NCHRP Problem Statement

I. PROBLEM NUMBER

To be assigned by NCHRP staff.

II. PROBLEM TITLE

Development of Guidelines for Uniform Service Life Design for Bridges

III. RESEARCH PROBLEM STATEMENT

There is limited experience in the state DOT’s with rational design for service life. A few notable large signature bridges have been designed for specific service life criteria. But, most agencies rely on subjective evaluation of perceive successful practices for identification and assessment of design alternatives to improve service life. SHRP2 has developed a Guide for Service Life under the project “Bridges for 100 Year Service”.

The Highway Subcommittee on Bridges and Structures (HSCOBS) of the American Association of State Highway and Transportation Officials (AASHTO) maintains the Load and Resistance Factor Design (LRFD) Specifications for Bridges as part of its responsibility to design and manage the nation’s highway infrastructure. The LRFD Specifications contain requirements for strength design and some serviceability checks. However, there are no comprehensive guidelines for design for service life.

A research project has just been completed by the Strategic Highway Research Program 2 (SHRP2) titled, R-19A, or “Bridges for 100 Year Service Life”. That effort lays the groundwork for establishing recommendations for extending service life, and could be useful in developing a process for assuring uniform service life of various bridge components and elements. However, there are some elements of a comprehensive process for service life design that were not included in the SHRP2 project, such as a computerized tool for comparing life cycle costs of life extending materials and detailing practices, life extension technologies for post-tensioned concrete structures, nationally recognized life cycle cost parameters for the three major environmental categories, severely corrosive (coastal), moderately corrosive (deicing applications), or mild (dry areas).

It is expected that the contractor will use existing research and guidance to prepare the draft AASHTO guidelines. This strategic research need is identified in the AASHTO Highway Subcommittee on Bridges and Structures’ 2013 Strategic Plan for Bridge Engineering, as part of Advancing the AASHTO Specifications, Extending Service life, and Optimizing Structural Systems.

IV. LITERATURE SEARCH SUMMARY

A detailed literature search and review of current practices and methods utilized by State DOT’s and international practices will be summarized. This will include a full review of design practices by state DOT’s and consultants that have been published as well as other guidelines, manuals and studies such as those listed below.
V. RESEARCH OBJECTIVE

The research objective is to develop draft guidelines in AASHTO format for Uniform Service Life Design for bridges.

Tasks anticipated in this project include the following:

- **Computerized Tool for Bridge Life Cycle Cost Analysis.** The tool would allow analysis of the fault trees for various bridge components and assess short term and long term costs for tradeoff comparison and decision making for service life design.
- **Workshop Organization.** A workshop of state DOT’s would be organized to define climatic zones, determine nationally adopted parameters for life cycle cost analysis and collect data on service life of various bridge elements and materials within those climate zones.
- **Demonstration Design Guides.** The guidance developed will be demonstrated by preparing detailed state specific specifications for 3 states, one in each of the climatic zones.
- **Development of Final Recommended AASHTO Preservation Guide (Manual).** After the workshop and state-specific guidance is completed, the contractor will finalize recommended design methods and tools for formal review and adoption by the entire Subcommittee.
- **Prepare a final report.** Document the entire research effort and include the final draft recommended guidelines and design examples.
- **Prepare a recommended implementation plan for the new Guidelines.**

VI. ESTIMATE OF PROBLEM FUNDING AND RESEARCH PERIOD

**Recommended Funding:** $300,000

*(Note: This estimate may be changed by the AASHTO Standing Committee on Research.)*

**Research Period:** 24 months.

*(Note: This estimate may be changed by the AASHTO Standing Committee on Research.)*

VII. URGENCY, PAYOFF POTENTIAL, AND IMPLEMENTATION

There is an urgent need to develop and improve the current methods of bridge service life design. These improved methodologies will increase the reliability and effectiveness of highway bridges, leading to improved durability, safety and more effective management of bridges on state and local inventories. The results of this research will provide guidelines suitable for implementation by state DOT’s.

It is anticipated that the research results will be presented to the AASHTO, Subcommittee and Bridges and Structures, T-9 Technical Committee on Bridge Preservation for consideration and adoption as AASHTO Guidelines. The Technical Committee with work with FHWA and NHI to develop training as needed based on the new guidelines.

VIII. PERSON(S) DEVELOPING THE PROBLEM

Bruce Johnson, State Bridge Engineer
Chair of T-9 Technical Committee on Bridge Preservation
Oregon DOT Bridge Section
4040 Fairview Industrial Dr. SE
IX. PROBLEM MONITOR

Jeff L. Milton, Bridge Preservation Specialist
Chair, Bridge Technical Working Group – AASHTO SCOM
Structure and Bridge Division
Virginia Department of Transportation
4219 Campbell Avenue
Lynchburg, VA 24501
Phone: (434) 856-8278
Cell: (434) 841-1463
e-mail: Jeffrey.Milton@VDOT.Virginia.gov

X. DATE AND SUBMITTED BY

April 30, 2014

Bruce Johnson, State Bridge Engineer
Chair of T-9 Technical Committee on Bridge Preservation
Oregon DOT Bridge Section
4040 Fairview Industrial Dr. SE
Salem, OR 97302

Please submit completed problem statement to the following e-mail address:

nchrp@nas.edu

Questions on the process can be directed to the same address or cjencks@nas.edu.