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

	Page
Acronyms	ii
Preface	iii
Table of Contents	v
Chapter 1. Overview of CTDOT Roadway Information Systems Research Section	1
1.1 Purpose	2
1.2 Authority	2
1.3 CTDOT Policy on Research	2
1.4 Invention and Discoveries by State Employees	2
1.5 Functions of Roadway Information Systems Research Section	2
1.6 Legal Services	3
Chapter 2. Federal Highway Administration Research, Development and Technology Transfer Program Guidelines	5
Chapter 3. Connecticut Department of Transportation Research, Development and Technology Transfer Program	10
3.1 Research Work Program and Financing	11
3.2 Transportation Research Database(s)	12
3.3 Research Project Management	12
3.4 Product Evaluation and the Research Liaison Committee	17
3.5 Technology Transfer to Local Governments	18
3.6 Other Research Programs	19
3.7 Peer Review of the Research Program	21
3.8 Research Calendar	25
Chapter 4. Other Activities	28
4.1 High Value Research Recognition	29
4.2 Research Showcase	29
4.3 Outreach Reporting	29
4.4 Outreach Activities	30
4.5 Public Relations and Information Responsibility	31
4.6 Assistance to Other Branches of the State Government	31
4.7 Experimental Installations	31
References	33

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.

<u>Peer Review of External Agency</u>: *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 **<u>High Value Research Recognition</u>**: 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 **<u>Research Showcase</u>**: 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 **<u>Outreach Reporting</u>**:

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION

POLICY STATEMENT

POLICY NO. P&P - 9
June 10, 2016

SUBJECT: Research

The Connecticut Department of Transportation (Department) shall conduct and support research and development such that new and innovative technology is availed to address Department needs.

Transportation research is to be encouraged on all levels through a positive problem solving approach with the intent of yielding useful benefits and in the best interest of the Department and the public.

The Transportation Planning Director shall lead the Department's overall program, coordinating and administering research activities.

In meeting this policy, all research activities shall be undertaken in accordance with the Connecticut Department of Transportation Research Handbook, which shall incorporate applicable federal regulatory requirements.

(This Policy Statement supersedes Policy Statement No. E&C - 1 dated May 18, 2011.)

James Redeker
Commissioner

CONNECTICUT DEPARTMENT OF TRANSPORTATION

POLICY STATEMENT

POLICY NO. P&P - 10
June 9, 2016

SUBJECT: Product Evaluation

The Connecticut Department of Transportation (Department) shall, through research, assure that new and innovative materials, products, and methods which offer cost-effective improvements and solutions to Department needs or problems are evaluated for merit.

To provide a more efficient and organized evaluation of materials, products, and methods, the Transportation Planning Director shall direct the product evaluation program which will include decision-making authority over vendor applications and submissions.

The Department shall support and participate in the AASHTO National Transportation Product Evaluation Program (NTPEP). The industry will be directed to submit their products to NTPEP for testing when applicable product categories are available. The Department shall utilize NTPEP data in its product evaluation process and, wherever possible, shall utilize NTPEP data in lieu of conducting field tests in Connecticut.

Evaluation will involve a cooperative effort on the part of the industry and the Department. The Department will engage in product evaluation of well-developed and marketable products and processes.

In meeting this policy, all product evaluation activities shall be undertaken in accordance with the Connecticut Department of Transportation Research Handbook.

(This Policy Statement supersedes Policy Statement No. E&C - 2 dated May 18, 2011.)

James Redeker
Commissioner

CONNECTICUT DEPARTMENT OF TRANSPORTATION

POLICY STATEMENT

POLICY NO. P&P - 11
June 9, 2016

SUBJECT: Implementation of Research Results

Implementing methods, materials and products derived from successful research are essential to serve and promote the best interest of the Department and the public. An innovative program has been developed and is housed in the Bureau of Policy and Planning which promotes and encourages results oriented and implementable research where warranted.

The Transportation Planning Director shall emphasize the importance of an implementation plan with defined goals and objectives as an outcome of research performed. The role of the researcher will be one of advising, recommending, and encouraging implementation when project findings warrant such action.

In meeting this policy, all implementation activities shall be undertaken in accordance with the Connecticut Department of Transportation Research Handbook, which shall incorporate applicable federal regulatory requirements.

(This Policy Statement supersedes Policy Statement No. E&C - 3 dated May 18, 2011.)

James Redeker
Commissioner

CONNECTICUT DEPARTMENT OF TRANSPORTATION

POLICY STATEMENT

POLICY NO. P&P - 12
June 9, 2016

SUBJECT: Dissemination of Research Findings

An organized flow of research and technical information is a benefit to all concerned in addressing transportation needs through research, development, implementation, and technology transfer activities.

Technical information emanating from transportation research by international, national, regional, and Departmental sources shall be disseminated to affected and interested personnel.

All research reports prepared by the Department shall be made available electronically through the National Transportation Library in Washington, DC; the National Technical Information Service in Alexandria, Virginia; and the Transportation Research Board Library in Washington, DC. The Department will post the research findings on our Department website.

The Transportation Planning Director shall lead, coordinate, and administer the Department's research dissemination activities.

In meeting this policy, all dissemination activities shall be undertaken in accordance with the Connecticut Department of Transportation Research Handbook.

(This Policy Statement supersedes Policy Statement No. E&C - 4 dated May 18, 2011.)

James Redeker
Commissioner

Memorandum of Understanding No. MOU-PPPPP-n-YYYY-x

Memorandum of Understanding Between the Connecticut Department of Transportation and the University of Connecticut for Project No. [ ], "[Project Title]"

This Memorandum of Understanding (hereinafter referred to as "MOU") is by and between the Connecticut Department of Transportation (hereinafter referred to as "ConnDOT") and the University of Connecticut (hereinafter referred to as "UConn").

ConnDOT provides a broad range of services and primarily focuses on its mission to provide a safe, efficient and cost-effective transportation system that meets the mobility needs and is aimed at improving the lives of Connecticut's people. Similarly, UConn serves the people of Connecticut through its teaching, research and public service activities carried out on its campuses. Through various joint activities, both ConnDOT and UConn can accomplish their respective missions in some areas of specialization.

For purposes of this MOU, cooperative projects are defined as any activity of interest where joint participation between ConnDOT and UConn will improve the capacity of ConnDOT to provide enhanced services to the people of the State of Connecticut and will develop the ability of UConn to further its teaching, research and public service missions.

Acknowledging the commonality of interests involved, ConnDOT and UConn enjoy mutual benefits by entering into a cooperative working association with each other under terms that will aim towards achieving their respective missions and, thus, maximize the benefits for both resulting from the unification of purpose and sharing of resources.

WITHNESSETH, THAT:

WHEREAS, ConnDOT provides a broad range of services and primarily focuses on its mission to provide a safe, efficient and cost-effective transportation system that meets the mobility needs of the people; and,

WHEREAS, UConn, acting through its respective campuses provides teaching, research and public services for the people of Connecticut; and,

WHEREAS, both parties agree that the people are best served when the resources and expertise of its public entities are shared to address topics of common interest; and,

WHEREAS, UConn is authorized to enter into this MOU under Sections 10a-104, 10a-108 and 10a-110 to 10-110g of the General Statutes of Connecticut as amended to date; and,

WHEREAS, ConnDOT is authorized to enter into this MOU under Sections 13b-4, 13b-10, 13b-23 and 13b-24 of the General Statutes of Connecticut, as amended to date.

NOW, THEREFORE, KNOW YE THAT:

ConnDOT and UConn enter into this Memorandum of Understanding (Memorandum of Understanding No. MOU-PPPPP-n-YYYY-x) between the Connecticut Department of Transportation and the University of Connecticut to conduct a research study for Project No. [ ], "[Project Title]," under the terms and conditions specified below. These terms and conditions remain in full force and effect, until amended or terminated.

LIST OF MOU SECTIONS

MOU SECTION		PAGE NUMBER
1.	TERM	4
2.	PROJECT IDENTIFICATION AND PROPOSAL	4
3.	PROJECT FUNDING	5
4.	PRINCIPAL INVESTIGATOR(S)	5
5.	PROJECT ADMINISTRATORS	6
6.	PROGRESS REPORT(S)	7
7.	INTERIM REPORT(S)	8
8.	FINAL REPORT(S)	9
9.	INDEPENDENT CAPACITY	10
10.	CHANGES IN THE PROPOSAL	11
11.	PROJECT COSTS	11
12.	CHANGES IN BUDGET	12
13.	INVOICES AND PAYMENTS	12
14.	FISCAL RECORDS	14
15.	SUBCONTRACTS	16
16.	SUBLETTING, ASSIGNMENT OR TRANSFER	16
17.	OWNERSHIP	17

18. INTELLECTUAL PROPERTY 20

19. PUBLICATION RIGHTS 22

20. GOVERNMENTAL REQUIREMENTS 25

21. TERMINATION OF MEMORANDUM OF UNDERSTANDING 26

22. APPROVALS 28

SIGNATORY SHEET FOR MEMORANDUM OF UNDERSTANDING No. MOU-PPPPP-n-YYYY-x 29

1. TERM

The term of this MOU shall begin on _____ and shall expire on _____.

