



**This month ...**

ACPA and its affiliate, the Innovative Pavement Research Foundation, explore a range of topics related to the latest developments in airfield pavements.

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**Next month...**

*Read the latest information about pavement rehabilitation tips and techniques. Don't miss it!*

## **Airfield Pavement Research Produces Results** **Industry helps develop new national standard for P-501**

The [Innovative Pavement Research Foundation](#) (IPRF), through a cooperative agreement with the Federal Aviation Administration (FAA), is leading a project to rewrite the primary specification used for airfield pavement design and construction. P-501, which was developed in February 1989, has until now, seen only minor administrative changes.

"The new specification is intended to replace a deficient specification," said Jim Lafrenz, P.E., IPRF's Program Manager and American Concrete Pavement Association's (ACPA) Director of Airports. "The FAA P-501 specification is the cause of many over-constructed airfield pavements."



P-501 is the standard specification used by airport owners, engineers, and contractors to specify, construct, and rehabilitate concrete pavements at commercial airports.

One of its current limitations is lack of guidance on a range of issues, including concrete mix design and smoothness criteria. The revised specification will address these issues and other outdated practices, as well as promote constructability and consistency.

"This new specification will bring a paradigm change in practices and create techniques that are less costly, less time consuming, and more reliable for those industries that elect to use the specification," Lafrenz explained.

The process used to develop the new specification marks the first time industry, the public sector, and a government agency have been directly involved together to develop airfield construction and specification standards. The technical panel for the research project includes representatives from [ACPA](#), [Airport Consultants Council](#), [American Society of Civil Engineers](#), [Airports Council International - North America](#), [National Association of State Aviation Officials](#), the [Department of Defense \(U.S. Army Corps of Engineers\)](#), and [FAA](#).

## Addressing Base Materials

An additional technical panel is involved in research to revise FAA specifications P-304 (Cement Treated Base Course) and P-306 (Econcrete Subbase Course). The revisions to both specifications address the misconception that stronger bases result in longer pavement life.

The revised specifications will reduce the strength requirement for stabilized subbase material but also include a maximum strength requirement. A reduction of the strength requirement allows earlier access for construction equipment, reduces project time, and improves pavement performance.

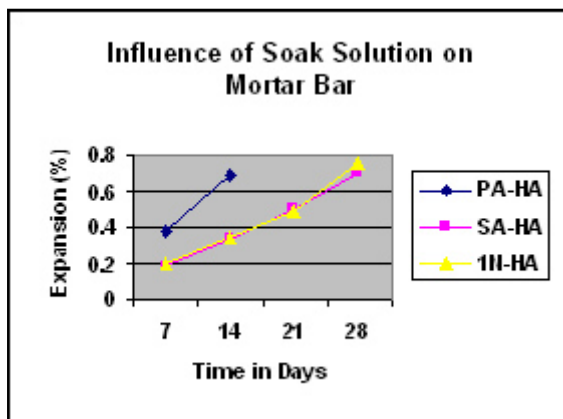
Applied research also is being conducted to create three new specifications that address drainable bases. The specifications apply to cement-treated permeable bases; asphalt-treated permeable bases; and unbound permeable bases.

Currently, there are no FAA specifications that address drainable bases. The new specifications will govern the minimum material requirements, construction, and acceptance for cement, asphalt, unbound treated drainable/permeable base. This will allow engineers to specify the construction of a drainable base, which allows water to escape from underneath the pavement surface that would otherwise remain in the pavement structure and become a contributor to pavement failure.

The specifications are expected to be released in mid-2005. Visit [www.iprf.org](http://www.iprf.org) for more information. Also, look for more information in future issues of **CONCRETE PAVEMENT PROGRESS**.

## Airfield Pavement Deicers and Concrete Pavement Surface Performance

The Federal Aviation Administration (FAA), Northwest Region, has recently implemented a modification to specification P-501 (for airfield concrete pavements). The modification is intended to identify aggregates with the potential to react with airfield pavement deicing and anti-icing chemicals.



The modification changes the soak solution and the soak time when using ASTM C-1260, Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method). It's often presumed that chemicals used to control ice on airfield pavements accelerate Alkali Silica Reaction (ASR). Visual observations of pavement deterioration at some airports appear to confirm this assertion.

A research team at Clemson University recently accomplished preliminary testing for the Innovative Pavement Research Foundation (IPRF) using reactive aggregates and airfield deicing chemicals.

Mortar bars made of high-alkali cement and spratt limestone were soaked in two different deicing chemicals. A control sample followed the ASTM C-1260 protocol with sodium hydroxide (NaOH) as the soak solution.

The expansion of the mortar bar, soaked in the potassium acetate deicer solution, was almost 200% greater than the mortar bars soaked in either the control solution or the sodium acetate deicer solution. The ASR gel was observed in the control bar but it did not form in the mortar bars soaked in deicer solution.

The expansion observed in the mortar bars, soaked in deicer solutions, may not be caused by the traditional ASR. However, it is obvious that a very aggressive reaction occurs when the potassium acetate deicer solution is used. The reaction may not be ASR, but a reaction is occurring nonetheless.

Airport pavement owners, consultants, and contractors are advised that if potassium acetate-based deicers are used on airfield pavements, they should seek advice in the areas of aggregate mineralogy and concrete chemistry.

ACPA will release more information on the research results in a future issue of *Research & Technology Update*. Look for an announcement of the next R&T Update in future issues of **CONCRETE PAVEMENT PROGRESS**. For more information or to comment on this article, please contact [Jim Lafrenz](#) at 202-842-1010.

