance of individual research projects or the annual research program. The documentation of a successful performance of the research effort is important to continue to receive the management and financial support that it requires. Objective and quantifiable parameters provide the basis for this support.

3.4 Product Evaluation and the Research Liaison Committee

Product evaluation is an important arm of research and implementation process. The Product Evaluation personnel in the Research Section carry out the Departmental Policy on Product Evaluation [2]. Whenever an industry representative or consulting engineer approaches an official of any Bureau of the Department concerning a new product, material, or process, the official is responsible for directing the individual to the Product Evaluation personnel who then obtains appropriate information on the potential value of the product, material, or process to the Department. After the vendor has provided sufficient documentation on a new product, material, or process, the item is referred to the Research Liaison Committee for review and recommendations. The new product evaluation submittal form is included as reference [10]. The specific functions of the Product Evaluation personnel are: reviews all new products, materials and processes properly submitted to the Research Section; coordinate with various Departmental personnel in affected units to obtain field and laboratory evaluations; communicates with other states, FHWA, the National Transportation Product Evaluation Program (NTPEP), and the Highway Innovative Technology Exchange Center (HITEC); maintains current files on new products, materials and processes under evaluation; maintains and publishes an Approved Products List; and advises the Bureau of Engineering and Construction staff on the value and requirements for further testing of products, materials or processes. This function is carried out with active Departmental effort and input through members of the Research Liaison Committee.

Industry representatives or consultants requesting that a product be considered for field evaluation, must:·1) Define a condition or problem in the State of Connecticut where use of the product would provide a marked improvement; 2) Provide data substantiating all claimed benefits before the product is considered for evaluation. The data should be well documented and include a direct comparison with the material currently specified; 3) Provide a free sample

of the product for laboratory evaluation; and, 4) If it is decided to field-evaluate the product, the manufacturer shall: a) Provide free of charge, enough material for an adequate number of test installations; and, b) Provide for the installation of this material at no additional cost to the State of Connecticut. The Research Section or other unit designated by the Research Liaison Committee, documents the results of laboratory and/or field evaluations. The Department reserves the right to limit the use of all findings for promotional purposes by the manufacturer.

The Research Liaison Committee meets to recommend one of the following actions for each submission to the Department: 1) Immediate adoption; 2) Trial installation for further evaluation; 3) Further study and evaluation, to avoid duplication; 4) Refer back to initiator for additional information; or, 5) Rejection. The functions of the Research Liaison Committee are advisory and consist of: 1) Setting priorities on product evaluations; 2) Establishing and maintaining an approved list of materials and products; 3) Recommending implementation of new products and research findings into departmental operations; and, 4) When requested by the Chair, providing input on screening of research project proposals, which have been submitted to or originated within the Department. Membership of this Standing Committee is established by Administrative Memorandum every January. Membership consists of the Chair and one person each from: Office of Material and Management, Office of Construction, Bridge Consultant Design Unit, Office of Maintenance, Highway Design Section, Office of Facilities Design, Division of Traffic Engineering, and the Division of Materials Testing. The committee secretary shall be a nonvoting committee member from the Product Evaluation, Research Section. Bureau Heads, Office Directors, or Division Managers recommend appointment of the committee members from their respective organizations. Outside experts and other members of the Department are asked to attend Committee meetings, as required. The procedures of the Research Liaison Committee are those prescribed and approved by a majority of its members. The Research Liaison Committee meets as required by the Chair, which is generally at sixty day intervals.

3.5 Technology Transfer to Local Governments

This activity is administered by the Roadway Information Systems Research Section through the Local Technical Assistance Program (LTAP) managed by the Technology Transfer (T2) Center. The T2 Center was established at the University Of Connecticut School Of Engineering's Connecticut Transportation Institute (CTI) in 1983 under a contract with the Department. The purpose of the Center is to provide training and technical assistance tailored to address the needs of Connecticut's local governments in the areas of roads, bridges, and public transportation. The Center is guided by an advisory committee comprised of Town government personnel that work with and manage local roads, bridges, and community transit functions. Ex-officio (non-voting) members represent the Department and the FHWA. Generally, the Research Section supervisor, a Research Engineer and a representative from the

Connecticut FHWA Office are members of the T2 advisory committee. The activities of LTAP are funded at 50% by Federal funds according to the FAST Act and the remainder (sometimes in excess of 50%) is provided by the State. The SP&R funding can be used by the State as the non-federal share for LTAP managed by the T2 center.

