SHRP II Request for Proposals

Renewal Focus Area
Project Number: R06
Project Title: A Plan for Developing High-Speed, Nondestructive Testing Procedures for Both Design Evaluation and Construction Inspection
Date Posted: September 11, 2006

SHRP II Background

To address the challenges of moving people and goods efficiently and safely on the nation's highways, Congress has created the second Strategic Highway Research Program (SHRP II). SHRP II is a targeted, short-term research program carried out through competitively awarded contracts to qualified researchers in the academic, private, and public sectors. SHRP II addresses four strategic focus areas: the role of human behavior in highway safety (Safety); rapid highway renewal (Renewal); congestion reduction through improved travel time reliability (Reliability); and transportation planning that better integrates community, economic, and environmental considerations into new highway capacity (Capacity). Under current legislative provisions, SHRP II will receive approximately $150 million with total program duration of 7 years.

Renewal Focus Area

The overall goal of the SHRP II Renewal program is to develop a consistent, systematic approach to performing highway renewal that is rapid, causes minimum disruption, and produces long-lived facilities. The renewal scope applies to all classes of roads.

Project Background

Highway renewal connotes the reconstruction or extensive rehabilitation of roadways and structures currently in service. Interruptions in service are necessarily disruptive to highway users and to communities and business interests that depend on the uninterrupted use of these facilities. The public has little tolerance for repeated or extended lane closures or traffic restrictions. Lane closures and other traffic restrictions also increase personal safety risks to highway users and highway workers. Consequently, there are strong incentives to reduce to a minimum those periods of disruption related to highway design and construction. High-speed nondestructive testing and data collection techniques for purposes of design, construction quality control, quality assurance, and final acceptance have the potential to significantly reduce disruption related to highway renewal. Nondestructive or minimally destructive testing techniques can further reduce traffic disruption by improving construction quality and reducing the need for rework or removal and replacement of substandard work or materials. Similar techniques available to agencies could reduce delay associated with quality assurance and acceptance and accelerate the removal of traffic restrictions. Such techniques should also be applied to pre- and post-construction performance monitoring and data collection improving both design and asset management while minimizing traffic restrictions related to field data collection.

Improving and accelerating data collection and inspection techniques have been longstanding goals, but the impetus to develop accelerated methods is much stronger for rapid renewal than for traditional activities. In addition, technological developments, including nano-technologies, make achieving these goals more attainable today. For example, modern computer processors enable mass data collection and reduction to provide immediate results and upload data to project databases. Improved handheld data acquisition systems and noncontact sensors allow portability and measurement "on the fly." Remote data collection procedures can also speed the process while reducing the risk of worker injury. With specialized equipment, one-pass operations could simultaneously evaluate a facility for a variety of design- and performance-related parameters. *In situ* nondestructive testing is generally considered to have an advantage in terms of speed, ease, cost, and relevance to performance, but other minimally destructive methods may also be employed if suitably rapid and reliable.

To the extent possible, data from construction inspection and acceptance tests should share attributes with data from tests for design and performance monitoring so that they can be incorporated into an asset management system. The move to performance specifications and construction warranties implies that the characteristics monitored during and after construction should be those related to ultimate performance and not merely those properties that are convenient to measure. This also implies that entities responsible for the inspection and monitoring of roadways and structures should have test methods available that permit assessment of factors critical to performance.

Objectives

The overall objective of this work is to develop a process to identify existing or, if necessary, to develop new and quickly implementable technologies for rapid, nondestructive testing of *in situ* conditions for purposes of design, construction inspection, and performance monitoring. These technologies would limit or reduce traffic disruption on existing facilities during preliminary engineering investigations, and provide more rapid and reliable information on as-built conditions. Similarly, rapid inspection of new construction would facilitate timely re-opening of roadways and structures during re-construction.

Accomplishing the objectives of this project will require a thorough review of existing testing methods and new technologies for inspection, followed by evaluations of promising techniques. Where existing procedures are not available, an approach to research and development will be required to devise new inspection techniques.

Tasks

Task descriptions are intended to provide a framework for conducting the research. SHRP II is seeking the insights of proposers on how best to achieve the research objective. Proposers are expected to describe research plans that can realistically be accomplished within the constraints of available funds and contract time. Proposals must present the proposers' current thinking in sufficient detail to demonstrate their understanding of the issues and the soundness of their approach to meeting the research objective.

All tasks should consider construction activities, techniques and/or materials related to construction of earthworks, pavements, bridges, tunnels, and other highway structures.

Task 1: Identify basic design and construction properties and parameters needed for performance monitoring, without which the scheduling of renewal projects cannot be optimized.

Task 2:Based on the results of Task 1, identify existing and emerging technologies and techniques that meet these needs and significantly reduce traffic disruption without compromising data quality or long-term performance. These technologies should provide test results within 24 to 48 hours or, preferably, in "real-time."

