Oklahoma Department of Transportation

Planning & Research Division

2008 Research Manual

This document is prepared according to requirements of 23 CFR Parts 420 and 511, and is in compliance with all requirements of 23 U.S.C. 307 and its implementing regulations with respect to the research, development and technology transfer program.

Hard Copies are available upon written request from the Printing Services Branch. The Planning and Research's Research Manual is available at a cost of **$2.87** per copy plus shipping and handling.

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Preface

Regulations contained in Title 23, code of Federal Regulations, Part 420, Subpart B – Planning and Research (P&R) Program Management require each State to develop and maintain documentation that describes the management process and the procedures for selecting and implementing P&R activities. After consultation with many State Highway Agencies in 1995, and a thorough review of their manuals, the Oklahoma Department of Transportation (ODOT) selected the California Department of Transportation's Research Manual, developed by Caltrans, as a baseline manual for documenting its' own management process and procedures.

This manual required only minor modifications in regards to the current practice and responsibility of the ODOT's Research, Development and Technology Transfer unit. Specific terminology and definitions have been adopted by the ODOT, to be consistent with this manual.

During 1995, in the light of a declining work force and a perception of excessive middle management, the Research & Development Division was combined with the Planning Division to form the Planning and Research Division. For the sake of this manual, the Planning and Research Division's research staff and operation will be herby called the "Engineering Services Branch".

The Engineering Services Branch is responsible for conducting research, managing research contracts, providing technology transfer - internally and externally, as well as the traditional managing and administering the research program. The Annual Work Programs describe the research projects within the program and they generally address transportation facility problems within these categories: roadway, structures, planning and environment, and maintenance and operations.

In 2007-08 a rewrite of the Research Manual was undertaken to become more current with the addition of new resources and the implementation of the requirements of ADA Section 508 and Oklahoma HB 2197.

For the manager, the *Research Manual* describes the organizational and procedural process of providing management direction to the Program. This direction is implemented by Departmental and transportation industry managers.

For clients, the *Research Manual* describes a continuous process for problem identification. The Engineering Services Branch allows any ODOT employee to call in a problem at any time. The Engineering Services Branch immediately investigates research possibilities and communicates to the client the need for research or the availability of solutions. A warranted research project is then prioritized, a work plan prepared and a project programmed by the committee structure identified in the manual.

For the researcher, the *Research Manual* identifies a process that uses a panel of experts, users, and clients to guide the project from concept to implementation. This concept has been successfully applied by the Transportation Research Board.

For research program management, the *Research Manual* introduces the concept of implementation reviews and cash management to assure a well managed program of projects. The manual also documents the important research procedures that are required by FHWA.

Summed up, this *Research Manual* provides the guidance that the Department staff needs to conduct an effective, responsive research program that actively solves present and emerging transportation facilities problems.

We hope you find it as useful as we anticipate.

R.C.

SECTION 1 GENERAL INFORMATION

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1.1 Introduction - Research, Development and Technology Transfer Program Overview

The demands placed upon transportation facilities in recent years have presented an increasingly difficult challenge to the State: rising load limits, higher tire pressures, increased truck lengths and deteriorating infrastructure; serious disasters such as fires, floods, and tornadoes; and shortage of funds due to dwindling gallon-based gas taxes and lack of public support for increasing gas taxes. These developments have all taken an overwhelming toll on the State transportation system. Compounding this challenge has been the added burden of transportation needs competing for limited resources.

To properly operate and maintain the State transportation system during the current trend of budget cuts, downsizing and reorganization, is all the more reason to focus scarce, limited resources on researching new materials, techniques, technology and specifications. The time is critical for the ODOT to pursue research with renewed emphasis on the technological advances that would improve the effectiveness and efficiency of the planning, design, construction, operation, and maintenance of these facilities.

It is ODOT's goal to provide quality research support in areas that respond to the public need for safe, accountable, flexible, efficient, economical, convenient, and environmentally compatible transportation service.

The Research, Development and Technology Transfer (RDTT) Program identifies research needs, arranges for the conduct of, and secures appropriate funding for, research projects with specific objectives and prescribed timeframes. Through applied research, development, and demonstration activities, the RDTT projects focus on providing the ODOT with knowledge, processes, and products that will contribute to improved transportation facilities.

The RDTT Program consists primarily of selected research projects originated by Department personnel and others who believe there is a problem or need and that a research project will provide the necessary information to resolve the problem. Research projects are selected with the aim of providing a coordinated and balanced effort among the various technical, socioeconomic and environmental subject areas and also among the various types of research.

The RDTT Program conducts work through in-house research, contracted research and collaborative research. Although some research is conducted in-house by Department researchers, the majority of the projects are conducted for the ODOT under contract by universities, other governmental agencies, or private organizations. Collaborative research offers the Department the ability to further leverage State funds and includes partners such as the Transportation Research Board (TRB) and the Oklahoma Transportation Center (OTC) as well as other state highway agencies.

ODOT's RDTT program is accomplished through research projects with well-defined objectives and with durations from one to five years. Normally, the end product of a research project is a published final report. Research results are implemented through new specifications, standard plans, test methods, new or revised procedures, computer programs, manual changes, or policy and procedure directives either before or after completion of a research project. Additional implementation plans may be necessary to encourage full implementation, that is, to make the results part of the ODOT standard operational practices.

1.2 Authority for Research

1.2.1 State Authority

The RDTT program is conducted by the Engineering Services Branch of ODOT's Planning & Research Division.

1.2.2 Federal Authority

The authority for a state research organization to use federal funds is found in 23 United States Code (U.S.C.) 505. The authority for the state to administer State Planning & Research (SPR) funds is found in 23 CFR 420, Subpart B.

1.2.3 The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

The SAFETEA-LU of August 10, 2005 established substantive changes pertinent to the RDTT program. SAFETEA-LU builds on this firm foundation, supplying the funds and refining the programmatic framework for investments needed to maintain and grow our vital transportation infrastructure. SAFETEA-LU addresses the many challenges facing our transportation system today – challenges such as improving safety, reducing traffic congestion, improving efficiency in freight movement, increasing intermodal connectivity, and protecting the environment – as well as laying the groundwork for addressing future challenges.

Research and Studies

SAFETEA-LU authorizes a total of $2.271 billion for Title V programs through 2009, including Surface Transportation Research, Training and Education, Bureau of Transportation Statistics, University Transportation Research, ITS Research, ITS Deployment (2005 only) and the Transportation Technology Innovation and Demonstration Program (such sums as may be necessary from the General Fund). In contrast to TEA-21's programmatic flexibility for research, SAFETEA-LU directs all research funds to designated projects and initiatives.

Obligations are limited to $411 million per year for 2005-2009 to be distributed nationwide.

Following is a description of the highway elements of Title V research.

Surface Transportation Research Program

SAFETEA-LU establishes new principles and practices for Federal surface transportation research activities, to include all activities leading to technology development and transfer, as well as the introduction of new and innovative ideas, practices, and approaches, through such mechanisms as field applications, education and training, and technical support.

The surface transportation research program addresses fundamental, long-term highway research aimed at significant research gaps, emerging issues with national implications, and research related to policy and planning. All research activities are to include a component of performance measurement and evaluation, should be outcome-based, and must be consistent with the research and technology development strategic plan.

Some specific features include strengthening and expanding the operations element in research, including provisions addressing transportation system management and operations, operational methodologies to reduce congestion, transportation security, and asset management. A set-aside of $14 million per year for 2005-2009 is authorized for the exploratory advanced research program to address longer-term, higher-risk research, including highway infrastructure materials, health effects, safety, environment, data acquisition, and operational performance. The long-term pavement performance program, funded by a set-aside of $10.12 million per year for 2005-2009 is continued. The due date for the Infrastructure Investment Needs Report was set at July 31, 2006, and every two years thereafter, and the report must include any information necessary for comparison with conditions and measures in previous reports.

Long-Term Bridge Research

The Innovative Bridge Research and Deployment Program is continued with a new set-aside for high performance concrete bridge technology. In addition, several new initiatives to address bridge life and performance include -- Long-term Bridge Performance, High Performing Steel Bridge Research and Technology Transfer, and Steel Bridge Testing.

Technology Deployment

SAFETEA-LU continues and expands efforts to accelerate the adoption of innovative technologies by the surface transportation community. Two new programs established are the Innovative Pavement Research and Deployment program, with a set-aside for research to improve National Highway System (NHS) pavements, and the Safety Innovation Deployment program. Several demonstration projects and studies are authorized.

International Highway Transportation Outreach

This program is continued, funded at $300,000 per year for 2005-2009 from Surface Transportation Research funds, and a new annual report to Congress is required.

National Cooperative Freight Transportation Research Program

An advisory committee is to be selected to develop a national research agenda for this program, funded at $3.75 million per year for 2006-2009 from Surface Transportation Research funds.

Training and Education

The Local Technical Assistance Program (LTAP) is continued at a total of $11.1 million per year for 2005- 2009, and the Dwight D. Eisenhower Transportation Fellowships are continued at $2.2 million per year for 2005-2009. New training and education initiatives include -- Garrett A. Morgan Technology and Transportation Education program, funded at $1.25 million for 2006-2009, the

Transportation Education Development Pilot program, funded at $1.875 million per year for 2006-2009, and a Transportation Scholarship Opportunities Program which provides authority for the establishment of scholarship and mentoring programs. Another new provision allows States to obligate IM, NHS, STP, CMAQ, and Bridge funds for training and other educational activities at 100% Federal share. To disseminate the results of the Surface Transportation Congestion Relief Solutions initiative, an annual set-aside of $750,000 from Training and Education funds is authorized for 2006-2009.

Freight Planning Capacity Building

SAFETEA-LU authorizes a new program for research, training, and education to support enhancements in freight transportation planning, funded at $875,000 per year for 2006-2009 from Training and Education funds.

1.3 Transportation Research Program Definition and Focus

The ODOT's transportation research is conducted in eight major subject areas as listed below:

- Materials
- Construction
- Maintenance
- Planning
- Bridge
- Safety
- Environment
- Traffic

1.3.1 Engineering Studies

Encompasses all subjects that require a project manager with sufficient technical background and experience, generally an engineer, to recognize, analyze and make recommendations concerning test procedures, design specifications, material sources, and procedures used in the construction and maintenance of roadways and structures.

1.3.2 Product Evaluation

Product evaluation encompasses reviewing product specifications, experimental testing, and field evaluation of new products and processes for constructing and maintaining roadways and structures.

1.3.3 Special Studies

Special studies encompasses field investigations, literature reviews, surveys, testing, field support and other in-house efforts that require expediency and/or studies that are outside the traditional engineering areas.

1.4 Research Organization and Administration

1.4.1 Administrative and Research Responsibilities

ODOT's RDTT Program involves the coordination and interaction of various groups or individuals:

- Research Council
- Research Advisors
- Engineering Services Branch
- In-House Researchers (Project Managers)
- Outside Research Contractors (universities, transportation research centers, other government agencies, private entities, etc.)
- Research Contract Managers

The roles and responsibilities of each individual or group involved in the development of the Research and Development Program are outlined in Figure 1. The State Planning and Research (SPR) Program contains two parts. Part I is Planning and Part II is Research. The ODOT Planning & Research Division administers the SPR Program funds.

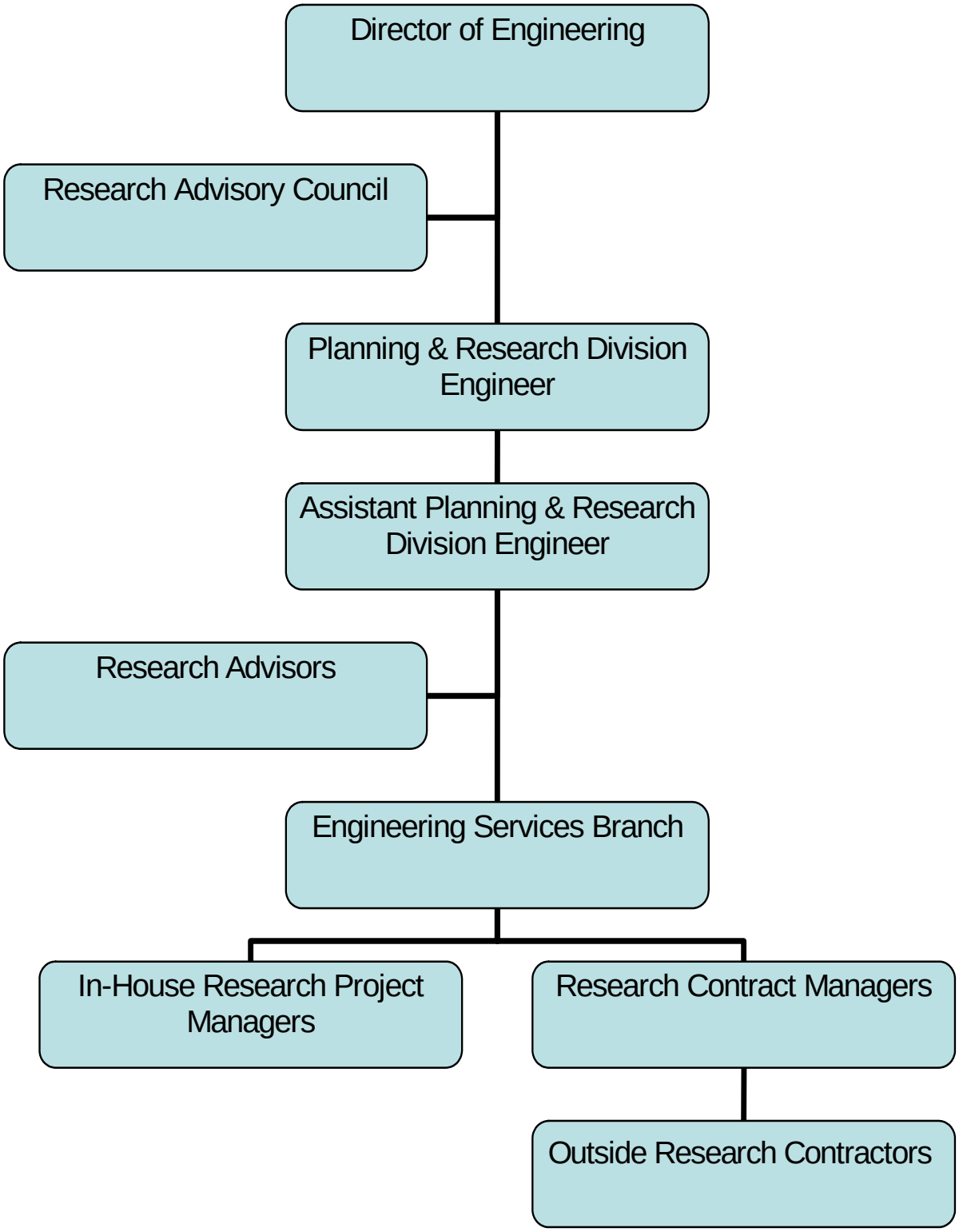

Figure 1 Research and Development Program

1.4.2 Research Council

The ODOT Research Council's membership consists of the Chief Engineer / Deputy Director, Assistant Chief Engineer / Director of Engineering, Assistant Chief Engineer / Director – Operations, and the Planning & Research Division Engineer. The role of the ODOT Research Council is to provide broad research program review and establish priorities for research funding. This Council reviews program area funding and establishes future target funding percentages by major subject areas for the research expenditures of the Department.

1.4.3 Research Advisors

ODOT's Research Advisors consist of Planning & Research Division staff, other ODOT Divisions' staff with appropriate technical expertise, and the following task forces established by ODOT:

- Asphalt Quality Improvement Task Force
- Concrete Quality Improvement Task Force
- Pavement Improvement Committee
- Bridge Quality Improvement Task Force

1.4.4 In-House Research Project Managers

Each research project is assigned to a person who has overall responsibility for the project. In-house research is conducted by the project manager (PM) often with the assistance of one or more researchers. Responsibilities of the PM include:

- Primary technical and administrative responsibility to conduct the project; he/she is the key person in the production of usable research results, responsible for preparing technical reports, and recommending appropriate action(s) to management.
- Familiarity with the operating problems in the technical area being researched, the theory underlying these problems and with research methodology.

