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Debunking Myths About Concrete Pavements

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Misconceptions or lack of understanding about concrete pavements often impact the selection of the best pavement type.

Those who believe concrete pavements "cost too much," "take too long," or "are too difficult to repair" may be surprised to learn concrete costs less during the pavement's life cycle, can be opened faster than ever, and can be repaired easily with the proper equipment, materials, and processes.

Concrete pavements are well suited to withstand heavy traffic and harsh seasonal changes. Although many agencies realize these benefits, there are still highways across the country that require perpetual maintenance and repair or are unsafe. Each year, in fact, more than 13,000 people die on the nation's highways because of poor road conditions, according to the U.S. Department of Transportation's National Highway Traffic Safety Administration.

A recent comparison of initial costs of pavements across the nation indicates the difference in **initial costs** between concrete and asphalt pavements of similar structural capacity may be as little as 8 percent.



Photo depicts full-depth repair prior to drilling holes for dowels in adjacent slabs. Full-depth repairs address almost all structural distresses and will extend the original pavement design life.



Worker installing retrofit dowel assembly into prepared slot. Note blue joint re-former placed in-line with existing joint. Dowel bar retrofit restores load transfer at undoweled transverse joints or cracks.

Determining **true** pavement costs should include indirect costs associated with work zones and maintenance.

Quality concrete pavements require little to no maintenance, a clear advantage over flexible pavements, which require frequent roadway maintenance and rehabilitation, resulting in traffic congestion, high user costs, and work zone safety issues.

The time required to construct concrete pavements is generally equal to or less than a multi-lift asphalt pavement. Concrete pavements are constructed in a single lift and may be paved full width or in single-lane width, depending on specific project requirements.

The use of fast track paving techniques and materials significantly reduces construction-related traffic delays. High performance concrete mixes may exceed 400 psi flexural strength in four hours, allowing overnight or weekend construction projects to open quickly. In addition, concrete maturity meters and corresponding strength correlations are now used routinely by a number of agencies in determining realistic strength-based opening times.

Concrete pavement restoration can return a pavement to a near-new condition. For example, dowel bar retrofit can enhance structural capacity, and then can be followed by diamond grinding to restore ride quality, a functional issue.

These procedures are well proven, cost effective, and can substantially lengthen the life of the pavement.



Photo depicts the diamond grinding of a concrete pavement. Research shows that diamond-ground pavements are at least as quiet as asphalt pavements. Diamond grinding restores pavement surfaces, removes joint faulting, and improves skid resistance

. Quality assurance/quality control specifications have fostered innovation in concrete paving. Paving operations are monitored to maintain strict tolerances for thickness, consolidation, smoothness, surface texture, and the myriad factors necessary to construct a long-lasting, high performance pavement.

Quality assurance/quality control specifications, life cycle costs, and performance characteristics are key when selecting a pavement. These factors, combined with sound design, construction techniques; concrete materials, and equipment, will yield durable, long-lasting, and cost effective pavements.

Construction Project Serves as Test Site for Concrete Mixes

An award-winning project served as the site for testing two new concrete mixes. ACPA member [Cherry Hill Construction, Inc.](#), Jessup, Md., working with the Maryland State Highway Administration, recently placed a test section that will help determine the value of using low-shrinkage concrete and fatigue-resistant concrete paving applications. The work was part of a project on U.S. Route 50/Salisbury Bypass, in Salisbury, Md., and was the first in the nation to require the contractor to warrant repairs for all transverse and centerline joint seals for three years.

Cherry Hill Construction used a 12-cubic yard modular concrete batch plant and a fleet of triaxle rear dump trucks for the 18 lane-miles of 10-inch jointed plain concrete paving.

A value engineering proposal submitted by the contractor resulted in concrete shoulders instead of asphalt, based on long term savings in maintenance costs and added structural value.

A quality control program led to a pavement surface that exceeded ride specifications without corrective action.



ACPA presented Cherry Hill Construction two awards for this innovative project in Salisbury, Md.

ACPA presented the contractor and agency two "Excellence in Concrete Pavement Awards" for divided highways (rural) and best in show. Originally scheduled to take three years, the project was opened to traffic seven months ahead of schedule. The concrete mixes used in the test sections were developed by the University of Maryland and the Federal Highway Administration. The project also served as a test site for a new wet reflective tape for highway markings on concrete.

Construction Partners Use Technology to Manage Large-Scale Project

Managing any construction project requires effective communication among stakeholders, but when the project is one of the largest of its type in the state's history, communication can be extremely challenging.

Public and private partners working on the largest pavement project in Pennsylvania found a solution to improve cross-communications. The key? A website, which allowed quick exchange of project information among team members.