Task 3: Based on the findings of Task 2, develop a plan to further assess the applicability of the technologies that show the greatest promise for rapid renewal projects. The plan should address, at a minimum, speed, ease of use, accuracy, cost, and relevance of each technology as an inspection and quality control/assurance tool. For the technologies assessed, describe potential applications in the highway renewal environment, list their advantages and limitations, and cite applicable case histories.

Task 4: For those needs that are not addressed by the technologies identified in Task 2, define the nature and type of testing needed, the application of the test results, the potential for reducing disruption and improving design and construction quality. The above should include consideration of any ongoing and planned research with similar objectives by SHRP II and others. Examples include SHRP II Project R01, Encouraging Innovation in Locating and Characterizing Underground Utilities, and R07, Performance Specifications for Rapid Highway Renewal. The unfulfilled needs should be prioritized according to their potential to accelerate design and/or construction, minimize disruption, and improve overall construction quality and performance.

Task 5: Produce a plan to develop new testing methods that satisfy the unfulfilled needs identified in Task 4. The plan should describe a mechanism for development of new methods, evaluation criteria to select among competing methods, and definition of the outcome expected upon execution of the plan. The plan should also provide experimental design criteria to ensure that the new methods meet the unfilled need.

Task 6: Revise the plans from Tasks 3 and 5 based on SHRP II review and prepare a Final Report that describes the entire project and includes both plans.

Deliverables

- A Final Report detailing the results of Tasks 1 through 6
- Quarterly progress reports
- Two interim meetings with TRB staff, one in Washington, DC, and one at the contractor's facility
- Telephone conference calls, as needed
- A report presented at a meeting of the TCC for Highway Renewal in Washington, DC

Funds Available: Tasks 1 through 6: $350,000
Contract Period: One year

Responsible Staff: Robert Raab, rraab@nas.edu, 202-334-2569

Authorization to Begin Work: January 2007, anticipated

Proposals (20 single-bound copies and an electronic MS Word file on CD or DVD) are due not later than 4:30 p.m. on October 26, 2006

This is a firm deadline, and extensions simply are not granted. In order to be considered, all 20 copies of the agency's proposal and the electronic version on CD or DVD, accompanied by the executed, unmodified Liability Statement must be in our offices not later than the deadline shown, or they will be rejected.

Delivery Address:
PROPOSAL-SHRP II
ATTN: Neil F. Hawks
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Transportation Research Board
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Liability Statement

The signature of an authorized representative of the proposing agency is required on the unaltered statement in order for SHRP II to accept the agency's proposal for consideration. **Proposals submitted without this executed and unaltered statement by the proposal deadline *will be summarily rejected.*** An executed, unaltered statement indicates the agency's intent and ability to execute a contract that includes the provisions in the statement. Here is a printable version of the Liability Statement (pdf). A free copy of the Adobe Acrobat PDF reader is available at http://www.adobe.com.

Special Note

Special Note: Proposals will be evaluated by SHRP II staff and Expert Task Groups (ETGs) consisting of individuals collectively very knowledgeable in the problem area. Selection of an agency is made by the SHRP II Oversight Committee, based on the recommendation from SHRP II staff and the ETG. The following factors are considered: (1) the proposer's demonstrated understanding of the problem; (2) the merit of the proposed research approach and experimental design; (3) the experience, qualifications, and objectivity of the research team in the same or closely related problem area; (4) the proposer's plan for participation by disadvantaged business enterprises—small firms owned and controlled by minorities or women; and (5) the adequacy of facilities.

General Notes

1. According to the provisions of Title 49, Code of Federal Regulations, Part 21, which relates to nondiscrimination in federally assisted programs, all parties are hereby notified that the contract entered into pursuant to this announcement will be awarded without discrimination on the grounds of race, color, religion, sex, national origin, or disability.

2. The essential features required in a proposal for research are detailed in the brochure entitled **"Information and Instructions for Preparing Proposals for SHRP II Research." Proposals must be prepared according to this document, and attention is directed specifically to Section IV for mandatory requirements. Proposals that do not conform with these requirements will be rejected.**

3. The total funds available are made known in the project statement, and line items of the budget are examined to determine the reasonableness of the allocation of funds to the various tasks. If the proposed total cost exceeds the funds available, the proposal is rejected.

4. All proposals become the property of the Transportation Research Board. Final disposition will be made according to the policies thereof, including the right to reject all proposals.

IMPORTANT NOTICE

Potential proposers should understand clearly that the research project described herein is tentative. The final content of the program depends on the level of funding made available. Nevertheless, to be prepared to execute research contracts as soon as possible after sponsors' approvals, the Strategic Highway Research Program is assuming that the tentative program will become official in its entirety and is proceeding with requests for proposals and selections of research agencies.