2. PROJECT IDENTIFICATION AND PROPOSAL

The work to be carried out during the period of this MOU is described in the proposal (hereinafter referred to as "Proposal") for the project identified below. The Proposal is attached hereto and incorporated as part of this MOU.

Project Number: [ ]

Project Title: "[Project Title]"

UConn KFS Number:

3. PROJECT FUNDING

(A) Funds, facilities, assigned personnel or other contributions made by either party shall be available only for the work described in this MOU.

(B) Neither ConnDOT nor UConn is obligated to expend funds or to make payments in excess of the amounts specified in this MOU and any relevant Amendments.

(C) For multiple-year projects, future participation may be contingent upon legislative or congressional appropriations to ConnDOT and/or UConn.

The total project cost for the period of this MOU shall not exceed $_____.

Federal Funds: $_____ CFDA Number: _____

State Funds: $_____

Other Funds: $_____

Total Funds: $_____

4. PRINCIPAL INVESTIGATOR(S)

(A) UConn shall assign the Principal Investigator(s) for each project conducted under this MOU.

(B) The Principal Investigator(s) or, in his/her/their absence, his/her/their supervisor shall provide technical leadership and conduct the activities of the project, including all progress reports, technical reports, and other project deliverables.

The following individual(s) is(are) designated as Principal Investigator(s):

Name:

Title:

Organization:

Address:

Telephone:

Fax:

E-Mail:

5. PROJECT ADMINISTRATORS

(A) The Project Administrators shall be the contact person) for the business aspects of this MOU, including all invoices, payments and Project Amendments.

(B) All related correspondence shall be directed to the Project Administrators so designated in this MOU.

The following individuals are designated as Project Administrators to serve as contacts for business matters:

CONNECTICUT DEPARTMENT OF TRANSPORTATION

Name:	Mr. Michael Connors
Title:	Transportation Assistant Planning Director
Organization:	Connecticut Department of Transportation
Address:	Connecticut Department of Transportation 2800 Berlin Turnpike P. O. Box 317546 Newington, CT 06131-7546
Telephone:	(860) 594-2037
Fax:	(860) 594-2056
E-Mail:	Michael.Connors@ct.gov

UNIVERSITY OF CONNECTICUT

Contractual Matters:

Name: Ms. Laura Kozma
Title: Director of Research Administration and Faculty Services
Organization: University of Connecticut
Address: University of Connecticut
Sponsored Program Services
438 Whitney Road Extension
Unit 1133
Storrs, CT 06269-1133
Telephone: (860) 486-3798
Fax: (860) 486-3726
E-Mail: Laura.Kozma@uconn.edu

Post-Award Administration:

Name: Ms. Daniela Parciasepe
Title: Grants and Contracts Specialist
Organization: University of Connecticut
Address: University of Connecticut
Office for Sponsored Programs
438 Whitney Road Extension
Unit 1133
Storrs, CT 06269-1133
Telephone: (860) 486-2269
Fax: (860) 486-3726
E-Mail: Daniela.Parciasepe@UConn.edu

6. PROGRESS REPORT(S)

UConn will provide progress report(s), if specified in the Proposal, on a(n) _____ basis, in accordance with the provisions specified below:

UConn will provide ConnDOT with progress reports in electronic ADOBE™ Portable Document Format (PDF) documents, which are to be received no later than three (3) working days after the end of the reporting period.

7. INTERIM REPORT(S)

UConn will provide an interim report(s), if specified in the Proposal, in accordance with the provisions specified below:

UConn will provide ConnDOT with a draft interim report(s) in electronic ADOBE™ Portable Document Format (PDF) document(s), on specified tasks for review by ConnDOT and the Federal Highway Administration (FHWA). Within ninety (90) calendar days after acceptance of the interim report(s) by ConnDOT, subject to action on review commentary, ten (10) copies of the interim report(s) shall be furnished to ConnDOT. A set of reproducibles, as well as an electronic ADOBE™ Portable Document Format (PDF) document, used in the preparation of the interim report(s), will be provided to ConnDOT within thirty (30) calendar days after the interim report(s) is(are) delivered to ConnDOT.

8. FINAL REPORT(S)

UConn will provide a final report(s), if specified in the Proposal, in accordance with the provisions specified below:

UConn will provide ConnDOT with a draft final report(s) in electronic ADOBE™ Portable Document Format (PDF) document(s) for review by ConnDOT and the Federal Highway Administration (FHWA). Within ninety (90) calendar days after acceptance of the final report(s) by ConnDOT, subject to action on review commentary, ten (10) copies of the final report(s) shall be furnished to ConnDOT. A set of reproducibles, as well as an electronic ADOBE™ Portable Document Format (PDF) document, used in the preparation of the final report(s), will be provided to ConnDOT within thirty (30) calendar days after the final report(s) is(are) delivered to ConnDOT.

9. INDEPENDENT CAPACITY

(A) The parties agree that employees of ConnDOT, in the performance of their duties and activities under this MOU, shall continue to be in the legal status of ConnDOT employees and not as employees of UConn.

(B) Likewise, employees of UConn, in the performance of their duties and activities under this MOU, shall continue to be in the legal status of UConn employees and not employees of ConnDOT.

10. CHANGES IN THE PROPOSAL

(A) The scope of work, budget, period of performance, specification of deliverables, or any other part of this MOU shall be amended by mutual agreement of the parties to this MOU.

(B) This MOU need be formally amended only for significant project changes as defined in Section 10(A) above, an increase or decrease in the amount of funding, an extension to the project or early termination of the project.

(C) Refer to Section 12 regarding provisions for changes in the approved budget.

11. PROJECT COSTS

Project costs shall include all necessary costs for the work conducted under this MOU, in accordance with the approved budget. Project costs may include, but are not limited to, the following:

(A) Compensation for all personnel directly engaged in the performance of work conducted under this MOU, including reimbursement to other employers for the services of borrowed personnel.

(B) Fringe benefits shall be charged at rates that are established by the State of Connecticut Office of the State Comptroller and by UConn.

(C) Reimbursements for travel costs or similar expenses shall be governed by the relevant collective bargaining Agreements in effect between ConnDOT or UConn and its employees, and/or applicable State of Connecticut, ConnDOT or UConn policy.

(D) Any other necessary direct costs and expenses incurred in the conduct of the work under this MOU.

12. CHANGES IN BUDGET

In the event that a transfer of funds between budget categories, contained in the approved budget is required, UConn may make cumulative transfers among direct cost categories of up to ten percent (10%) of the total approved budget, without approval of ConnDOT. Larger changes require prior approval of ConnDOT. In no case, however, will ConnDOT be responsible for expenses in excess of the approved total amount.

13. INVOICES AND PAYMENTS

(A) UConn shall submit properly-executed invoices (State Transfer Invoice), no later than forty-five (45) calendar days after the end of each billing period, for payment for a billing period not to exceed a calendar quarter. The invoice shall indicate the total costs incurred for the billing period in accordance with the provisions of Section 13.(B) below.

The State Transfer Invoice shall be submitted to:

Mr. Michael Connors
Transportation Assistant Planning Director
Connecticut Department of Transportation
2800 Berlin Turnpike
P. O. Box 317546
Newington, CT 06131-7546.

(1) Payments to the University for work specified shall be based upon the following dated and signed certification: "The undersigned hereby certifies that payment of the sum claimed under the cited Agreement is proper and due and that information on the fiscal report is correct and such detailed supporting information is on file, available for certification and/or audit purposes, and that all services called for by the Agreement to the date of this billing, _____, have been met.

_____	_____
Director or Appropriate Title"	Date

(B) ConnDOT shall pay UConn, in accordance with the approved Proposal, for all work authorized by ConnDOT and performed in accordance with the terms specified herein. UConn may request partial payments for work performed. These requests for payment may be submitted for a billing period not to exceed a calendar quarter. Partial payment will be made by ConnDOT on the following basis:

(1) Partial payments will be equal to one hundred percent (100%) of UConn's costs incurred for each billing period, in conformance with the budget contained in the Proposal, until the cumulative total amount invoiced equals 95% of the total of this MOU value. If an invoice is submitted which results in the cumulative total amount invoiced exceeding 95% of the total MOU value, ConnDOT shall withhold payment of that invoice and any further invoices, in accordance with the provisions of Section 13.(B)(3).

(2) ConnDOT agrees to pay UConn an amount not to exceed the total amount of the approved budget contained in the Proposal, for the contract period, established in accordance with the provisions of Section 3(C).