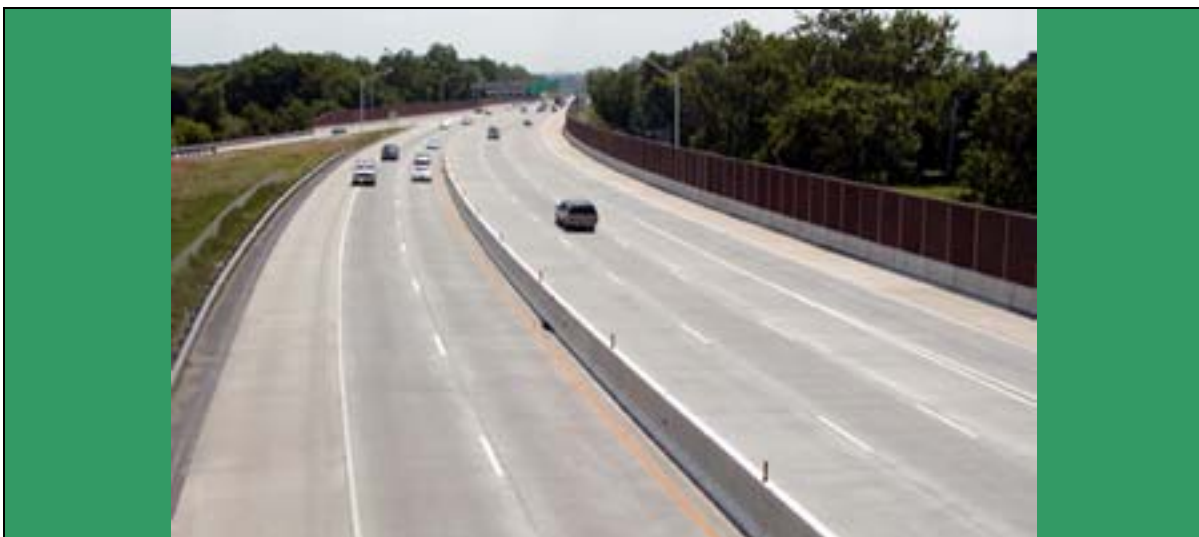
The approach allowed fast and secure dialogue and a quick resolution of issues. Documents of any size were viewable and corrections or comments were made directly on the documents.

Close cooperation between the Pennsylvania Department of Transportation and Hi-Way Paving, Inc., Hilliard, Ohio, was a critical success factor in the reconstruction and widening of US-30 Sections 11 & 11A, Lancaster County, Pa.

The primary contractor, Dick Corporation, Pittsburgh, Pa., earned a \$1 million bonus for completing the project 54 days ahead of schedule.

Using two pavers during the project played an important role in staging the project. One paver was set up while the other was placing concrete.

The effective use of equipment, time, and communication were all factors in the project, which provided a smooth-riding pavement averaging 26.41 inches/mile (zero blanking band on the profilograph).



The American Concrete Pavement Association named the project a 2003 Excellence in Concrete Pavement Awards winner in the category of Divided Highways (Urban).

Technical Tip

Concrete Pavement Preservation

'Pavement preservation' refers to all the actions taken to provide and maintain serviceable roadways, including corrective and preventive maintenance, as well as minor rehabilitation projects, according to the [Foundation for Pavement Preservation](#).

The concrete pavement industry has developed a strategy for assessing pavement conditions and applying the best preservation technique(s) to return a concrete pavement to like-new condition.

A subset of these pavement preservation techniques is known as concrete pavement restoration (CPR), which is used to restore a moderately distressed concrete pavement to like-new condition. CPR techniques include diamond grinding, full-depth repair, partial-depth repair, slab stabilization, load-transfer, and joint resealing, among others.

Among the first considerations should be the type(s) of preservation technique(s) to apply, based on the type and amount of deterioration present in the candidate pavement. The basic process involves assessment to determine whether the distress is structural (which affect the pavement's ability to carry traffic) or functional (which may affect ride quality and safety, but do not impact the pavement's load-carrying capability).

Preventive CPR techniques include:

- Joint and crack resealing to minimize the infiltration of surface water and incompressible materials into the joint system;
- Retrofitting concrete shoulders to decrease edge stresses and corner deflections, as well as to reduce the potential for transverse cracking, pumping, and faulting;
- Retrofitting edge drains by adding a longitudinal drainage system to assist in the removal of water that may cause pumping, faulting and durability distress.

Corrective and preventive CPR techniques include:

- Dowel bar retrofit to increase the load transfer efficiency at transverse cracks and joints;
- Slab stabilization to restore the support to concrete slabs by filling small voids that develop under the concrete slab at joints, cracks, or the pavement edge.
- Full-depth patching, i.e., removing and replacing at least a portion of a slab to the bottom of the concrete, to restore areas of deterioration. Full-depth patches improve pavement rideability and structural integrity and extend pavement service life.
- Partial depth patching to restore localized areas of deterioration that do not extend through the slab.
- Diamond grinding to remove bumps and re-profile the surface of concrete pavements. This improves the riding comfort to motorists and decreases the severity of dynamic or impact loads from heavier vehicles.

