

OPTIMIZING PAVEMENT LEVELS OF SERVICE

Apavement's level of service is a measure that combines a pavement's design criteria – such as freeway, primary arterial, collector and local street or road – with traffic conditions such as speed, travel time, freedom to maneuver, user comfort and convenience, traffic interruptions and safety.

As pavement performance and durability impacts a highway's level of service (LOS), road contractors are in a position where they can favorably influence a highway's LOS today and tomorrow via best-practice construction techniques, such as providing exceptional smoothness for concrete or asphalt pavements. That exceptional smoothness often is rewarded by bonuses is just one more reason to consider the effect of future LOS on road construction.

Frequently, contractors may enhance future LOS via value engineering. After examining the plans, jobsite and materials, the right team – contractor, civil engineer, soils engineer and equipment manager – may employ value engineering to revise original specs or plans for a product equal to, or better than, the original design in terms of service and durability, often at a substantial reduction in costs.

Or the contractor may demonstrate how a marginal increase in initial cost can result in a significantly better-performing pavement with



Smoothness is a key criteria in measuring a pavement's level of service.



Photo: Tom Kuennen



Durable interstate pavement with extended life cycle begins with base stabilized to engineering designs, or value-engineered to save money while providing enhanced longevity.

better service to taxpayers, with added value well beyond the higher initial cost. Current highway funding contains several directives to both set and monitor pavement performance targets.

Not always this way

It wasn't always this way. The original interstate construction build out (1956 to 1991) emphasized construction speed, for example. The entire 42,000-mile system was to have been completed in 20 years, so the focus was on productivity, not longevity, and certainly not smoothness as defined today.

Deep-section pavements like today's asphalt Perpetual Pavements were not allowed, and the goal was to put down pavement as fast as possible, toward a goal of total system completion by 1975.

This whole philosophy reflected that early federal-aid funds were for

construction, not state maintenance activities. Maintenance – today the key to sustained high LOS – was to be the complete responsibility of the states. Congress and the Federal Highway Administration even made sure states did not enhance their pavement designs to reduce future maintenance responsibilities.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) called for engineers to take a close look at how they were evaluating paving materials.

One particular problem was rutting in asphalt. "Rutting became a national epidemic in the 1980s," says Gerry Huber, associate director of research, Heritage Research Group in Indianapolis.

This led to the most important development in hot mix asphalt and pavement design, the shift to performance-graded (PG) liquid asphalts, as evidenced in Superpave.



Photo: Oregon DOT



Oregon, 1968: Interstate highways were built for speed of construction, not durability or longevity.

This performance-based approach offers more durable pavements specifically designed with local temperature extremes and traffic loads in the equation. Superpave designs are providing longer-lived asphalt pavements that will stand up to local climate and traffic volumes at lower long-term costs.

In the meantime, concrete also went through massive changes. The appearance of high-performance concrete (HPC) pavements in the late 1990s – and the adoption in 2006 of a 12-point “Road Map” for concrete pavement research – put portland cement concrete pavements onto a fast track that is moving PCC pavement designs far beyond those of the Interstate boom.

Today, with the prevalence of mandated life-cycle costing, performance-graded asphalts, durable high-performance concretes, pavement preservation, Perpetual Pavements and Highways for Life as promoted by the FHWA, the focus is on absorbing higher initial construction costs to ensure long-term pavement performance and LOS.

Now, engineering designs permit contractors to build a high level of service into a highway, while maintaining high LOS.

Elements of LOS

“Level of service” in surface transportation is a general term that can apply to traffic operations as well as pavement performance. Roadways that are overly congested compared to their capacity are not meeting a traffic operations level of service. But it’s extended to other applications as well.

For example, the forthcoming National Cooperative Highway Research Program report, NCHRP 14-27: *Guide for the Preservation of Highway Tunnel Systems*, will say a state agency’s level of service goals and objectives for tunnels might include:

- Reliability, the ability to keep a tunnel open and operational

- Safety, maintaining safe conditions for the traveling public and workers
- Security, reducing the vulnerability to technological or natural hazards
- Preservation, increasing the remaining life of the asset
- Quality of Service, improving the experience for the driving public, and
- Environment, reducing the environmental impact.