(3) Final payment will be processed following completion of all services called for in this MOU, as well as receipt of all project deliverables. The final payment to UConn shall include the amount invoiced for the final billing period plus any amount withheld on previous billings, in accordance with the provisions of Section 13.(B)(1).

14. FISCAL RECORDS

(A) UConn will maintain an accounting system that is adequate to segregate and accumulate reasonable, allocable and allowable costs and maintain accounts and records, in accordance with generally accepted accounting principles consistently applied.

(B) All books, documents, payrolls, papers, accounting records and other evidence pertaining to costs incurred under this MOU shall be maintained and such records shall be made available during regular working hours for inspection by authorized representatives, during the period of this MOU and for three years thereafter.

(C) These records shall reflect total project costs including documentation of ConnDOT and UConn contributions, and all third-party contributions, to the project. Copies of project records shall be furnished, if requested.

(D) UConn shall preserve all of its records and accounts concerning the implementation of this MOU including, but not limited to, any records, books, or other documents relative to charges, including charges for extra work, alleged breaches of the Project MOU, settlement of claims, or any other matter involving UConn's or Subcontractor's demand for compensation by ConnDOT for a period of not less than three (3) years from the date of the termination of this project under this MOU. If any litigation, claim, or audit is started before the expiration on the three (3) year period, the records shall be retained until all litigations, claims, or audit findings involving the records have been resolved.

(E) UConn shall permit the authorized representatives of ConnDOT, the United States Department of Transportation and the Comptroller General of the United States to perform an annual inspection and audit of all data and records of the University relating to its performance under this MOU.

15. SUBCONTRACTS

UConn shall obtain written approval from ConnDOT before entering into any subcontract with another party/parties to perform all or a part of the approved Proposal.

16. SUBLETTING, ASSIGNMENT or TRANSFER

Neither party shall sublet, sell, transfer, assign or otherwise dispose of its right title or interest in this MOU, or any part thereof, without the written consent of the other party.

17. OWNERSHIP

(A) Funding Acknowledgement Statement

The title to all products of research generated under this MOU shall reside with UConn. However, UConn grants to ConnDOT, the United States Government, and the general public, a non-exclusive, irrevocable, royalty-free, worldwide license in such work products to use, reproduce and prepare derivative works. UConn may use any of the data, plans and reports completed under the terms of this MOU for whatever purpose and may distribute products in any way. However, the following text must appear on the inside front of any reports or publications: "This report was prepared by the University of Connecticut, in cooperation with the Connecticut Department of Transportation and the United States Department of Transportation, Federal Highway Administration. The opinions, findings and conclusions expressed in the publication are those of the author(s) and not necessarily those of the Connecticut Department of Transportation or the Federal Highway Administration. This publication is based upon publicly supported research and is copyrighted. It may be reproduced in part or in full, but it is requested that there be customary crediting of the source."

(B) Capital Equipment Ownership Listing

Capital equipment is defined to include tangible, nonexpendable, personal property charged directly to this MOU, and as defined by applicable federal and state legislation in effect at the start of this MOU.

Title to all capital equipment purchased by UConn with ConnDOT funds, as listed below, shall remain the property of ConnDOT upon completion or termination of this MOU, subject to the regulations of the United States Department of Transportation, 2 CFR § 200.33, which is hereby made a part of this MOU:

_____.

All equipment not listed shall remain the property of UConn upon completion or termination of the study.

(C) For this MOU, a list shall be maintained of all equipment, and priority for use of such equipment throughout its useful life shall be to further the joint cooperative ventures of the parties.

18. INTELLECTUAL PROPERTY

(A)

The terms "Invention" or "Discovery," as used herein mean any invention or discovery of UConn conceived or first actually reduced to practice in the course of or under this MOU, and includes any art, method, process, machine or manufacture, design or composition thereof, or any variety of plant, which is or may be patentable under the Patent Laws of the United States of America or any foreign country.

23 CFR § 420.121(j) of the "State Planning and Research Program Administration, Final Rule," 2 CFR § 200.448, and 37 CFR 401.14,

"Standard Patent Rights Clauses," are herein by reference made part of this MOU.

The periodic reporting requirements defined in this MOU shall include disclosure of potentially patentable inventions or discoveries first conceived or reduced to practice since the prior report. UConn shall have title to such inventions or discoveries. UConn shall have the right to file patent applications on such inventions and discoveries. UConn shall give written notice of its intention to file a patent application with respect to any such discovery or invention within sixty (60) days after disclosure to ConnDOT. If UConn becomes the owner of any patent with respect to any invention or discovery covered by this paragraph, it shall grant to ConnDOT and the Federal Government a paid-up, royalty-free, nonexclusive, irrevocable license, with the right to sublicense to practice or have practiced for or on the behalf of governmental agencies, either Federal, State, or municipal agencies including counties and townships, or quasi-governmental agencies, the patented invention or discovery. Any royalties from sales in the private sector or outside the United States shall be assigned to UConn. With respect to inventions or discoveries covered by this paragraph which are not patented or patentable, such inventions or discoveries shall be jointly owned with each party having the unrestricted right to practice or have practiced the same on its behalf.

(B) 37 CFR, Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," is herein by reference made part of this MOU.

19. PUBLICATION RIGHTS

(A) Copyright Provision

UConn shall be free to copyright material developed under this MOU with the provision that ConnDOT and FHWA reserve a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use the work for government purposes, as specified in Section 17.(A) and 18(A). A copy of all material proposed to be copyrighted shall be prospectively provided to CTDOT and FHWA.

(B) Publication Disclaimer Statement

No reports, articles, papers or publications may be published by UConn without the written authority of ConnDOT except as provided for in the following items:

> A11 reports, articles, papers or publications shall contain the disclaimer: "This report [article, paper or publication] does not constitute a standard, specification or regulation. The contents of this report [article, paper or publication] reflect the views of the author(s) who is(are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the views of the Connecticut Department of Transportation or the Federal Highway Administration."

(C) Unauthorized Publication Disclaimer Statement

It is anticipated that, in addition to interim and final reports that may be specified in this MOU, UConn may wish to publish papers or articles based, in whole or in part, on information developed under this MOU. UConn shall have the right to so publish provided the manuscript is submitted to ConnDOT for concurrence. ConnDOT will have forty-five (45) calendar days to review the manuscript. If no response is provided by ConnDOT at the end of the specified period, UConn may proceed with publication. In the event of nonconcurrence by ConnDOT, UConn may publish the manuscript provided the following statement is included: "The Connecticut Department of Transportation and the Federal Highway Administration do not concur with the findings and conclusions of the manuscript."

20. GOVERNMENTAL REQUIREMENTS

(A) This MOU uses Federal funds in accordance with 2 CFR § 200.

(B) The parties agree to comply with all Federal and State of Connecticut ordinances, laws, regulations and policies, as applicable to their respective organizations, including, but not limited to, by reference: 2 CFR § 200 addressing federal procurement procedures; applicable Public Acts addressing Equal Employment Opportunity and Non Discrimination; Executive Orders delineated in Connecticut Governor Dannel P. Malloy's Executive Order No. 47, dated April 24, 2015, and those Executive Orders amended or enacted in the future; the Regulations of the United States Department of Transportation (Title 49, Code of Federal Regulations, Part 21), issued in implementation of Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4; and, Appendix CR.

(C) UConn agrees to comply with 2 CFR § 200.317addressing federal procurement procedures. UConn further agrees to provide UConn's procurement procedures that will be used under this MOU to FHWA for approval.

21. TERMINATION OF MOU

(A) This MOU may be terminated in its entirety by either party upon sixty (60) days written notice to the other party. This MOU may be terminated by ConnDOT at any time if UConn fails to comply with all Federal and State of Connecticut ordinances, laws, regulations and policies, as applicable to their respective organizations, or fails to perform in accordance with the terms and conditions set forth in this MOU. UConn will immediately act to minimize project costs upon issuing or receiving such notice, and will submit to ConnDOT a report describing all work completed to date.

(B) This Agreement may be terminated by either party on at least sixty days (60) days advance written notice to the other party specifying the date of termination.

(C) ConnDOT will reimburse UConn a percentage of the total project cost that is equal to the percentage of work completed.

(D) Upon receipt of written notification from either party that this MOU is to be terminated, UConn shall immediately cease operations on work stipulated in this MOU and assemble all material that has been prepared, developed, furnished or obtained under the terms of this MOU, that may be in its

possession or custody and shall transmit the same to ConnDOT on or before the sixtieth (60th) day following the receipt of the written notice of termination. Said material shall include, but not be limited to, documents, plans, computations, drawings, notes, records, correspondence, equipment and other deliverables.

(D) In the event of termination of this MOU, UConn shall permit the authorized representatives of ConnDOT, the United States Department of Transportation, the Federal Highway Administration and the Office of the Inspector General to inspect and audit all data and records of UConn relating to its performance under this MOU until the expiration of three (3) years after termination of this project under this MOU.