- Planning, designing, and generally overseeing the research project. For team projects, project design, day-to-day control and direction of the work may be delegated.
- Accomplishment of the project within the approved budgeted amount of funding and time. If discoveries or unexpected problems during the course of the work indicate that changes from the original concept of the project or a change in the budget is necessary, the PM should inform the Planning & Research Division Engineer as soon as possible to take necessary administrative action. If the project includes any outside contract work, the PM should maintain coordination and oversight in accordance with Section 4 of the Research Manual.

1.4.5 Research Contract Managers

Research can be performed by an entity outside of the department. Like in-house research projects, each research contract is also assigned to a person who has overall responsibility for the contract. This person is a department employee and is identified as the research contract manager. Research contract manager's responsibilities are briefly described below.

- Coordination and oversight of the contractor's work in accordance with Section 4, Outside Research/Contract Management. This oversight provides assurance that the contractor is complying with the research agreement; that the time schedule is being met; the required reports are submitted in a timely manner; and that other contractual obligations are being met as stipulated by the contract.
- Notification of any changes to contract or project funding to the Planning & Research Division Engineer as soon as possible to allow for timely departmental approval processing.

If for any reason a research contract manager assignment is changed the Planning & Research Division will notify the outside research contractor. This

change request requires the new proposed contract manager's name and reason for the change.

1.4.6 Outside Research Contractors

The outside research contractor (e.g., universities, transportation research centers, other government agencies, private entities, etc.) having been awarded a research contract, is responsible for conducting the research project as stipulated by the contract. The contractor's project manager (CPM) is the person identified by the contractor who has the overall responsibility for the research contract for the contractor. The CPM maintains the same types of responsibilities for the research contract as those described above for the in-house research PM except the CPM is responsible for reporting to the department’s contract manager.

If for any reason there is a change in the CPM, formal approval is required from the Planning & Research Division. The change request should include the new proposed CPM's name, qualifications, and the reason for the change. This change request is transmitted from the contractor through the research contract manager to the Planning & Research Division Engineer.

1.5 Glossary of Research Terms

1.5.1 Definitions

Abstract: A brief description of a project or report which includes a description of the basic objectives, the procedure followed, the findings and definitive gains in the specific area of the research.

Agreements:

- **Basic Agreement:** Contract with Oklahoma State University, University of Oklahoma, Langston University and the Oklahoma Transportation Center containing most of the general contractual requirements to perform research for ODOT. All campuses of the University are covered under this master agreement.
- **Project Agreement:** A supplemental contract to the Basic Agreement specifying the funding and performance requirements to be met while under contract for a specific project.
- **Supplemental Agreement:** A contract modification to the Project Agreement for the purpose of providing additional funding and/or time.
- **Interagency Agreement:** Contract with other State agencies for the performance of specific research work.
- **Standard Agreement:** Contract with private consultants, other governmental agencies and educational institutions, for the performance of specific research work for ODOT.

Credit Line: A clause in the report acknowledging the financial support and technical cooperation of the sponsoring agency, or agencies.

Consultant: Qualified individual, group or firm, able to perform specialized research or to provide technical advice to a responsible department unit performing research. A consultant engaged by the ODOT is usually termed "contractor" in the agreement.

Contractor's Principal Manager: The person assigned primary technical and administrative responsibility to conduct the research project for the contractor.

Coordination: General monitoring of a research project within the program to ensure that it is proceeding as planned and the work is in accordance with the terms of the contract with respect to level of effort, adherence to time schedule, conformance with the approved work plan, the submittal of required reports, etc.

Department: Oklahoma Department of Transportation.

Disclaimer Clause: A standard clause that must appear verbatim in all published research reports involving FHWA participation as shown below:
"The contents of this report 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 official views or policies of the State of Oklahoma or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation."

Director: Director, Oklahoma Department of Transportation.

Disclosure Statement: A separate statement included in all published interim or final reports prepared for the ODOT by the contractor identifying the number and dollar amounts of all contracts or subcontracts in excess of $5,000 relating to the research or preparation of the report.

Dissemination: Distribution of facts or findings to appropriate Programs, Offices, Divisions and/or parties for review and possible implementation.

Fiscal Year: For the State, a 12-month monetary budgeting period from July 1 through June 30 of the next year (FY 08 is from July 1, 2007 through June 30,

2008). For the Federal Government a 12-month period from October 1 through September 30 of the next year (FFY 08 is from October 1, 2007 through September 30, 2008).

Implementation: Incorporation of new or revised procedure, standard, design, or specification (resulting from research findings) into the ODOT's operations.

Key Word: Descriptive term used in an abstract for purposes of information storage and retrieval.

Priority Ranking: Assignment of a proposed or ongoing project to a relative position of importance with respect to other research projects. Priority ranking is based on factors such as need, savings and potential for improved quality of service and implementation.

Program:

Annual Work Program: The Department's Annual SPR Work Program consists of the current and proposed Planning & Research efforts to be financed in part with Federal-Aid 2 percent funds. Part I of the Annual Work Program has to do with planning. Part II is an organized listing of the Department's SPR and Pooled Fund participating research and development projects, both current and proposed, giving an account of program status, proposed work and estimated cost respectively. Each Annual Work Program is identified by an FHWA designated number, e.g., SPRY-0010(042) and JP# 01946(50) for FFY 2008 and SPRY-0010(044) and JP# 01946(52) for FFY 2009.

Projects:

- **Continuing Project:** A project that extends into a succeeding fiscal year.
- **Deferred Project:** A project that is postponed until a later time due to funding restrictions or a current lack of resources to do the work.

- **Development:** Translation of basic or applied research results into prototype materials, devices, techniques or procedures for the practical solution of a specific problem in transportation.
- **Demonstration:** Demonstrating the application of new materials, devices, techniques or procedures in actual operations to prove or disprove the practicability and utility of the item being demonstrated, and to correct any minor problems.
- **Research Project:** A research project is an individual research and development investigation with the objective of supplying or confirming a specific theory, design or data. The project must be completed within a limited amount of time and funds, and must produce a published report describing the results of the investigation.

Proposal:

- **Funded Research Proposals:** This group of proposed research proposals has been reviewed and given high priority within the Department, resulting in their placement in the current funded Annual Work Program. Each proposal has an acceptable work plan, budget and cash flow schedule that includes invoicing of work during the current year.
- **Unfunded Research Proposals:** This group consists of approved, but unfunded, research projects for the current year. Depending upon the schedule of development and time required to execute necessary contracts, some of these proposals may be available as replacements for delayed or terminated "funded" proposals. If additional funds become available, these proposals become the prioritized basis for selecting additional funded projects.
- **Research Needs Statements:** This group is composed of suggested research projects that are deemed to have merit but have not yet had a full Project Proposal submitted to, or accepted by, the Planning & Research Division. This includes all research ideas and problem

statements submitted in-house and from academia, other states and/or industry.

- **Request for Proposals (RFP):** A procedure whereby the Planning & Research Division will solicit proposals to perform research from qualified consultants, agencies, or universities. The RFP procedure allows the Department to obtain a number of proposals to choose from. After evaluation and approval one is selected and a contract awarded. For RFP contents, and procedures, see Section 2.
- **Research Proposal:** A detailed research plan with substantiating data submitted for approval to conduct a research project. The research project proposal includes a title, justification and background data, a review of previous research and pertinent literature, objectives, work plan, etc. For research proposal contents and procedures, see Section 3.
- **Unsolicited Proposal:** An offer (usually accompanied by a proposal) from a university, consultant, independent researchers, or others to perform research work not specifically requested by ODOT.
- **Work Plan:** The section of the research proposal outlining the procedures the researcher plans to follow to conduct the research project.

Reports:

- **Annual Report:** Gives an account of the accomplishments, savings and cost of all research projects completed during the federal fiscal year period immediately preceding the Annual Report date. The report also includes the continuing projects where resulting benefits have been implemented during the accomplishment reporting period.
- **Final Report:** A final report should document the data gathered, the analysis performed, the results achieved, the significance of the results to the Department's operations and recommendations on the means by which the research results may be implemented. A final report may also provide the basis for additional research.

- **Interim Report:** An interim report documents a major phase of a research project, i.e., whenever a project develops significant findings that might be implemented into operating procedures prior to the completion of the overall study. An interim report may also provide the basis for additional research. If research is performed in phases, each interim report shall be labeled “Phase #...” Interim report.
- **Progress Report:** The Research Progress Report provides information on the status of an individual research project on a monthly basis. This enables research administrators and participating federal agencies to periodically evaluate the progress of a particular research project to determine if the potential for producing significant results is strong enough to warrant project continuation.

Research:

- **Research:** Scientific investigations including analytical and/or experimental activities to discover or apply new facts, techniques, methods and natural laws.
- **Research Problem Statement:** A brief preliminary statement of the proposed problem to be researched, descriptions of the research scope and justification, and an estimate of cost and time to conduct the project.
- **Basic Research:** A systematic analytical and experimental investigation to increase knowledge of fundamental phenomena usually without direct application.
- **Applied Research:** A systematic, analytical and experimental investigation of natural phenomena to gain specific new knowledge to improve the functional characteristics of a new emerging system usually resulting in direct application of results.

Study: Nearly synonymous with the term "research project".

Technology Transfer: A systematic process by which the existing research knowledge of others is transferred operationally by the Department into useful

processes, products or procedures. Technology Transfer can also involve the advancement and promotion of implementation of ODOT's own research results.

1.5.1 Abbreviations

AASHTO	American Association of State Highway & Transportation Officials
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FTA	Federal Transit Administration
IBRD	Innovative Bridge Research & Deployment
ITS	Intelligent Transportation Systems
LTAP	Local Technical Assistance Program
LTPP	Long Term Pavement Performance
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTIS	National Technical Information Service
NTPEP	National Transportation Product Evaluation Program
ODOT	Oklahoma Department of Transportation
OTC	Oklahoma Transportation Center
P & R	Planning & Research
RAC	Research Advisory Committee
RDTT	Research, Development & Technology Transfer
RFP	Request for Proposals
RIP	Research In Progress
RNS	Research Needs Statements
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SCOR	Standing Committee on Research
SHRP	Strategic Highway Research Program
SI	International System of Units
SPR	State Planning & Research
TCRP	Transit Cooperative Research Program

TRB	Transportation Research Board
TRIS	Transportation Research Information Service
WASHTO	Western Association of State Highway & Transportation Officials

SECTION 2 PROGRAM DEVELOPMENT

2.1 Introduction

2.2 Development of the Research Program
2.2.1 Project Initiation
2.2.2 The Continuous Research Needs Assessment
2.2.3 Research Problem Statements
2.2.4 Problem Statement Solicitation

2.3 Evaluation/Approval Process

2.4 Annual Work Program Direction/Projects

2.5 The Research Proposal
2.5.1 Proposal Preparation
2.5.2 Proposal Preparation Cost and Funding
2.5.3 Contents of Research Proposals
2.5.4 Requirements of Proposal Approval

2.6 Funding Sources
2.6.1 FHWA State Planning and Research (SPR) Program
2.6.2 FHWA Direct Contracts
2.6.3 Other Direct Contracts
2.6.4 FHWA Construction Evaluated Projects
2.6.5 NCHRP
2.6.6 Pooled Fund Projects
2.6.7 State Financed Projects

2.1 Introduction

There are several funding programs for research. The federally funded SPR program is the main funding source for the ODOT research and is discussed in detail in this section. Section 2.5 discusses all funding programs. Multi-year research projects will require separate contracts for each fiscal year. Each year shall require an end of phase final report. Supplemental agreements will only be used for a revised scope of the project, an increase of time or an increase of costs.

2.2 Development of the SPR funded Research Program

The Research Program is developed annually by the P & R Division. Projects which comprise the program include continuing and new research, with federal participating funds, pooled fund studies and direct contracts. The paragraphs that follow describe the development process of the SPR Research Program.

2.2.1 Project Initiation

Research projects may be initiated by any of the ODOT Divisions, industry, or academic institution. The purpose is to resolve a transportation problem. The research project should provide information needed to resolve or to reduce the problem.

Research projects can be initiated at any time through submittal of a completed Research Problem Statement, or as a special submittal to the P & R Division. Submittal of a research proposal can serve the same purpose.

2.2.2 The Continuous Research Needs Assessment

The Continuous Research Needs Assessment is a Departmental activity whereby a combination of correspondence (e.g., a memo and Research Problem Statement), interviews, and appropriate follow-up is administered Department wide by the P & R Division. This ultimately leads to a Work Program. Research proposals may be submitted at any time, and annually the P & R Division in conjunction with the Research Advisory Committee will assess proposals and the Department's financial ability to fund the projects, and amend the Work Program to incorporate new projects.

2.2.3 Research Problem Statements

The Research Problem Statement is used to gather basic information for a

potential research project. The requested information includes: the project title, the proposed approach, anticipated benefits, a statement of urgency, and estimates of the time and cost required to conduct the project (see figure 2).

2.2.4 Problem Statement Solicitation

For each federal fiscal year the ODOT P & R Division solicits problem statements from transportation professionals in the Department, as well as the membership of existing task forces and committees, industry, and the universities in December. Problem statements are due by January 31st.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

FFY20XX Problem Statements

(Please submit no later than January 31, 20XX for consideration for FFY 20XX)

Problem Title	
Research Problem Statement	
Objective	
Research Proposed	
Estimate of the Problem Funding	
Estimate of the Research Period	
Urgency and Payoff Potential	
Related Research	
Person(s) Developing the Problem	
Process Used to Develop Problem Statement	
Date	
Submitted By	

Submit to:
Ron F. Curb, P.E.
Planning & Research Division
Oklahoma Department of Transportation
200 N.E. 21st Street, Room 3-A7
Oklahoma City, Oklahoma 73105-3204
405-522-3795 FAX 405-521-6917
E-Mail: rcurb@odot.org

Submit by Email

Figure 2 Research Problem Statement

2.3 Evaluation, Selection, Approval and Posting Process

The P & R Division will perform additional literature surveys on the problem statements received and select the research problem statements for the SPR program in consultation with the Research Council no later than March 15th. For problems selected by the P & R Division, requests for proposals will be issued by April 15th. The proposals will be due by June 1st. The proposals will be reviewed and evaluated by the P & R Division Staff and Research Advisors. The selection process will be completed by July 1st.

The P & R Division staff will prepare the draft of the Annual SPR-Research program by August 1st. The draft will be submitted to FHWA for approval by August 15th.

Upon approval of the draft SPR program the Final Annual SPR program will be posted to the internet and contracts will be drawn

2.4 Annual SPR-Research Program

The Annual SPR - Research Program, part II of the SPR, consists of an annual accounting of the status of all research projects both on-going and proposed, for the subject fiscal year.

It must be approved by the Director of Engineering and ultimately the Federal Highway Administration by October 1 of each year.

2.5 The Research Proposal

A research proposal documents the need to conduct a particular research project and provides sufficient information to assess the probability of its success. It clearly defines the objective, provides a detailed work plan for achieving the objective, and indicates how the research findings are expected to be used. In addition, it provides a staffing plan, detailed work time schedule, a detailed cost estimate, and a manpower analysis.

2.5.1 Proposal Preparation

Whether research is performed in-house or outside the Department, a research proposal must be prepared. For in-house research, the Engineering Services Branch is responsible for the preparing of the research proposal. For information on Outside Research and Contract Management, including details of the RFP process, see Section 4.

2.5.2 Proposal Preparation Costs and Funding

Funding for the proposal preparation is from general research activity funds within the Planning & Research Division. As an alternative to the above funding procedure, a Division may elect to prepare its proposal and charge it to their overhead expenditure authorization.

2.5.3 Contents of a Research Proposal

Research project proposals must contain, but not necessarily be limited to, the following essentials:

2.5.3.1 Identification

A title sheet that shows the following:

- A concise title of the proposed research project.
- For outside research, the name and business address of the organization that will conduct the work.
- Name, title and mailing address of the responsible principal investigator(s) (PI) for the organization.

