

## Contents of a Research Proposal

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

### 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 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 its 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. Images are often very helpful in this process. This section should explain the options for approaching and solving the problem, then explain which approach will be taken in the project and why. The scope of the research and the basic parameters being investigated should also be included.
- **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.

## **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.

## **Personnel and Lab Qualifications of Research Team**

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. The Principal Investigator (PI) or any substitutes to the PI shall preferably be a Professional Engineer registered in the State of Oklahoma. In addition, any substitution shall have equivalent or higher qualifications than the PI selected in the original contract.

The research personnel who will be conducting the research shall have been deemed qualified by the PI prior to the start of the research.

The laboratories performing the work shall have a documented Quality Management System (QMS) acceptable to ODOT. The intent of the QMS is to document to ODOT that the lab has the necessary calibrated and/or verified equipment, competent technicians, and quality system in place to properly conduct testing on highway construction materials used in the research. The PI is required to submit a copy of the universities laboratory QMS prior to the award of a contract to proceed. As a means of achieving this goal it is recommended that the PI and his/her staff refer to AASHTO R-18 for guidance in developing the QMS for conformance with this policy.

Periodic lab inspections by ODOT representatives may be conducted during the performance of the contract, and any infractions noted at the time of such inspections will be brought to the attention of the PI and corrective actions taken.

## **Facilities Available**

Describe facilities to be used to conduct the research project.

## **Reports**

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

## **Work Time Schedule**

Include a bar 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 a progress chart in semi-annual reporting where required.

## **Resource Analysis**

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

## **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.