UConn further agrees to include in all its subcontracts here under a provision to the effect that the subcontractor agrees that ConnDOT, the United States Department of Transportation, the Federal Highway Administration and the Office of the Inspector General, or any of their duly authorized representatives, shall until the expiration of three (3) years after termination of the project under the subcontract, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract.

22. APPROVALS

This MOU is subject to the approval of:

(A) For ConnDOT: the Commissioner, or his/her designee.

(B) For UConn: the President, or his/her designee.

SIGNATORY SHEET FOR MEMORANDUM OF UNDERSTANDING No. MOU-PPPPP-n-YYYY-x

CONNECTICUT DEPARTMENT OF TRANSPORTATION	**UNIVERSITY OF CONNECTICUT**
APPROVED:	**APPROVED:**
Date:	**Date:**
By: _____	**By:** _____
Authorized Signature	**Authorized Signature**
Name: Mr. Thomas J. Maziarz	**Name:**
Title: Bureau Chief, Bureau of Policy and Planning	Title:

T R B
COOPERATIVE RESEARCH PROGRAMS

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TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

CONTENTS

Section 1 General Requirements, 1

Section 2 Report Organization, 2
- Front Matter, 2
  - Cover, 2
  - Acknowledgment of Sponsorship and Disclaimer, 2
  - Title Page, 2
  - Table of Contents, 2
  - List of Figures and Tables, 2
  - Author Acknowledgments, 2
  - Abstract, 3
- Body of the Report, 3
  - Executive Summary, 4
  - Chapter Sequence and Descriptions, 4
    - Chapter 1 Background, 4
    - Chapter 2 Research Approach, 4
    - Chapter 3 Findings and Applications, 4
    - Chapter 4 Conclusions and Recommendations, 4
    - Chapter Sections, 5
- References, 5
- Appendixes, 5

Section 3 Style, 6
- Text, 6
- Artwork, 7
- References, 8
- Bibliography, 10
- Abbreviations, Acronyms, and Symbols, 10
- Footnotes, 10
- Use of Copyrighted Material, 11

SECTION **1**

GENERAL REQUIREMENTS

Research results are of little value if they are not disseminated; therefore, each of the Cooperative Research Programs of the Transportation Research Board makes every reasonable attempt to publish and to distribute widely the reports submitted on each project. Because the published reports become part of an ongoing series, consistency in their style of presentation is desirable. This guide provides information to research agencies so that the reports conform to the desired format.

The acceptability of final reports depends on three criteria: (1) fulfillment of project objectives as set forth in the contract, (2) adequacy of documentation, and (3) clarity of presentation. Reports should be complete in all their parts, organized appropriately to serve their purposes, accurate in matters of fact and documentation, and edited for basic uniformities of style and usage. Furthermore, all text and artwork should be suitable for publication with minimal editing so as to reduce the need for extensive modifications that will delay publication and may result in unintended changes of meaning.

SECTION **2**

REPORT ORGANIZATION

CRP reports typically follow a standard format of front matter, body, and appendixes. The content of each is described below in the order of presentation.

FRONT MATTER

When a preliminary draft final report or a contractor's final report is submitted to CRP for review and possible publication, the draft report should contain all the following items as front matter.

Cover

The front external cover of reports submitted to CRP must be of light-colored, nonglossy material, preferably paper or heavy cardstock, and capable of accepting rubber-stamp ink without smearing. All reports must be numbered. For sample covers, click here.

Acknowledgment of Sponsorship and Disclaimer

All interim and final reports must contain two statements printed exactly as indicated here, either on the inside front cover or as the first sheet following the cover, preceding everything else and exclusive of any other information.

Title Page

A title page listing the same information as the external cover should follow the acknowledgment and disclaimer statements. This title page should include the authors' names, their affiliations, and the cities and states of their affiliations.

Note: CRP editors use the title page information to determine the listing of the authors in the published report; authors will be grouped by company affiliation. For sample covers, click here.

Table of Contents

A sample table of contents is shown here. Chapter and appendix titles, and at least the principal section headings within chapters, are included.

List of Figures and Tables

An acceptable list of figures and tables is shown here. All figures and tables must be included. Requirements for artwork (e.g., figures, tables, equations, and exhibits) are discussed in Section 3, Style.

Author Acknowledgments

The author acknowledgments section in the report should include the titles and affiliations (**at the time the research was completed)** of the research team members and other contributors, and their

connection with the research. If changes in title or affiliation have occurred, the titles or affiliations at the time of report submission also should be stated. Author acknowledgments do not cite CRP staff assistance or, usually, the assistance of typists or proofreaders. A typical acknowledgment statement follows:

> The research reported herein was performed under NCHRP Project 12–58 by the Department of Civil, Structural, and Environmental Engineering at the University at Buffalo (UB), State University of New York (SUNY). UB was the contractor for this study, with the Research Foundation of SUNY serving as Fiscal Administrator.
>
> Dr. Stuart S. Chen, P.E., Associate Professor of Civil Engineering at UB, was the Project Director and co-Principal Investigator. The other authors of this report are Dr. Amjad J. Aref, Associate Professor of Civil Engineering at UB and co-Principal Investigator; Il–Sang Ahn, Research Assistant and Ph.D. Candidate at UB, Methee Chiewanichakorn, Research Assistant and Ph.D. Candidate at UB, Aaron Nottis, Jeffrey Carpenter, and Ioannis Kalpakidis, Research Assistants and M.S. Candidates at UB. The work was done under the general supervision of Professors Chen and Aref at UB.

Abstract

An abstract of no more than 200 words, suitable for use in computerized information storage and retrieval systems, should be presented after the acknowledgments. The abstract will be provided to the Transportation Research Information Services (TRIS) and the National Technical Information Service (NTIS). The abstract should use direct statements in complete sentences to describe the work scope and principal findings. An example follows:

> This report documents and presents the results of a study of the safety aspect of curb use. Full-scale tests in combination with computer simulations were applied to investigate vehicle behavior upon impact with a series of commonly used curbs. Three curb designs taken from the AASHTO geometric design manual and a special configuration 13 inches high were given consideration in the study. The four curbs were investigated at three vehicle approach angles and at three speed levels. Such vehicle responses as redirection, trajectory, path, roll and pitch, and acceleration were observed and evaluated. The model results correlated well with the full-scale results. The findings of the study suggest that curbs of the configurations tested have no redirection capabilities to enhance safety in a high-speed travel environment.

BODY OF THE REPORT

The body of a typical CRP report is designed to provide information to the transportation administrator, the operations-oriented transportation professional, or any other reader whose primary concern is to put research results into practice. (Sometimes, appendix material, such as a user's guide, is ultimately intended as the primary publication—in such instances, consult with the Program Officer regarding content organization.) For CRP reports, organization is very important. CRP asks authors to follow our standard structure as follows:

- Executive Summary
- Chapter 1 Background
- Chapter 2 Research Approach
- Chapter 3 Findings and Applications
- Chapter 4 Conclusions, Recommendations, and Suggested Research

- References
- Appendixes

Executive Summary

The Executive Summary often is the most influential part of the report and should be written with the busy transportation administrator in mind. The Executive Summary should provide a readable yet condensed description, explained within the context of the project scope and objectives, of the research findings, recommendations, products, and conclusions. The summary should contain only information essential to gain an understanding of the findings and how they relate to the solution of operating problems–it is NOT an abbreviated version of the full report.

Chapter Sequence and Descriptions

Report chapters should be structured in a concise and logical manner that is suitable to the subject matter, clearly describing the research approach, findings, conclusions, and recommendations.

The recommended sequence of chapters is outlined below, with a description of the typical content for each chapter. However, the structure of some reports may not conform to this sequence; in such cases, the research agency is encouraged to confer with the responsible CRP Program Officer.

Chapter 1: Background

Discussions of the problem that led to the study, current knowledge that can help in solving the problem, and the objectives and scope of the completed research are presented in this section. This chapter should not contain the details of any survey that may have been performed, any forms that may have been used in soliciting information, or details regarding test procedures or mathematical analyses that may have been used. All such details are to be provided in appendixes.

Chapter 2: Research Approach

This chapter presents the approach used in addressing the problem.

Chapter 3: Findings and Applications

The material in this chapter expands on the Executive Summary. A “finding” is the result of an examination. This chapter should include, as appropriate, summary data; principal mathematical formulas developed; what the findings mean, in terms of use in standards, specifications, policies, and procedures; what the findings add to an understanding of the problem and what effects they have on economy, safety, amenities, and convenience; an assessment of their limitations, and other information. However, details should be presented in the appendixes. Design charts, spreadsheets, software, and other items of immediate use to practicing engineers or other users may be presented here or presented in the appendixes.