2.5.3.2 Statements

- Problem Statement - A clear, concise statement of the problem to be solved by the proposed research, usually in one to three sentences. Justifications and explanations belong in the "background" section.
- Objective - A concise statement identifying the purpose or products of the research. The objective(s) should be about twenty- five words in length and phrased in positive terms (e.g., to develop, to determine, measure, rather than broad generalities, such as, to investigate, to study).
- Background and Significance of Work - A statement placing the research project in proper context with ODOT's or other potential user operations.
    - Include the findings of the literature search. These findings should demonstrate either that there has been no other research on the problem with the same approach or that the proposed research project will extend, modify or refine prior research. Relate the proposed research to past research accomplishments either by the ODOT or others, and as appropriate show how it builds upon rather than duplicates any previous research. A complete literature search that includes TRIS is required for all project proposals.
    - A statement indicating the researcher's understanding of the underlying principles involved and supporting the approach being taken.
    - This section should be written so that a person with a technical background, not necessarily in the subject being researched, can understand it. It should define key terms, such as,

processes, equipment so the reader quickly grasps the picture. One or two simple sketches and/or photos are often very helpful in this process. This section should explain the options for approaching and solving the problem, then explain which approach(s) will be taken in the project and why. The scope of the research and the basic parameters being investigated should be here also.

- Benefits - Enumerate the benefits anticipated from the research, such as, better service to the public, savings of time or money, increased safety, improved aesthetic quality or preservation of the environment. Cost-benefit ratios, net-present value and cost effectiveness measures should be considered. All assumptions, data and calculations must be shown.
- Implementation - A statement identifying specific areas of potential application of the research findings, such as: changes in specifications, standards, policy, training, practice, procedure, software and instructions for computer application, and how the findings will ultimately resolve/reduce the problems. If the research findings cannot be applied immediately, this portion of the research proposal should identify the additional steps necessary to complete for the application to begin (additional research, field testing). Refer to the details of implementing in the Implementation Manual.

Proposal preparation should be a coordinated effort between the Planning & Research Division and the unit expecting to implement the research findings. The proposal preparation should be forwarded to the potential user offices for review. This communication should help to obtain research findings suitable for implementation. The PI and co-PI should work together throughout the duration of the research project to meet this purpose.

2.5.3.3 Work Plan

The plan or approach intended to be used should be fully described and specify

in detail how the research project will be structured and performed to meet each research objective.

The work plan must identify major operational phases and relate these phases to manpower requirements, time schedule and cost estimates and provide the following information as applicable:

- Basic Research (concept oriented)
    - The basic approach to the development of the theory.
    - Specific hypothesis derived from the theory.
    - Criteria for acceptance or rejection of hypothesis.
    - Theoretical framework (experimental design) for study.
    - Significant variables to be tested.
    - Data analysis and statistical procedures.
- Applied Research (problem oriented)
    - Principles or theories to be used in the solution.
    - Possible solutions of problem.
    - Critical experiments to test the applicability of the theory.
    - The kind and range of variables to be tested.
    - Criteria to be used for acceptance or rejection of possible solutions.
    - Experimental facilities available.
    - Data analysis and statistical procedures.
- Development
    - The device, process, or system to be developed.
    - The applied research upon which the development is to be based.
    - Method(s) to solve the problem.
    - The kind and range of variables considered in the development.
    - Facilities available for the development.
    - Data analysis procedures, including adequate statistical methods.
    - Criteria to be used for acceptance or rejection.
- Test and Evaluation
    - Item to be evaluated or measured.

- The extent of the development of the item. Testing procedures.
- Conditions under which evaluation will be made.
- Control to be used.
- Data analysis procedures, including adequate explanation of statistical methods.
- Criteria to be used for acceptance or rejection.

2.5.3.4 Technical Advisory Staff

Include a statement of the qualifications of the principal investigator and other key personnel including their experience, capability and past performance of research work in relation to the contracted organization.

2.5.3.5 Facilities Available

Describe facilities to be used to conduct the research project.

2.5.3.6 Reports

Describe the reports (including film reports) to be prepared. Research project reports should document the research performed and indicate what project objectives have been met.

2.5.3.7 Work Time Schedule

Depending on the nature and complexity of the study, include a bar chart, Critical Path Method diagram, flow chart, or other type of progress chart to illustrate the interrelationship and scheduling of the operational phases and tasks of the research project. If properly prepared, this chart can also be used as the progress chart required in the semi-annual report.

2.5.3.8 Resource Analysis

Conclude the analysis with a summary statement on the availability of skilled personnel for the research project and availability time frame.

2.5.3.9 Additional Basic Categories

- Expendable materials, supplies including reproduction costs.
- Consultant fees for professional and support people.
- Specialized nonexpendable equipment, or instruments to be constructed, purchased or rented, including computer charges.
- Provide a detailed list identifying each piece of equipment, however, the components of each piece need not be listed.
- Travel necessary for the indirect conduct of the research.
- Overhead and indirect costs where applicable.

If there are different sources of funds other than State and SPR, which are to be accounted for, be sure to break out the costs associated with those funds.

2.6 Funding Sources

Transportation research is generally financed by federal and/or state funds. After approval of a research project by the Research Council, the Engineering Services Branch may provide independent technical monitoring of the research project and its final report.

2.6.1 FHWA - State Planning and Research (SPR) Program

Federal statutes require that two percent of the federal aid highway funds and bridge replacement funds apportioned to the states each year be expended only for planning and research. These statutes allow that of this two percent, twenty-five percent must be spent on research.

These categories of planning and research funds have become known in the jargon of the FHWA and of state transportation agencies as "SPR" funds. The ODOT uses federal SPR funds in performing highway research work. The ODOT's' research projects are generally considered for SPR participation.

2.6.2 FHWA Direct Contracts

The Federal Highway Administration (as a research contracting party) may negotiate with the ODOT (as the contractor) to conduct research. Such direct contracts do not involve federal participation in the usual sense, but rather provide for federal reimbursement of 100 percent of the ODOT's' costs with funding which is over and above Oklahoma's regular highway apportionment.

2.6.3 Other Direct Contracts

The ODOT occasionally performs research work for others under direct contract if the ODOT has an urgent need for the research results and research work is budgeted separately in the Work for Others Program (re: section 4.8).

For possible sources of funding, the ODOT may submit an unsolicited research proposal to an outside party such as the Federal Highway Administration, National Cooperative Highway Research Program, Transit Cooperative Research Program, or Environmental Protection Agency.

2.6.4 FHWA Construction Evaluation Projects

This is a program by which FHWA and the State determines the relative merit and cost effectiveness of material, process, method, equipment item or traffic operational device. The results of these evaluations are summarized in an annual memo report.

2.6.5 NCHRP

The National Cooperative Highway Research Program (NCHRP), a cooperative program for contract research, is sponsored by state transportation agencies of all 50 states, the American Association of State Highway and Transportation Officials (AASHTO) and the FHWA. The program is administered by the Transportation Research Board of the National Academy of Sciences, and funded by 5 1/2 percent of each states two percent SPR funds. The annual program is developed to provide practical solutions to problems that are of mutual interest to all or most states and that have a high probability of success. Since a minimum of two years elapses between submitting problem suggestions and contract award, this program does not lend itself to problems that require immediate action - but works well for problems of national interest.

2.6.6 Pooled Fund Projects

This is another cooperative research program that strives to solve problems of mutual interest, is funded by several state transportation agencies, and is administered by FHWA in cooperation with the sponsors. For problems of

nationwide interest, the FHWA Washington, D.C. headquarters administers the projects, while problems of regional interest may be handled by a FHWA regional office or one of the sponsors. Pooled-fund projects normally are 100 percent SPR funded without funds from the State.

2.6.7 State Financed Projects

Although 100 percent state financed (nonparticipating) projects can still be approved, currently Engineering Services Branch takes full advantage of the matching funds by considering all possible projects for federal participation. Projects of relatively limited scope and local interest may be approved for state financing.

2.6.8 Innovative Bridge Research and Deployment (IBRD) Program

The focus of the IBRD is to promote, demonstrate, evaluate, and document the application of innovative designs, materials, and construction methods in the construction, repair, and rehabilitation of bridge and other highway structures.

The Engineering Services Branch assists the Bridge Division by soliciting ideas and administering the funds.

SECTION 3 IN-HOUSE RESEARCH

3.1 Research Performed within the ODOT

3.2 Tips for Successful Project Administration

3.3 Research Project Staff

3.4 Purchase or Rental of Research Project Equipment with SPR Funds
3.4.1 Non expendable Equipment Statement
3.4.2 Residual Values
3.4.3 Multiple-Project-Use Equipment
3.4.4 Inventory Procedures
3.4.5 Disposal of Equipment

3.5 Changes in the Research Project

3.6 Termination of the Research Project

3.1 Research Performed Within ODOT

Research projects are conducted primarily in two different ways either in-house or under contract by outside entities.

Benefits and Uses of In-house Research

- Bring scientific and technical knowledge to bear on transportation problems
- Give transportation administrators and managers reliable and substantive advice (quick and accurate) during emergencies and natural disaster situations
- Serve as a knowledgeable and unbiased resource for determining criteria and recommending priorities for transportation program investment, project development and policy implementation
- Rapidly assess emerging research results and determine appropriate applications to benefit the State's transportation program
- Evaluate field-implemented transportation innovations for cost-saving and safety implications before authorizing standardized use
- Provide a professional knowledge base for soliciting, awarding, monitoring and evaluating an appropriate level of high-quality and cost-effective contracted research

3.2 Tips for Successful Project Administration

- The program is developed on a continuous basis. Each new addition to the program requires a completed research problem statement which outlines the problem, the proposed approach, anticipated benefits and a statement of urgency. Complete this form with the reader in mind. This is the primary "sales tool" for a project. Since some of the people involved in the development of the research program do not have an understanding of the technical details, the form should be completed in clear non technical

language. Do not rely on technical jargon to justify the project. Pay particular attention to developing a concise, descriptive title for the project.

- Proposals for new projects and submittals to modify continuing projects may be submitted at any time for approval.
- Be aware of the tendency to "bite off more than one can chew" (in terms of defining the scope of the research) in the work plan.
- Do not omit the necessary literature search prior to a research effort. In addition to the literature search, contact experts on the subject and discuss your research intentions with them.
- Staff the project with personnel that understand both the academic and practical viewpoints.
- Be sure to establish statistical controls.
- Do not neglect a continuous planning review. Planning is important to maintain project organization, to meet time schedules with completed interim or final reports and basically for overall project control.
- Design the research methodology in detail and revise when necessary.
- When conducting the research project, follow the definite, detailed plan outlined in the research proposal.
- Avoid deviating from the plan or enlarging the project scope unless it has been definitely determined that the project objectives will not be met through the original design.
- Seek approval from appropriate authority if variations from the approved work plan are significant.
- Maintain project boundaries. Do not permit the project to grow as it progresses.
- Maintain objectivity. Do not allow preconceived notions to influence the analysis and conclusions.
- Prepare reports that focus on the new found knowledge not on numerous pages of statistical and technical details.
- Annual progress reports and cash flow plans are required from ODOT contract managers and ODOT project managers for all research projects.

These reports should be submitted in April.

- Project managers should arrange to receive updated accounting information on their projects prior to preparing the progress reports, although there is a one to two month lag in the data.
- Write your report as you go along. Some researchers write comprehensive interim reports which are very helpful when it is time to write the final report.
- Prepare as many charts, graphs, tables, photographs, etc., in their final format as soon as possible.
- In order to plan for a smooth transition of project findings to implemental benefits, other parties who are responsible for implementation should be brought on board early.
- Involve other people (technicians, etc.) in the work plan preparation. Also, where appropriate, involve people from design, construction, field divisions, etc.
- Hold regular meetings with the people involved in the research project to make sure it is staying on track.
- Always examine your data closely for internal consistency before beginning your analysis.
- Don't push your data further than it was meant to go. An attempt to quantify the effects of many variables with a meager database will only lead to more questions than you started with.

3.3 Research Project Staff

Personnel assigned to the role of project manager should be thoroughly knowledgeable of the department's operations related to the project, the subject area, and applicable research techniques to professionally conduct a valid research study. If the assigned personnel are not informed about these areas, personnel with this knowledge should be assigned to the project in a consulting capacity.

A project manager should devote the major portion of their time to conducting the research project (if the nature of the project permits continuous work). Failure to do so could result in project delays, increases in project costs, or lead to project findings of minimal quality.

3.4 Purchase or Rental of Research Project Equipment with SPR Funds

SPR research project funds should not be used to purchase or rent normal equipment in an adequately organized and equipped research and development laboratory. SPR research project funds are authorized, however, for the rental or purchase of specialized, non-expendable equipment. This type of equipment is defined as equipment not usually provided by the Department and does not include normal equipment as defined above. In addition, the FHWA defines non-expendable equipment as equipment costing more than $300 per unit with a service life of one year or more.

All non-expendable equipment purchased with SPR research project funds must be accounted for throughout the life of the project. This is accomplished through normal inventory records and a statement of disposition at the conclusion of the project.

Equipment costs must be managed carefully so that only those equipment costs attributable to an SPR research project will be charged to that project.

Equipment purchased with SPR research project funds requires prior Engineering Services Branch approval of all such equipment to be purchased, constructed, or rented in excess of $1,000.

3.4.1 Non-expendable Equipment Statement

Prior to or concurrent with the draft final report submittal of an SPR participating research project, a statement regarding non expendable equipment purchased for the project should be submitted to the Engineering Services Branch.

The statement should provide detail on each item, a description (including make,

model and serial number), condition, date of purchase and purchase price.

The statement should also reconcile the equipment shown in the research proposal or authorized later with the equipment that is being salvaged. Unless the equipment is to be disposed of at public auction, the statement should include the residual value for each item and justification for the residual value (such as method of depreciation and vendor's quote).

3.4.2 Residual Values

The residual values are determined by the Comptrollers Division asset inventory.

3.4.3 Multiple-Project-Use Equipment

If the ODOT purchases or constructs specialized equipment to be used on more than one research project, the equipment may be purchased with other than research project funds. Then the same rental rate should be charged to each research project or other activity for which the specialized equipment is being used.

3.4.4 Inventory Procedures

Each Project manager is responsible for maintaining proper inventory records in accordance with the ODOT procedures for each piece of equipment that are valued at $300 or more, either purchased or built with study funds.

3.4.5 Disposal of Equipment

If a public auction is proposed for the disposal of surplus equipment, the non expendable equipment statement should include the following:

- who will conduct the auction,

- when and where will the auction be held,
- how will it be publicized, and
- two draft copies of the portion of the auction announcement that includes descriptions of the items up for bid

The Engineering Services Branch shall evaluate any proposed auction to dispose of equipment, and the has the authority to approve or disapprove of the disposal of equipment. After the auction, the responsible research manager should report to the Engineering Services Branch the results of the auction. The research project is credited with the amount of the net proceeds from the auction sale (after deducting the pro rata overhead charges for conducting the auction).

3.5 Changes in the Research Project

If the need for major changes becomes apparent while the project is in progress, it may become necessary to revise one or more of the following: the work plan, time schedule, authorized costs, staff, or equipment.

All revisions must be submitted for approval, if possible, before continuing the work. Only the essential component parts of the originally approved item need be discussed in the revision, but the revision must be fully documented as to the need and the proposed revision delineated.

The approval process for these revisions is the same as for the research proposal. The revision(s) should be forwarded with justification to the Engineering Services Branch.

Minor changes in funding (fiscal year or total cost) should be forwarded with justification by the project manager directly to the Engineering Services Branch.

A change in PI or co-PI requires formal notification of the Engineering Services Branch (see Section 1.4.1, Administrative and Research Responsibilities).

3.6 Termination of the Research Project

If research has started on an approved project, then later found to be unproductive, further research is unwarranted and the research project should be terminated immediately.

To terminate a research project under these circumstances, the project or contract manager shall submit a formal termination request with a termination report to the Engineering Services Branch. See Section 5.7, Documentation and Presentation of Research Findings, for the termination report outline.

