**RESEARCH NEEDS PROBLEM STATEMENT**

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| **TITLE** |
| Life Cycle Cost Model for Steel Bridge Corrosion Prevention |
| **BACKGROUND/DESCRIPTION** |
| Preventing corrosion of steel bridges is a long-term proposition. The consequences a particular strategy will have on future generations is often given less weight than the near-term consequences (e.g., project cost, impact on the travelling public). |
| **OBJECTIVE** |
| Develop a credible, useful, dynamic life cycle cost model that can be used by all levels of a public transportation agency to make informed decisions regarding corrosion prevention of steel bridges. End-users may include policy makers, planners, designers, and maintenance departments. |
| **POTENTIAL BENEFITS** |
| There are five primary benefits of this project:   * Optimize life-cycle planning, risk management, and financial planning for steel bridges. * Support development, implementation, and improvements to agency asset management plans for improving and preserving steel bridges. * Identify the appropriate corrosion prevention technology to be selected for a given environment. * Allow realistic projection of maintenance needs, creating a basis for policy-makers to plan for or even mandate future maintenance expenditures over the life-cycle of the structure. * The savings in maintenance, repair, and replacement costs could approach $1 billion per year if the annual cost of bridge corrosion was reduced by just 10%. |
| **RELATED RESEARCH** |
| A number of life-cycle cost models and analyses are available (e.g., FHWA RealCost). However, these models rely on the user to make assumptions about corrosion performance. A universal, comprehensive, and credible set of corrosion assumptions and criteria have not been developed to inform these models. |
| **TASKS** |
| The proposed work should include the following tasks:   1. A Literature Review should identify and catalog the life-cycle cost, service life prediction, maintenance strategy, and other related models. Each identified model should be evaluated and catalogued. (2-3 months) 2. An Agency Survey should be conducted to identify the critical factors which should be included in the life cycle cost model. (2-3 months) 3. A Model Development plan should be created that incorporates an iterative process of development and testing ensuring the widest possible applicability/acceptance. (4-6 months) 4. The model should be developed, tested, and validated in accordance with the project plan. (16-24 months) |
| **IMPLEMENTATION** |
| Implementation of the LCCA model will require validation and institutionalization. The model should be validated by one or more agencies through demonstration cases. The model can be institutionalized by working with trade associations such as National Steel Bridge Alliance, The Society for Protective Coatings, or NACE International. The model may also inform the current AASHTOWare products. |
| **ESTIMATE OF PROBLEM FUNDING** |
| This research effort is anticipated to cost more than $300,000. |
| **RESEARCH PERIOD** |
| This research is anticipated to last between 24 and 36 months. |
| **RESEARCH PRIORITY** |
| This research priority is high. |
| **RELEVANCE** |
| Provides a basis for long-term decision-making which will more effectively allocate resources to design, construct, and maintain steel bridges. |
| **SOURCE INFORMATION** |
| NCHRP Synthesis 48-03 |
| **RNS DEVELOPER** |
| J. Peter Ault, P.E. |
| **SPONSORING COMMITTEE** |
| Candidates include: AFF20 AHD 30 (Structures Maintenance), AHD35 (Bridge Management), AHD37 (Bridge Preservation), and/or AHD45 (Corrosion). |
| **CO-SPONSORING COMMITTEE(S)** |
| [Other committee(s) responsible for developing this statement.] |

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| **SUBJECT CATEGORIES**  *(Select at least one or up to five categories)* |
| |  |  | | --- | --- | | Administration and Management | Materials | | Aviation | Motor Carriers | | Bridges and Other Structures | Operations and Traffic Management | | Construction | Passenger Transportation | | Data and Information Technology | Pavements | | Design | Pedestrians and Bicyclists | | Economics | Pipelines | | Education and Training | Planning and Forecasting | | Energy | Policy | | Environment | Public Transportation | | Finance | Railroads | | Freight Transportation | Research | | Geotechnology | Safety and Human Factors | | Highways | Security and Emergencies | | History | Society | | Hydraulics and Preservation | Terminals and Facilities | | Law | Transportation (General) | | Maintenance and Preservation | Vehicles and Equipment | | Marine Transportation |  | |

**RESEARCH NEEDS PROBLEM STATEMENT**

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| **TITLE** |
| National Steel Bridge Corrosion Database |
| **BACKGROUND/DESCRIPTION** |
| Multiple steel bridge corrosion prevention schemes have been developed and implemented in the United States. While a few bridges of each technology have been the subject of documented corrosion studies, the only unbiased, comprehensive set of corrosion performance data is NBI ratings. Unfortunately, component level ratings at best provide a vague indication regarding the performance of the corrosion prevention scheme. Surveys suggest that when a bridge owner has concerns based on the NBI inspection results, they will often perform a more detailed evaluation of the corrosion condition. The results of these inspections potentially provide a wealth of information on the performance of alternative corrosion prevention schemes. Unfortunately, the inspections are performed with a wide range of procedures nor are they archived in an accessible location. |
| **OBJECTIVE** |
| This project seeks to create a standard format for collecting and reporting steel bridge corrosion data and create an accessible location to archive data for researchers, designers, maintainers, and others. The data will be integrated with NBIS data, environmental data, and other existing databases to generate a predictive model which can reduce or eliminate the need for follow-up inspections. |
| **POTENTIAL BENEFITS** |
| There are three primary benefits of this project:   1. By developing a standard set of evaluation procedures, bridge owners will be able to more efficiently evaluate bridges where corrosion is a concern. 2. By consolidating data collected from bridges where corrosion is a concern, researchers, designers and maintainers will be able to identify patterns and practices which lead to poor performance of various corrosion prevention schemes. 3. The savings in maintenance, repair, and replacement costs could approach $1 billion per year if the annual cost of bridge corrosion was reduced by just 10%. |
| **RELATED RESEARCH** |
| There is no directly related research, however individual studies of bridge corrosion problems will inform the present research. |
| **TASKS** |
| 1. Survey Bridge Owners to determine what steel bridge corrosion data is available (including NBI component and element level ratings as well as special inspections), what additional data is feasible to collect, and how the database might be used. (3-6 months) 2. Collect and distill existing steel bridge corrosion data. This should include NBIS data and data from special studies. (9-12 months) 3. Develop the database format and inspection procedures based on the results of the survey and an analysis of the existing data. The scheme should be relevant to both painted steel and uncoated steel bridges. Alternative sites for data archiving should be evaluated which are easily populated and maintained. (9-12 months) 4. Beta test which should include working with multiple agencies to both collect the new corrosion data and evaluate the database content and output. (12-15 months) |
| **IMPLEMENTATION** |
| The database will inform transportation decision-making by providing bridge designers and maintainers access to a broad range of field performance data. The data could also be used as the basis of a life cycle cost model for corrosion impact on steel bridges. |
| **ESTIMATE OF PROBLEM FUNDING** |
| This research effort is anticipated to cost more than $300,000. |
| **RESEARCH PERIOD** |
| This research is anticipated to last more than 36 months. |
| **RESEARCH PRIORITY** |
| This research priority is high. |
| **RELEVANCE** |
| Provide a data resource that allows designers and maintainers to make more informed decisions and extend their visibility to more effective corrosion prevention and control technologies. |
| **SOURCE INFORMATION** |
| NCHRP Synthesis 48-03 |
| **RNS DEVELOPER** |
| J. Peter Ault, P.E. |
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