



Pavement Renewal Solutions 2015 Annual Progress Report

Overview of product activity

Using existing pavements when rebuilding or repairing pavements can be an economical and environmentally positive practice. By being able to identify when and where this technique can be successful, highway agencies can apply the process with more confidence, and reap the benefits of lower cost, and more rapidly rehabilitated facilities.

The second Strategic Highway Research Program (SHRP2) developed ***Pavement Renewal Solutions*** (R23), which offers technical assistance and training to transportation agencies and an interactive web-based pavement design scoping tool that provides guidance for deciding under what conditions to use existing pavement as part of roadway renewal projects. The web tool, known as ***rePave*** (<http://www.pavementrenewal.org/>), offers six specific steps for selecting an appropriate reconstruction technique. It includes guidelines for data collection, testing, and other information needed for scoping, pavement design, and construction specifications, as well as information on using asphalt, concrete, and innovative materials. These strategies can be used on reconstruction projects to reduce costs, speed project completion, and save resources compared to completely removing and replacing the existing pavement.

During the SHRP2 research phase, the product was found to bring significant value to a transportation agency that used the scoping tool and guidance during the planning and implementation phase of a rehabilitation project. For example, the *Pavement Renewal Solutions* guidelines were used by the Washington State Department of Transportation to develop four projects with costs ranging from \$10 million to \$20 million each, which is 30 to 60 percent of the cost to remove the existing pavement and construct a new pavement.

In March 2014, funding and technical assistance for the *Pavement Renewal Solutions* SHRP2 product was made available to states in Round 3 of the Implementation Assistance Program (IAP), administered by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO).

Nine states are currently using Pavement Renewal Solutions for their roadway rehabilitation projects. They include the:

- Arizona Department of Transportation (ADOT)
- California Department of Transportation (Caltrans)
- Kentucky Transportation Cabinet (KYTC)
- Louisiana Department of Transportation and Development (LADOTD)
- Minnesota Department of Transportation (MnDOT)
- New Jersey Department of Transportation (NJDOT)
- New York State Department of Transportation (NYSDOT)

- North Dakota Department of Transportation (NDDOT)
- Utah Department of Transportation (UDOT)

The IAP offers funding assistance at varying levels. Four states – Arizona, California, Kentucky, and Minnesota – are lead adopters, meaning that their IAP assistance helps offset costs associated with product implementation and risk mitigation. The other states received support at the user incentive level, which provides funding to accomplish a variety of implementation activities ranging from conducting internal assessments to organizing peer exchanges.

Activities that occurred through 2015

Technical Assistance

To help states in their implementation efforts, seven of the nine state DOTs received technical assistance and training from FHWA and AASHTO in 2015. MnDOT, ADOT, KYTC, UDOT, NJDOT, NDDOT, and Caltrans received four hours of training, developed by the consultant team, on the use of the *rePave* program and on the *Pavement Renewal Solutions* guidelines. Extensive technical assistance was also provided via webinars, phone calls, and face-to-face meetings. NYSDOT and LADOTD are scheduled to receive training in Spring 2016. More information on these states will be included in next year’s annual report.

As part of that technical assistance, a subject matter expert (SME) worked with each agency to conduct an agency assessment to better understand how each DOT identifies, prioritizes, funds, and builds its pavement renewal and reconstruction projects, and what challenges may exist to using the *Pavement Renewal Solutions* tools. A “Prep Kit” was developed to help the consultant team, FHWA, AASHTO, and others conduct agency assessments. The Prep Kit included materials such as a template for invitations, agenda, a detailed itinerary, a PowerPoint presentation, handout materials, and follow-up materials as needed.

Based on the assessment, a **recommended plan of action** was developed for each agency that summarizes and suggests how challenges can be managed when using the *Pavement Renewal Solutions* guidelines.