SECTION 4 OUTSIDE RESEARCH/CONTRACT MANAGEMENT

4.1 Research Conducted Under Contract Outside of the ODOT

4.2 Public Sector Research Contracts

4.3 Private Sector Research Contracts
4.3.1 The Request for Proposals (RFP)

4.4 Sole Source Method

4.5 Contract Contents
4.5.1 General Information
4.5.2 Specialized Equipment
4.5.3 Subcontracts
4.5.4 Travel
4.5.5 Payments
4.5.6 Contract Amendment
4.5.7 Supplemental Agreement

4.6 Contract Research Proposal Acceptance

4.7 Contract Management
4.7.1 Coordination and Surveillance of the Research Contract
4.7.2 Equipment Monitoring
4.7.3 Contract Performance Evaluation

4.8 Research Work for Others
4.8.1 General Information
4.8.2 Work Plan Development and Administration

4.1 Research Conducted under Contract Outside of ODOT

The performance of Department research projects by universities, other public agencies, or private consultants is considered when the Department does not have the necessary personnel, expertise, or equipment to conduct the research. Performance of the work will be in accordance with a detailed proposal which is submitted to the Engineering Services Branch by the PI through the Contract Office of the respective organization. For the purposes of this manual, it shall be understood that the words ‘contract’ and ‘agreement’ can be used interchangeably.

4.2 Public Sector Research Contracts

Most of the ODOT research contracts are with Universities, University Transportation Centers other state agencies, an agency of the federal government or other public organizations. When seeking to contract for the performance of research with any of the above entities, the CPM may negotiate informally with as many or as few such public organizations as may be deemed necessary in order to select the best PI to do the research.

After determining that the proposed research project has been authorized and that funding is available, the Engineering Services Branch will:

- review the research contract proposal package for accuracy and completeness,
- obtain necessary approvals and signatures,
- and process and execute the contract.

The Engineering Services Branch will return the fully executed agreement to the Contract Office of the PI. The CPM will formally notify the PI of the effective date to begin work.

4.3 Private Sector Research Contracts

Research to be performed under contract by an organization in the private sector usually involves issuance of a Request For Proposal (RFP). The RFP is a solicitation procedure to evaluate proposals from bidders and determine to whom the contract should be awarded. A RFP should state, "Here is what we wish to have accomplished; how will you accomplish it for us; and how much will we have to pay you?"

The RFP is prepared by the CPM with the assistance of Engineering Services Branch staff and the Division requesting the research.

4.3.1 The Request for Proposal (RFP)

The Contract Project Manager must clarify what is wanted beforehand and communicate it to prospective research contractors in order to receive more acceptable proposals.

RFPs should include:

- A clear description of the problem to be solved - if a problem cannot be clearly delineated it is either not sufficiently understood to be successfully addressed by a research contractor or it is not really a problem deserving attention
- In specific and realistic terms, identify what the research contractor is to accomplish. This would include any desired approach to the problem;

  practical, policy, technological, and legal limitations; specific questions to be answered; format and number of copies of the completed reports; and the extent and nature of the assistance and cooperation which will be available to the research contractor from the Department
- The standards which will be used in evaluating the research proposals

- Firm or estimated time schedules including dates for: award of contract, commencement of performance, submission of progress reports, quarterly meetings and date of completion
- A statement that payments will be based on identified deliverables, products and/or documented milestones
- A resume from each person who will exercise a major administrative role or major policy or research role on behalf of the research contractor

4.4 Sole Source Method

Contracts may be awarded without competitive bids or proposals under special circumstances. If all three of the following conditions can be met, a sole source exemption can be granted:

- It has been determined that it would be in the Department's best interest to utilize the sole source method.
- The Department can justify selection of a contractor to perform proposed contract work without utilizing the formal selection process.
- Approval, according to 23 CFR 172 and/or 23 CFR 635, has been granted by the ODOT Legal Division (General Counsel) the Senior Staff and the FHWA.

Regardless of whom the sole source contractor is, documentation of the following must be provided within or along with the memorandum including transmittal letter(s) to the file:

- The prospective contractor's qualifications: this person, group of people or company is uniquely capable of performing the research work, possesses specific knowledge, skills and/or information.
- Selection of the contractor was based on the evaluation and dismissal of other prospective, competitive contractors and civil service.
- Approval of the sole source exemption.

A completed research contract proposal package for sole source selection must be included for appropriate Division approval and shall include the following:

- Research Project Statement
- Contractor Letter/Proposal Cover Sheet
- The research contractor’s proposal
- Principal Investigator(s) Resume
- Literature Search

4.5 Contract Contents

Contracts for research projects or the related master agreements are the responsibility of the Engineering Services Branch and will include general information, equipment, subcontracts, travel, payments, contract amendments and additional contract requirements.

4.5.1 General Information

All contracts must contain the following general information:

- Names of parties involved.
- A brief statement of objective.
- Statement of work to be performed. Generally, the work is described by the contractor's proposal which is attached to and by reference made a part of the contract.
- Description as basis for payment and allowable costs. A list of deliverables with dates of delivery. Payments will be contingent upon the ODOT's' receipt of deliverables/products.
- The source of funds.
- Requirement that research work be completed within a specific time period and that interim and final reports be produced at specific intervals.
- Ownership of research data, publication rights, patent rights, civil rights clauses, disputes clauses, contingent fees, liability, inspection of work, access to records, cost principles, records retention requirements, and equipment inventory record requirements.
- Date of expiration of contract.
- Provision for credit reference disclosure statement and disclaimer clause in reports.
- Any subcontract in excess of $10,000 as a result of this contract shall contain all of the provisions stipulated in this contract.

4.5.2 Specialized Equipment

The purchase or rental of specialized equipment required in the conduct of a research study is an allowable cost under most contracts.

4.5.2.1 Itemized Special Equipment

Items of specialized equipment to be purchased for the study should be itemized in the cost estimate portion of the research proposal and included as direct costs. As noted above, the research proposal, by reference, is made a part of the contract, thereby covering the purchase of such equipment. Some guidelines for the purchase of specialized equipment, in addition to those provided in Section 3.0 are as follows:

The item has a useful life usually of more than two years and a unit purchase price usually of more than $500 (for specific requirements, see applicable research agreement).

The items of equipment included as direct costs have been excluded from the indirect costs.

4.5.2.2 Title To Specialized Equipment

The title to specialized equipment purchased under a contract rests with the Department. At the end of the project, the Department may:

- Have such equipment turned over to the Department with any costs incurred by the contractor for such return being designated as an allowable charge against the contract. If the study is federally participating, the PI will then credit the study with the residual value of the equipment as agreed upon with the appropriate federal agency.

- By mutual agreement with the contractor, and upon approval of the appropriate agency if the study is federally participating, allow the contractor to purchase such equipment at a price equal to its residual value. The residual value would then be credited to the study.

- Authorize continued use of such equipment for another research project the contractor may have with the Department.

4.5.2.3 Inventory Records

In this case, residual values will be established for the equipment. The new study will be charged an amount equal to the residual value and the completed study will be credited with a like amount. When such equipment is no longer needed, it shall be disposed of in accordance with the two paragraphs above.

Inventory records are required to be maintained by the contractor and any subcontractor for all specialized equipment purchased with or built with funds provided under the research agreement. The PI is responsible for ensuring that proper inventory records are maintained.

4.5.2.4 Rental of Specialized Equipment

Specialized equipment may be rented if its rental rates and costs are included in the estimate portion of the research proposal; otherwise, prior approval by the Department is necessary. Engineering Services Branch approval must also be secured if the project is federally participating and the rental cost is more than 20 percent of the total contract amount. To document rental payments for all pieces of rented equipment, the contractor must retain vendor rental invoices. These invoices must indicate the vendor name and address, the equipment rented and the amount paid by the contractor.

4.5.3 Subcontracts

The contractor will be required to perform all work with his own staff, except specialized services or other tasks specifically exempted in the contract. Specialized services are those services not ordinarily furnished by a contractor performing the particular type of research project.

Specialized services and subcontract work are to be identified and itemized in the estimate of cost portion of the research proposal that by reference is made a part of the contract. Approval prior to execution is required of the Engineering Services Branch where subcontracts will provide research data.

After the contract is fully executed, additional subcontracting or additional specialized services must have the written approval of the Engineering Services Branch.

4.5.4 Travel

Travel required by the contractor's personnel for the effective performance of the research will be reimbursed, subject to Department Policies. Travel for the purpose of attending meetings not directly contributory to the research project and for the sole purpose of presenting papers or lectures related to the research project will not be reimbursed. Department approval is required prior to the contractor's travel reimbursement if the travel involved was not described in the approved proposal.

4.5.5 Payments

Progress payments for research under contract will not be made until the receipt of identified deliverables or products. The State retains 10 percent from each progress payment for research contracted with an organization other than those in the public sector. Payment cannot be made for costs incurred by the contractor prior to the stated performance period or after the expiration date of the contract. Where costs are anticipated subsequent to the contract expiration date, the contractor should submit a request for an appropriate time extension (see Section 4.5.7).

The Research Contract Managers will verify and approve all invoices before

submitting them for payment. While RCMs are not required to perform audits before approving invoices, "reasonable judgment" should be used to determine that the work and expenses were accomplished. The RCM should know the technical progress of the contract. Each invoice should match the contract cost proposal and be accompanied by a progress report. If there are any discrepancies between the invoice and the cost proposal or the progress report, the PI should be contacted and details of the discussion documented with a copy going to the Contract Office of the PI.

4.5.6 Contract Amendment

Any alterations or change to the original contract such as additions, subtractions, or by substitution, will require a contract amendment. The amendment will be in writing as agreed to by the contracted parties.

4.5.7 Supplemental Agreements

Time extensions, changes in funds, or changes in the scope of the work require the preparation of a supplemental agreement.

The PI should submit his request to the RCM by the date stipulated in the contract.

The completed research contract agreement should be submitted to the Engineering Services Branch in the same manner as the original research contract proposal.

Upon acceptance of the proposed contract change by the Engineering Services Branch, it will be processed and executed.

4.6 Contract Research Proposal Acceptance

Once the prospective PI has been selected, the RCM should formally transmit acceptance of the contractor's proposal by memorandum to file. The memorandum should include the following information:

- A copy of the Request for Proposal and a list of the names of those parties from whom proposals were solicited.
- One copy of each proposal or reply received and the names of those solicited who did not reply.
- A description of the system or procedure used to obtain the proposals, together with an evaluation of each proposal.
- The identification of the recommended proposal and the basis of the recommendation. FHWA requires that the Department have on file documentation that the PI is qualified professionally and will have properly trained and experienced personnel available to perform the services within the time prescribed.
- The information or data necessary to show compliance with the Department's civil rights implementation plan for minority consultant contractor utilization pursuant to 23 CFR 200 and 49 CFR 21.
- Justification if the proposal accepted is not the lowest priced proposal received.

4.7 Contract Management

4.7.1 Coordination and Surveillance of the Research Contract

For research projects performed under contract, the RCM is responsible for the coordination and surveillance of the PI's work. Coordination means guiding the PI's work towards potential benefit to the Department and consultation with sponsoring Divisions as required. Surveillance means the monitoring of the performance of the research project to assure that it is in accordance with the terms of the contract with respect to level of effort, expenditures, adherence to time schedule, conformance with approved work plan, and timely submittal of required deliverables. The RCM is also responsible for reviewing and approving all of the PI's invoices and supporting progress reports for adequate contract performance.

4.7.2 Equipment Monitoring

In regards to equipment, the RCM is responsible for ensuring the PI and any co-PIs are maintaining adequate inventory records in accordance with the agreement. The record for each piece of major equipment purchased with or built with contract funds should include the following:

- A description of the non expendable equipment including the manufacturer, the serial number and model number (on purchased equipment) and any other identification number.
- Source of the non expendable equipment and the research project number or title.
- Acquisition date and unit cost.
- Location, use and condition of the non expendable equipment and the date the information was reported.
- Final disposition data including date of disposal and sales price or the method used to determine the salvage value.

4.7.3 Contract Performance Evaluation

Upon completion of the contract, the following will be completed:

At the RCM's discretion, require the PI to hold a final meeting with Department personnel during which findings, conclusions, and recommendations will be presented.

Take the steps necessary to implement the PI's recommendations and findings as appropriate.

4.8 Research Work for Others

4.8.1 General Information

In deciding whether or not to respond positively to the RFP, the RCM must consider:

- The ODOT general policy regarding the performance of work for others.
- Availability of the necessary expertise, staff, equipment and building space without reducing the effectiveness in the performance of its primary duties.
- The anticipated benefit to ODOT, if any, for performing the requested research.

4.8.2 Work Plan Development and Administration

As appropriate, the responsible Division may:

4.8.2.1 Decline to perform the research and advise the requesting agency or division (no such response is necessary in the case of NCHRP RFP's); or

4.8.2.2 Propose to conduct the research by adhering to the following procedure:

- The PI is responsible for preparing the proposal (either solicited or unsolicited) and submitting it for approval by the appropriate office.

4.8.2.3 Summarize the proposed research work plan to be approved by the Division Engineer. The work plan should consider the following:

- The nature of work to be undertaken, the research objective and justification from the ODOT's perspective.
- The nature and extent of any direct involvement by other organizations.
- Personnel requirements to conduct the project for each Federal fiscal year of the projected life of the proposed research project.
- If the Engineering Services Branch performs the research work under the terms of the proposed work plan, will it cause a delay in any other

activities? If so, what activities would be adversely affected and by how much?

- An estimate of Cost/Benefits for the research. This estimate should include all the savings and benefits brought about as a direct result of the research. Any underlying assumptions and methods should be documented.
- Details of total cost by Federal fiscal year.

4.8.2.4 The Division Engineer will consider the project if he or she approves the research proposal. The PI will submit the approved proposal to the grantor who will prepare the contract documents.

4.8.2.5 Upon receipt of the contract documents from the grantor, the Principal Investigator will review them.

- The Engineering Services Branch will initiate the processing of the contract documents and will return them to the grantor after they have been signed on behalf of the State.
- Any subsequent changes, which revise the project, will be handled in the same manner as state funded projects.
- Copies of all correspondence and reports regarding contract research for others should be retained by the Engineering Services Branch.

SECTION 5 DOCUMENTATION AND PRESENTATION OF RESEARCH FINDINGS

5.1 Research Reports, Documentation and Presentation

5.2 Guidelines for Effective Reports and Presentations
5.2.1 Define Objective for Targeted Audience
5.2.2 Select the Mode
5.2.3 Quality of Illustrations
5.2.4 Report Organization

5.3 Research Reports
5.3.1 The Interim Report
5.3.2 The Final Report

5.4 Administering the Interim and Final Report: Approval, Publication, and Distribution
5.4.1 Approval Process for Interim and Final Reports
5.4.2 Publication and Reproduction of Interim and Final Reports
5.4.3 Report Distribution

5.5 The Annual Accomplishment Report and the Estimate of Research Project Cost and Savings
5.5.1 Definition and Purpose
5.5.2 Estimate of Research Project Cost and Savings Report

5.6 The Research Project Termination Report
5.6.1 General Information
5.6.2 How to Prepare a Termination Report

5.7 Public Presentation of Research Results
5.7.1 General Information
5.7.2 FHWA Participating Research
5.7.3 Research Without Federal Participation

5.1 Research Reports, Documentation and Presentation

Research documentation is the primary communication link between the researchers and the reviewers. Documentation should be used as a tool to keep all levels of managers and reviewers informed of project progress, findings, problems, schedules, and expenditures. A well documented project develops good rapport between the researcher and reviewers and is an asset to continuity. It also serves as the mechanism for the implementation of research findings into operational practices, policies or techniques.

Usually an effective presentation depends upon careful planning from the inception of the project. If special photography or video are required to convey the findings to the users, the costs and time needed may be substantial and should be included in either the research project work plan or as a separate implementation plan (see Section 6, Implementation and Technology Transfer).

5.2 Guidelines for Effective Presentations

5.2.1 Define Objective for Targeted Audience

If the objective of the research project is well defined, the selection of the mode for presenting the findings can be relatively easy. For example, if the objective is to develop an improved test method to achieve statewide uniformity, a training class presented in each Division might be an effective mode of presentation. On the other hand, if the objective is to demonstrate the effectiveness of a vehicle barrier system, a slow motion video of a crash test for presentation to Traffic Engineers to view might be appropriate.

