R&T UPDATE
Concrete Pavement Research & Technology

ACPA REPORT TO MEMBERS
TRANSPORTATION RESEARCH BOARD 80TH ANNUAL MEETING

The 80th Annual Meeting of the Transportation Research Board was held in Washington, D.C. on January 7-11, 2001. ACPA members, chapter/state paving association executives, and ACPA staff participated in many sessions and committee meetings, sharing new concrete paving technology with specifying agencies from throughout the U.S. and Canada.

As the primary forum for nationwide technology transfer for transportation issues, the TRB Annual Meeting offers a unique opportunity to present concrete pavement advancements directly to key decision makers. Additionally, concrete industry representatives gain first-hand knowledge of the issues, opportunities and new technical developments that concern our customers.

This report summarizes the most significant presentations and events. Where noted, copies of technical papers can be obtained upon request from Debbie Howard at ACPA (Telephone: 847-966-2272 or e-mail: dhoward@pavement.com).

ACPA Reception Draws Top Officials — For the fifth consecutive year, ACPA sponsored a reception at the Willard-Intercontinental Hotel, attracting over 250 top transportation officials, ACPA members, ACPA chapter/state association executives and ACPA national staff. The ACPA-TRB reception has become a highlight for the entire paving community. It is now the premier national gathering occurring annually at a national meeting for ACPA members, governmental officials, academia, and others interested in concrete pavement.

ACPA gratefully acknowledges the generous contributions of our members that make this event possible. Sponsors are listed on an insert to this report.

ACPA Breakfast Meeting to Improve Concrete Pavement Products & Processes — Continuing a long-standing tradition, ACPA hosted a breakfast meeting to learn more about the concrete pavement issues affecting state DOTs. Through special invitation, representatives from Indiana, New York, Minnesota, Pennsylvania, Georgia, Nebraska, Kansas, Wisconsin, Iowa, and South Dakota DOTs shared their viewpoints. Listening to our customers was the primary goal of the ACPA Chapter/State Association and ACPA national staff that participated. Topics raised by DOT's included: pavement selection process; noise; surface texture; design-build; warranties; maturity method for concrete strength determination; air test behind pavers; smoothness; and mid slab cracking. A total of 25 people were in attendance and all agreed that this event was successful and should be continued next year.

ACPA Exhibit Booth Draws Good Interest — Traffic at ACPA's exhibit booth was very heavy as a large number of transportation officials sought information about concrete pavement. ACPA national and chapter/state association staff manned the exhibit throughout the TRB meeting, answering questions and distributing information on concrete pavement. The exhibit booth is an

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excellent forum for one-on-one discussions with transportation officials from throughout the U.S and Canada.

Accelerated Concrete Pavement Construction Session Overflows Meeting Room — A session on accelerated concrete pavement construction, organized by ACPA, drew a large crowd. The session demonstrated projects where fast-track concrete paving was used to meet strict construction time limits. Robert McCord (Ballenger Paving – A Division of APAC Georgia, Inc.) summarized the tremendous effort to reconstruct Runway 9R-27L at Atlanta-Hartsfield Airport in 33 days. IPRF-sponsored research by University of California-Berkeley documented the remarkable reconstruction of 2.8 lane-km of Interstate highway in 55 hours on I-10 near Pomona, CA. Washington DOT described weekend intersection reconstruction, also documented through IPRF-funded research. Finally, a presentation by the University of Texas described recent research to develop precast, post-tensioned concrete slabs for new road construction (paper available from Debbie Howard).

Concrete Durability Workshop Focuses on Investigative Techniques — For years, the concrete industry has been working to make the process of evaluating concrete with specialized petrographic techniques more systematic and consistent. A successful workshop entitled *Investigative Techniques for Assessing Concrete Durability Problems* addressed this topic. The workshop highlighted recent technological developments and improvements on visual and petrographic techniques including methods for visual assessment and field sampling/handling of deteriorated concrete pavement, concrete specimen preparation for stereo optical and scanning electron microscopy, and applications of chemical mineralogy and petrography to assessing concrete durability.

Performance-Related Specifications (PRS) for Concrete Pavement — This session focused on the concrete pavement project constructed in Indiana in 2000. Comments from the Indiana Chapter of ACPA cautioned that this process should be used only after a mature QC/QA program has been in place for a number of years. Indiana has had such a program for over 10 years. This PRS project was an extension of Indiana DOT's QC/QA program. Their goal is to provide adequate financial incentive to encourage very consistent standard deviation of contractor process-control tests. Indiana DOT found that the incentive included on this project was probably too low and plans to work with the Indiana Chapter-ACPA to increase incentives on future PRS projects.

Laboratory Testing, Data Analysis, and Interpretation Procedures for Distressed Concrete Pavements — In recent years, there has been an increased awareness of materials related distress (MRD) in concrete pavements. Research by Michigan Technological University presents a protocol for identifying possible causes of MRD. The protocol is part of a series of guidelines prepared for the detection, analysis, and treatment of MRD in concrete pavements. The guidelines have been applied to a number of pavements and were found to be useful in steering the investigation without stopping at the first distress mechanism that was identified. (Paper available from Debbie Howard)

IPRF Research Demonstrates UTW Repair — Since its inception in 1991, ultra-thin whitetopping (UTW) has moved beyond the experimental stage and has become a viable pavement rehabilitation alternative. As UTW pavements age and carry traffic, repair methods will be needed. A presentation by Construction Technology Laboratories (CTL) highlighted UTW repair techniques, The techniques were demonstrated on UTW test sections at FHWA's Accelerated Pavement Loading Facility (ALF). The Innovative Pavement Research Foundation sponsored the research,