3.6 Other Research Programs

Connecticut Cooperative Transportation Research Program (CCTRP): In 1962, the Connecticut State Legislature established a continuing research program now known as Connecticut Cooperative Transportation Research Program between the CTDOT and the University of Connecticut [11]. Section 13a-256 of the Connecticut General Statutes, provides for a continuing research effort at the University of Connecticut and provides funds annually from the Department Budget for the conduct of research at the University under the jurisdiction of the Joint Highway Research Advisory Council (JHRAC).

The JHRAC consists of eight members. Four members are designated by the Commissioner of Transportation and four are designated by the Provost of the University of Connecticut. JHRAC sets the policies governing the Connecticut Cooperative Transportation Research Program and approves projects to be undertaken. The Chair is elected annually and alternates each year between CTDOT and the University of Connecticut. Detailed Policy and Procedures of the Council are maintained by the Council and updated periodically, when required.

The goals of CCTRP are: 1) To improve and facilitate the movement of goods and services on the state system; 2) To introduce improved materials and methods of operation for the design, construction, maintenance, and management of the state system; 3) To increase the safety and convenience of the state system for the people of Connecticut; and, 4) To minimize any undesirable environmental impact of existing and proposed transportation facilities on adjacent properties and communities. Identifying, evaluating and researching transportation related problems shall achieve these goals. The CTDOT Research personnel review the project proposals, monitor project progress, review and distribute final reports and provide technical guidance and assistance, wherever necessary.

Connecticut Academy of Science and Engineering (CASE): The Connecticut Academy of Science and Engineering is a private, nonprofit, public-service institution that identifies and studies issues and technological advances to benefit the people of Connecticut, and provides unbiased, expert advice on science and technology-related issues to the State government and other Connecticut institutions [12]. The Department financially supports CASE through a service subscription under a standard contract. Furthermore, additional funding is provided, as deemed advisable, to complete at least one project. The CTDOT Research personnel review the project proposals, monitor project progress, review and distribute final reports and provide technical

guidance and assistance, wherever necessary, in the projects associated to transportation in the State. The Research personnel also serve as Department liaison with CASE and other agencies.

New England Transportation Consortium (NETC): The NETC is a cooperative effort of the transportation agencies of the six New England States including Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, and the FHWA [13]. Through the Consortium, the state's pool professional, academic, and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system. The Consortium operates through 1) a committee structure consisting of: a Policy Committee, an Advisory Committee and Project Technical Committees, and 2) a Coordinator and Lead State. The Consortium maintains detailed policies and procedures, which are approved by the Policy and Advisory Committees and updated periodically, as required. The cooperative NETC activities and projects are supported by CTDOT with 100% federal SP&R funds. The CTDOT Research personnel participate in the NETC meetings; problem statement solicitations; are appointed to NETC Policy Committee, Advisory Committee and Technical Committee(s); and, provide technical guidance and assistance, depending on their area(s) of expertise.

Cooperative Research Programs:

National Cooperative Highway Research Program (NCHRP): The NCHRP is administered by the TRB [14]. It is sponsored by the member departments, which include individual state departments of transportation, of the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the FHWA. Individual projects are conducted by contractors with oversight provided by volunteer panels of experts. All of the state transportation departments contribute to an annual cooperative pool to fund the program's activities. The CTDOT supports NCHRP by 100% federal SP&R funds which is stipulated in the CTDOT Work Program. The Research personnel participate in NCHRP activities administered through AASHTO-Standing Committee on Research (AASHTO-SCOR) and AASHTO-Research Advisory Committee (AASHTO-RAC) such as problem statement solicitation; and, reviewing, scoring and submission of ballots for problem statements. The Research and other Department personnel also serve NCHRP projects based on their areas of expertise as panel members, liaisons, and/or principal investigator. In addition, Research personnel also participate in other special task forces and committees created to address transportation related problems. The annual Work Program also allocates funds for activities supported by AASHTO such as NTPEP, AASHTO Approved Product List (APEL), participation in AASHTO SHRP

Lead states and Transportation and Civil Engineering (TRAC) initiatives as well as AASHTO Technology Implementation Group (TIG).

