

## TECHNICAL SUMMARY

Analysis of Past NBI Ratings to Determine Future Bridge Preservation Needs

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P.I.: Dr. Xiaoduan Sun, UL Lafayette

LTRC Contact:

Walid Alaywan, MSCE, P.E.

Phone (225) 767-9106

## INTRODUCTION

PONTIS, a comprehensive Bridge Management System (BMS) software system, is an analytical tool that can predict bridge element deterioration and answer questions related to bridge preservation. Because of the intensive data requirement in PONTIS, the Louisiana Department of Transportation and Development (LADOTD), like 40 other state DOTs in the country, has not been able to fully utilize PONTIS modeling capabilities.

To solve this problem, an innovative approach was developed in this project: using readily available National Bridge Institute (NBI) data in PONTIS to evaluate the long-term performance of the bridge system under various alternatives of BMS. The element deterioration models were based on a thorough study of the deterioration process of the three NBI elements. The bridge preservation plans and associated cost schemes were also developed according to the current La DOTD's practice and available information.

The results from this project have demonstrated that it is feasible and practical to use rich historical NBI data for BMS analysis. LADOTD's current \$70 million annual budget for bridge systems seems sufficient to meet the preservation needs, but not nearly adequate to meet the needs of bridge functional improvement. The bridge preservation plan, if implemented successfully, can maintain the bridge system in good operating conditions for a long time under a limited annual budget.

## OBJECTIVES

The goal of this project was to develop a practical procedure for the LADOTD bridge management system. Specifically, the research team used the current and past NBI data to develop a three-element database for the PONTIS program and calibrate the generalized Louisiana bridge element deterioration models.

## SCOPE

Considering the main goal of this project, the scope of work was limited to analyzing the preservation and improvement needs for planning the Louisiana bridge management system with the PONTIS program and current available NBI data.

## RESEARCH APPROACH

The on-system bridges were first grouped into four types based on their building materials and type of structures. Variations of element rating over time were summarized as tables. Based on these tables, a deterioration matrix was developed for each element. A cost matrix was also estimated based on the information obtained from LADOTD for the element rehabilitation and replacement.

To simulate the bridge deterioration process, the research team defined the element rehabilitation actions and the

corresponding ratings as well as all relevant parameters required by the PONTIS program concerning the rule of system optimization, bridge deterioration environment, and the constraints of the system.

With every procedure and parameter developed and defined, the research team ran the PONTIS program with several carefully defined scenarios that are important to a bridge management system.

## CONCLUSIONS

The following conclusions were drawn from this project:

1. The project has demonstrated that it is not only feasible but also very practical to use NBI data for a bridge management system, particularly in making effective funding decisions at network system level. While waiting for the completion of PONTIS database, LADOTD can use its readily available rich NBI data to conduct analyses and evaluate long-term performance of the bridge system under various budgetary and operating scenarios.
2. The current \$70 million annual bridge program budget is not sufficient to satisfy both the preservation and improvement needs of the Louisiana highway bridge system. It is only enough for the state bridge preservation work.
3. Based on the preliminary result, it is clear that bridge preservation actions do have an impact on long-term system performance. Therefore, identifying effective and efficient bridge management strategies is crucial to the LADOTD's bridge management system.
4. To identify the best and most cost-effective BMS strategy, a detailed sensitivity analysis on the preservation actions, associated costs, and improved ratings is needed.

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