Chapter 4: Conclusions and Recommendations

The conclusions should emphasize the most important findings and may extend the findings beyond conditions specific to the project. Successful applied research will result in specific

recommendations that should facilitate application of the findings and should be accompanied by information on potential benefits that can be expected from using the research products. A plan for implementing the research products should be part of the recommendations. If the project findings have revealed specific areas where further research would be valuable, these areas should be described in this chapter.

Chapter Sections

Within the chapter structure, subheadings should be used to separate subject matter. Properly used headings help readers, especially readers with limited time. As illustrated here, four levels are usually sufficient for CRP reports. Follow these styles.

REFERENCES

The last item in the body of the report is a list of the references cited in the text. Reference style is discussed in detail in Section 3.

APPENDIXES

Generally, appendix materials are provided for researchers, developers of manuals and guidelines, and other users of the research results who are interested in the maximum degree of technical detail provided by the project effort. They are usually not published by TRB with the report, but are made available electronically.

In some cases, appendixes may not be necessary or may be minimal in number and content; in others, appendixes may be larger than the body of the report. Each appendix must be designated by letter and title, and references to appendixes should be made, as necessary, at appropriate places in the text.

Appendixes may include the following items:

1. Manuals, guidelines, and proposed specifications;
2. Documentation and further elaboration of research findings;
3. Forms, checklists, and worksheets;
4. Mathematical analyses;
5. Bibliography (however, these may also be handled as a separate section in the same way that references are handled); and
6. Project statement and project work plan (including any approved revisions).

The table of contents shown here is an example of the appendix material provided with one final report. Ordinarily, bulky background data (such as computer-related files) are not provided, but are retained by the research agency (see CRP contract article relating to Data Retention and Disposition).

SECTION 3

STYLE

To achieve consistency in series publications, CRP editors use standard reference works for guidance. The latest edition of *Merriam-Webster's Collegiate Dictionary* is the preferred authority for spelling and capitalization. The *Chicago Manual of Style* and *Words Into Type* are also generally followed. Rules of style designed to ensure reasonable consistency in CRP reports follow.

TEXT

In preparing text for reports, adhere to the following:

1. Keep the formatting SIMPLE. Do NOT use quote boxes, icons, elaborate headers and footers, color, shading, pull quotes, and so forth. CRP contracts out to typesetters who format reports per specifications appropriate for technical publications. Generally, unusual or non-standard formatting wastes everyone's time and effort. If a more elaborate report format is needed, please discuss it with the responsible CRP program officer early.
2. Provide all material in hard copy format (including quotes, references, and so forth) on 8½- x 11-in. paper.
3. Provide all text material electronically in MS-WORD-compatible format.
4. Provide artwork electronically in a separate file or files (e.g., EPS, TIFF, or JPG).
5. Do not submit PDF files.
6. Make sure that electronic files and hard copy match exactly.
7. Begin each chapter or appendix on a new page.
8. Paginate the front matter with lowercase Roman numerals at the bottom of the page.
9. Paginate the body of the report consecutively with Arabic numerals at the bottom of the page.
10. Paginate appendixes with letters and Arabic numerals at the bottom of the page (i.e., A-1, A-2, …, B-1, B-2, and so forth).
11. Make sure that all symbols, Greek letters, and mathematical signs are exact, defined, and absolutely unambiguous; for example:

    - w versus ω [omega]
    - p versus ρ [rho]
    - Y versus Ψ [psi]
    - capital O versus θ [theta] versus 0 [zero]
    - capital X versus χ [chi] versus × [multiplication sign]
    - lowercase l [el] versus number 1 [one]

12. Show the relative positions in equations and formulas of all subscripts, superscripts, fractions, and operators.
13. Give units of measure common to the field of research reported. Specific requirements for the units to be used in a project are dictated by the need to facilitate application of the findings in a particular technical area.
14. Provide appendix material as separate electronic files.
15. For large documents (that is, more than 75 pages), separate chapters into separate electronic files.

16. Call out the artwork in the text (for example, "See Figure 1") to indicate the position of the artwork.
17. Check every reference call-out in the text to ensure that the publication year and the spelling of the author's name match those of the reference list in the end. This step will save authors' time later because editors frequently find inconsistencies that require the author to verify references under tight production deadlines.
18. CRP permits the use of author-year referencing as well as sequentially numbered referencing. Use one or the other format in the text, not both. If using numbered references, put the number of the reference in parentheses following the cited text and italicize the number (but not the parentheses). If using author-year referencing, adhere to the examples below:

Single author:	(Jones, 2005)
Two authors:	(Jones and Smith, 2005)
Three or more authors	(Jones et al., 2005)

    Author-year reference lists should be provided alphabetically and, within a category, chronologically, e.g.,

    Jones, R., 2001

    Jones, R., 2003

    Jones, R., and Smith, T., 2002

Projects may require that reports use (1) U.S. units solely; (2) customary U.S. units as the primary system, followed by SI units in parentheses; (3) SI units of measurement exclusively; or (4) SI units as the primary units of measurement, followed by customary U.S. units of measurement in parentheses. Additionally, issues related to hard or soft conversions of measurements may arise. The research agency should discuss the use of measurements with the CRP Program Officer early in the project.

General guidance on the appropriate use of metric units is available through the AASHTO *Guide to Metric Conversion*, AASHTO R1 (AASHTO's formal policy on metric), or through ASTM E380 *(Standard Practice for Use of the International System of Units (SI)*).

ARTWORK

Artwork consists of (1) tables (that is, systematic arrangements of data, in rows and columns for ready reference) and (2) figures (that is, diagrams or pictorial illustrations of textual matter). Artwork should be self-explanatory and should supplement, not duplicate, information given in the text. Adhere to the following instructions:

1. Provide artwork on pages separate from text material.
2. Number all tables in the body of the report consecutively with Arabic numerals.
3. Number all figures in the body of the report consecutively with Arabic numerals.
4. Order the pages in appendixes by appropriate letter and consecutive Arabic numerals (e.g., A-1, A-2, …, B-1, B-2, …, and so forth).
5. Title all tables to identify their contents. Cite the source of the material.

6. Caption all figures to identify their contents. Cite the source of the material.
7. Identify each piece of artwork (i.e., figures and tables) by author's name and the project number in addition to figure or table number.
8. Arrange tabular matter so that the intended comparisons are clear. Choose appropriate vertical columns to provide reasonable balance to horizontal and vertical dimensions.
9. When a dash (—) is used in a table, **indicate its meaning** in a footnote (e.g., missing data, data not available or applicable).
10. Combine tables of similar form in order to reduce space requirements, eliminate heading duplications, and permit easier comparison of values.
11. Use superscript **letters** for footnoting numerical values in tables, but superscript **numerals** for footnoting other material in tables.
12. Check the **accuracy of all totals**.
13. Cite each figure and table by number at the appropriate places in the text.
14. Design figures and tables to meet CRP publication requirements. In the published report, artwork will be reduced to 1-column width (3 ½ in.) or full-page width (7 ¾ in.). Lettering and numerals must be of adequate size and clarity on original drawings to permit this reduction.
15. Use figures of comparable size and scale when they are intended to be compared.
16. Use abbreviations, numerals, and capitals consistent with text material (see recommended style manual).
17. Submit **one copy of each of the following for publication purposes**
    a. Photographs—glossy prints, high-resolution digital files, or color slides.
    b. Line drawings—original black-on-white tracings, sharp photographic copies, or original laser print copies. (Photocopies and blueprints are seldom reproducible. Do not use fine-grid graphs unless the grid is quite open. Avoid screen tints.)
18. Check the spelling of all text in figures and tables.
19. Develop figures and tables so that their meaning does not depend on use of color (e.g., in bar charts)—CRP reports are rarely printed in color and color figures reproduced in black and white can lose meaning.

All artwork must be capable of being reproduced directly from **original** material submitted by the author; therefore, photocopies are not acceptable because they do not reproduce clearly. Research agencies should provide the highest possible resolution of art. Because art typically looks better on a computer screen than in print, something may look to be of acceptable quality on a screen, but be unacceptable for print. Photos should be at least 300 dpi, and scanned line drawings or exhibits should be at least 1,200 dpi. Make sure that art does not depend on color to convey meaning—CRP generally prints in black and white.

For further information, consult CRP Editorial Staff.

REFERENCES

Reference sections, unlike bibliographies, list only sources cited in the text and in the order of citation. (Bibliographies generally include all sources consulted, not just those cited in the text, and generally are organized alphabetically.) CRP prefers reference sections to bibliographies.

The listing of references demands absolute accuracy. Definite rules for the identification of reference materials have been adopted. These rules should be carefully observed. At a minimum, authors should supply enough information so that readers can verify the reference.

1. List numerous references together at the end of the text in the **order in which they are cited in the text**. An item in this list is referenced in the text by an italic Arabic numeral in parentheses at the pertinent point.

   Example: Beskow (*14*) says…

2. Be sure that
   (a) names are spelled correctly and consistently.
   (b) initials and dates are correctly given.
   (c) the title of the article is given as published.
   (d) ACS (American Chemical Society) abbreviations are used for periodicals and other standard publications.