5.2.2 Select the Method

The following is a list of the various methods available to present research findings:

Final Report

Interim Report

Oral Presentation

Demonstration / Guided Tours

Bus tours, mobile labs, products & equipment

Training Class

Audio - Visual Aids

Static photos and diagrams (film or digital)

Laptop & Projector (electronic presentation, etc.)

Video / Audio (mpeg, avi, DVD, CD, etc.)

5.2.3 Quality of Illustrations

The quality of illustrations deserves special attention. Researchers should use the ODOT Office Services for processing of film, graphic arts, and publications, and the Training Division's Video Production Branch for DVD recording.

A series of well conceived illustrations can often convey your message with a minimum of supplementary explanation. Such illustrations can also greatly facilitate preparation of the final research report.

5.3 Types and Descriptions of Research Reports

5.3.1 Report Organization

The first few pages of an interim or final report are normally intended as an introduction to the report, its contents, and an overview of the project. All supporting descriptions and data are delegated to the body of the report and its appendices. Generally, there are two types of report documentation: interim and final reports. Detailed instructions on how to prepare, publish and distribute these reports are provided on the following pages and as described in the ODOT Research Documentation Guidelines.

5.4 How to Prepare the Research Progress Report

5.4.1 How to Prepare Interim Reports

An interim report documents a chronological or major phase of a research project. An interim report should be prepared any time that a research project develops significant research findings that might (l) be implemented into the Department's operating procedures prior to completion of the research project or (2) provide the basis for additional research or complete a major phase of a project.

Interim reports should provide a concise summary that is a clear statement of the subject matter of the report and of any significant findings and conclusions with their potential application and benefits. Include a recommended course of action indicated by the research conclusions.

Interim reports may be supplemented by photographs, or other communication technique.

Requirements for research report preparation are comparable for both interim and final reports. Please refer to the latest approved ODOT Research Documentation Manual for these standard reporting requirements.

5.4.2 The Final Report

The final report should document the data gathered, the analysis performed, the results achieved, the significance of the results to the ODOT's operations and recommendations on the means by which the research results may be implemented.

The final report documents the completed research project. It provides the necessary link between the knowledge discovered and the implementation of this

knowledge. For projects of a long-range nature, the final report places the findings in proper perspective with other knowledge so that future payoff is possible. A final research report should demonstrate whether the investigator actually accomplished what was planned in the research proposal, or what proposal objectives were not met along with a description of the problems encountered which prevented meeting them. The final report also provides an implementation statement.

Generally, the final tasks of conducting a research project are preparing the draft final report and publishing and distributing the final report. Normally, the final report is in the form of a formal written report. Electronic files, generated from the original applications, will accompany the written report. However, the final report may be supplemented by photographs, or other communication techniques.

The acceptability of the final report is judged on three criteria: (1) fulfillment of research objectives; (2) adequacy of documentation; (3) clarity of presentation. The final report must fully document the research work which was done. It should include convincing evidence to back up any conclusions and recommendations. Ideally, the user will have no lingering questions about the validity of the findings after reading the report. Thus, implementation can be done quickly and enthusiastically. There may be a short implementation section in the report which states clearly and concisely how the findings will be used.

The researcher should remember that even if a new device or process being studied is a failure, the research project is "successful". Therefore, it is equally important to document the work completely, state clearly in the report that the findings were not consistent with the hypothesis, and disseminate the findings. The potential users need to understand why the ideas were rejected. When the report is distributed to the research and user community, the unsuccessful ideas

may not get repeated. All of this information contributes in the effort to perform the best work possible in the ODOT.

Whether research findings were as anticipated or not, the projects may wind down with some questions unresolved or new questions generated. The final report should list any needed future research.

All reports submitted to the Transportation Research Board (TRB) must follow the guidelines contained in the annual TRB booklet titled "Information for Authors and Speakers".

Each final report written by or for the Department should contain the elements listed below and in this order:

Cover Page
Title Page
Technical Report Documentation Page, (Form # DOT-F-1700.7, Block Descriptions)
Table of Contents
Illustrations and Tables
Disclosure Section
Disclaimer
Foreword, Preface, or Acknowledgments
Introduction
Overview of Report Contents
Problem
Background and Literature Search
Objectives and Scope
Body of Report/Technical Discussion
Test Conditions

Test Facility

Test Equipment

Instrumentation

Test Article or Material or Site

Test Methods and Procedures

Test Parameters

Test Results (Factual Only)

Evaluation (Results analyzed, evaluated, compared against standards and judgments made)

Conclusions and Recommendations

Implementation

Appendices

Details on Test Equipment, Methods, etc.

Raw Test Data

Detailed Drawings, Specifications

Side Issues

References, Literature Cited, or Bibliography

Cover - Examples are available upon request from the Engineering Services Branch.

Title Page - Examples are available upon request from the Engineering Services Branch.

TECHNICAL REPORT DOCUMENTATION PAGE

1. REPORT NO. FHWA/OK 99(x)	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.
4. TITLE AND SUBTITLE Cathodic Protection - Systems Restoration and Maintenance		5. REPORT DATE March 1999 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Kimberly L. Gordon		8. PERFORMING ORGANIZATION REPORT
9. PERFORMING ORGANIZATION NAME AND ADDRESS Oklahoma Department of Transportation Office of Research 200 N.E. 21st Street, Room 2A2 Oklahoma City, OK 73105		10. WORK UNIT NO. 11. CONTRACT OR GRANT NO. Item 2417
12. SPONSORING AGENCY NAME AND ADDRESS Oklahoma Department of Transportation Office of Research 200 N.E. 21st Street, Room 2A2 Oklahoma City, OK 73105		13. TYPE OF REPORT AND PERIOD COVERED Final Report March 1994 - May 1998 14. SPONSORING AGENCY CODE
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

Chloride intrusion causes deterioration of bridge decks. Agencies have used several methods to prevent the intrusion of chloride ions, but only one proven and recognized method, cathodic protection (CP), exists to control corrosion in existing salt-contaminated reinforced concrete bridge decks. In 1985, the Bridge Division of the Oklahoma Department of Transportation (ODOT) used CP on the salt-contaminated Bird Creek and Bird Creek Overflow bridge decks in Tulsa, Oklahoma. Both bridges are found on SH 266 approximately 2.90 km (1.8 mi) east of US 169.

After several rectifier unit failures and problems over the life of the CP system, the rectifier unit needed to be replaced. The primary objective of this project was restoration of the CP systems to full operational status by replacing the existing TIE rectifier with a saturable core reactor rectifier unit. The project also involved verifying that the systems were operational and functioning properly, rewiring the new systems to accommodate fewer zones, performing deck surveys to gauge the condition of the decks and making minor repairs as needed.

After more than ten years in service, several system failures and months out of service, both decks show corrosion potential readings higher than 350 millivolts on less than 3 percent of the deck. In addition, less than 1 percent of both decks have delaminations. Both bridge decks are in good condition.

While there are many practical applications for cathodic protection in Oklahoma, currently, there are no plans to use this particular type of cathodic protection system on additional bridge decks. At this time, Division VIII personnel are monitoring and maintaining both CP systems with support from the Office of Research. Monitoring consists of routine maintenance and minor troubleshooting when necessary.

17. KEY WORDS	18. DISTRIBUTION STATEMENT No restrictions. This publication is available from The Office of Research, Oklahoma DOT.		
19. SECURITY CLASSIF. (OF THIS REPORT) Unclassified	20. SECURITY CLASSIF. (OF THIS PAGE) Unclassified	21. NO. OF PAGES 61	22. PRICE

Figure 3 Technical Report Documentation Page

The following paragraphs describe each report element.

Technical Report Documentation Page - Form DOT-F-1700.7 - the first right hand page after the cover for all published research reports (See Figure 3).

Numbers in boxes 1, 8 and 11 are provided to the author by the Engineering Services Branch. Instructions to complete the form are as follows:

Block 1 Report Number
This number is the same as the one appearing on the cover of the report. For reports on in-house research, the number is derived in the following manner:

Example: FHWA/OK 07(01)

FHWA: Abbreviation of federal agency (in this example, Federal Highway Administration) participating in the research. If the research project does not include federal participation, start the report number with OK and continue as indicated below. The following paragraphs describe each report element.

OK: State of Oklahoma

07: The calendar year in which the report was submitted to the appropriate project manager for approval.

(01): The serial number denoting the sequential order in which the report was submitted for approval during the calendar year. For reports compiled on research performed under outside contract, the report number will be furnished by the Engineering Services Branch. Do not use a locally created report number.

Block 2 Government Accession Number
leave blank.

Block 3 Recipient's Catalog Number
leave blank.

Block 4 Title and Subtitle

The title should be the same as the one appearing on the cover of the report. Capitalize all letters of the title. When a report is prepared in more than one volume, this block should show the main title plus the volume number and the subtitle for the volume being reported.

Block 5 Report Date

This date should agree with the one appearing on the cover and should normally be the month and the year of the submittal of the report to the appropriate project manager for approval.

Block 6 Performing Organization Code

leave blank.

Block 7 Author(s)

List name(s) and author's affiliation if it differs from the performing organization.

Block 8 Performing Organization Report Number

leave blank.

Block 9 Performing Organization Name and Address

Give name, city, state and zip code. List no more than two levels of the organization.

For in-house reports, the office responsible for the research project should be listed, such as:

Planning & Research Division
Oklahoma Department of Transportation
200 NE 21st Street, Rm. 3-A7
Oklahoma City, Oklahoma 73105-3204

Block 10 Work Unit Number
leave blank.

Block 11 Contract or Grant Number
Show the project identification number. If this space is left blank, the report will not be accepted by the National Technical Information Service (NTIS).

Block 12 Sponsoring Agency Name and Address
This would normally be shown as:

Oklahoma Department of Transportation
200 NE 21st Street
Oklahoma City, Oklahoma 73105-3204

However, if the research project for which the report has been written is being conducted under direct contract for others, the name of the applicable, sponsoring organization and its address should be shown.

Block 13 Type of Report and Period Covered
Indicate either interim or final report. For interim reports, indicate the time period covered if pertinent.

Block 14 Sponsoring Agency Code
leave blank.

Block 15 Supplementary Notes
If appropriate, indicate that the study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration. In addition, insert

the study title if it is different from the report title. If the report title is a multivolume and is identified as "Vol. 2" or "Vol. 3", note whether the preceding volume(s) has (or have) been published and, if so, indicate the source.

Block 16 Abstract

Include a brief (not to exceed 200 words) factual summary of the most significant information contained in the report. This should include advice on how the results of the research can be used or applied, when applicable.

Guidelines for Writing an Abstract - The author of the abstract should have a set of questions in mind while preparing the abstract. Three of the questions are primary because the answers will generally bring out the major concepts of the report.

Primary Questions

(a) What relations among variables are discussed?

Nearly all research is devoted to the study of relations among variables.

The relations will often be expressed as:

"the effect of" (independent variables) "on" (dependent variables)

e.g., the effect of temperature and loading rate on pavement deflection

or as:

"the correlation of" (correlated variables) e.g., the correlation of profile X with profile y.

(b) What processes are discussed?

The answers to this question will be the major concept in a number of documents. The process name may be analysis, evaluation, construction, development, weathering, simulation and will involve inputs and outputs.

(c) What other subjects are discussed?

A report may contain major subjects that are neither relations nor processes in the context (e.g., modal preference, limitations, origin and destination) For each relation, process, or other subject that is found in answer to the primary questions, three secondary questions are to be asked.

Secondary Questions for Each Answer to a Primary Question

(a) What are the results or conclusions reached in the study, i.e., for the relations, processes or other subjects?
Answers to these questions indicate what was learned from the study or
concluded from the discussion often in terms of applications and uses introduced by the words "for," "to be used for," "to be applied to".
What scope and limitations are given for the study, i.e., for any relation, process or other subject?
Answers to these questions will often be the objects of prepositions And include time or space location (e.g., at night, in Oklahoma), Climate (e.g., during frost periods), ambient conditions (e.g., at high humidity), hosts for variables (e.g., deflection of asphalt concrete, profile X as measured by the CHLOE Profilometer), and other scope definers (e.g., stock piling of aggregates in bins, weight limitations for trucks).

(b) What scope and limitations are given for the study, i.e., for any relation, process or other subject?
Answers to these questions will often be the objects of prepositions And include time or space location (e.g., at night, in Oklahoma), Climate (e.g., during frost periods), ambient conditions (e.g., at high humidity), hosts for variables (e.g., deflection of asphalt concrete, profile X as measured by the CHLOE Profilometer), and other scope definers (e.g., stock piling of aggregates in bins, weight limitations for

trucks).

(c) What methods are employed in the study?

Answers will include devices, procedures and other means of accomplishment often preceded by words such as, "by means of" (e.g., shadow vehicle, regression analysis, computer modeling, freeze-thaw apparatus, home interviews).

Thus, to analyze the Content of Report: Determine all answers to questions 1, 2, and 3. For each of these answers, determine answers for a, b, and c.

To Abstract Contents of Report: Arrange answers with regard to importance, compactness, grammar and readability. Omit general discussion and insignificant details.

Block 17 Key Words

Select terms or short phrases that identify the principal subject in the report and words that are sufficiently specific and precise to be used as index entries for cataloging. The authorized term index in the Transportation Research Thesaurus (TRT) may be helpful in this regard.

Block 18 Distribution Statement

If the report is on a federally participating project, or is being conducted under a direct contract with a federal agency, state:

"No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161."

For non participating studies, use the above statement if the report will be available to NTIS. Otherwise, leave blank.

Block 19 Security Classification (of this report)

Insert the word, "Unclassified."

Block 20 Security Classification (of this page)
Insert the word, "Unclassified."

Block 21 Number of Pages
Insert the total number of pages including title page and other front matter pages.

Block 22 Price
Leave blank.

Table of Contents - an organized listing of important report sections in outline form, with beginning, but not inclusive, page numbers. Outline numberings or letterings, if any, are carried only before main items: Column heads (as "Chapter" or "Section" on the left, and "Page" on the right) and dot leaders may or may not be used. At the beginning of the outline, a list of "Appendixes," etc., may appear, with the heading centered but no dividing line above it.

Illustrations and Tables – A list of main titles, all illustrations, except tables are called "Figures," and may include drawings, diagrams, maps, charts, or graphs and photographs. Column heads "Figure" or "Table" on the left and "Page" are usually used. "Tables or Illustrations" may appear at the foot of the "Contents" or on a separate page in the front or end matter.

If there are many illustrations, number consecutively as they are referred to in the text as "Figure 1" (usually "Fig. 1") below the illustration and preceding or above its title in initial caps.

The contractor is free to copyright material, including interim reports and final reports, developed under the contract with the provision that the Department and the 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.

Disclaimer Statement - Reports must include a disclaimer statement in or before the introduction. For research reports involving FHWA participation, the disclaimer statement shall say verbatim:

"The contents of this report 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 official views or policies of the OKLAHOMA DEPARTMENT OF TRANSPORTATION, the STATE OF OKLAHOMA or the FEDERAL HIGHWAY ADMINISTRATION. This report does not constitute a standard, specification, or regulation."

Foreword, Preface and Acknowledgments - each should be placed on a separate page, or the last two may be combined and usually replaces a letter of transmittal. These items are presented as part of the front matter (Financial support is acknowledged as "This work was supported by . . .")

Introduction - First, introduce the report by clearly identifying the exact subject being considered and how the final report is organized. Next, identify the problem that lead to the research project and how it relates to prior research and to other current research. Then indicate the research project's objectives, as shown in the research proposal and any later supplements, and briefly summarize how the research findings respond to each specific research objective. Lastly, relate the significance of the research findings to the overall operations of the Department. Keep the introduction brief and concise. This

section should not contain details of any state-of-the-art survey, test procedure, or mathematical analysis.

Body - In general, the body of the report should contain a statement of the research procedure(s) in sufficient detail to permit the research to be replicated. Also include a description of the data recorded, a detailed statement of how the data was analyzed, and a summary of the analyses. Any data, photos or output files may be placed in an appendix or in a separate volume. Any problems encountered during the progress of the research should be described in the body of the report. Also include a discussion of the meaning of the relationships observed or derived from the research.