ACPA has a range of technical resources that address pavement preservation and CPR techniques. These include "Concrete Pavement Repair Manual " (JP002); Pavement Rehabilitation Strategy Selection (TB015P); and "CPR for City Streets" (CD023P). To order ACPA publications, go to the ACPA website, www.pavement.com; call toll-free 1-800-868-6733; or fax requests to 847-966-9666.

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ACPA Literature Showcase

Constructing Smooth Concrete Pavements



This 28-page technical bulletin (TB006P; published in 2003) covers all of the aspects of concrete pavement design and construction that affect pavement smoothness.

Factors discussed include base/subbase, horizontal and vertical curves, embedded items, concrete mixture, grade preparation, stringline setup, operation of the paving machine, and finishing crew activities, among others.

The measuring devices for smoothness measurement in construction acceptance is also covered. An excellent resource for training contractor crews and resident engineers before paving.

The cost of this publication is \$20.00. To order TB006P, go to www.pavement.com; call toll-free 1-800-868-6733; or fax requests to 847-966-9666.

Concrete Pavement News Digest

ACPA Launches Dowel Bar Alignment Research ... ACPA and [ERES Consultants Division of Applied Research Associates, Inc.](#) began dowel bar alignment research to determine the level of dowel alignment routinely achieved in typical concrete pavement construction ... The assessment will be based on the testing of 10 to 20 in-service pavement sections ... ERES is performing a visual distress survey of each pavement section and analyzing whether any of structural distresses such as they observe on the project, such as cracking or spalling, are attributable to the as-built alignment of the dowel bars ... The alignment of dowel bars embedded in concrete can now be evaluated with unparalleled accuracy and speed using a state-of-the-art nondestructive testing device developed specifically for evaluating dowel bar alignment ... The research is expected to be finished in August ... For more information, contact [Jerry Voigt](#) at 847-966-2272.

ACPA Evaluates Modified Smoothness Profiler ... A recent experiment, sponsored by ACPA, evaluated [Ames Engineering, Inc.](#)'s new equipment that was modified to improve problems with smoothness measurement repeatability and reproducibility which ACPA uncovered in their [2002 profiler experiment](#)... The study found that none of today's current lightweight surface profiling equipment is adequate for coarse textured pavement.

ACPA evaluated Ames Engineering's modifications to their Lightweight Inertial Surface Analyzer (LISA) ... The experiment evaluated the repeatability of two modified versions of LISA on coarse-textured concrete pavement ... In the experiment, a standard (unmodified) Ames LISA, owned and operated by the Iowa Department of Transportation, served as the experimental control to identify the level of improvement provided by the modified configurations.

Repeatability values for the modified LISA equipment were above ACPA's acceptability standards for transverse tined pavement. The IRI values produced by the modified

LISA were 18 to 20 in. per mile lower than those produced by the original configuration on a longitudinally tined site ... This is a significant improvement and a successful step in the direction of improving lightweight profilers. However, the repeatability on longitudinal tining is still below ACPA's ideal acceptability threshold.

Although this recent experiment found that slight improvements are still necessary for coarse longitudinal textures (e.g. longitudinal tining), it also displayed that the modified LISA profiler improves the reliability of surface profile measurements. The research is part of a broader ACPA initiative to improve the measurement of smoothness on concrete pavement. The goal of ACPA's strategic plan is for state DOT's to adopt uniform ride quality measurement standards with the following characteristics:

- Is based on the International Roughness Index
- Uses equipment and procedures that are repeatable and reproducible
- Uses equipment readily available to contractors for quality control
- Is not improperly influenced by surface type or texture
- Represents the actual experience of the traveling public

Correcting the measurement repeatability and reproducibility problems must be done before these goals can be achieved. Click [here](#) to view ACPA's most recent research report.

IPRF Selects Team to Head Applied Research Project ... The [Innovative Pavement Research Foundation](#) (IPRF) announced the selection of a research team to head Project 03-9 (Potential for Acceleration of Alkali Silica Reaction In the Presence of Pavement Deicing Chemicals) ... Scheduled to begin this month, the project will determine if alkaline halide salts have the potential to aggravate the expansion rate and damage concrete pavement ... The project is part of the IPRF and [Federal Aviation Administration's](#) Cooperative Agreement of 2000.

ACPA Concrete Pavement Progress is published four times a year and covers current practices and case histories in the concrete pavement industry. ACPA **Concrete Pavement Progress** is distributed free of charge to public officials, ACPA members, executive committee, board of directors, and affiliated chapter/state paving associations.

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