3. Avoid unpublished references. Do not use expressions such as "Paper prepared for presentation…," or "Paper presented at…" when publication has occurred.
4. Print the names of journals, proceedings, bulletins, and so forth in italics; print the titles of papers in Roman, thus: Jones, J. J., A Technical Paper. *Proceedings*, American Society for Testing Materials, Vol. 22, Part II (1922) p. 450.
5. In citing (and in listing), if reference is made to the whole work, give the total number of pages; if only to a specific part, give the pages involved. If several separate pages or parts of the same work are referred to at different places in the text, give the entire work in the reference list; in the text, simply use (*3*, pp. 16-21), (*3*, p. 24), (*3*, Ch. 5). A reference in the list should not be repeated or be referred to by the use of ibid., loc. cit., and so forth.
6. Make sure that entries agree with text and other citations of references. **Text revisions may require renumbering or other reference changes and vice versa**.
7. Use the following samples as guidance on treating reference items:

Periodical:	Smith, John M., "Unanticipated Uses of Asphalt by Juveniles." *Highway Periodical*, Vol. 1, No. 2 (January 10, 2009) p. 36.
Proceedings:	Smith, J. M., and A.B. Jones, "Punishment and Reducing Vandalism" 5th Int. Conf. on Enhancing Transit, Jacksonville, Florida, Proceedings Vol. 5 (2009) pp. 1-8.
Report/Book:	Smith, K. T., and T. D. Jones, *Challenges to Marketing Transit in the Death Valley,* Brown Publishing, Inc., Bristol, England (2009) 7,500 pp.
Websites:	http://trb.org. (As of February 10, 2006).

For further information, consult CRP Editorial Staff.

BIBLIOGRAPHY

Bibliographies, unlike reference sections, list sources consulted, but not necessarily cited in the text. Bibliographies generally are organized alphabetically. (Reference sections list only the sources cited in the text and in the order of citation.) Although CRP prefers reference sections, if a bibliography is included, arrange the entries as one of the following:

1. **Alphabetical Arrangement by Author.** Arrangement by author will include names of persons (i.e., authors, editors, and compilers) and corporate bodies (e.g., governmental agencies, societies, institutions, and so forth). In listing federal governmental agencies, "U.S." should precede the name of the agency so that such entities may be grouped in the bibliography.

2. **Chronological Arrangement.** A bibliography may be arranged chronologically to show the development of a subject. Entries are then arranged alphabetically by author under the year.

3. **Classified Subject Arrangement.** This arrangement is made on the basis of a systematic division of the subject of the bibliography. Alphabetical author arrangements are used in such lists under each subject.

Each entry in a bibliography provides information that should result in ready identification. Entries must be sufficiently detailed, intelligible, and consistent in form with the style followed throughout the bibliography.

An annotation, in the form of a paragraph, may be placed after the main body of the entry. Compress the annotation to the fewest possible words.

For further information, consult CRP Editorial Staff.

ABBREVIATIONS, ACRONYMS, INITIALISMS, AND SYMBOLS

Abbreviations, acronyms, initialisms, and symbols should be fully defined the first time they are used in the report; the definition should be given first followed by the abbreviated term in parentheses. Including a list of the abbreviations, acronyms, initialisms, and symbols used in the text is desirable. However, including such a list does not absolve report authors from defining terms in the text itself—this is particularly true for equations and formulas.

For further information, consult CRP Editorial Staff.

FOOTNOTES

Do not use footnotes to the text. Incorporate such notes within the text. Footnotes are acceptable only for artwork. If material does not make sense in the body of the text, it probably is not necessary to the report.

USE OF COPYRIGHTED MATERIAL

Authors are responsible for obtaining any necessary permissions for use of copyrighted material. Authors must obtain permission from the original publisher to reprint any table, photo, or other artwork or to excerpt large portions of text. If there is any doubt about whether reprinted material is copyrighted, the principal investigator should check with the original author and/or publisher. Permission in writing to use copyrighted material must then be obtained by the research agency—not by CRP editorial staff—from both the author and the publisher. Copies of all correspondence regarding permission to use copyrighted material, particularly the final letters granting permission, should be transmitted to CRP, where they will become part of the permanent file on the particular report.

Practically all commercial journals are copyrighted in toto, as are most association journals, all commercial books, many association books and manuals, many special reports (e.g., ASTM, TRB, and so forth), and all newspapers. Any use of foreign materials should be checked as carefully as materials published in the United States.

After permission to use copyrighted material has been obtained, provide both a bibliographical reference to the source and a specific tie to the referenced material, particularly exhibits. For text material, the edition and page (preferably located by lines) should be cited; for tabular material, the page and table number should be given.

Project No. ___ **COPY NO. ___.**

[INSERT TITLE]

PRELIMINARY DRAFT
FINAL REPORT

Prepared for
[Insert the appropriate program name, e.g., ACRP]
Transportation Research Board
of
The National Academies

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES
PRIVILEGED DOCUMENT

This report, not released for publication, is furnished only for review to members of or participants in the work of the CRP. This report is to be regarded as fully privileged, and dissemination of the information included herein must be approved by the CRP.

[Insert Author Name(s),
Relevant Research Organization Name
City, State
Month, Year]

Figure 1. Example of preliminary draft final report cover for CRP report.

Project No. ___ **COPY NO. ___.**

[INSERT TITLE]

FINAL REPORT

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[Insert the appropriate program name, e.g., ACRP]
Transportation Research Board
of
The National Academies

[Insert Author Name(s),
Relevant Research Organization Name
City, State
Month, Year]

2. Example of revised final report cover for CRP.

ACKNOWLEDGMENT OF SPONSORSHIP

This work was sponsored by one or more of the following as noted:

c American Association of State Highway and Transportation Officials, in cooperation with the Federal Highway Administration, and was conducted in the **National Cooperative Highway Research Program,**

c Federal Transit Administration and was conducted in the **Transit Cooperative Research Program**,

c American Association of State Highway and Transportation Officials, in cooperation with the Federal Motor Carriers Safety Administration, and was conducted in the **Commercial Truck and Bus Safety Synthesis Program,**

c Federal Aviation Administration and was conducted in the **Airports Cooperative Research Program,**

which is administered by the Transportation Research Board of the National Academies.

DISCLAIMER

This is an uncorrected draft as submitted by the research agency. The opinions and conclusions expressed or implied in the report are those of the research agency. They are not necessarily those of the Transportation Research Board, the National Academies, or the program sponsors.

Figure 3. Acknowledgment of sponsorship and disclaimer for CRP preliminary draft final reports and final reports.

CONTENTS

LIST OF FIGURES AND TABLES v

ACKNOWLEDGMENTS vii

ABSTRACT viii

EXECUTIVE SUMMARY 1

CHAPTER 1 Background 2
Problem Statement and Research Objective
Scope of Study

CHAPTER 2 Research Approach 5
Stateof-the-Art Summary

CHAPTER 3 Findings and Applications 17
General Recommendations

CHAPTER 4 Conclusions and Suggested Research 20
Conclusions
Suggested Research

REFERENCES 25

ABBREVIATIONS, ACRONYMS, INITIALISMS, AND SYMBOLS 28

APPENDIX A **State of the Art** A–1

APPENDIX B **Case Study Reports** B–1

APPENDIX C **Annotated Bibliography** C–1

APPENDIX D **Survey Interview Forms** D–1

Figure 4. Sample of table of contents for revised final reports.

CHAPTER NUMBER

CHAPTER TITLE

FIRST-LEVEL HEADING (bold, caps, flush left)

The text begins here…
and continues here…

Second-Level Heading (bold, initial caps/lowercase, flush left)

The text begins here…
and continues here…

Third-Level Heading (italics, initial caps/lowercase, flush left)

The text begins here…
and continues here…

Fourth-Level Heading. (bold run-in) The text begins here…
and continues here…

Figure 5. Employment of headings within chapters.

STATE OF CONNECTICUT

DEPARTMENT OF TRANSPORTATION

April 5, 2016

ADMINISTRATIVE MEMORANDUM NO. 61

SUBJECT: Department Standing Committees

Attached is an up-to-date copy of the Department's List of Standing Committees.

Procedures for fulfilling Standing Committee responsibilities are as follows:

1) Changes, deletions, or amendments to Department policies, standards, or regulations must have the approval of the Committee Oversight Designee and the Commissioner of Transportation.

2) Minutes of all Committee meetings shall be recorded, with copies being forwarded to the Committee Oversight Designee to keep the Designee informed of Committee actions and decisions.

3) The Chairperson shall prepare an annual summary report of the previous year's progress toward established goals and objectives, and submit to the Office of Management and Technology Services by the end of January.

4) The Office of Management Services shall coordinate with the Committee Oversight Designee to make recommendations to the Commissioner for the annual updating of Standing Committees.