Conclusions and Recommendations - Provide detailed statements of those relationships that were found to exist. Also provide a description of the tests used for significance and the degree of confidence one may have in the stated findings.

Implementation - This statement should point out any immediate practical application of the research findings. The following should be considered:
the application of new procedures
new or revised specifications, standards or designs
the use of new materials
the development of new equipment
the rejection of a proposed new procedure
a determination that no problem exists
other positive benefits
no conclusions, but suggest other research needed, and why

Describe any potential benefits to be derived from implementing the research findings. Examples of potential benefits could be in terms of savings in time,

money, lives, increased safety, better service, improved aesthetics, improved environment, increased energy efficiency, and enhanced capability of solving transportation problems that may become available to the engineering, planning or related professions, and other user and nonuser benefits. When savings can be expressed in terms of dollar amounts, estimate the first year savings, and the subsequent average annual savings anticipated upon application of the research results.

If the findings are positive, but not suitable for immediate application, indicate the extent of additional work needed to produce results suitable for implementation; e.g., testing for verification, combining, correlating and interpreting additional research, etc.

If significant implementation is proposed that could be profitably shared or an implementation plan will be prepared, such information should be included. For more information, see Section 6, Implementation and Technology Transfer.

Appendices - The supplementary material titled and identified A, B, C; or 1, 2, 3; or I, II, III if Roman numerals have not been used for Chapters. Appendices include information such as supporting data, substantiation of evidence, documentation, charts, photographs, and other details referred to in the text (usually by footnotes) not appropriate for the body of the report.

References, Literature Cited, or Bibliography a list of books or other authoritative writings that have been cited ("called out") in the text as "stated by Lee (1968, p.l2)," or "(Ref. 6)," or just "(3)," and which have not been carried in footnotes or listed at the end of each chapter. They may be arranged here alphabetically, or numerically to correspond to their citation numbers in the text.

A bibliography is a listing of pertinent or consulted literature, usually not cited in the report text. The list may be divided according to subject or type of writing.

5.5 Administering the Interim and Final Report: Approval, Publication, and Distribution

5.5.1 Approval Process for Interim and Final Reports

Prior to publication, the approval of draft research reports follows standard Department procedures. All final reports including films, videotapes, or, slide presentations, as well as interim reports, must be approved and transmitted by the Engineering Services Branch. The transmittal memorandum should summarize:

The conclusions of the research.

The impact on Department operations.

An estimate of Cost/Benefits for the research. This estimate should include all the savings and benefits brought about as a direct result of the research. See Section 5.6.2 for details on how to prepare the "Estimate of Research Project Cost and Savings Report".

How the findings should be disseminated and implemented by the Department. Provide recommended procedures for implementation and expected benefits.

If implementation is not practical or possible, the transmittal memorandum should indicate any other value the research may have provided within the context of Departmental operations such as: the findings verified existing policies, the findings provided a basis for needed additional research, or it’s not practical or possible to implement the findings.

A completed Annual Accomplishment Report should accompany the draft final report. A copy of the transmittal memorandum together with draft copies of the report are to be forwarded to the Engineering Services Branch. If the research project involved federal participation, the transmittal memorandum should state the proposed disposition of non expendable equipment charged to that project

(see Section 3.4). As appropriate, indicate in the memorandum that research project funds were not used to purchase any non expendable equipment or that none were assigned to the project.

5.5.2 Publication and Reproduction of Interim and Final Reports

A report is ready to be reproduced in its published version after: it has been approved by the Engineering Services Branch.

Any comments from FHWA or others have been acted on for possible incorporation in the report.

5.5.2.1 Reports from Contractors of Non-Profit Organizations

Reports from contractors who are nonprofit organizations may be published if the ODOT fails to complete its review within 4 months from the date of submission. Reports from such contractors may then be published without Department concurrence. However, the Department does have the right to publish a technical addendum.

5.5.2.2 In-House Research Reports

For in-house research reports, the number of copies to be reproduced is the responsibility of the project manager. The following number of copies must be delivered to the Engineering Services Branch:

4 (four) copies of draft interim and draft final reports.

125 (one hundred twenty-five) copies of published final reports (including final interim reports).

4 (four) copies of published final reports in accessible electronic format.

If the project manager determines that more copies of a research report will be necessary, a formal request with justification should be submitted to the Engineering Services Branch prior to such reproduction.

This justification should indicate the proposed distribution of the report, how the Transportation Program (or other program as appropriate) will benefit from such a distribution, and the additional cost for reproduction over the first printing.

5.5.2.3 Outside Research Reports

For outside research, the applicable agreement will state the number of copies of the published report to be furnished to the Department.

5.5.3 Report Distribution

The Engineering Services Branch is responsible for the formal distribution of reports. It is also responsible for submitting abstracts of ongoing research to the Research In Progress (RIP) Database and completed reports to the Transportation Research Board (TRB) Library.

5.6 The Annual Report, and the Cost Estimate of Research Projects

5.6.1 Definition and Purpose

The Annual Report, as compiled by the Engineering Services Branch in July of each year, includes the report of accomplishments and savings on each research project. This report is primarily derived from the "Estimate of Cost and Savings Reports" (see Section 5.6.2) received for individual research projects.

5.6.2 Estimate of Research Project Cost and Savings Report Analysis

5.6.2.1 Required Report Years

The years encompass federal fiscal years. The project manager/contract manager must submit a Cost Analysis to the Engineering Services Branch by October 30 of the reported fiscal year. The following is a summary of required report years for the Cost Analysis:

Submit the first annual report for the first federal fiscal year that includes implementation of research findings/benefits (even if the research project itself is still continuing), or at project completion.

Submit the Estimate of Research Cost Analysis annually for at least four consecutive federal fiscal years.

For research projects where research benefits are implemented while the research project is continuing, submit an annual report for the first year of implementation and consecutively through, and including, three fiscal years past the completion year of the research project.

For research projects where research benefits are implemented in the completion year of the research project, submit an annual Cost Analysis with the final report consecutively through, and including, three fiscal years past the completion year of the research project.

For research projects where research benefits are implemented after the completion year of the research project, submit an annual Cost Analysis with the final report consecutively through, and including, three fiscal years past the completion year of the research project. If implementation will occur after the reporting period, predict when implementation is likely to occur and project the four year savings, if possible.

The intent of the Estimate of Research Cost Analysis is to show (a) the total cost of the research project, (b) a brief summary of the research objectives and the findings, (c) how the findings were used, and (d) all the savings and benefits brought about as a direct result of the research over the four year reporting period.

5.6.2.2 How to Prepare the Estimate of Research Project Cost and Savings Report Analysis

The following should be included in a Cost Analysis:

Name of Project: Actual project title

Project Item Number: List the four digit item number that was assigned by the Engineering Services Branch.

Findings: Briefly describe the findings or conclusions.

How Have Research Findings Been Used: List applications of research findings. The following types of questions should be considered.

Did findings result in a benefit from:
the application of new procedures?
the issuance of new standards, or designs?

the use of new materials?
the development of new equipment?
a proposed new procedure to be rejected?
a determination that no problem existed?
no conclusions, but suggest other research needed?
other positive benefits?

Indicate the Method of Implementation: If the findings were not usable, describe why.

Reporting Period: Identify the fiscal year covered by the report.

Gross Project Expenditure: Show the actual gross project expenditures from inception to completion on completed projects or expenditures from inception to the date of the savings reporting period on continuing projects. Gross expenditures will include costs incurred under agreements with consultants and universities, and any assistance charged by other ODOT Divisions.

Estimate of Savings: Provide an estimate of actual dollar or time savings resulting from the application of the project findings, if possible.

Describe How Savings Were Derived: In the description, indicate the estimating procedure used. Show estimated unit cost multiplied by the number of units, rather than giving a blanket statement of total dollars without showing the estimating procedure used, if possible.

5.7 The Research Project Termination Report

5.7.1 General Information

If the researcher finds during the process of conducting a research project that further research would either be unproductive or unwarranted, the project manager is to request termination of the project by submitting one copy of a Termination Report to the Engineering Services Branch.

5.7.2 How to Prepare the Termination Report

To prepare a Termination Report, follow the outline below.

Title - The title should indicate that it is a Termination Report and should identify the project.

Objectives - List the objectives of the research project from the proposal.

Objectives Achieved - List the objectives achieved prior to termination of the project and describe how they were met.

Objectives Unattained - List the objectives not achieved at the time the project was terminated and indicate why.

Document What was Accomplished - Later if other researchers wish to conduct research in the same subject area, they will know what has already been accomplished.

Reason for Termination - Indicate the reason(s) for terminating the project.

Expenditures - Specify the dollar amounts expended under the following four categories: personnel, (including consultants), materials, equipment, and travel.

Non Expendable Equipment - Provide the following:

Indicate if there was no non expendable equipment purchased or assigned to the project.

If non expendable equipment was acquired, identify the equipment, when it was purchased or assigned, and what the purchase price or value of the equipment when it was assigned to the project.

- What the current depreciated value of the equipment is and how that value was determined.
- Indicate when authority was granted to purchase non expendable equipment

5.8 Public Presentation of Research Results

5.8.1 General Information

Discussions of a research project are permitted with small groups or as part of lectures to employees or students. However, these discussions are limited to the status of the research project, and the group should be informed that project results are not yet final. Papers, articles or press releases that include descriptions of the goals or objectives of a study are permitted but should not disclose data or results, unless prior approval is granted by the Engineering Services Branch.

There is no restriction on disclosing research findings or results after the report covering these findings has been approved for publication. Once published, such reports are in the public domain.

5.8.2 FHWA Participating Research

Dissemination of significant technical findings from a research project is encouraged. Two (2) copies of any such paper, article or press release are to be formally submitted to the Engineering Services Branch for approval before release for publication or to the media. All such papers, articles or press releases should contain a statement equivalent to the following:

"This paper presents findings from a study sponsored jointly by the Oklahoma Department of Transportation and the Federal Highway Administration and at the time of publication was not reviewed by the sponsors for policy implications."

Sometimes the scheduled time for preparation of a paper containing previously undisclosed findings does not permit time for formal review and acceptance. Under these circumstances, an abstract and notification of intent to present the paper should be submitted to the Engineering Services Branch for presentation approval. To protect the interests of the sponsoring agencies, such presentations should contain a statement equivalent to the one provided above. Draft copies of these papers should be submitted to the Engineering Services Branch for review and acceptance as soon as completed.

For dissemination of previously undisclosed findings from FHWA participating research projects conducted under outside contract for the ODOT, refer to the publication clause of the applicable agreement.

5.8.3 Research without Federal Participation

Presentation of previously undisclosed technical findings developed from in-house research projects without federal participation to groups or persons outside the Department must be approved in advance by the Planning & Research Staff and the Engineering Services Branch. Also, a credit reference and a disclaimer clause should be included.

For dissemination of previously undisclosed findings from a research project without federal participation conducted under outside contract for the ODOT, refer to the publication clause of the applicable agreement.

SECTION 6 IMPLEMENTATION AND TECHNOLOGY TRANSFER

6.1 Implementation of Research Findings

6.2 Implementation Policy

6.3 Implementation Responsibility

6.3.1 Project Manager

6.3.2 Project Panel

6.3.3 Implementation Engineer

6.3.4 Contract Manager

6.4 Implementation Methods

6.4.1 Spreading the Word

6.4.2 Implementing Research Findings

6.4.3 How to Prepare Implementation Plans

6.4.4 Follow-up and Reporting

6.4.5 Implementation Effectiveness

6.5 Technology Transfer (T2)

6.5.1 General Information

6.5.2 Technology Transfer Coordinator

6.1 Implementation of Research Findings

Implementation is a crucial stage in the research process. Implementation is the incorporation of the results into the every day practices of the organization. No matter how derived the research is of little importance if it is not implemented.

6.2 Implementation Policy

It is the policy of the Department to incorporate valid and appropriate research findings into the Department's operations as reasonably possible. Implementation may include a new or revised procedure, standard, design, specification, test method, accessible computer program, or manual change.

6.3 Implementation Responsibility

6.3.1 Principal Investigator

It is the responsibility of the principal investigator on a research project to present research findings in a usable form and, where appropriate, to make recommendations on how these findings may be implemented.

Contact with other state departments of transportation may be helpful to learn about their experiences with similar research projects and implementation of the findings. The principal investigator must also work with the Planning & Research Division to develop the most suitable mechanism for incorporating the changes into the Department. This may include an accessible brochure, an accessible presentation, an accessible training class or an accessible user's manual.

6.3.2 Project Panel

Each research project has a research advisory council representing the functional areas most affected by and concerned with the research topic. The research advisory council is kept informed of the progress of the study and preliminary results throughout the course of the study. The research advisory council is therefore uniquely qualified to offer suggestions and support for the implementation process. Near the end of the study the research contract manager will meet with the research advisory council and Planning & Research Division Engineer to determine the implementation potential of the project and decide on the best methods to achieve implementation.

6.3.3 Planning & Research Division Engineer

The role of the Planning & Research Division Engineer is to facilitate, coordinate, and monitor the implementation process. Guidelines for implementation planning are presented by the Planning & Research Division Engineer to the research contract manager and the research advisory council to aid in the development of the Implementation Plan.

The Planning & Research Division Engineer is responsible for monitoring the status of implementation efforts on an annual basis and reporting the findings in a Research Implementation Status Report. Three years after completion of a research project the Planning & Research Division Engineer submits the Research Implementation Final Report which documents the level of implementation achieved, the costs of the research project and implementation efforts, and the benefits realized from implementation.

6.3.4 Project Manager

The Project Manager is responsible for overseeing a given research project also bears responsibility for evaluating completed research and placing it in proper context with operations. They are usually qualified to recommend any methods or approaches to use to achieve incorporation of the findings into Departmental operations.

All research final reports including all supporting files as discussed in Section 5 are to be approved by the Planning & Research Division. A transmittal memorandum should state what was found in the study, what the findings mean to the operations of the Department, how the findings should be implemented by the Department or other organizations, and give recommended procedures for implementation and expected benefits.

In addition, an "Estimate of Research Project Cost and Savings" must be attached to the transmittal to the Planning & Research Division, see Section 5.6 for more information.

6.4 Implementation Methods

6.4.1 Notification

Although the final report documents the entire project in detail, it should not represent the final effort of the research. Often it is not appropriate for promoting any required change of methods, policies or operational procedures. For complete implementation, managers and supervisors must support the project recommendations. Maintenance and construction workers may need training in new procedures. See Section 5 - "Documentation and Presentation of Research Findings" for a variety of methods to orient potential users about the research findings.

The researcher is often the best qualified source for preparing a training class, slide presentation, user's manual, or executive report. The researcher is most familiar with the research and the background, has built up momentum on the project, and usually has a personal interest in seeing the hard work put to good use. Thus, the researcher should include these activities in the research proposal during the planning and preparation process or as a separate effort later, after completion of the actual research, as an Implementation Plan. The researcher should confer with the research advisory council about effective modes of presentation, coordinate with the Planning & Research Division Engineer, and then promote the use of any recommended aids in the Implementation Plan. This should be completed as soon as possible in order to expedite implementation.

6.4.2 Implementing Research Findings

One of the key means of implementing research findings is through the incorporation of new or revised standards into the ODOT's day to day operations. These include the ODOT's specifications, plans, test methods, and manuals. A draft of these new standards should be included in the final report. In some cases, the new standard may be adopted before the final report is published.

Then the approved standard should be included in the report and clearly labeled as such. Actual incorporation of the new material may still require an Implementation Plan, see Section 6.4.3.

Whenever new standards are adopted the researcher should request the opportunity to review any later changes made in the proposed standards. This is to ensure that the standards prepared have interpreted the research findings correctly and not introduced any new problems.

6.4.3 How to Prepare Implementation Plans

The research contract manager should work with the research advisory council and the Implementation Engineer or Sponsoring Division to develop Implementation Plans for research projects completed by or for the Department which are considered to have potential for statewide or nationwide implementation.

