R&T UPDATE
Concrete Pavement Research & Technology

ACPA REPORTS HIGHLIGHTS OF 82ND ANNUAL TRB MEETING

PART 1: MAINTENANCE AND REHABILITATION

The 82nd Annual Meeting of the Transportation Research Board was held in Washington, DC from January 12-16, 2003. ACPA Members, chapter/state paving association executives, and ACPA National staff participated in many sessions and committee meetings, sharing and learning about new concrete paving technology with specifying agencies and researchers from throughout the US 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 and members.

This report is the first of two that will summarize most of the significant presentations and events. Copies of most of the technical papers can be downloaded from the ACPA website at www.pavement.com/techserv/RT4.01.pdf. Links directly to the papers are available after each article through the Adobe Acrobat online version of this R&T issue. Please contact Debbie Howard at dhoward@pavement.com or 847-966-2272 if you have any questions.

ACPA Reception Again Draws Top Officials

For the seventh consecutive year, ACPA sponsored a reception at the Willard-Intercontinental Hotel, attracting over 300 top transportation officials, ACPA members, chapter/state association executives, ACPA national staff, consultants, and university professors. The ACPA-TRB reception was once again a highlight of the 5-day conference and the premier annual gathering at a national meeting for ACPA members, governmental officials, academia, and others interested in concrete pavement.

ACPA gratefully acknowledges the generous contributions of the members that made this event possible:

AMERICAN HIGHWAY TECHNOLOGY
APAC-GEORGIA, INC., BALLENGER PAVING DIVISION
APPLIED PAVEMENT TECHNOLOGY, INC.
ASH GROVE CEMENT COMPANY
BECHTEL GROUP, INC.
BERNS CONSTRUCTION CO., INC.
CEDAR VALLEY CORPORATION
CEMEX
CENTRAL ATLANTIC CONTRACTING CO.
CLARKSON CONSTRUCTION COMPANY
COLD SPRING CONSTRUCTION CO.

American Concrete Pavement Association
5420 Old Orchard Rd.
Suite A100
Skokie, IL 60077
Phone: 847-966-2272
Fax: 847-966-9970
www.pavement.com

(continued)

CONCRETE PAVING ASSN. OF MINNESOTA
CONCRETE REINFORCING STEEL INSTITUTE
CONSTRUCTION TECHNOLOGY LABORATORIES, INC.
DUIT CONSTRUCTION CO., INC.
ERES CONSULTANTS, A DIVISION OF ARA
GCC DACOTAH
GUNTERT & ZIMMERMAN CONST. DIV., INC.
HARPER COMPANY, THE
HOLCIM (US) INC.
ILLINOIS CEMENT COMPANY
INDIANA CHAPTER - ACPA
IOWA CONCRETE PAVING ASSOCIATION
IRVING F. JENSEN CO., INC.
KOSS CONSTRUCTION COMPANY
LAFARGE NORTH AMERICA
LEHIGH CEMENT COMPANY
LONE STAR INDUSTRIES, INC.
MASS GRINDING & GROOVING
PAVERS, INC.
PENHALL COMPANY
R.D. BLUE CONSTRUCTION, INC.
RC CEMENT COMPANY, INC.
SANDERS SAWS, INC.
SJOSTROM & SONS, INC.
ST. LAWRENCE CEMENT CO. - U.S. DIVISION
ST. MARYS CEMENT INC. (CANADA)
VULCAN MATERIALS COMPANY
W. R. MEADOWS, INC.
WESTERN STATES CHAPTER - ACPA

Maintenance Committee Focuses on Pavement Preservation

Larry Galehouse (former Michigan DOT) is the new chairman of the Maintenance Committee, A3C05, which is a three-year obligation that bodes well for the industry. Galehouse is a strong supporter of concrete pavement in the maintenance arena and should provide a lot of support for the concrete pavement industry. Larry pioneered Michigan's Pavement Preservation program in 1992. He noted that Michigan DOT started the program with $6 million and has steadily increased the funding to $73.5 million in 2002, with a target of $100 million within the next few years. Michigan is a special case, with a balanced Pavement Preservation program divided between asphalt and concrete pavement. Most DOTs in attendance reported their Pavement Preservation funds are dedicated towards thin asphalt surface treatments used for both asphalt and concrete pavements. The International Grooving & Grinding Association (IGGA) and ACPA have been working hard to eliminate this bias on a state-by-state basis, but much more effort is required. Many state maintenance budgets are being cut in 2003, yet dedicated pavement preservation budgets are benefiting from increased funding and recognition. This shift in focus from new construction to pavement preservation is due largely to the FHWA's emphasis on asset management.

Acceptability of Pavement Roughness on Urban Highways by the Driving Public

At the University of California, the driving public's attitude toward acceptable levels of road roughness was examined using data collected on urban highways. Individual driver acceptability levels were

matched with International Roughness Index (IRI) levels to examine the existence of potential user acceptability thresholds. The observed trends were compared with the federal IRI guideline of 170 in/mi (2.68 m/km) for "acceptable ride quality," recommended by the Federal Highway Administration for the National Highway System (NHS). The results support this federal IRI guideline and indicate that IRI provided a very good indication driver acceptability. The study did not distinguish differences between IRI measurement or public perception by surface type. (03-4430)

Bubbles in Sealants?