As part of the technical assistance offered to states, four **user group webinars** were held in 2015. During the webinars, representatives from Washington State, California, Utah, and Minnesota presented on how they are using, or will use, the *rePave* tool. The webinars offered DOTs the opportunity to hear best practices and discuss any challenges they are facing in their implementation efforts.

Building Awareness

To increase awareness of the *Pavement Renewal Solutions* tools and guidelines, three presentations were given at key pavement conferences. Tom Deddens, Pavement Materials Engineer, FHWA, Kansas Division, gave two presentations on *Pavement Renewal Solutions* – one at the Arizona Pavement Conference and another at the American Society of Civil Engineers Airfield and Highway Pavements Conference. Jason Puccinelli, Associate Engineer at NCE, provided a presentation on the SHRP2 tool at the Nevada Concrete Conference.

Other **marketing efforts** included the development of a *Pavement Renewal Solutions* web page on AASHTO’s SHRP2 website, and the development of a brochure on all SHRP2 pavement-related tools, which included information on *Pavement Renewal Solutions*. Presentations, brochures, tools, articles and videos are all housed on the new product web page, which has proved valuable in providing up-to-date information about this SHRP2 tool to individuals in the transportation field and to expand visibility of the product beyond the IAP states.

Key achievements in 2015

Action plans were developed for eight of the nine participating states based on an assessment conducted of each agency's process for funding and building pavement renewal and reconstruction projects. The following is a summary of recommended action plans and activities for each state.

- **Kentucky Transportation Cabinet:** The agency is currently changing its pavement design procedures, as well as refining its Pavement Management System (PMS). In many ways, *Pavement Renewal Solutions* can be used as a resource as the agency makes these changes. Because KYTC already designs its interstate and parkway pavements for long life, no policy restrictions exist to using *Pavement Renewal Solutions* as a resource and for scoping purposes. KYTC personnel agreed to develop a detailed plan for implementing *Pavement Renewal Solutions*. The plan will include detailed information on the test case reviewed by the team, as well as procedures that may be established to make use of the various features found in *rePave*. KYTC may also document some of its past projects using **flexible pavements**, which were providing long-life service. Specifically the agency would identify those projects where KYTC had cored the pavement cracks and found top-down cracking. That plan would be submitted to the FHWA for its review within the next few months.
- **Arizona Department of Transportation:** Following an analysis and series of meetings, it is recommended that ADOT adopt a long-life pavement design policy as the agency moves forward in adopting new design procedures and acquires a new PMS. ADOT has experienced reasonably long-life performance from its existing pavements; however, this favorable performance was probably more a consequence of the conservative nature of past design procedures. In future, new construction may be limited because of restrictive budget constraints. As the current pavements age and deteriorate, these pavements will need to either be reconstructed or renewed. The *Pavement Renewal Solutions* product and *rePave* in particular should be considered as a resource in developing long-life solutions for these projects.

For **rigid pavement**, it is recommended that ADOT increase its design life for pavements from 30 years to 40 years. As ADOT converts to AASHTO's *Mechanistic-Empirical Pavement Design Guide (MEPDG)* approach, the agency will find the design thickness will be thinner compared to that produced by the 1993 *AASHTO Guide for Design of Pavement Structures (AASHTO Guide)*. This will permit the DOT to adopt long-life design principles without increasing project costs.

For **flexible pavement**, it is also recommended that ADOT consider increasing its pavement design life to 40 years for the same reasons. As ADOT converts to the MEPDG design procedures, the agency will find that the total hot-mixed asphalt (HMA) thickness will also be less than comparable designs with the *AASHTO Guide*. As a consequence, the actual cost to adopt a 40-year-design policy may not be much greater than current costs on a first-cost basis. During a 40-year period, the increased performance life will prove to be more economical both to the agency and the traveling public. ADOT is also in the process of acquiring a new PMS that will include the use of a decision tree as part of the optimization process. It is recommended that ADOT carefully consider the treatments that are included in those decision trees to be consistent with the types of projects it is likely to construct. When the PMS recommends pavement renewal, *Pavement Renewal Solutions* should be used as a resource in developing long-life solutions for these projects.