Transit Cooperative Research Program (TCRP): The TCRP, similar to NCHRP, is a cooperative program administered by the TRB [15]. The Research personnel participate in TCRP activities such as synthesis of transit practice topics, selection of synthesis topics, development of problem statements, and may serve as project panel members based on their area(s) of expertise.

Transportation Pooled Fund Program (TPF): The TPF program supports research, planning, and technology transfer activities in cooperatively solving transportation-related problems. These activities may be jointly funded by several federal, state, regional, and local transportation agencies, academic institutions, foundations, or private firms as a pooled fund study. It is a popular means for State Department of Transportation, commercial entities, and FHWA program offices to combine resources and achieve common research goals [16]. A federal or state transportation agency may solicit pooled fund studies and perform as the lead agency. Local and regional transportation agencies, private companies, foundations, and colleges/universities may partner with any or all of the sponsoring agencies to conduct pooled fund projects, but they may not lead or solicit the initiation of a study. The lead agency manages the research of the pooled fund study, performs its related administrative functions, and provides all the reports and deliverables to the project partners in a timely manner. The partner agencies commit and transfer the funds to the lead agency through the respective FHWA Division Office. The CTDOT apportions SP&R funds to support the TPF projects in its Research Work program. Research and other Department staff may participate in pooled fund studies depending on their area(s) of expertise. The CTDOT also apportions stipulated funds to the TRB correlation service through the FHWA TPF project 'core program services for Highway Research, Development and Technology Program'. The 'Transportation Pooled fund Procedures Manual' [17] and the 'Transportation Pooled Fund Program Financial Process Guidebook' [18] contain step-by-step procedures on "how to" advance a TPF project from conception to close out for lead agency and detailed instructions for participating in a pooled fund project as a partner. The links to both the documents are included as references.

3.7 Peer Review of the Research Program

A quality research program depends upon its ability to implement effective and timely solutions to the problems of the Department or enrich the existing program with the input of outside personnel familiar with state transportation research programs. Peer exchange examination of the deliverables of the Research Section is a program designed to improve the quality of the management system. The FHWA mandates participation in peer exchanges of RD&T management process and of other States DOT programs on a periodic basis as stated in

23 CFR 420.209. The peer exchange is an activity independent of the research process, conducted by a team of non-agency personnel (at least every five years). The Department shall consider its reporting as it would any other report that is designed to improve the management processes.

Peer Review of CTDOT Research Program: *The review team*: The peer-exchange team should include a panel of approximately four to five people and should include participants from other State research programs, FHWA staff, universities, or other relevant participants. At least one or two of the panel members should have participated in previous peer exchange panels. A State must hold a peer exchange periodically, which means at least every five years, if not more frequently, and entails at least a 2- to 3-day agenda, onsite at the host State's location.

Travel arrangements: The estimated travel and other cost of the peer exchange team are programmed in the fiscal year Research Work Program and are eligible for 100% Federal funding. The Department will reimburse travel expenses of the exchange-team members.

Meeting agenda: The agenda of the peer exchange is intended to advance the research processes within the agency. AASHTO-SCOR/RAC has developed the following list of possible topics for peer exchange. This classification would assist with the categorization of the Peer Exchange Reports and also improve the findability of relevant reports within the Peer Exchange Reports database. The purpose of this list is to provide a standardized way to group existing and future reports to facilitate information sharing among agencies involved in transportation research management.

1. Research Project and Program Management (Scope Note: Use this topic category if a peer exchange was general and covered the entire research program or where program and/or project management was specifically listed as an objective).

2. Alignment of the Research Function with Departmental Missions and Goals (Scope Note: Includes the concepts of policy research and strategic planning).

3. Research Staffing Needs, Capacity Building, and Skill Sets.

4. Research Collaboration and Partnerships (Scope Note: Includes research with UTCs, pooled fund projects, participation in national programs, and research funding strategies).

5. Optimizing the Value and Quality of Research (Scope Note: Includes development, solicitation, review, and prioritization of research ideas, forming advisory panels, project and contract management, dealing with principal investigators, quality of reporting).

6. Implementation/Deployment of Results/Technology Transfer.

7. Information and Knowledge Management (Scope Note: Includes libraries, information databases, Transportation Knowledge Networks).

