U.S. Department of Transportation
Federal Highway Administration

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Priority, Market-Ready Technologies and Innovations

Construction Analysis for Pavement Rehabilitation Strategies (CA4PRS)

New

CONSTRUCTION & PROJECT MANAGEMENT

Problem: State transportation agencies are increasingly shifting their focus from constructing new highways to rehabilitating and reconstructing existing facilities

Transportation agencies face many challenges today, including

- Aging infrastructure.
- Increase in traffic volume with shrinking construction windows.
- Increase in construction cost.infrastructure.
- Increase in work zone accidents and fatalities.

We need to be able to build highways that are safer, longer lasting, and faster at a lower cost.

Furthermore, Highway rehabilitation projects often cause congestion, safety problems, and road accessibility issues. With this in mind, agencies face a challenge in finding economical ways to rehabilitate deteriorating roadways in metropolitan areas while also keeping the traveling public as safe as possible and minimizing disruptions for local communities and surrounding businesses.

Solution: The CA4PRS software identifies optimal rehabilitation strategies that balance the construction schedule with inconvenience to drivers and transportation agency costs

Getting in, getting out, and staying out just got easier. As transportation departments increasingly turn their focus from new construction to rehabilitating and reconstructing existing highways, accelerating construction is key to reducing problems with congestion, safety, and user delays, particularly in heavily traveled urban areas. As part of its overall traffic management plan, the California Department of Transportation (Caltrans) is using a new software tool aimed at reducing highway construction time and the resulting impact on traffic. CA4PRS is designed to help planners and engineers select economical rehabilitation strategies while minimizing disruption to drivers and the surrounding community.

CA4PRS was developed under a Federal Highway Administration (FHWA) pooled-fund study by the Partnered Pavement Rehabilitation Center at the Institute of Transportation Studies, University of California (UC) Berkeley. California, Minnesota, Texas, and Washington State participated in the study. CA4PRS was selected by American Association of State Highway and Transportation Officials' (AASHTO) Technology Implementation Group as a 2006 priority technology and the International Road Federation Global Achievement Award for Research 2007.

CA4PRS identifies optimal rehabilitation strategies that balance the construction schedule with inconvenience to drivers and transportation agency costs. The program considers the "what if" scenarios for such variables as rehabilitation strategy; construction window (i.e., nighttime, weekend, or continuous closures); number of lanes to be closed for rehabilitation; material selection; pavement base type; and contractor logistics, including access to the site and production rates. The CA4PRS results can also be integrated with traffic simulation tools to estimate road user delay costs arising from construction. The software aids in establishing schedules, developing staging construction plans, estimating cost (A) + schedule (B) contracts, and calculating incentive and disincentive specifications for contracts.

CA4PRS software users need specialized training to use the software effectively. Because the software package is new, State Transportation Departments may need to work with their IT departments to justify its incorporation as standard software. Users can buy software licenses from UC Berkeley. Caltrans is working with FHWA to include the software with the training package. Buying the software as an enterprise license for $150,000 will enable States other than the pooled-fund States to access the software after training.

Benefits

Demonstrations have shown that CA4PRS is user-friendly, easy to learn, and valuable in any project phase. Its greatest value lies in its capability to provide information to the planner/designer to optimally balance pavement design, construction constraints, traffic operations, and agency budget for transportation agencies—especially during the planning and design of rehabilitation projects. CA4PRS yields additional benefits when its results are integrated with various traffic simulation modeling tools in quantifying the impact of work zone lane closures to the whole highway network, including local arterials and neighboring freeways.

CA4PRS helps agencies, contractors, and consultants prepare strategies (including the Plans Specifications, and Estimates (PS&E) package) for highway projects by

- Estimating working days and CPM schedules,
- Developing construction staging plans.
- Supplementing traffic management plans.
- Outlining incentives and cost (A) + schedule (B) contracts.

Application of the CA4PRS model to urban freeway rehabilitation projects in California, including the I-10 Pomona, I-710 Long Beach, and I-15 Devore projects, has demonstrated its value in saving millions of dollars for both Caltrans and road users. In 2004, the I-15 Devore reconstruction project (5.5 km) was completed within only two 9-day periods of one-roadbed continuous closures with around-the-clock construction operation instead of 10 months of traditional nighttime closures. The innovative and integrated approach of "Rapid Rehab with accelerated construction" on this project saved $6 million of the agency cost as well as the significant reduction of overall road user cost by the schedule compression.

Successful Applications: Confirming the effectiveness of the CA4PRS software through rehabilitation and reconstruction projects

Since 1999, the capabilities of CA4PRS have been confirmed on several major highway rehabilitation projects in states including California, Washington, and Minnesota. The software was validated on the 2.8-lane-km I-10 Pomona Project, which used fast-setting hydraulic cement concrete and was completed in one 55-hour weekend closure. The software was also used to develop a construction staging plan for the I-710 Long Beach Project, in which 26 lane-km of asphalt concrete were reconstructed in a series of eight 55-hour weekend closures—two weekends ahead of schedule.

CA4PRS was used with traffic simulation models to select the most economical rehabilitation scenario for the I-15 Devore Project. The 4.5-km concrete reconstruction project, which would have taken 10 months using traditional nighttime closures, was completed over two 9-day periods using one-roadbed continuous closures and around-the-clock construction. Implementing continuous closures rather than repeated nighttime closures in this project resulted in significant savings. Alternative strategies enabled by use of CA4PRS led to an accelerated project process dubbed "Rapid Rehab" that was praised by professionals.

Other sponsoring State Transportation Departments have also used CA4PRS for analyses of corridor rehabilitations. The Washington State DOT used it to analyze reconstruction of Interstate 5 through Seattle, and the Minnesota DOT used it to analyze the rehabilitation of interstates 394 and 494 in St. Paul.

Additional Resources

To learn more about AASHTO-Technology Implementation Group's approved technologies, visit http://tig.transportation.org.

For more information, contact:

James Sorenson
FHWA Office of Asset Management
(202) 366-1333
james.sorenson@fhwa.dot.gov

To request additional copies of this publication, contact:

Carin Michel
carin.michel@fhwa.dot.gov
(410) 962-2530

TaMara McCrae
tamara.mccrae@fhwa.dot.gov
(202) 493-3382

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