

Updating Renewal Research in SHRP 2

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How can our highway system be renewed to provide new standards of service while we are still using it? Bridges, roadways, and tunnels that are vital to Americans and to our national economy now require extraordinary measures to restore efficient movement of people, goods, and services. The challenge is to accomplish renewal rapidly, minimizing delays and disruption, and producing structures that last and can be easily maintained. Answers are now emerging from SHRP 2 Renewal research and products are in development to help meet the challenges.

One emerging answer points to opportunity for improvements in each phase of a highway facility's life cycle. Not limited to the construction phase of highway renewal activities, advanced tools and techniques developed from the research, when routinely used in planning, design, procurement, operational, and maintenance phases, will reduce project preparation and execution times; minimize disruptions to traffic, utilities, and neighborhoods; and extend the time between major renewal activities.

At this writing, all of the projects in the Renewal research plan are either active or complete. This document highlights some of the emerging research products. Full descriptions of projects in the Renewal research plan are available on the Renewal web page: www.TRB.org/SHRP2/Renewal. You can stay informed as the research products develop and move toward implementation by subscribing to SHRP 2 News for Renewal. Subscribers receive a brief email announcement when a new report, webinar, or other product is available.

Pavements

Research Products

Products from Renewal research for pavements are tools to improve pavement design, help users select the best pavements for their highways, improve construction, and increase service life. Modular pavements, which are constructed off-site and delivered in sections to the roadway, can shorten lane closure times. Design procedures, model specifications, construction guidelines, and training materials are being created so this method can be more commonly used. Similar products are being developed for composite pavement systems, which combine benefits of different paving materials. Geotechnical solutions to improve the soil under new pavements and preservation and rehabilitation strategies for existing pavements are also being developed and catalogued.

Webinar

In September 2010, SHRP 2 hosted a webinar that explored ways to evaluate pavement preservation strategies for high-traffic volume roadways. This webinar was part of Renewal project R26: Preservation Approaches for High-Traffic Volume Roadways. The final report is expected to be available in 2011.

Publication

In July 2010, SHRP 2 released First Fruits Report S2-R21-RW-1: 2008 Survey of European Composite Pavements. This report documents a survey of in-service composite pavement sites in the Netherlands, Germany, and Austria that the R21 research team conducted in May 2008 to assess the design, construction, and performance of composite pavement systems. The survey focused on the field performance of two types of composite pavements: asphalt over concrete and two-lift, wet-on-wet concrete. The information gathered for this report was used in the design and development of a plan to test composite pavements under SHRP 2 Renewal Project R21: Composite Pavement Systems. This report is available on the SHRP 2 website in electronic format. Project R21 is still active.

Project Demonstration

At the MnROAD test facility, two sections of composite pavements were constructed as part of Renewal project R21. Test sections of hot-mix asphalt over portland cement concrete and two layers wet-on-wet portland cement concrete composite pavement were constructed in 2009 and performance data continue to be collected. Video of the construction process will be included in training materials that will accompany the guidelines and model specifications for constructing composite pavements, which are the main products of the project.

Bridges

Research Products

Training materials, AASHTO-formatted design and construction specifications, analysis methods, and plans for innovative bridge designs are being created in SHRP 2 Renewal research. Several products will help to increase bridge service life over 100 years, including AASHTO-formatted LRFD design and construction specifications, a Bridges for Life guide, load rating specifications, and design and analysis methods. Geotechnical solutions for bridges are also being developed, including an electronic catalog of existing and emerging materials and systems for ground improvement; model design, construction, QA/QC, and cost estimating procedures; and draft performance specifications. And an online library of nondestructive techniques and testing protocols for concrete bridge deck deteriorations is being assembled.

Symposia

SHRP 2 co-hosted the First International Symposium on Long-Lived Bridges in June 2010 in Brussels, Belgium. This was the third SHRP 2 symposium organized in col-

laboration with the Forum of European National Highway Research Laboratories (FEHRL). Presenters included representatives from the Federal Highway Administration; ZAG, Slovenia; LCPC, France; Rutgers University; and Rijkswaterstaat, Netherlands. The Second SHRP 2/FEHRL International Symposium on Long-Lived Bridges is planned for January 22, 2011.