8. Research Performance Measures and Communicating the Value of Research Projects and Programs (Scope Note: Includes both internal and external outreach and marketing).

A comprehensive agenda will include all the major topics stated. This broad agenda is anticipated to be most useful for the first peer exchange and periodically thereafter. Unless all aspects of the program are discussed, peer exchange discussions will be less than complete. However, it is believed that using the comprehensive agenda for every peer exchange would be excessive, repetitive and result in diminishing benefits. A focused agenda, unlike the comprehensive agenda, will concentrate on one or more topics. The outcome of the exchange will reflect in part the clarity of the goals, as well as a step by step examination of the selected topic(s).

Program review: During the peer exchange review process, the research program is reviewed based on the topics selected for the peer exchange. The copies of CTDOT Research Work Program and Research Handbook are to be made available to the review team. The process for putting together a work program is a description of the early stages of the management system. The process to input the various elements is subject to policy, financial and management considerations. These issues will be discussed with the review team. The review team may also have to be provided with all solicitation correspondence for problem statements and the problem statements received in the current fiscal year; information about Product Evaluation and Research Liaison Committee including minutes of meetings; information about contract research process including a list of all projects that were put into the contract process, a list of all proposals received, the results of the proposal review process for each project and the names of all contractors (Universities) selected; and, copies of each project's most recent quarterly report or recently completed final reports will be made available to the review team. The peer exchange team will also be provided with records of project related committee or task-force meetings for state-selected projects. Research personnel will detail the two different types of meetings: contractor vs. in-house project meetings, and the frequency of the meetings. Examples of the efforts made in the implementation of the project results will also be made available for selected projects. Certain projects will be selected to discuss the type and distribution of the reports generated by the project. All aspects of the technology transfer effort including implementation activities will be explained to the peer exchange team. Examples of the activities will be defined using the Work Program and annual summary document. The number of personnel and the budget may affect the output of the Research Section. The current financial and personnel resources, as defined in the Work Program, will be discussed with the peer exchange team. The current budget appropriation, source of funds, allocation of funds between activities in the program, organization chart and explanation of the use of personnel will be detailed. In addition, the peer exchange team will be provided with a list of all training programs available to personnel, including state sponsored courses, research development courses, FHWA courses and university programs in transportation because the technical capabilities of the research team can be defined by its educational and practical experience background. The team will be informed about the process that supervisors use to

advise personnel of the training courses of which they should avail themselves. A list of all personnel and their degrees, training courses and years of experience will be made available to the team.

Peer Exchange Report: A close-out meeting together with the Connecticut FHWA Office representative and the State senior management have to be held on the peer exchange. According to 23 CFR 420.209 (a) (7), the peer exchange panel must also prepare a written report of the exchange. Preferably, the report should be written before the closeout meeting with the senior management or before the panel members leave. The report should include a brief introduction that identifies all of the participants on the panel and describes the purpose and intent of the activity. The body of the report should briefly discuss those aspects of the research program that the panel explored. The conclusion section of the report should reflect the highlights of the open discussions and should be written using a panel consensus approach. The report should include an endorsement by all the members of the panel. A copy of the report should be forwarded to the Connecticut FHWA division administrator upon completion of the peer exchange.

Agency Response to the peer review exchange: The peer exchange is a vigorous effort conducted for the benefit of the research program. It will be accomplished by qualified peers to improve the research process. The recommendations of the team will be discussed with the Research personnel and Department management. Every effort will be made to incorporate the recommendations that can improve the quality of the research program. Before the next peer exchange, a follow up report or memorandum, summarizing changes that were or were not made to the program based on the previous peer exchange, should be submitted to the Connecticut FHWA office and the State senior management.

Peer Review of External Agency: *The review team*: Personnel of the Research Section will program time to serve as peer exchange team members. Research personnel assigned to participate will perform a review in other states, following the agenda developed to meet the needs of the host state. Research personnel do not anticipate serving as a team member more frequently than once per year. However, in the event that requests are received and other states cannot serve, a request and justification may be prepared for consideration through the chain of command.

Travel arrangements: Research will allocate personnel expenses for peer exchange travel, as deemed necessary. It is anticipated that the host state will reimburse travel expenses of the exchange-team members. Travel funds will not be programmed to cover the cost of Connecticut's participation in the peer exchanges of other states or agencies. If a pooled fund project is set up by the FHWA to cover the costs of the peer review team visiting the state, the state may participate in the pooled fund project.