The content and purpose of an Implementation Plan is to provide the potential user with documentation of the research project and enable them to become sufficiently familiar with and understand the research findings for implementation. The Plan may result in a pamphlet, video, slide presentation, users manual, applications brochure, training class or any combination of these formats.

The Implementation Plan is considered to be an effort within the research project. Each plan should provide a brief statement of the research to be implemented, the scope of implementation, the description of the techniques to be used, personnel to be used, breakdown of cost and the approximate time duration of the effort. Funding for this type of activity may come from the research project budget. At the conclusion of each project, an Implementation Plan outlining the individual effort and results should also be prepared and submitted together with a copy of the project final report to the Planning & Research Division.

An Implementation Plan should include sufficient information about the research such that a prospective user can incorporate the new concept into their operations. It must be presented in a clear concise manner. It should provide a brief synopsis of the research problem and objectives, the nature and significance of the accomplishments, and an explanation why their adoption and use represents an improvement over existing practices. Also, an indication of what changes are called for in new or modified equipment or methods, materials, quality control techniques, or procedures is required.

Additional information may include a contact person, quantitative and qualitative benefits, design criteria, new or changed procedures or practices, specifications, and construction procedures or practices.

6.4.4 Follow-up and Reporting

The implementation efforts are monitored for three years after completion of each research project and documented in annual Research Implementation Status Reports. The Research Implementation Final Report reflects the accomplishments of the implementation efforts and includes a benefit/cost analysis.

6.4.5 Implementation Effectiveness

The research implementation management procedures are evaluated annually by comparing project implementation goals with accomplishments. This evaluation is included within the Planning and Research Annual Report.

6.5 Technology Transfer (T2)

6.5.1 General Information

Technology Transfer normally refers to the process by which existing research knowledge of others (outside of ODOT) is transferred operationally by the Department into useful processes, products, or procedures. However, Technology Transfer can also involve the advancement and promotion of implementation of the ODOT’s own research results.

6.5.2 Technology Transfer Coordinator

In order to improve the Department's handling of Technology Transfer and to compliment the FHWA's efforts in that regard, a Technology Transfer Coordinator has been designated within the Planning & Research Division as the principal contact with the FHWA on all matters of Technology Transfer.

Section 7 Peer Exchange

7.1 Introduction

7.2 Technical Process

7.2.1 Planning the Peer Exchange

7.2.2 Conducting the Peer Exchange

7.3 Report and Close-out

Section 7 PEER EXCHANGE

7.1 Introduction

The Federal Highway Administration requires that each state host a peer exchange periodically to review its research program. Peer exchanges, as required under 23 CFR, Section 420.207(b) are a practical and effective tool to foster excellence in RDTT program management. They provide an opportunity for participants to share best practices and management innovations through an open exchange of ideas, knowledge, and brainstorming. The goal of the peer exchange is for participants from various state research programs, the Federal Highway Administration, the host state, and others as deemed appropriate, to share information and to identify the strengths and opportunities for improvement of the host state's RDTT program. At the end of the two to four day exchange the participants, known as the Peer Exchange Team, develop a report which the host state refers to for program improvements.

The cost of hosting a peer exchange is included in the Research Work Program for the fiscal year in which it will be held. In accordance with 23 CFR 420.209(a)(7), expenses for hosting peer exchanges are eligible for 100% federal funding.

7.2 Technical Process

7.2.1 Planning the Peer Exchange

It is the State's responsibility to initiate their peer exchange. The composition of the peer exchange team, the items covered, the duration of the peer exchange, and other issues are at the State's discretion.

7.2.1.1 Team Selection

The host State shall include three to four members from the RAC membership. At least two of the members should have previous peer exchange experience. The host State is also encouraged to include a participant from the local area FHWA office in the group.

One of the visiting team members must be designated as the Team Leader.

7.2.1.2 Coordinating the Exchange

The host State shall personally contact each of the prospective team members by email or telephone to establish availability and tentative dates. Once the members have been selected and the date established, a copy of the host State's Transportation Research Manual shall be sent to each team member at least 2 weeks prior to the visit. Along with the manual, the host State's Research Program Manager should identify focus areas considered desirable for discussion during the exchange.

Visitors should agree to participate in the team only if they do so voluntarily and have a desire to both offer and receive new ideas. The visitors need to review the materials sent by the host State. They should not try to compare the host State's documentation with either the FHWA regulations or guidance, or the NCHRP "Guide for Developing a State Transportation Research Manual." The purpose of the visit is not to check for compliance with requirements. It is the responsibility of the FHWA Division Office to check for compliance. The visitors

should come prepared to discuss their RDTT program and their successes and failures and to participate in open discussions.

7.2.2 Conducting the Peer Exchange

The duration of the peer exchange is at the discretion of the host State. Generally, the visit should be scheduled to last 2 to 4 days to allow for time to meet, prepare a team report and conduct a “close-out” discussion.

The host State should prepare an agenda for the visit. The agenda should include:

- Opportunity for the team to look at example projects as they have advanced (and are advancing) through the system from solicitation to implementation. Both “good” and “bad” examples should be shared. If appropriate, examples of in-house, university, and consultant research should be provided.
- Discussion with both contract and staff researchers.
- Some historical perspective of staff and financial resources.
- Staff training.
- The contracting process, including RFP’s, selection, monitoring, etc.
- Technology transfer and implementation techniques.
- Discussion of the Research Manual and Work Program.
- Committee structure.
- Time for the visitors and host State to prepare a Team Report. The content of the report is discussed in Section 7.3.
- A scheduled “Close-out.” The “Close-out” activity is described in Section 7.3.

7.3 Report and Close-out

If at all possible, the report should be written before the close-out conference. As a minimum, the report should be prepared before the visitors leave. The report is to be considered a team effort that involves all of the visitors and the host State Research Program Manager.

The “close-out” should be conducted with the senior staff and the Research Advisory Council. The “close-out” should highlight the most positive aspects of the host state research program and the aspects of the host state program that the visitors intend to incorporate into their own programs. Any suggestions agreed to by the team, should also be highlighted to the host State senior staff, with the understanding that upper management support is necessary to make significant changes.

The report should include a brief introduction that identifies all of the participants on the team and describes the purpose and intent of the activity. The body of the report should briefly discuss those aspects of the Research Program that were reviewed by the team.

The conclusion section of the report should reflect the highlights of the open discussions and written as a team using a “team consensus” approach. The report should reflect the aspects of the host State’s program that the visitors desire to incorporate into their own programs as well as (1) the desirable features of the host State’s program that should be emphasized and (2) those aspects of the host State’s program that appear to warrant a new or expanded approach.

The report is most likely to be of value if it is kept brief and to the point. The use of “bullet” phrases and other outlining techniques should be used to help avoid the need to “wordsmith” the report and minimize the time needed to review the document.

The report should include an endorsement by all of the members of the team. A copy of the report should then be forwarded to the FHWA Division Administrator. If the host State elects to not endorse the report, a separate written response should then also be forwarded to the FHWA Division Administrator.

Follow-up

One additional activity that appears to have substantial merit involves some effort to follow-up on the consensus reached during the peer exchange. About a year after the visit, the host State should initiate a “Round Robin” report that identifies any changes that have occurred and that were introduced as a result of the visit. Each of the visitors should add to the report those activities that were enhanced in their respective programs as a result of their participation in the peer exchange. The report would be circulated among all members of the team until everyone has had an opportunity to review other’s comments. This is a completely optional activity. Its initiation is dependent upon the desires of the host State.

SECTION 8 PRODUCT EVALUATION

Section 8.1 Introduction

Section 8.2 Product Evaluation Task Force

Section 8.3 Product Evaluation Process

8.3.1 Submission of Products for Review

8.3.2 Assignment for Review

8.3.3 Review Tracking and Posting of Results

SECTION 8 PRODUCT EVALUATION

Section 8.1 Introduction

Purpose of the Program

The Product Evaluation Program exists to:

- centralize and streamline the receipt and processing of vendor requests for ODOT to evaluate new products,
- expand field evaluation of products, and
- communicate findings to vendors and interested department personnel.

Definition of a New Product

In the context of this program, a new product is a product or process currently available on the market for immediate acquisition for which ODOT does not have a current specification, or a product which appears to be equal or superior to existing products covered by a specification.

Department Commitment

The department evaluates new products to assist in the utilization of new or improved materials, products, or equipment beneficial to the total transportation effort. Some of the goals of the analysis are to determine whether a product is ready for use and whether it would be beneficial to ODOT operations. This evaluation may involve confirming vendor data, to avoid the expenditure of public funds on research and development of commercial products.

Section 8.2 Product Evaluation Task Force

Membership

The Planning and Research's Engineering Services Branch, several divisions, and generally members of upper management provide employees to serve on the Task Group. These employees are selected for their expertise in performing preliminary evaluations of new products. The Task Group may include representatives from:

- P&R Engineering Services Branch (Chair)
- Construction Division
- Maintenance Division
- Traffic Engineering
- Bridge Division
- Roadway Design
- Field Division
- And others as needed

Responsibilities

The Product Evaluation Task Group serves as ODOT's clearinghouse for coordinating the evaluation of commercially available products for which Department specifications do not exist.

Products evaluated by the Task Group are generally assigned to a Division for review. The Division's review comments form a strong basis for the final product evaluation. The Task Group does not endorse products. Their review and evaluation is limited to determining if a product may be useful in Department operations, and whether it is a product the Department may wish to procure or use on future construction and maintenance projects.

The representative of the Division assigned to evaluate the product is responsible for the monitoring and final decision for the particular product assigned. This responsibility includes developing criteria by which to accept,

reject, or defer a product for further testing. Either laboratory or field testing may be recommended. All conclusive evidence of the evaluation determination is submitted to P&R Engineering Services to be maintained as records of the Product Evaluation Program.

Section 8.3 Product Evaluation Process

8.3.1 Submission of Products for Review

Product information is submitted directly to P&R Engineering Services by a vendor completing a Product Evaluation Request form. ODOT employees outside P&R Engineering Services who are approached by a vendor may refer the vendor directly to P&R Engineering Services.

Initial product reviews are performed based on the product information submitted. These initial reviews do not typically include a test of the product itself, but may conclude that testing of the product is necessary before a final conclusion can be reached. If testing is considered necessary, the vendor will be notified and asked to provide a sample of the product for testing, at no cost to ODOT. Only those products provided at no cost to ODOT will be further tested under the Product Evaluation Program.

8.3.2 Assignment for Review

The Product Evaluation Task Group makes an initial assessment of whether the product should be evaluated. If ODOT specifications currently exist for the product submitted for review, no evaluation is performed under the Product Evaluation Program, and the vendor is notified of the lack of need for further product review. The Task Group may also determine that a product should not be evaluated based on other issues, such as the type of product being of no apparent use within Department's operations. The Task Group shall conduct a literature search including the AASHTO Product Evaluation List website at http://apel.transportation.org. Evaluations conducted by other state departments of transportation could be found at the website.

If the Task Group determines that the product should be evaluated, it selects a Division and/or a project to perform the evaluation. The selection is based on the functional area of ODOT operations that the product is most likely to benefit.

8.3.3 Review Tracking and Posting of Results

The status of product evaluations conducted under ODOT's Product Evaluation Program is included in the annual Product Evaluation Report. In addition, this may be posted on the AASHTO Product Evaluation List website at http://apel.transportation.org . Evaluations conducted by other state departments of transportation may also be found there.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

Planning & Research Division

NEW PRODUCT EVALUATION REQUEST

Lab Use Only

N.P.E.#

Instructions: Answer all questions. Use "X" to indicate choices. Where a question is not applicable, enter "N/A". Attach sheet if needed. Refer to Item No. when explaining any item.

1 TRADE (PRODUCT) NAME: _____

TRADE (BRAND) NUMBER: _____

2 PATENTED? ☐ YES ☐ NO DATE APPLIED FOR: _____

NON-DISCLOSURE AGREEMENT REQUIRED? ☐ YES ☐ NO If yes, please explain: _____

3 GENERIC DESCRIPTION:

_____

4 CATEGORIES BEING SUBMITTED FOR:

☐ **EQUAL PRODUCT:** Products are similar to products that are currently used by the Oklahoma Department of Transportation (ODOT) and are covered by existing specifications or standards #_____ *(please provide ODOT standards).*

** The manufacturer or supplier shall provide certification(s) and/or test results from an independent testing laboratory addressing all existing specifications and standards. The product status will be* ***Qualified, Conditional Use,*** *or* ***Rejected****.*

☐ **NEW PRODUCT:** Products that are not addressed by current ODOT specifications or standards.

** The Product Evaluation Committee will determine if the product installation is warranted. The product status will be* ***Qualified,*** **Conditional Use,** or **Rejected**.

5 HAS THE PRODUCT BEEN PREVIOUSLY SUBMITTED:

☐ YES ☐ NO

If yes, reason for resubmittal:

_____

6 HAS THIS PRODUCT BEEN USED IN THE PAST OR PRESENTLY BY ANOTHER GOVERNMENT AGENCY OR STATE DOT?

☐ YES ☐ NO

If yes, list references of approval:

_____

7 HAS THIS PRODUCT BEEN APPROVED AND ENTERED INTO THE AASHTO APPROVED PRODUCT EVALUATION LIST?

☐ YES ☐ NO

If yes, please provide the URL:

_____

Figure 4-1 New Product Evaluation Report

8

MANUFACTURER: _____

ADDRESS: _____

CITY: _____ STATE: Oklahoma ZIP CODE: _____

CONTACT PERSON: _____ PHONE: _____

WEBSITE: http:// _____

DISTRIBUTOR: _____

ADDRESS: _____

CITY: _____ STATE: Oklahoma ZIP CODE: _____

CONTACT PERSON: _____ PHONE: _____

WEBSITE: http:// _____

9

IF THIS PRODUCT IS USED, WHAT WOULD BE THE BENEFITS (COST, SAFETY, ETC.) TO THE DEPARTMENT?

_____

10

IS THIS PRODUCT IN PRODUCTION AND READILY AVAILABLE ON THE MARKET? ☐ YES ☐ NO

11

MEETS THE REQUIREMENTS OF THE FOLLOWING SPECIFICATION (BE SPECIFIC):

☐ ODOT #	AGENCY: _____	CONTACT: _____	PHONE: _____
☐ AASHTO #	AGENCY: _____	CONTACT: _____	PHONE: _____
☐ ASTM #	AGENCY: _____	CONTACT: _____	PHONE: _____
☐ ANSI #	AGENCY: _____	CONTACT: _____	PHONE: _____
☐ OTHER :	AGENCY: _____	CONTACT: _____	PHONE: _____

OTHER AGENCY APPROVALS (DOT's, FHWA, Cities, Counties)

12

CAN A DEMONSTRATION OR PRESENTATION BE PROVIDED? ☐ YES ☐ NO

WILL MATERIALS BE AVAILABLE FOR FIELD TESTS OR EVALUATION AT NO COST TO THE DEPARTMENT? ☐ YES ☐ NO

WILL ODOT SUPPORT SERVICES BE NEEDED (TRAFFIC CONTROL, LABORER, TECHNICAL) ☐ YES ☐ NO

13

IS THIS PRODUCT MANUFACTURED BY ANOTHER COMPANY FOR YOU? ☐ YES ☐ NO

If yes, please provide the following:

ORIGINAL MANUFACTURER: _____

ADDRESS: _____

CITY: _____ STATE: Oklahoma ZIP: _____

PHONE: _____

IF YOU RE-NAMED THIS PRODUCT, WHAT WAS THE ORIGINAL PRODUCT'S NAME

IS PRODUCT GUARANTEED? ☐ YES ☐ NO

COPY OF WARRANTY ATTACHED? ☐ YES ☐ NO

CONDITIONS: _____

Figure 4-2 Continued

14	MATERIAL SAFETY DATA SHEET (OHSA-20 or OSHA-174) ENCLOSED?	☐ YES	☐ NO
	SPECIAL HANDLING ? ☐ YES ☐ NO — If yes, Please provide Instructions:		
15	MATERIAL DESCRIPTION OR SHOP DRAWING FURNISHED?	☐ YES	☐ NO
	ARE INSTRUCTIONS OR DIRECTIONS FOR INSTALLATION, APPLICATION, LIMITATIONS, OR USE AVAILABLE?	☐ YES	☐ NO
	IF REQUESTED, CAN FREE SAMPLES BE FURNISHED?	☐ YES	☐ NO
	IS NATIONAL TRANSPORTATION PRODUCT EVALUATION PROGRAM (NTPEP) TEST DATA AVAILABLE FOR THIS PRODUCT? If yes, please provide NTPEP supporting data	☐ YES	☐ NO
	IS LOCAL TRANSPORTATION PRODUCT EVALUATION PROGRAM (NTPEP) TEST DATA AVAILABLE FOR THIS PRODUCT? If yes, please provide NTPEP supporting data	☐ YES	☐ NO
	HAVE YOU ATTACHED INDEPENDENT TEST REPORTS CONFORMING TO OUR SPECIFICATIONS?	☐ YES	☐ NO
	LIST CONTACTS YOU MADE WITH OKLAHOMA DEPARTMENT OF TRANSPORTATION REGUARDING THIS PRODUCT:		
	Division: ____ Contact: ____ Phone: ____		
	Division: ____ Contact: ____ Phone: ____		
16	ADDITIONAL COMMENTS / INFORMATION (i.e. Environmental Considerations)		

DISCLAIMER:

Acceptance of a product for evaluation by the Oklahoma Department of Transportation is in no way a commitment to purchase, recommend, or specify the product investigated, regardless of its performance. In addition, the manufacturer and vendor shall be responsible for all liabilities for injuries caused by defect in the design of, or manufacture and labeling of, their products. The manufacturer is responsible for keeping ODOT informed as to any changes in the product makeup, manufacture's location, distribution and representatives. Any changes without proper notification could result in rejection of the product.