Project Demonstrations

Accelerated bridge construction (ABC) techniques will be demonstrated on a new bridge near Council Bluffs, Iowa, as a pilot test of findings of Renewal project R04. Using ABC techniques, this bridge replacement is designed to be completed in two weeks. A series of innovations will be included, for example, ultra-high performance concrete will be used in the joints, marking the first such application in the United States.

In another demonstration, Virginia DOT worked with contractors for Renewal project R06A to conduct field validation testing of NDT technologies to identify bridge deck deterioration and detect and characterize defects on Route 15 over I-66 in Haymarket, Virginia. A variety of technologies were tested, including ground-penetrating radar, impulse echo, ultrasonic, seismic, and resistivity.

Nondestructive Testing

Research Products

SHRP 2 Renewal products for nondestructive testing (NDT) will include training materials, protocols, procedures, technical summaries, and documentation. Testing protocols and training materials are being developed on how to use infrared and high-speed ground penetrating radar to perform uniformity measurements on new hot-mix asphalt layers. Technical summaries are also being developed for using NDT to identify delaminations between hot-mix asphalt layers. Draft model specifications, guidelines, and documentation of field data and performance are being created for real-time smoothness measurements on portland cement concrete pavement during construction. To facilitate the use of continuous deflection devices, training materials are being developed and existing continuous deflection devices are being documented. Tools, test procedures, and protocols are being developed for mapping voids, debondings, and moisture behind or within tunnel linings. In addition, draft procedures and protocols are being created for field spectroscopy devices.

Project Demonstration

In May 2010, SHRP 2 conducted a demonstration in Georgia of real-time smoothness measurements on portland

cement concrete pavements during construction. In the demonstration, the research team evaluated and demonstrated the GOMACO Smoothness Indicator and the Ames Engineering Real Time Profiler.

Publication

SHRP 2 Research Report S2-R06-RW: A Plan for Developing High-Speed, Nondestructive Testing Procedures for Both Design Evaluation and Construction Inspection was published in September 2009. Project R06 evaluated the existing and emerging nondestructive evaluation (NDE) technologies and their state of implementation to satisfy NDE requirements for highway renewal. For the requirements not yet addressed with fully implemented NDE techniques, a research plan was devised to develop technologies for the most pertinent requirements for bridges, pavements, tunnels, soils, and retaining walls through the life of the facility. The findings of this project related to NDE and its recommendations for subsequent research in this area are presented in the report. Seven SHRP 2 Renewal projects are continuing research on nondestructive testing and nondestructive evaluation.

Project Demonstrations

Texas DOT, Florida DOT, and Minnesota DOT participated in field tests of ground-penetrating radar, an infrared bar system, and nuclear density measurements to assess hot-mix asphalt density and segregation. A fourth demonstration will be conducted in AASHTO region 1 during 2011. The results from these demonstrations will support draft recommendations on how these NDT technologies can be incorporated into existing department of transportation specifications for construction quality assurance. A video of the infrared bar in action is on the SHRP 2 website.

Field tests of nondestructive testing and evaluation techniques will be carried out in most of the seven projects related to this topic.

Project Delivery/Construction

Research Products

Delivering transportation improvement projects is complicated by many factors. SHRP 2 Renewal research addresses some important factors that are not related to materials or design but have strong impact on project delivery and construction. Products of these research projects include strategies for managing complex projects and reducing worker and manager fatigue, and an index of performance specifications for rapid renewal projects. In the field of risk management, SHRP 2 is developing guidelines and training materials for implementing the strategies. To encourage

more innovative management, SHRP 2 is creating guides with strategies and training materials. At the corridor and network levels, SHRP 2 is developing training materials for strategic approaches, as well as recommended practices, methods, and dynamic tools.

Project Demonstrations

Missouri DOT worked with the research team that is developing performance specifications for rapid high-way renewal to demonstrate a geotechnical performance specification for pavement foundations using intelligent compaction technology and mechanistic-based in situ point measurements. The findings should help document the connection between quality control/quality assurance measurements and performance. Demonstration projects also will be conducted on a bridge deck in Virginia—results of durability parameters and the use of NDT for rapid renewal will be compared to the results achieved through a traditional method specification—and on a complete pavement section (soil subgrade, subbase, and HMA layers) in Louisiana, where intelligent compaction technology will be applied in hopes of approaching a comprehensive pavement specification.