- **California Department of Transportation:** For **rigid pavements**, Caltrans would continue to follow its current policy to design for 40 years of traffic for new pavements. The agency could also use *Pavement Renewal Solutions* to consider the use of rigid overlays over both their existing flexible and rigid pavements in the form of unbonded Portland Cement Concrete (PCC) overlays. These unbonded overlays would be designed in a manner similar to how the agency designs new pavements for 40 years of traffic, in accordance with Caltrans' current policy on new pavements. The unbonded PCC overlay placed on I-80 near Donner Pass is a good example of this technique.

For **flexible pavements**, Caltrans may consider using *Pavement Renewal Solutions* to help design its HMA overlays over flexible or rigid pavements for 40 years of traffic loads. This will require a change in pavement design policy, but could be included as part of the agency's conversion to CalME, a software program developed by Caltrans using the Mechanistic-Empirical (ME) methodologies for analyzing and designing the performance of flexible pavements design program. It is assumed that Caltrans will need to perform a comparative analysis between *rePave* output and CalME to ensure that *rePave* will produce pavement design configurations and thicknesses that are close enough to CalME to be used for scoping purposes. Caltrans' 12 District offices currently identify and scope major rehabilitation and reconstruction projects with considerable interaction between Headquarters personal and the District. As a result of the training and technical assistance provided on the *Pavement Renewal Solutions* tools and guidelines, Caltrans agreed to train its District offices on the *rePave* scoping tool and encourage its use.

- **Minnesota Department of Transportation:** Following an analysis and series of meetings, it was recommended that MnDOT review its existing policies related to long-life **flexible pavements**. The design and rehabilitation of these pavements should be compared to recommendations from *rePave*. MnDOT is now planning to estimate the tensile stress experienced by these pavements under full-truck loading to compare to what is used in the design tables in *rePave*.

Although MnDOT only designs its flexible pavements for 20 years of traffic, the agency is clearly seeing much longer structural performance from these pavements. In looking at long-life performance through the implementation efforts for *Pavement Renewal Solutions*, the agency may want to consider bringing its design policy in line with actual pavement performance for both flexible and rigid pavements.

MnDOT is in the process of adjusting its policy on how information from the PMS is used in developing the six-year construction program. To meet the upcoming MAP-21 targets for ride and pavement conditions, the agency may need to fund mostly resurfacing projects. As a consequence, the DOT may have little reason to use the *Pavement Renewal Solutions* tools unless some major rehabilitation projects are included in the six-year construction program.

- **New York State Department of Transportation:** NYSDOT sees no limitations on using *Pavement Renewal Solutions*. A number of areas have been identified where the tools could be helpful as the agency develops its new *Comprehensive Pavement Design Guide* and Asset Management System. In addition, NYSDOT is considering the development of a decision matrix similar to *Pavement Renewal Solutions* that would include resurfacing as well as reconstruction.

NYSDOT plans to review and compare its past projects against the final design recommendations offered through *rePave*. If some of these comparisons are finished in advance of the *rePave* training in late February or March 2016, they can be used as demonstrations during the training.

- **Utah Department of Transportation:** The agency has a progressive approach to pavement management (PM) and pavement design. The state has adopted the most recent pavement design procedure from AASHTO and is one of the leading states in its implementation. UDOT is using one of the more advanced PM programs and more importantly, it is using the information produced by that process to develop its pavement maintenance and rehabilitation program. UDOT has experience using most of the approaches contained in *Pavement Renewal Solutions*. The use of *rePave*, however, may offer a few more options depending on specific site conditions. Its use will provide more consistent technique selection throughout the agency, with site-specific recommendations as well as the resources to support the design and construction of long-life pavements. The resources will also provide background information on designing and building long-life pavements that UDOT may want to study as it considers long-life design and construction in its pavement policy.