5) The Chairperson shall recommend abolishment of the Committee when the purpose for which it was created has been achieved. This may be accomplished through the annual reporting procedure or upon the approval of the Committee Oversight Designee.

6) Committee members shall be appointed from all Department offices according to their personal qualifications and anticipated contributions to the Committee. Appointments shall be made either by the Commissioner on an annual basis or the Committee Oversight Designee during the year. The provisions of the State's Code of Fair Practices shall be complied with when making Committee appointments.

7) The Chairperson shall submit a list of recommended members who will serve on the Committee for the coming year, to the Office of Management Services by January 1.

8) Committee members are encouraged to rotate to allow new members to serve and to present a fresh point of view to Committee problems.

9) The Chairperson shall recommend filling vacancies as they occur to the Committee Oversight Designee.

10) The Chairperson shall recommend a successor to the Committee Oversight Designee in the event that he/she resigns.

11) Provisions shall be made for the resignation of those members who feel they can no longer serve on a Committee. A resignation request will be transmitted through the Chairperson to the Committee Oversight Designee for approval.

James Redeker, Commissioner

Attachment

CONNECTICUT DEPARTMENT OF TRANSPORTATION

LIST OF STANDING COMMITTEES

	PAGE
1) BRIDGE DESIGN STANDARD PRACTICES COMMITTEE	2
2) CTDOT/FHWA STEWARDSHIP COMMITTEE	2
3) CONSULTANT SERVICES EVALUATION AND SELECTION PANELS	2
4) CONTRACT BOARD OF REVIEW	3
5) DIVERSITY COUNCIL	3
6) EMPLOYEE RECOGNITION COMMITTEE	3
7) JOINT HIGHWAY RESEARCH ADVISORY COUNCIL	3
8) MANAGEMENT COMMITTEE	4
9) NEGOTIATIONS COMMITTEE	4
10) PERFORMANCE MEASURES COMMITTEE	4
11) RESEARCH LIAISON COMMITTEE	4
12) ROUTE NUMBERING AND ROAD RECLASSIFICATION COMMITTEE	4
13) SCENIC ROAD ADVISORY COMMITTEE	5
14) SCREENING COMMITTEE	5
15) SNOW AND ICE COMMITTEE	5
16) STANDARD SPECIFICATIONS COMMITTEE	6
17) TECHNICAL ADVISORY COMMITTEE	6

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10. Kevin Blasi – Division of Bridges – State Bridge Design
11. Andrew Cardinali – Division of Bridges, Bridge Consultant Design
12. David Cutler – Division of Bridges, Bridge Consultant Design
13. Robert Lauzon – Office of Research and Materials
14. Robert Zaffetti – Office of Bridge Safety and Evaluation
15. Leo Fontaine – Office of Engineering
16. Ted Aldieri – Federal Highway Administration (non-voting member)

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5. David Nardone – Federal Highway Administration
6. Eloise Powell - Federal Highway Administration
7. Debra Ramirez - Federal Highway Administration

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14. Tarishia Martin - Transportation Engineer 2, Construction

6) EMPLOYEE RECOGNITION COMMITTEE

1. Cheryl Malerba – Commissioner's Office, Oversight Designee
2. Cynthia Young – Bureau of Engineering and Construction, Chairperson
3. Nancy Malinguaggio - Bureau of Finance and Administration, Vice Chairperson
4. Bonnie Murone - Bureau of Engineering and Construction – Dist. 4 - Secretary
5. Luis Crespo – Bureau of Highway Operations - Dist. 1
6. Ralph Desanti – Bureau of Engineering and Construction
7. Steve Livingston - Bureau of Policy and Planning
8. Melissa Martone - Bureau of Finance and Administration
9. Robert Moore – Office of the Commissioner
10. Sharon Okoye – Bureau of Policy and Planning
11. Mary Petzold – Bureau of Policy and Planning
12. Audrey Phelan – Bureau of Highway Operations – Dist. 4
13. Mary Rinaldi – Bureau of Finance and Administration
14. Kurt Spring - Bureau of Finance and Administration
15. Kathy Sugland – Bureau of Policy and Planning
16. Donna Weaver – Bureau of Policy and Planning
17. Vacant - Bureau of Engineering and Construction – Dist. 3
18. Lynn Warzecha - Bureau of Engineering and Construction – Dist. 2

7) JOINT HIGHWAY RESEARCH ADVISORY COUNCIL

1. Brad Overturf – Bureau of Policy and Planning, Oversight Designee
2. Tom Maziarz – Bureau of Policy and Planning, Chairperson
3. James P. Connery – Bureau of Engineering and Construction
4. Thomas A. Harley – Bureau of Engineering and Construction
5. To be determined. (M. Lonergan retired 04/01/16. A replacement has not been named.)
6. James Mahoney (UCONN)

7. Michael Accorsi (UCONN)
8. Amvrossios Bagtzoglou (UCONN)
9. Richard Christenson (UCONN)

8) MANAGEMENT COMMITTEE

Membership to be determined.

9) NEGOTIATIONS COMMITTEE

1. Pam Sucato – Office of the Commissioner, Oversight Designee
2. Gary Belina – Bureau of Finance and Administration, Chairperson
3. Barbara Ricozzi - Bureau of Highway Operations
4. Bart Sweeney – Bureau of Highway Operations
5. Eric Feldblum – Bureau of Engineering and Construction, Alternate Committee Member
6. Hugh Hayward – Bureau of Engineering and Construction, Alternate Committee Member

10) PERFORMANCE MEASURES COMMITTEE

1. Cheryl Malerba – Office of the Commissioner, Oversight Designee
2. Colleen Kissane – Bureau of Policy and Planning, Chairperson
3. Edgardo Block – Bureau of Policy and Planning – Performance Management, Secretary
4. James Redeker - Commissioner
5. Anna Barry - Deputy Commissioner
6. Robert Card - Bureau of Finance and Administration
7. Thomas Maziarz - Bureau of Policy and Planning
8. Thomas Harley - Bureau of Engineering and Construction
9. Scott Hill - Bureau of Engineering and Construction
10. To be determined - Bureau of Highway Operations (M. Lonergan retired 4/1/16. A replacement has not been named.)
11. Richard Andreski - Bureau of Public Transportation
12. Judd Everhart - Office of the Commissioner – Communications
13. John Krewalk - Office of Information Systems
14. Karen Reimer – Asset Management
15. Kurt Salmoiraghi – Federal Highway Administration (non-voting member)

11) RESEARCH LIAISON COMMITTEE

1. Thomas A. Harley - Chief Engineer, Oversight Designee
2. Leo L. Fontaine – Engineering Services, Chairperson
3. Andrew J. Mroczkowski – Product Evaluation Unit, Committee Secretary
4. Mary K. Baier – Office of Construction
5. Michael S. Cherpak – Highway Design Section
6. David A. Cutler – Bridge Consultant Design Unit
7. John R. Giannini – Division of Materials Testing
8. Edward F. Girolamo - Office of Maintenance
9. Mark F. Makuch – Division of Traffic Engineering
10. Christopher C. Sherman – Office of Materials Management
11. Michael J. Strong – Office of Facilities Design

12) ROUTE NO. & ROAD RECLASSIFICATION COMMITTEE

1. Thomas Maziarz – Bureau Chief of Policy and Planning, Oversight Designee
2. Al Iallonardo – Division of Roadway Information Systems, Chairperson
3. Gregory Ciparelli – Division of Roadway Information Systems, Secretary
4. Richard Jacobson – Division of Strategic Planning and Projects
5. Sunny Ezete – Division of Traffic Engineering
6. Paul Metsack – Division of State Design
7. Jeffrey Anderson, Office of Maintenance and Highway Operations

District Maintenance Directors*

1. Alan White
2. Jeffery Wilson
3. Jack Yeomans
4. Cosmo Ignoto

District Engineering Managers*

1. Ravi Chandran
2. Kenneth Fargnoli
3. Robert Obey
4. John Dunham

*Attendance based on agenda.