The peer exchange process is designed to let the states interact with other states on a formal review basis. Personnel can both learn from and give guidance to other agencies on the research process. This is an excellent opportunity to participate in and gain the benefits of a non-intrusive review of the agency's research process. The process should result in recommendations covering the State's focus areas, such as: problem solicitation process, work program, contract research effort, communications project monitoring, project reporting, technology transfer, and implementation efforts.

3.8 Research Calendar

The research calendar serves as a reminder for the various research activities that occur throughout the calendar year within the Department as well as other activities that the personnel of the Research Section participate in and/or perform.

January

- TRB annual meeting
- Quarterly report (Oct-Dec) due - January 15
- NCHRP - Synthesis of Highway Practice topics due
- TCRP - Problem Statement solicitation
- AASHTO High Value Research Solicitation

February

- AASHTO - Legislative briefing
- NCHRP - Ballots completed/returned
- Contribution reminder (NCHRP)

March

- FHWA - SP&R Annual Work Plan development begins
- CASE - Brain storming session(s) - March 15
- NCHRP - Summary of ballots to SCOR
- NCHRP - SCOR prioritize/select projects
- NCHRP - Funds obligation due
- NCHRP - IDEA proposals due
- Contribution reminder (TRB-Core Services)
- TRB - Annual state visits announced
- TCRP - Synthesis of Transit Practice topics due
- NETC - Problem Statements due
- AASHTO High Value Research Submission - March 31
- AASHTO SCOR winter meeting

April

- Quarterly Report (Jan-Mar) due - April 15

- NCHRP - Panel nominations solicitation
- NCHRP - Preliminary program announced

May

- AASHTO - Spring Meeting
- NCHRP - Synthesis topics selected
- NCHRP - Panel member nominations due
- NCHRP - Board of Directors ballot distributed
- TCRP - Synthesis topics selected
- Transit IDEA proposals due
- TIG - Requests for topics
- AASHTO Region 1 High Value Research voting
- MOU amendments - start May 1

June

- FHWA-SP&R Annual Work Plan due
- TRB - Call for Abstracts for Annual Meeting
- Contribution reminder (TPF Studies)
- TCRP - Problem Statements due
- NCHRP - State Funding agreement due end of June

July

- Quarterly Report (Apr-June) due - July 15
- AASHTO-RAC Annual Meeting and Ahead of the Curve training
- NCHRP - Problem statement solicitation
- NCHRP - AASHTO Board of Directors ballot due
- LTAP - National Meeting - July 18-21

August

- TRB - Annual Meeting abstracts due
- FHWA - Summary of Research Activities due

September

- AASHTO - Annual Meeting
- NCHRP - Problem statements due
- NCHRP - IDEA proposals due
- CCTRP (JHRAC) - Funds obligation due
- NETC - Funds obligation due

October

- CTDOT - Problem statement solicitation - October 1
- Quarterly Report (July-Sept) due - October 15th
- TRB - Field Visit

- TRB - Annual Meeting Preliminary Announcement
- TCRP - Project selection

November

- NCHRP - Problem statement evaluation completed
- NCHRP - Synthesis of Highway Practice call for topics
- NCHRP - Problem submitters informed of status

December

- CTDOT - Problem statements due - December 1
- NETC - Problem Statement solicitation
- NCHRP - Ballot distributed to SCOR and RAC
- TCRP - Project panelists solicitation

Chapter 4

Other Activities

The Research personnel in addition to research participate in various other activities.

4.1 **High Value Research Recognition**: AASHTO SCOR and AASHTO RAC are proactive committees dedicated to promoting quality and excellence in research and in the application of research findings to improve state transportation systems. Effectively communicating the overall potential and value of research is integral to delivering improved transportation services. It is important to document and publicize the value of successful research projects. AASHTO sponsors the recognition of successful research by promoting friendly competition among the member states through High Value Research (HVR) appreciation. On an annual basis, the CTDOT Research Section submits as many high value research projects as appropriate, through the RPM website during the AASHTO HVR solicitation process. The research personnel from State DOT's vote and rank the projects submitted from their specific AASHTO region based on the impact of the projects considering both the breadth and depth. Members are not allowed to include their own HVR in the ranking vote. The RAC regional Chair then decides and submits the top four HVR projects per region to be considered for the "Sweet 16" selection process. The AASHTO RAC Sweet 16 projects may be featured in the annual "Research Makes a Difference" brochure produced by NCHRP.