Utilities/Railroads

Research Products

Improving the process that highway agencies and railroads use when highway projects interact with railways can speed project delivery. Model agreements that are based on successful practice and can be easily modified have been developed in Renewal project R16. Appendix C of research report S2-R16-RR-1: *Strategies for Improving the Project Agreement Process between Highway Agencies and Railroads* includes the agreements, and Microsoft Word versions of the agreements are available on the SHRP 2 website.

SHRP 2 is also developing products to improve utility location and reduce utility conflicts. Models and guidelines for 3-D utility location, nondestructive testing tools for detecting and locating buried utilities, and advancing prototype locating technologies are in development. A utility conflict matrix has been developed to help transportation agency and utility professionals match appropriate technologies to the conditions and requirements of location and characterization needs.

Project Demonstrations

Two training sessions on the use of the Utility Conflict Matrix developed to expedite the process of coordination among highway agencies and utility owners (Project R15-B) are scheduled for January, 2011. One will be held in Little

Rock Arkansas, and one in Pierre, South Dakota. Twenty-five or more state DOT officials are expected to attend each of these training sessions.

Publications

Three research reports are available on these topics:

- In November 2010, SHRP 2 published Research Report S2-R16-RR-1: Strategies for Improving the Project Agreement Process between Highway Agencies and Railroads. This report provides a comprehensive collection of recommended practices that promote cooperation between railroads and transportation agencies on highway projects that cross or lie alongside railways. It also presents standard processes and successful practices that can help both sides reduce the time and cost of project reviews. The report includes a series of model agreements that both parties can use and amend as needed.
- SHRP 2 published Research Report S2-R01-RW: Encouraging Innovation in Locating and Characterizing Underground Utilities in October 2009, which identifies existing and emerging technologies and lists recommendations for subsequent re-

search in this area. The report provides a thorough and insightful review of locating practices, current and emerging technologies, and recommended improvements.

- In July 2009, SHRP 2 published Research Report S2-R15-RW: Integrating the Priorities of Transportation Agencies and Utility Companies. This report documents current practices, opportunities for improvement, and anticipated barriers for integrating utility and transportation agency priorities in highway renewal projects. Thirteen best practices that span the whole project life cycle are also documented in a tool box format. Finally, the report provides a plan for future research in this field.

Webinars

TRB held two webinars on these topics: A webinar in December 2009 explored Research Report S2-R01-RW: Encouraging Innovation in Locating and Characterizing Underground Utilities, and a webinar in September 2010 explored Research Report S2-R16-RR-1: Strategies for Improving the Project Agreement Process between Highway Agencies and Railroads. Both webinars are available on the SHRP 2 website.

RENEWAL TECHNICAL COORDINATING COMMITTEE

Catherine M. Nelson, Oregon Department of Transportation; Randell H. Iwasaki, Contra Costa Transportation Authority; Rachel K. Arulraj, Parsons Brinckerhoff, Inc.; Michael E. Ayers, American Concrete Pavement Association; Thomas E. Baker, Washington State Department of Transportation; John E. Breen, University of Texas, Austin; Daniel D'Angelo, New York State Department of Transportation; Steven D. DeWitt, North Carolina Turnpike Authority; Thomas Donovan, California Department of Transportation; Alan D. Fisher, Cianbro Corporation; Michael Hemmingsen, Michigan Department of Transportation; Bruce V. Johnson, Oregon Department of Transportation; Leonne Kavanagh, University of Manitoba; Thomas W. Pelnik, III, Virginia Department of Transportation; John J. Robinson, Jr., Pennsylvania Department of Transportation; Michael M. Ryan, Michael Baker, Jr., Inc.; Clifford J. Schexnayder, Arizona State University; Ted M. Scott, II, American Trucking Associations; Gary D. Taylor, Retired Transportation Engineer; Thomas R. Warne, Tom Warne and Associates, LLC; Gary C. Whited, University of Wisconsin, Madison; Stephen J. Gaj and Cheryl Allen Richter, Federal Highway Administration; James T. McDonnell, American Association of State Highway and Transportation Officials; Lance Vigfusson, Manitoba Infrastructure and Transportation; Amir N. Hanna and Frederick D. Hejl, TRB Liaisons

SHRP 2 RENEWAL STAFF

James W. Bryant, Jr., Senior Program Officer; Monica A. Starnes, Senior Program Officer; Mark S. Bush, Senior Program Officer; Noreen Stevenson-Fenwick, Senior Program Assistant

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