Following initial construction, the major activity that will lead to sustained high LOS will be preservation work. And to optimize

preservation expenditures, they need to be administered through a pavement management program (PMS) as part of a wider asset management program.

Government asset management philosophy compels government agencies to borrow private-sector concepts of inventory, initial value and net present value and apply them to their physical assets.

That in turn helps agencies optimize their limited financial resources. Asset management automatically puts the emphasis on life-cycle costing, and how limited expenditures now can ensure optimal value later.



Illinois, 2006: Perpetual Pavement is placed on I-70 in Illinois, part of a new era in long-lived, high-LOS pavements.

Photo: Illinois Asphalt Pavement Association

PMS and asset management

The nexus between PMSs and asset management programs can be complex and involve multiple software programs running on a single, or multiple platforms. For example, Fort Collins, Colorado's system of integrated asset management is helping that city control costs and program maintenance by combining its varied infrastructure inventories into a single platform.

The result will be an integrated pavement, bridge and utility management tool that – among many other things – will overlay sewer condition, water line condition, pavement condition and bridge condition to permit city management to program maintenance and capital projects, and help determine where to spend city funds.

"The great value of the system is that it gives us a clear understanding of the condition of the entire network, be it bridges, pavements, or eventually, utilities," said Rick

Richter, director of infrastructure services, City of Fort Collins.

The city selected the dTIMS infrastructure asset management system from Deighton Associates and migrated eight years of pavement condition data into the new system.

"It was really important not to lose that history because it gave us a real benefit in setting up our baseline," Richter said. "When we first started in 1989 we had no history, but by 1997 we had a good idea of how the pavements had performed over the previous eight years, and we could sit down and develop the baseline, the deterioration curves, and treatments and triggers. We then moved into the development of the full-function program."

The program gave Fort Collins some new capabilities in forecasting pavement maintenance and preservation activities.

"We had a greater ability to determine the process used to predict

deterioration of roadways," Richter said. "Being able to enter our data so the curves and predictions were accurate was a big benefit." Another benefit: the ability to forecast budgets and perform cost benefit analyses of different pavement treatments. "We could see what would be needed to maintain a condition, versus what would happen under a constrained budget, and produce both scenarios in graphs and charts. It was a huge leap for us," he says.

Pavement preservation and LOS

Maintenance of a high pavement condition LOS is intimately bound to best-practice pavement preservation. Pavement preservation is an important tool used to extend public agency resources to increase the useful life of roads at a significant cost savings over the life of the road. Research shows spending \$1 to preserve a road in good condition precludes spending \$6 to \$10 to reconstruct it later, after it's too

Inspire the Next Generation of Road Builders.

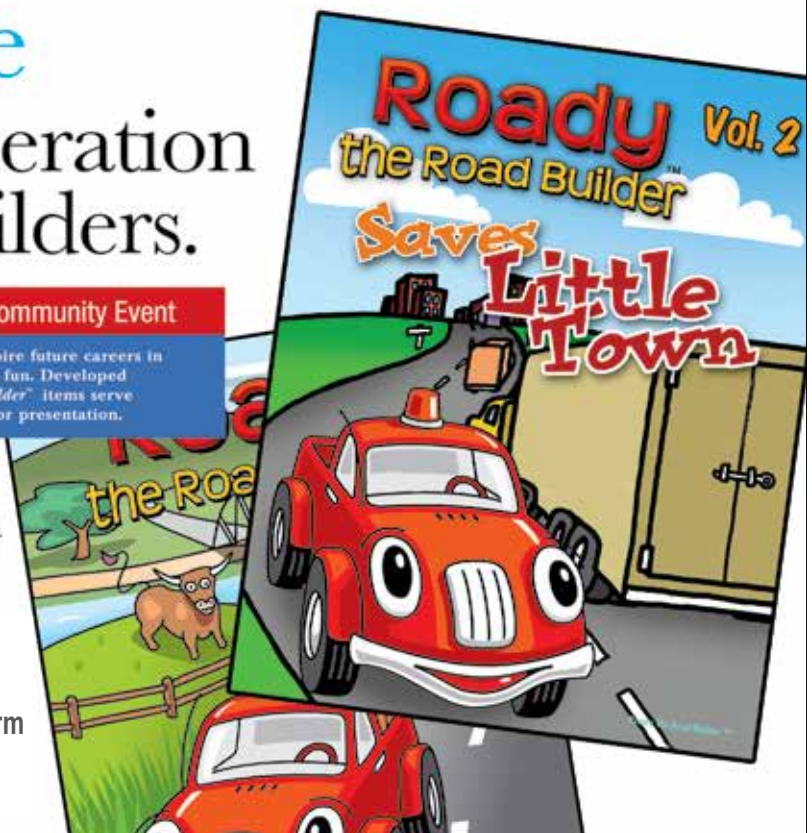
Let Roady Add Some Fun To Your Next Community Event