For consideration by the Oklahoma Department of Transportation, submit this completed form to:

Mr. Ron F. Curb, P.E. , CPM
Engineering Services Manager
Oklahoma Department of Transportation
Planning & Research Division
200 N.E. 21st Street, Room 3-A7
Oklahoma City, OK 73105-3204
Email: spr@odot.org

Signed: _____ Date: _____
(Supplier's Authorizing Agent)

Name: _____
(Please Print or Type)

Title: _____

Figure 4-3 Continued

OKLAHOMA PRODUCT EVALUATION PROCEDURE:

Product evaluation requests fall into two classes: "EQUAL" or "NEW". When a request for product evaluation is received by the Planning & Research Division, the information is reviewed to determine if it is an "Equal Product" or a "New Product" that requires status review by other Division(s).

"**EQUAL PRODUCTS**" Products are similar to products that are currently used by the Oklahoma Department of Transportation (ODOT) and are covered by existing specifications and standards.

The manufacturer or supplier shall provide certification(s) and/or test results from an independent testing laboratory addressing all existing specifications and standards. The product status will be *Qualified, Conditional Use, or* Rejected.

"**NEW PRODUCTS**" Products that are not addressed by current ODOT specifications and standards.

The Product Evaluation Committee will determine if the product installation is warranted. The product status will be *Qualified, Conditional Use, or Rejected.*

PRODUCT STATUS:

Qualified List: "Equal" products must meet all pertinent specifications. They will be subject to acceptance testing on a project basis. There are two parts to this list, "Approved" and "Qualified". Products in the "Approved" category are those products that have a low consequence of failure. Those placed in the "Qualified" category are products that we want to monitor more closely.

Conditional Use: "New" or "Equal" products will be allowed a trial installation on one project only, recommended for a demonstration project, or recommended as an experimental feature.

Rejected: Products do not meet our specifications or has failed performance testing. The vendor will be notified.

Trial Installation of conditional use "New" or "Equal" products requires incorporation into a project where they can be monitored during installation and for a performance evaluation period usually ranging from 6 to 12 months depending on the type of product. Unless otherwise specified, it will be the manufacturer's responsibility to locate an active ODOT project, either construction or maintenance, which will incorporate the product. This should be accomplished within one year of notice of conditional use status.

If a product satisfies this evaluation, it will be placed on the Qualified Products List (QPL).

Unsatisfactory Performance, at any time, will result in a rejection of a product and removal from the QPL.

Submit by Email | Print Form

Figure 4-4 Continued

REFERENCE FOR OSHA MATERIAL SAFETY DATA SHEET:

http://www.osha.gov/dsg/hazcom/msds-osha174/msdsform.html 4/25/2007

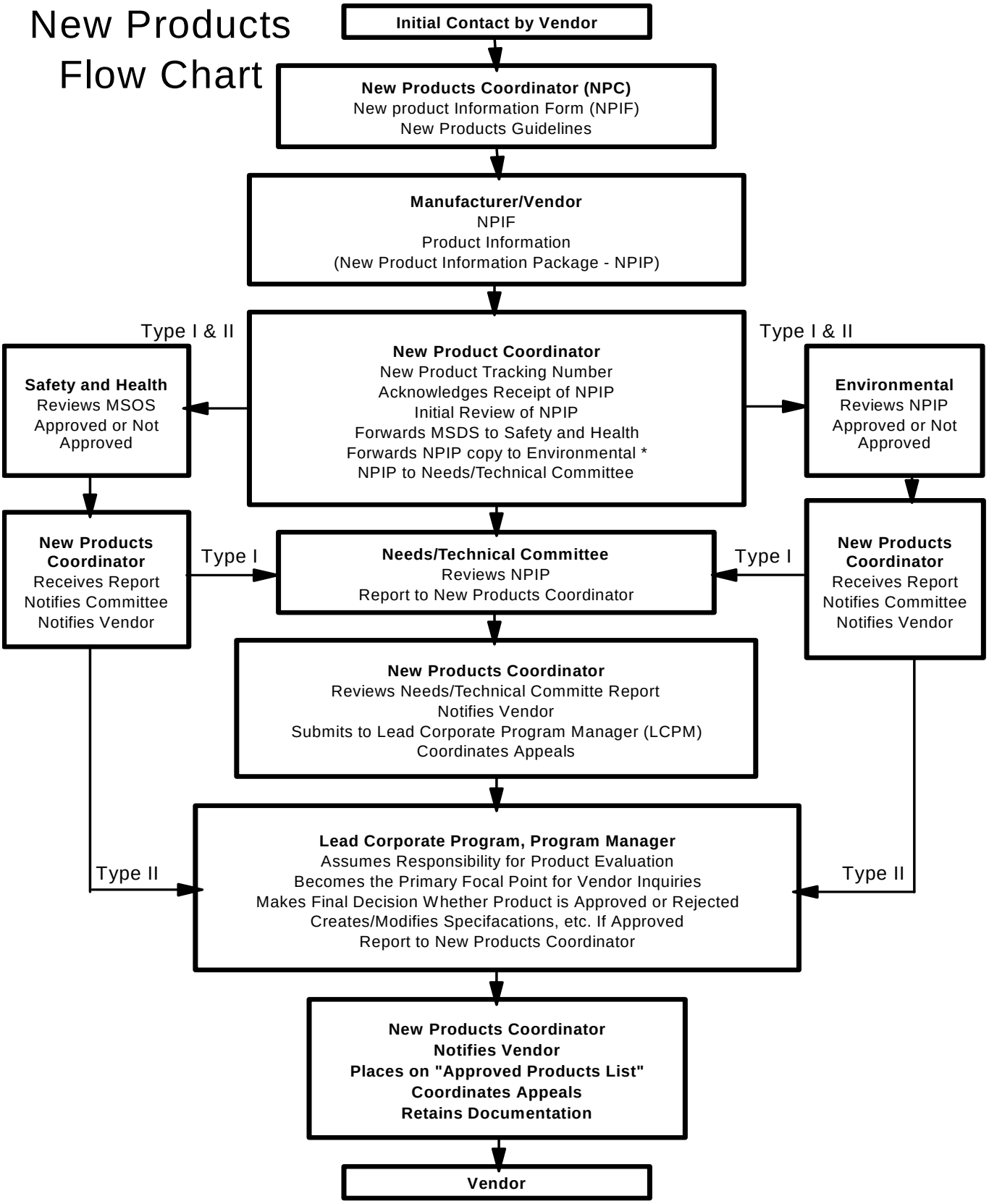

Figure 5 New Products Flow Chart

SECTION 9 TRANSPORTATION POOLED FUND PROGRAM

The Transportation Pooled Fund (TPF) Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies.

When significant or widespread interest is shown in solving transportation-related problems, research, planning, and technology transfer 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.

To qualify as a pooled fund study, more than one state transportation agency, federal agency, other agency such as a municipality or metropolitan planning organization, college/university or a private company must find the subject important enough to commit funds or other resources to conduct the research, planning, and technology transfer activity. If a subject has been studied previously, the new study should provide new information that will complement or advance previous investigations of the subject matter.

A federal, state, regional, or local transportation agency may initiate pooled fund studies. Private companies, foundations, and colleges/universities may partner with any or all of the sponsoring agencies to conduct pooled fund projects.

Project Numbers

Historically, pooled fund studies have been numbered either SPR-2(###) for the FHWA-led (national) studies and SPR-3(###) for the State-led (regional) studies. Many projects using these numbers are still active. With the reengineering of the program, however, a new numbering series has been established, TPF-5(###), encompassing both FHWA- and State-led studies.

Oklahoma's Process for Participation in Pooled Fund Studies

Upon receipt of notification of an existing or potential pooled fund study, all parties with possible interest will be notified. Parties with interest shall request participation in writing to the Planning & Research Division Engineer. Each request shall be signed by the appropriate division, office or committee head. The request shall identify a person to represent the department and participate in any meetings for the pooled fund study. Participation will be determined by one or more of the following factors:

- Usefulness to the department
- Availability of funds
- Advancements of existing or previously completed studies

Upon acceptance of a submittal, the Planning & Research Division Engineer will begin the process of contract execution.

For more information, procedures or forms refer to: http://www.pooledfund.org

SECTION 10 Research Office Coordination

10.1 Research Library

10.2 Document Management

10.2.1 Paper Files
10.2.2 Setting Up Files
10.2.3 Completed Projects
10.2.4 Follow up or Implementation Documents
10.2.5 Final Reports
10.2.6 Miscellaneous

10.3 Electronic Files

10.4 Research Program Web Site Management

10.5 Research Reports

10.5.1 Report Production

10.1 Research Library

The Engineering Services Branch supports staff, consultants and contractors by providing information on a topic, developing search strategies, answering reference questions, conducting literature searches (TRIS & RIP), locating facts and statistics, identifying additional information sources and obtaining articles and reports through inter-library loans. The following describes the services available from the Research Library:

- Catalog and maintain database of incoming publications continuously. Coordinate updates and webpage links with the Division's liaison to Technology Services. Facilitate and maintain quick and easy access to recent and frequently requested materials and information.
- Perform literature and information searches both electronically and manually as requested by Department personnel. Acquire reports and special information from external sources. Maintain awareness of pertinent resources for each information category.
- Review drafts of final reports for compliance with latest Research Manual and Documentation Guidelines including review parameters such as quality and completeness. Review Final Reports for compliance with reviewer comments and complete duplication, distribution and submission to TRB or others.
- Coordinate and distribute research information, such as executive summaries, surveys, reports and journals, to Department personnel, respond to requests for publications and track borrowed materials. Coordinate with FHWA and facilitate WASHTO-X video conferences including notification and documentation of attendees.

10.2 Document Management

10.2.1 Paper Files

The Research Office Manager manages the correspondence, reports, contracts and other information relating to the research program which is maintained in the Engineering Services Branch. This subsection outlines the process.

- **Correspondence:** All original incoming correspondence and copies of outgoing correspondence are maintained on file by the Research Office Manager.
- **File Organization:** Documents filed should be labeled, dated and placed in the file folder by document type and chronologically (most recent on top). Annually each file should contain a current report indicating the status of project balance, percent expended and pending project items such as invoices, progress reports, interim or final reports.
- **Categories:** There are categories of active research project files. Each of the following types of projects is arranged separately and each project within the category is alphabetized.
- **Active Project Files:** These are files of ongoing research tasks/projects. They are arranged by item number.
    a. State Planning & Research (SPR) Program Part 2
    b. Innovative Bridge Research & Deployment (IBRD) Program
    c. Pooled Fund Studies (NCAT, TRB, NCHRP, WASHTO-X and others)

        These are the projects that the Department is participating in with other states or governmental agencies. They are filed by project number and “Pooled Fund” is indicated on the file folder.
    d. University Transportation Center (UTC) Projects - Research and Innovative Technology Assistance (RITA)
    e. In-House Research & Survey
    f. Experimental Product & Evaluation

These are the projects that the Department is participating in through the construction program. They are filed by project name.

g. Highways for Life (HfL)
h. NCHRP Review
i. Long Term Pavement Performance LTPP/SHRP
j. Implementation
k. Technology Transfer

10.2.2 Setting Up Files

When a research project is proposed, a file is set up and maintained by the Research Contract Manager.

10.2.3 Completed Projects

When a research project has been completed and a final report published, the project file is moved to a holding file cabinet for three years before being processed for archives. The final report is distributed as required by Oklahoma State Statute 65 O.S. 1991, §3-113 through §3-114.

10.2.4 Follow up or Implementation Documents

Implementation activities often continue well after research projects are completed, the files (ie: implementation documents, plans, evaluations and summaries) are sent to archives. These files are identified and organized by item number and title.

10.2.5 Final Reports

Research final reports, upon acceptance, are distributed as per section 10.2.3 with a copy placed in the project file for archival purposes. One or more copies are placed into the P&R library by category. Copies may be loaned to persons by following a simple checkout procedure. Extra copies may also be available upon request.

10.2.6 Miscellaneous

Documents pertaining to administrative matters, national committees, personnel and travel for the research project are maintained by the Engineering Services Branch Manager and/or the P&R Office Manager.

10.3 Electronic Files

The Research Office Manager is responsible for managing Research Library electronic files (E-files).

- E-files are reviewed, organized, and maintained by subject title (ie: correspondence, research projects, PDFs, etc.)
- Research proposal/project files are created by project name and/or item number, depending upon the funding, and organized in the projects folder.
- E-files are updated on a regular basis for year-end closeout.
- Economic graphs of research expenditures are prepared annually by project categories and by organizational distribution. Provide printed graphs to Planning & Research Division Engineer for review and distribution.
- E-Files must comply with State HB2197 and Section 508 of the Rehabilitation Act.

10.4 Research Program Web Site Management

The Research Office Manager manages the P&R section of ODOT's website. The primary objective of the website is to distribute services, findings and information related to planning documentation, mapping, future studies, long range planning, research projects, report and publication distributions, library and reference centers, promotion of seminars, conferences, exhibits, and public involvement. This section may include information from FHWA, TRB, AASHTO, WASHTO-X, USDOT, OTC, LTPP and other state and local agencies.

As planning and research progresses, the Research Office Manager provides professional oversight and guidance to ensure the website is managed effectively and maintains compliance with State HB2197 and Section 508 (29 U.S.C. 794d) of the Rehabilitation Act.

10.5 Research Reports

Research project reports are required from all Principal Investigators conducting SPR and Pooled Fund research projects. Each Principal Investigator is required to submit Monthly or Semi-Annual Progress Reports, Draft Reports and Final Reports. Final Reports are published as ODOT Research Documents. Unique publication numbers will be assigned in the following format: FHWA/OK *yy(##).* Additional information on reporting requirements may be specified in the research contract.

10.5.1 Report Production

The Research Office Manager determines what media is most suitable for distribution (print, CD/DVD or placed on the internet), providing the Planning & Research Management with the report for review and a report distribution form to complete. The Research Office Manager arranges for the report to be prepared for distribution. Upon receipt of the report copies, the Research Office Manager distributes the report as indicated on the Report Distribution form.

All final Research Reports are distributed to project participants, the OTC Office, the ODOT Library, the Oklahoma Department of Libraries, the Transportation Research Information Service (TRIS), the National Transportation Information Service (NTIS), federal and other state transportation libraries, and others as identified by the Research Office Manager. Once the final report has been distributed, the project shall be removed from the Research In Progress (RIP) database.