4.2 **Research Showcase**: The Research Showcase presents a broad overview of the Departmental research program. The Director or Assistant Director of Policy and Planning, or designated research personnel would make a statement or presentation at the meeting. Meetings generally highlight distinctive issues. Meeting attendees are invited based on their interest and area(s) of expertise, and may include Bureau Heads, and personnel of all Bureaus and Offices of the Department, universities, consultants and other state and private agencies. Presenters may include the research supervisors, researchers, and other experts in specific field(s). Individual presentations expand awareness and knowledge within the Department about specific research projects. Presentations, when made, are by qualified personnel in the field, followed by an open discussion. A directed discussion solicits input from the meeting attendees. Research personnel are approachable at the Showcase and the Showcase includes a solicitation for input from the attendees through the research needs solicitation process. This type of meeting(s) elicits input to the research agenda. The Research Showcase is organized on an as needed basis.

4.3 **Outreach Reporting**:

Research Highlights: Annually, highlights from selected projects will be written up in a summary hand-out format. The publication will be utilized at the meetings such as Spring- and Annual-AASHTO meeting, national meeting of AASHTO-RAC, Annual New England Materials and

Research Engineers Meetings, Research Showcase, and various other outreach events including visits to the Roadway Information Systems Research Section.

Paper Publication of Highlights: Research highlights will include an image or graphic for each project summary. Contact will generally be directed to the principal investigators for each project. The highlights handout will be published in color and in sufficient quantity to meet estimated needs for the year.

Web Publication of Highlights: A version of the research highlights document will be prepared for Internet distribution. Hyperlinks will be included for e-mail contacts to the principal investigators and administrative contacts. Hyperlinks to related project information may also be included. For example, if Connecticut's current AASHTO-RAC High Value Research write-up is for a project included in Research Highlights, a hyperlink will link the two Web documents. Hyperlinks may be established to an archive of former High-Value write-ups, if this is established on CTDOT's research web site.

4.4 **Outreach Activities**: Outreach activities often overlap with each other and with other activities of the Research personnel, discussed earlier in this manual. Research personnel will be active participants in the technology transfer activities in the following ways:

- The progress of the research projects will be continuously examined to ensure that the deliverables are amenable to implementation.
- The results of research projects will be advanced for implementation.
- The expertise of Research personnel will be available to other operating units of the agency for problem solving and literature searches. In addition, Research personnel need to be cognizant of new developments, to bring pertinent improvements to the attention of the proper Departmental personnel, and to investigate specific problem areas and offer appropriate solutions. The Research Section acts as a consultant to other units in various matters at their request or as a result of data-acquisition systems, resident knowledge, training, and experience of Research personnel.
- The results of promising research from other agencies and publications will be made available to the Department's operating units.
- Information on FHWA Demonstration projects will be disseminated to agency personnel, and analyzed for a potential workshop session.
- Research personnel will coordinate and be supportive of the Department's Design and Construction personnel that assume responsibilities for the planning, installation, data gathering, and analysis of experimental features in construction.
- Research personnel will actively participate in the presentations, demonstrations, and meetings to involve potential partners in the research process.

- Research personnel will attend important regional and national meetings and disseminate pertinent information and research findings from other agencies to appropriate personnel within the Department's operating units.

4.5 **Public Relations and Information Responsibility**: Research personnel provide input to the Director of Communications, who is the Department's official media contact. The Department's policies and procedures in all contacts with other states, agencies, industry and the public shall be directed to accomplish the following end results: 1) no new material or procedure promising improved service and/or economy to the public will be overlooked; 2) information of value to the transportation industry will be published for the consideration and guidance of interested agencies; 3) industry representatives will be courteously received, acquainted with the problems for which their industry might have suggestions for solution; and, 4) industry personnel have confidence in and respect for the Department of Transportation and its representatives.