Non-Voting Members

1. Attorney General, Committee Advisor
2. Eloise Powell, Federal Highway Administration

13) SCENIC ROAD ADVISORY COMMITTEE

1. Thomas A. Harley – Bureau Chief Engineering and Construction, Oversight Designee
2. Colleen Kissane – Policy and Planning, Chairperson
3. To be determined – Highway Operations (R. Bruce Villcock retired 4/1/16. A replacement has not been named.)
4. Christopher Martin – Dept. of Energy and Environmental Protection
5. Al Iallonardo – Policy and Planning
6. Randall Fiveash – Dept. of Economic and Community Development
7. Lesgie Ruiz – Engineering, Secretary

14) SCREENING COMMITTEE

1. Robert Card – Bureau Chief Finance and Administration, Oversight Designee
2. Charles Roman – Bureau of Finance and Administration, Chairperson
3. Sohrab Afronzi – Bureau of Engineering and Construction
4. Mark Rolfe – Bureau of Engineering and Construction
5. Richard Jankovich – Bureau of Public Transportation
6. Valerie Joyner – Bureau of Finance and Administration
7. To be determined – Bureau of Highway Operations (M. Lonergan retired 4/1/16. A replacement has not been named.)
8. Neal Ryan – Bureau of Policy and Planning
9. Jeffrey Stewart – Bureau of Finance and Administration
10. Debra Goss – Bureau of Finance and Administration (non-voting member)
11. Connie Miano – Bureau of Finance and Administration (non-voting member)

15) SNOW AND ICE

1. Charles Drda – Maintenance Administrator & Oversight Designee
2. Bartholomew Sweeney – Office of Maintenance, Co-chairperson
3. John DeCastro – Office of Maintenance, Co-chairperson
4. Vincent Micali – Office of Maintenance, Secretary
5. Alan White – District 1 Maintenance
6. Jeffrey Wilson – District 2 Maintenance
7. Jack Yeomans – District 3 Maintenance
8. Cosmo Ignoto – District 4 Maintenance
9. Paul Rizzo – District 1 Maintenance
10. Phil Zoppi – District 3 Maintenance
11. James Chupas – Office of Maintenance/Equipment Repair
12. Janice Snyder – Stores
13. Charlesina Ball – Purchasing
14. Kevin Carifa – Office of Policy and Planning/Environmental

15. Christine Tedford – Office of Policy and Planning/Environmental
16. Gregory Dorosh – Facilities Design

16) STANDARD SPECIFICATIONS COMMITTEE

1. Thomas A. Harley - Bureau Chief & Committee, Oversight Designee
2. Robert E. Obey - Construction – District 3, Chairman
3. Janet L. Mazeau - Office of Construction, Secretary
4. Eric Tallarita - Office of Construction, Assistant Secretary
5. Teresa Donahue - Office of Construction, Assistant Secretary
6. Adam J. LeBlanc - State Design – Highway
7. Louis D. Bacho - Consultant Design – Bridge
8. Michael J. Stron - State Design – Facilities
9. Lisa N. Conroy - Traffic Engineering
10. (Vacant) - Consultant Design - Highway
11. John S. DeCastro - Maintenance
12. Eileen Ego - Construction – District 2
13. Richard N. Symonds - Construction – District 4
14. Robert G. Lauzonv - Division of Materials Testing
15. Andrew Piraneo - Environmental Planning
16. (Vacant) - Environmental Compliance
17. Jay D. Young - Office of Rails
18. Robert Foley - Contract Development

Non-voting Members:
1. Timothy Snyder - FHWA
2. Lawrence Russ - Attorney General's Office
3. Donald Shubert - CCIA
4. Peter Arborio - CCIA

17) TECHNICAL ADVISORY COMMITTEE

1. Cheryl Malerba – Commissioner's Office, Oversight Designee
2. John Krewalk – Department of Technology Services, Chairperson
3. Jose Romero - Department of Technology Services
4. Joe DiPietro - Department of Technology Services
5. Kevin Nursick – Commissioners / Communications Office
6. Bill Pratt – Bureau of Engineering and Construction
7. Mike Connors – Bureau of Policy and Planning
8. Zav Kohan – Bureau of Finance and Administration
9. Hal Decker - Bureau of Highway Maintenance
10. Jim Stutz - Bureau of Public Transportation
11. Donald Ward - Bureau of Engineering and Construction

STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION
NEW PRODUCT SUBMITTAL FORM

PE-FORM (REV 10/2013)

For ConnDOT Internal Use Only	
P.E. Number:	
Date Received:	

The New Product Evaluation Form (NPEF) provides the Connecticut Department of Transportation (ConnDOT) with information regading transportation related products or processes submitted for evaluation.

Instructions:

1. Complete this application form for **each product**. Please be concise.
2. **ANSWER ALL QUESTIONS**. Where a question is not applicable, enter "N/A".
3. Attach engineering, technical, cost, test and safety data.
4. Attach verification of ownership of the legal rights to the proprietary item or process. Verification may consist of a copy of the patent (cover page issufficient), copyright, license, or other pertinent document.
5. Incomplete New Product Submittal Packages will not be considered and will be discarded after 30 days.
6. Return **TEN (10)** identical collated copies of the above described information packet to theNew Product Evaluation Unit.

Connecticut Department of Transportation
Engineering Services
New Product Evaluation Unit Room 4212
2800 Berlin Turnpike
Newington, CT 06111

PRODUCT IDENTIFICATION:	
Product/Process Trade Name:	
Model/ID Number:	
Generic Name:	

PRODUCT MANUFACTURER:	
Company Name:	
Telephone No:	
Fax No:	
Address:	
City/State/Zip Code:	
Email Address:	
Web Page URL:	
Principal Business Activity:	

PRODUCT SUBMITTED BY (Distributor, Vendor, Manufacturer's Representative):	
Company Name:	
Contact (ConnDOT correspondence will be addressed to the contact person listed here):	
Title:	
Telephone No:	
Fax No:	
Address:	
City/State/Zip Code:	
Email Address:	
Web Page URL:	

STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION
NEW PRODUCT SUBMITTAL FORM

PE-FORM (REV 10/2013)

PRODUCT INFORMATION:

Proposed use of product:

General composition of product:

Does product utilize recycled materials? *(Indicate yes or no, and if applicable, list recycled materials.)*

Product limitations:

Alternate use for what existing product(s)?

Advantages over currently used product(s)?

How does this product speed up construction activities?

Does the use of this product aid ConnDOT in complying with any safety or environmental regulations?

Is product currently on the market? What year was product introduced?

Approximate cost per unit:

Approximate cost per unit in place:

ADDITIONAL INFORMATION:

Has product been evaluated previously by ConnDOT? Under what product name?

Who suggested ConnDOT be contacted?

Name(s) of ConnDOT employee(s) with whom discussions have been held:

PRODUCT MEETS THE FOLLOWING SPECIFICATIONS:

Yes	No	Agency	Specification Number
☐	☐	ConnDOT	
☐	☐	AASHTO	
☐	☐	ASTM	
☐	☐	FHWA	
☐	☐	Other DOT's (specify DOT):	
☐	☐	Other Nationally Recognized Agency (specify Agency):	

STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION

NEW PRODUCT SUBMITTAL FORM

PE-FORM (REV 10/2013)

PRODUCT TEST DATA:		
Yes	**No**	**Agency**
☐	☐	NTPEP
☐	☐	AASHTO
☐	☐	ASTM
☐	☐	FHWA
☐	☐	Other Nationally Recognized Agency (specify Agency):

NEW PRODUCT SUBMITTAL PACKAGE CHECKLIST	
☐	1. New Product Submittal Form.
☐	2. Product literature (brochures, cut sheets, specifications, etc.).
☐	3. Test data.
☐	4. Material Safety Data Sheet (MSDS), if required.
☐	5. Quality control plan, if product utilizes recycled materials.
☐	6. Contact list, if applicable, identifying other entities that have utilized the product.
☐	7. Other pertinent information.

THE FOLLOWING CONDITIONS APPLY FOR ALL NEW PRODUCT EVALUATIONS:

1. The Connecticut Department of Transportation (ConnDOT) policy is to ensure the objective, impartial, and consistent evaluation of new products for use in the construction, maintenance, and operation of the State's transportation system. Evaluations will be conducted only on new products that are fully developed and marketable products.

2. All product evaluations will be conducted in accordance with applicable laboratory testing and field evaluation criteria as determined by ConnDOT staff. Products which are accepted will be evaluated in accordance with applicable laboratory testing and/or field evaluation criteria designed to provide a true test of products stated characteristics and application. Such criteria shall be determined by ConnDOT staff.

3. The evaluation of a product is not a commitment by ConnDOT to purchase, recommend, or specify the product, regardless of performance.

4. For some products, the manufacturer will be required to provide installation, be present for installation, and/or to lend assistance to those involved with the installation. The manufacturer may also be required to provide materials and equipment required for the installation.

5. ConnDOT will prepare a summary report upon completion of a suitable evaluation period. This period will be one, which, in the view of the evaluating staff, provides adequate product exposure to its functional environment.

6. Data resulting from evaluations is considered public information and will not be considered privileged. As authorized by the signature below, all information developed during this product evaluation may be released by ConnDOT.

7. The submitter agrees to accept the return of any products or samples, for disposal, after the completion of the evaluation.

8. Product evaluations require commitments of time and resources by ConnDOT. Therefore, it is the applicant's responsibility to comply with the policy stated herein in order for ConnDOT to administer requests uniformly and impartially. Deviations from this policy may cause delay or rejection of request.

SIGNATURE:	
Submitted by (print name):	
Title:	
Signature:	
Date:	

If you have questions regarding the submittal of your product,
please contact the New Products Unit @ (860) 594-3296