Teaching kids how roads and bridges are built can inspire future careers in construction. Roady the Road Builder™ makes learning fun. Developed exclusively for *Better Roads* readers, *Roady the Road Builder™* items serve as long-lasting reminders of your organization's event or presentation.

Roady the Road Builder™ Coloring Book

Follow Roady the Road Builder™ into the world of road building and traffic safety. Geared for ages 3-7, this 20-page coloring book covers the basic steps in road and bridge building, as well as environmental concerns, heavy equipment and traffic safety. Kids will love coloring the construction equipment, landscapes and animals. \$1.20 - \$1.85 per book, depending on quantity.

To order, call (800) 430-4540 or visit
www.equipmentworld.com/roady-order-form
Email: roady@equipmentworld.com



far gone to maintain.

Crack sealing, chip seals, slurry surfacings and thin overlays are elements of the pavement preservation tool box. First funded locally, pavement preservation became eligible for funding in MAP-21, and it's included in the current U.S. Senate's 2015 surface transportation reauthorization bill (the DRIVE Act).

Pavement preservation practice extends pavement life, avoiding high future reconstruction or rehabilitation costs by spending smaller amounts at critical points in a pavement life. This helps federal highway dollars go further, along with creating less roadwork disruption, and less environmental impact..

The next era of pavement preservation – that of high volume pavements like dual lane highways and interstates – is underscored by two recent publications from the second Strategic Highway Research Program* (SHRP2), which provide a snapshot of current and future

high volume pavement practices. Research is taking place now under a nine-year SHRP2 project, R26: *Preservation of High-Traffic-Volume Roadways*, and FHWA is publicizing the benefits of select pavement preservation treatments for these critical highways.

Thirteen states are currently participating in R26 projects. Ultimately 135 projects in 38 states will be included in the \$130 million budget. **EW**

** Do an internet search for "Guidelines for the Preservation of High-Traffic-Volume Roadways" and its companion report, "Preservation Approaches for High-Traffic-Volume Roadways."*



In Escondido, California, 'scrub' seal is placed on a city street; sustained pavement longevity and LOS are dependent on best-practice pavement preservation techniques.

Photo: Western Emulsions, Inc.

Job matched attachments from Worksaver increase your bottom line!



Close-up of optional end plate, sold in pairs

Skid Steer Grader Blade



Engineered, Designed and Manufactured in the USA

Worksaver's patented SSGB-8A Grader is designed to be used by asphalt, landscaping, and concrete flatwork contractors. A 8', six-way hydraulically controlled moldboard with in-cab remote provides a smooth finished grade. When matched with a laser system the grader maintains a precise finish grade within a 1/4 - inch.



Worksaver, Inc., P.O. Box 100, Litchfield, IL 62556-0100
Phone: 217-324-5973 • Fax: 217-324-3356
www.worksaver.com • E-mail: sales@worksaver.com

Designed. Engineered. Remarkable Value.

PIONEER BRIDGES

A division of Bailey Bridges, Inc.



Prefabricated Steel Truss Bridges

Pedestrian & Light Vehicular Spans up to 250'

866-708-5778

www.pioneerbridges.com



QUALITY CERTIFICATION
MAJOR BRIDGE
SIMPLE BRIDGE

256-845-7575
256-845-7775 fax
119 40th Street NE
Fort Payne, AL 35967

BAILEY BRIDGES, INC.
Portable Bridges — Rent or Buy — Bridge Decking & Grids