Since the Research personnel may come into possession of confidential information in respect to new material or products under development, it is essential that such information be considered a privileged communication. Respect by industry for the integrity of the Department staff and Research personnel are necessary to maintain a positive and credible Departmental image. The Research Section frequently receives requests for information on many subjects. In all cases, the answer should clearly state the basis of the information supplied. Opinion, based on experience, is permissible provided it is emphasized that it is an opinion.

4.6 **Assistance to Other Branches of the State Government**: Whenever any other branch of the State Government may have need of information pertaining to research in the areas of planning, design, construction, maintenance, etc., of transportation systems, it may request such assistance from the Commissioner of Transportation, Deputy Transportation Commissioner, Bureau Heads or Chief Engineer.

4.7 **Experimental Installations**: Experimental installations may be made by any unit of the Department upon approval by the Director of Policy and Planning. It is essential that all test or experimental installations receive clearance in order to avoid duplication of effort. A great many items have already been researched and tested by the Department or other research organizations. Approval must be secured for all test installations.

Research may be described as the careful, systematic study to establish facts in a specific field, but the crux of the effort for the State is in the application of research results. The whole purpose of the research at the Department of Transportation is to improve the State

transportation system. The technology transfer activities of research are directed to benefit the larger community.

REFERENCES

Explanatory Note:

The policy and interpretive memoranda referred to in this section have been selected from the total body of Departmental Policy memoranda and reproduced herein because of their relevancy to the subject of this chapter. Should any statement elsewhere in this chapter be, or appear to be, in conflict with current policy and interpretive memoranda, or with future policy memoranda approved and published by the Commissioner, these policy and interpretive memoranda will prevail. It should also be noted that it is not necessary for each policy memorandum to have a corresponding interpretive memorandum, or for each interpretive memorandum to have a corresponding policy memorandum. There will be instances where policy memoranda will be so inclusive as not to require further interpretation. There will also be instances where interpretive memoranda amplify policies already set out, thus making it unnecessary to restate these policies in the form of policy memoranda. In the latter case, however, the interpretive memoranda should make reference to the policy source.

1. Connecticut Department of Transportation Policy Statement on Research, No. P&P -9.
2. Connecticut Department of Transportation Policy Statement on Product Evaluation, No. P&P -10.
3. Connecticut Department of Transportation Policy Statement on Implementation of Research Results, No. P&P -11.
4. Connecticut Department of Transportation Policy Statement on Dissemination of Research Findings, No. P&P -12.
5. Link to Title 23 - Code of Federal Regulations, Chapter 1, Subchapter E, Part 420-Planning and Research Program Administration, Subpart A - Administration of FHWA Planning and Research Funds and Subpart B - Research, Development and Technology Transfer Program Management.
   http://www.ecfr.gov/cgi-bin/text-idx?SID=b5e0bf128bf8129f9c0a0b4a70cb4175&mc=true&node=pt23.1.420&rgn=div5
6. Link to the Research Proposal Development Guide.
   http://www.ct.gov/dot/lib/dot/documents/dpolicy/research/ResearchProposalDevelopmentGuide.pdf
7. Typical Memorandum of Understanding (MOU).
8. TRB format for preparing Final Reports.
9. Annual Administrative Memorandum “List of Standing Committees”.
10. State of Connecticut Department of Transportation New Product Submittal Form for Product Evaluation.
11. CCTRP Website: http://www.cti.uconn.edu/cctrp/

12. CASE Website: http://www.ctcase.org/
13. NETC Website: http://www.uvm.edu/trc/netc/
14. NCHRP Website: http://www.trb.org/NCHRP/NCHRP.aspx
15. TCRP Website: http://www.trb.org/TCRP/TCRP.aspx
16. TPF Website: http://www.pooledfund.org/
17. Link to the 'Transportation Pooled Fund Procedures Manual' http://www.pooledfund.org/Reports/TPF%20Program%20Procedures%20Manual%20-%20March%202012.pdf
18. Link to the 'Transportation Pooled Fund Program Financial Process Guidebook' http://www.pooledfund.org/AuthorizedReports/TPF%20Program%20Financial%20Process%20Guidebook%20(August%202012).pdf
19. Link to Template for Work Program spreadsheet O:\Policy_Planning\RoadwayInfoSystems\Research&Implementation\Programs\SPR\Work Plans\2017&2018\Work Plan PDFs\Template for Work Program spreadsheet