Bubbles or voids sometimes occur in sealants that have been installed in concrete pavements. Generally viewed as a defect, bubbling can occur either during, or after installation, and with both hot applied and cold applied sealants. Bubbles form from a variety of causes including: gas evolution within the sealant, melting/out-gassing backer material, high moisture content in the pavement, and high ambient temperatures. The Army Corps of Engineers developed a lab testing procedure that has been shown to produce bubbles in sealant materials in a laboratory, which is sometimes specified for their joint sealing projects. Most, if not all of the sealants tested, experience bubbling during this evaluation. A separate lab study indicates that bubble formation in hot applied sealants is influenced by substrate, moisture content of concrete, and test temperature. However, 10 years of field performance evaluations of hot-applied sealants with various extents of bubbling conclude that the bubbling does negatively affect sealant life or performance. The Committee on Sealants and Fillers (A3C13) is proposing research on bubbling to extend our understanding of this interesting phenomenon.

Cost-Effectiveness of Joint and Crack Sealing

The sealing and resealing of joints and cracks in concrete and other pavements is a core component of pavement maintenance and restoration. However, this practice has recently been challenged by some research that indicates sealing may not be cost-effective. The Indiana Department of Transportation currently spends approximately four million dollars annually to accomplish joint and crack sealing and is seeking quantitative evidence to justify the expenditure through research. Indiana's survey of practice revealed that most agencies joint/crack sealing efforts are based on long standing policy rather than research. The primary objective of Indiana's research is to investigate the cost-effectiveness of joint/crack sealing in relation to pavement performance. Over two years, the statistical analyses of the studied sections indicate that there are no significant differences between sealed and unsealed sections. Indiana is continuing to monitor the sections until more meaningful results may be obtained. (03-3966)

First Dowel Bar Retrofit Project Posts 10-Year Results

Linda Pierce of Washington State DOT reviewed the performance of the first ever large-scale dowel bar retrofit (DBR) project on I-90, which is now 10 years old. The key findings from the presentation include:

- the DBR sections have performed well and have extended pavement life
- most of the distresses that have been seen are a result of poor construction or inspection:
  - slots cut too deep
  - heavy jackhammers used
  - foam core board misaligned
- some studded tire wear is evident in the slot backfill, but can be minimized with the addition of AASHTO #7 stone as extender aggregate in backfill material
- good inspection and knowledgeable construction crews help with performance of DBR

Washington has been pleased with the performance of their DBR sections, and they plan to continue retrofitting more of their older, faulted concrete pavements. (03-3341)

Performance of Dowel Bar Retrofits Under Heavy Vehicle Loading

The California Department of Transportation (Caltrans) constructed two dowel bar retrofit (DBR) test sections on US-101 near Ukiah, California, and a third section was designated the experiment's control section and was left alone. All three sections were subjected to accelerated pavement testing using Caltrans' Heavy Vehicle Simulator (HVS). The results demonstrated a large improvement in load transfer efficiency (LTE) and decreased deflection due to the DBR. The LTE was not damaged by loading the DBR sections and was less sensitive to temperature changes than the control section. Falling Weight Deflectometer testing showed slight damage to aggregate interlock at joints on the control section. A total equivalent loading of approximately 11,000,000 equivalent single axle loads was applied to each of the DBR sections without cracking or other failure occurring. The study concluded that dowel bar retrofit provides very good load transfer efficiency and reduced deflections in concrete pavements. In addition, the accelerated loading demonstrated a dramatic decrease in load transfer efficiency on the control section. This damage was identified by FWD testing and primarily at cool temperatures when the joint was wider. After the testing, the load transfer efficiency of the DBR sections did not change dramatically. (03-4161)

Whitetopping Goes Head-to-Head with Asphalt

In 1993, two hot-mix asphalt and four whitetopping overlay test sections were constructed on low volume TH 30 in southern Minnesota. Last year, a study was undertaken to examine the performance and costs associated with the test sections after nine years of service. Both hot-mix asphalt test sections have had routine preventative maintenance applied to them, adding to their long-term cost of operation and ownership, but they are performing up to their design expectations of 10 years. The whitetopping test sections are performing very well at the midpoint of their design life of 20 years. Most distresses to date are related to poor construction and materials, rather than inherent design features. As of 2002, the most economical design on a year-by-year basis is the six-inch thick, undoweled whitetopping test section. Based on these observations, the authors conclude that whitetopping has proven to be a good performing and economical rehabilitation option for low volume roads. (03-3076)

Mechanical Properties and Durability of Concrete Overlays

The main objective of this University of Alabama at Birmingham research was to analyze the mechanical properties and durability of several plain and fiber-reinforced concrete overlay mixtures. Eight different mix designs were tested for compressive and splitting tensile strength, modulus of elasticity, bond to existing surface (with three different surface roughness characteristics), and durability. Freeze-thaw tests were performed to determine the durability of the concrete mixtures. Strength and stiffness were investigated at 1, 3, 7, and 14 days. Laboratory tests on the strength and stiffness development of eight candidate concrete overlay mixtures showed that high strength concrete was appropriate for opening overlays to traffic in 24 hours or less, and normal strength concrete may be used if traffic loading may be delayed for 48 or 72 hours. For larger projects, where paving continues over several days, normal strength mixtures may be used when 48 to 72 hours or more of curing can be achieved before traffic loading begins, with high strength mixtures used for the last day's construction. All of the high performance concrete overlay mixtures tested appear to have satisfactory strength, stiffness, bond properties, and durability for use in bonded overlay construction. The normal strength concrete is more economical than the high strength concrete, but as is expected develops its design properties more slowly. (03-2831)

American Concrete Pavement Association
5420 Old Orchard Rd.
Suite A100
Skokie, IL 60077
Phone: 847-966-2272
Fax: 847-966-9970
www.pavement.com