Implementation of the *Pavement Renewal Solutions* into UDOT operations would be aided by changing its Pavement Design Policy to call for a 40-year design for both **rigid** and **flexible pavements**. The

policy could also encourage UDOT's regions to use *rePave* to help scope their major rehabilitation projects.

Pavement Renewal Solutions could also be used if the DOT adds long-life pavements into its pavement policy. The guide specifications included in the product should also be considered in project development, planning, specification, and estimate preparation to provide better long-life performance.

It is also recommended that *rePave* be included in the list of links in the UDOT *Pavement Preservation Manual*.

- **New Jersey Department of Transportation:** Based on a review of the NJDOT pavement management and design procedures, and the agency's project selection procedures, no apparent limitations exist for NJDOT in using *Pavement Renewal Solutions* for scoping purposes. After personnel received training on *rePave*, NJDOT is planning on testing *rePave* on a number of current and former projects to compare against its own processes. NJDOT is also exploring a number of guide specifications from *rePave* that it may bring into its own specifications. NJDOT may also use *Pavement Renewal Solutions* to help develop a more formal approach to designing and building long-life pavements. In many ways, *Pavement Renewal Solutions* confirms much of what the DOT is currently doing but provides a stronger foundation for those processes.
- **North Dakota Department of Transportation:** After agency personnel received training on *rePave*, NDDOT is planning on testing *rePave* on a number of current and former projects to compare against its processes. NDDOT is also exploring a number of guide specifications from *rePave* that it may bring into the agency's own specifications. Of particular interest is the guidance on surface layers and the justification for early sealing of the state's hot-mix asphalt pavements to provide longer-service lives.

Conclusion

This year has been a productive one for *Pavement Renewal Solutions*, with many state DOTs gaining a better understanding of the potential uses and value of this product.

Throughout the year, AASHTO and its contractor, CH2M, visited seven transportation agencies to conduct agency assessments and training sessions. Preparation for these visits included the development of a "Prep Kit" and training material. Following these agency visits, agency action plans were developed that included recommendations on how each agency can address challenges faced by using the *Pavement Renewal Solutions* guidelines. A big effort was also made to facilitate peer-to-peer learning by holding user group webinars among the implementation states. To help spread the word about the benefits of this SHRP2 product to a broad audience, the marketing team developed a *Pavement Renewal Solutions* web page and a brochure on all SHRP2 pavement-related tools, which included information on *Pavement Renewal Solutions*.

Thanks to these efforts, several agencies are now planning to train more staff members to use the *rePave* tool. The implementation goals for this project were for one agency to use the *Pavement Renewal Solutions* guidelines and *rePave* tool on one project and for five agencies to routinely use the tool and guidelines as a reference. A number of agencies are now using this SHRP2 product to assess past or current projects. NYDOT is using it to assess one specific project, and most of the agencies will be using it as a reference. Several agencies have indicated that they may use the guidance to help revise their pavement design guides.

What's Ahead in 2016

The coming year will be an equally active time for *Pavement Renewal Solutions*. AASHTO and CH2M will carry out an agency assessment and training at the two remaining implementation states – Louisiana and New York State – and will develop recommended agency action plans. Additional user group webinars will be held

throughout the year. To help gain a better understanding of how useful this product has been for states, AASHTO and CH2M will partner with Webkey, a web development company, to collect feedback from users of the *Pavement Renewal Solutions* product and guidelines. As the implementation progresses in each of the states, case studies will be produced highlighting successes and lessons learned and a white paper will be developed providing examples of four projects in Washington State where *Pavement Renewal Solutions* is being successfully implemented.

In addition, now that several lead adopters are using or considering *Pavement Renewal Solutions*, the next step will be to expand the product beyond the implementation states. We will achieve that by marketing the product at upcoming conferences, and providing training in states that may benefit from utilizing the tool. So far, Kansas has been identified as a non-implementation state that may benefit from the product, and discussion is under way to schedule training there.