



Project Summary

Texas Department of Transportation

0-5266: Feasibility Study for Development of Marine Exposure Site

Background

Durability is a serious issue for U.S. transportation infrastructure. The direct costs related to lack of durability are high and increasing, and there are substantial indirect costs to the traveling public due to deteriorated facilities. A recent study by the Federal Highway Administration estimated annual corrosion costs for the U.S. to be \$552 billion per year. Even so, corrosion is only one cause of these durability problems. These problems affect the state of Texas, which has one of the largest transportation systems (49,829 highway bridges and 192,113 lane miles of highways as of 2006).

One approach to reduce the high costs associated with the lack of durable infrastructure systems is to prevent and reduce the deterioration/corrosion of transportation structures in aggressive or coastal environments, where exposure conditions are severe and difficult to replicate in laboratory experiments. A proposed solution to solve these problems is the development of a marine exposure test site to test materials and structural components in an actual marine environment. The ultimate goals of the test site are to increase the durability and service life, reduce the capital and maintenance costs, and improve the quality, performance, and safety of the transportation infrastructure in Texas through real-exposure research, experimentation, and testing of construction materials, structures, and processes.

What the Researchers Did

The marine exposure test site, as a state facility, should provide benefits to the state of Texas and the taxpayers of Texas. To determine the feasibility of the development of a marine exposure test site on the Texas Gulf Coast, the researchers performed the following tasks:

- Identified the need for and uses of a marine exposure test site and the benefits to the Texas Department of Transportation (TxDOT) of having a devoted marine exposure test site.
- Investigated the costs and effects of durability problems in Texas.
- Made site visits to three marine exposure test sites maintained by NASA (Florida), the U.S. Army Corps of Engineers (Maine), and the U.S. Navy Facilities Command (California).
- Evaluated the existing exposure sites to identify site requirements and success factors for the Texas marine exposure test site.
- Developed a site evaluation matrix and through evaluations identified several sites on the Texas coast for the marine exposure facility.

Research Performed by:

Texas Transportation Institute (TTI),
The Texas A&M University System

Center for Transportation Research (CTR),
The University of Texas at Austin

Research Supervisor:

Kenneth Reinschmidt, TTI

Researchers:

Hyung-jin Kim, TTI

David Trejo, TTI

Kevin Folliard, CTR

Project Completed:

8-31-07

- Performed a cost-benefit analysis using computer models to evaluate future costs and benefits as well as future condition of the transportation facilities.
- Developed a management plan and made financial projections through the life-cycle of the test site.

What They Found

TxDOT has a goal to improve the overall condition of its transportation system, with focus on the elimination of structurally deficient bridges. However, attaining this goal is challenging. The forecast, using computer models, indicates that with current practices available budgets will not be sufficient to reduce the number of structurally deficient bridges. Annual direct deterioration costs to TxDOT are estimated to be \$2 billion per year, and indirect costs to the traveling public are estimated to be \$12 billion per year. To reduce these costs and improve the condition of the transportation facilities, TxDOT needs to take some innovative actions.

The cost-benefit analysis shows that although the development and operation of the site will require financial support, future benefits (tangible and intangible) will be very significant over a long period of time and the ultimate economic goals can be obtained. A long-term commitment by TxDOT for support of the site and for the experimental program is critical for success.

What This Means

The development of the Texas marine exposure site will be beneficial to TxDOT and the state of Texas. Long-term and effective management and operation of a marine exposure site will lead to success, where success can be measured by longer service lives of infrastructure components, reduced capital and maintenance costs, and improved quality, performance, and safety of the transportation infrastructure.

To achieve these goals, the project recommends that TxDOT establish the Texas marine exposure site as soon as possible. It also recommends that TxDOT:

- select a single best site from among those identified and prepare a detailed cost estimate for the site and support facilities, based on the site selected; and
- prepare a research plan for the investigation, development, and deployment of improved materials and processes to reduce deterioration in Texas transportation facilities.

For More Information:

Research Engineer - Tom Yarbrough, TxDOT, 512-465-7403
 Project Director - Agustin Ramirez, TxDOT, 956-702-6202
 Research Supervisor - Kenneth Reinschmidt, TTI, 979-845-8599

Technical reports when published are available at:
<http://library.ctr.utexas.edu/index.html>

www.txdot.gov
keyword: research



Research and Technology
 Implementation Office
 P.O. Box 5080
 Austin, Texas 78763-5080
 512-465-7403

This research was performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and not for product endorsement.