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which concludes that panel removal and replacement is an effective method for UTW pavement repair. A strong bond between the concrete and asphalt layers, even for distressed (cracked) panels was observed. (Paper available from Debbie Howard)

Sealant Test Section in Ohio Shows Early Results — Construction and evaluation of a joint sealant project near Athens, Ohio, was described by researchers from University of Cincinnati. Fifteen different material-joint configuration combinations were used, including a control section without sealing. Regarding sealant performance: the preformed compression seals have exhibited significantly better performance to date than liquid sealants, with one exception. In contrast, after only one year of service, silicone and hot-pour sealants are in fair to poor condition, mostly due to inadequate installation techniques including the lack of sandblasting to clean the reservoir. Regarding overall pavement performance: all sections are performing well with no visible signs of distress at the joints or in the pavement slabs. (Paper available from Debbie Howard)

Computer Program for Analyzing CRC Pavements — ERES Consultants presented work on the development of a computer program that employs 3D finite element modeling to determine critical tensile stresses in continuously reinforced concrete pavement (CRCP). These tensile stresses are responsible for development of CRCP punchouts. The procedure for stress prediction is based on a finite element model developed using ISLAB2000. The proposed rapid solution is faster than conventional methods and can be incorporated into a mechanistic-empirical CRCP design procedure. (Paper available from Debbie Howard)

CRCP-9 Analysis Program Developed by University of Texas Researchers — The Center for Transportation Research at the University of Texas at Austin has updated the CRCP-8 software which analyzes cracking behavior and punchout potential of continuously reinforced concrete pavements (CRCP). This new software is Windows-based, making it easier to use than the previous version. The new version also incorporates nonlinear variations of temperature and drying shrinkage through the depth of the concrete slab, curling and warping effects, creep effect of concrete, nonlinear bond-slip between concrete and steel, and consideration of changes in material properties with time. (Paper available from Debbie Howard)

Study: Cross Tensioned Concrete Pavement Feasible — Student researchers from Kansas State University presented the results of a feasibility study on designing and constructing cross-tensioned concrete pavement. Post-tensioned PCCP has been constructed in the United States with limited success due to the pavement gaps needed for post-tensioning operations. Cross tensioning may eliminate the need for such gaps or for any transverse joints and will resist the pavement's tendency to crack in any direction. (Paper available from Debbie Howard)

Benefits and Costs of Concrete Pavement Design Features — This paper, by ERES Consultants, presents a limited study of the life-cycle costs (LCC) of selected design features (slab thickness, base type, permeable drainage layer, joint spacing, load transfer at transverse joints, and widened slabs) for jointed plain concrete pavement (JPCP). Highway agencies currently utilize a wide variety of alternative design features for JPCP. These features have evolved over time based on previous field performance, research studies, and designs of other agencies. The results show that different design features can result in a wide range of benefits (extended life) and costs under different site conditions. It is important that pavement designers have adequate engineering tools to analyze a given design to achieve the lowest LCC over the long term for a given project site. (Paper available from Debbie Howard)

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Validation of HIPERPAV for Prediction of Early-Age Concrete Pavement Behavior — HIPERPAV is a computer program that predicts early-age strength and stresses in jointed concrete pavements (JCP) for the prediction of cracking. Each individual environmental, construction, design, and mix design input that influences early-age pavement behavior can be adjusted to find the optimum paving solution. A design that minimizes stresses and maximizes concrete strength will increase the potential for an extended service life. HIPERPAV was developed by Transtec Consultants, Inc. for FHWA. (Paper available from Debbie Howard)

Use of HIPERPAV in Forensic Analysis of Distressed Concrete Pavement at Lambert-St. Louis International Airport — The HIPERPAV program was used to investigate possible factors contributing to the appearance of random cracking in concrete placed at the Lambert-St. Louis International Airport in the summer of 1997. Of the three days of concrete placement, May 12, June 9, and June 11, only the concrete placed on May 12 exhibited cracking. The investigators, Transtec Consultants, found that the HIPERPAV analysis clearly demonstrated how the combination of higher winds, lower relative humidity, and a delay in the application of curing compound combined to cause much higher stresses and slightly lower strength in the concrete during the first 72 hours for the May 12 placement, which likely caused the premature cracking. (Paper available from Debbie Howard)

Concrete Pavement Design — A session devoted to concrete pavement design focused on developing better models for predicting pavement performance. The four presentations covered the following topics:

- Transtec, Inc. presented information on modeling the interaction (restraint) between a concrete slab and the underlying material so that better prediction of uncontrolled cracking can be determined and accounted for in overlay designs. (Paper available from Debbie Howard)
- A paper by researchers from South Africa, University of Illinois, and University of California – Berkeley discussing the different cracking failure modes for concrete pavements (transverse, longitudinal, and corner cracking) was presented. Their conclusion was that a complete analysis of the pavement must assess and consider all three modes of cracking. (Paper available from Debbie Howard)
- ERES Consultants, Inc. presented their work on the modeling of jointed plain concrete pavement fatigue cracking in PaveSpec3.0, the improved cracking model to be used in PRS specifications. (Paper available from Debbie Howard)
- Researchers from Marquette University and the Wisconsin Department of Transportation presented the performance results of test sections in Wisconsin that were constructed using different dowel alignments and materials. (Paper available from Debbie Howard)

TRB Devotes Four Sessions to Asset Management — This year's TRB meeting included four sessions on Asset Management with over 20 presentations. In the first session, upper level issues and programs were discussed, including policy implications of asset management. The second session addressed asset management applications, including guidelines for use at the state level. The third session described actual applications of asset management principles including an effort underway to privatize roadway maintenance in Washington D.C. Finally, a round table discussion summarized the current issues relating to the use of asset management practices by transportation agencies. Unfortunately, few of the presentations in these four sessions included papers or other documentation.

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