## FAA Allows Alternative Pavement Design

*Story contributed by Gary L. Mitchell, P.E.  
Director of Airports, Southeast Chapter - ACPA*

The Federal Aviation Administration (FAA), Southern Region, recently issued a policy statement to its Airport District Offices (ADO) that allows alternative pavement design options for general aviation airport projects for which only asphalt would have been considered previously.

Currently, an ADO typically has enough funding for only one pavement design. The policy statement assures funding for two. It was issued after a consultant developed two pavement designs and saved an airport owner \$50,000 in the initial construction cost on a project. This was the first time a general aviation airport project of this size was bid with alternate designs.

The project, rehabilitation of Williamsburg County Airport, Kingstree, S.C., is currently underway. The project involves five inches of whitetopping over five-thousand square yards of existing asphalt pavement. The airport handles general aviation traffic and aircraft rated at 12,500 lbs.

The first option developed, with the help of ACPA, was a five-inch conventional whitetopping (concrete) project. The second was full-depth reconstruction with asphalt pavement. The full-depth reconstruction with asphalt was required because of the high-severity block cracking. The bids showed that the initial construction cost of the concrete pavement option was \$50,000 less than the asphalt option. Incidentally, the lowest bids for both designs came from the same contractor.

This experience showed that the cost of alternative designs may be recouped as part of the overall project savings. Equally important, it demonstrates that those overall costs may be significantly reduced when more than one design is considered.

There are currently several airports in the southern region of the United States that will soon look at alternative pavement design options. In addition, some bids will include life-cycle cost provisions. For more information on alternative bid designs, contact [Gary Mitchell](#) at 704-369-0475.

## Top 10 Factors for Effective Partial-Depth Repair of Concrete Airfields

*Restore rideability, stop deterioration, reseal joints effectively*

Partial-depth repairs are simple, effective techniques used to correct localized area distress in concrete airfield pavements. Partial-depth repair is used when the distress is less than one-third the depth of the pavement. If the distress is greater than one-third depth, then a full-depth repair is needed for structural improvements.

The following are 10 factors to conducting an effective partial-depth repair on spalled pavements:

- **Repair Boundaries** - The repair boundaries should extend beyond the spalled area into the surrounding concrete by three inches to assure removal of all unsound concrete.
- **Removal of Existing Concrete** - Concrete can be removed by sawing, chipping, or milling. Sawing or chipping requires a minimum two-inch deep saw around the repair area.
- **Cleaning** - Prior to patching, the patch area should be sandblasted and/or waterblasted to remove all loose particles of dirt or dust, as well as oil and other contaminants. Any contamination of the surface will reduce the bond between the new material and the existing concrete.
- **Joint Preparation** - When placing a partial-depth patch adjacent to any joint, there must be no bond of the repair material to the face of the adjacent concrete. Use a compressible insert along the joint prior to placing the patch material. The new joint width should not be less than the existing joint or crack.
- **Patch Materials** - Although early opening to traffic requires high early-strength concrete, a common mistake is the use of exotic high- and early-strength materials that are not compatible with the existing concrete. The repair material should have only compressive strength equal to the tire pressure and not the full weight of the aircraft upon opening to traffic.
- **Placement of Patch Materials** - Any residue should be removed using oil-free airblowing equipment prior to placing a bonding agent. Bonding agent should be applied evenly in a thin coat and should not be allowed to puddle or dry out.



- **Finishing** - The patch should be finished level with the cross section of the existing pavement without leaving excess material on the adjacent pavement surface. After finishing, the patch should be given a burlap drag or broom finish to approximately match the surface finish of the existing adjacent concrete pavement.
- **Saw-Cut Runouts** - The bonding agent or joint sealant should be used to fill any saw-cut runouts that extend beyond the patch perimeter at patch corners.
- **Curing** - Proper curing generally requires the application of curing compound at the time bleed water has evaporated from the surface. Because curing is critical for partial-depth patches, a double application of liquid-membrane-forming curing compound should be used.
- **Joint Resealing** - Resealing will help prevent moisture and incompressibles from causing further damage. The joint faces must be clean and dry for good sealant performance.

### ***Read more about partial-depth repairs***



For more information about partial-depth repairs for concrete airfields, refer to ACPA's "Concrete Crack Partial-Depth Spall Repair Manual," ACPA catalog number JP003P.

The 54-page guide is the definitive resource for inspectors, engineers, contractor crews, and others involved with concrete pavement maintenance and repair on concrete highways, airfields, and roadways.

The pocket-sized manual provides guidelines for concrete pavement maintenance and repair techniques, including partial-depth patches, crack sealing, and joint resealing. The manual features subject tabs and is an annotated reprint of the [US Department of Defense](#) Tri-Services military manual UFC 3-270-03.

The cost of this publication is \$24.00. To order JP003P, go to [www.pavement.com](http://www.pavement.com) or access [it](#); call toll-free 1-800-868-6733; or fax requests to 847-966-9666.

## **Research Tips to Reduce Early Cracking in Concrete Airfields**

A recent study reported that construction variants combined with trigger conditions cause early cracking of concrete pavement. The study also showed that positive steps can be taken to limit those variants and reduce early cracking.

[ERES Consultants](#) studied more than 885 different pavement types at 119 airports. Table 1 shows a list of construction variants to avoid during construction, as well as three conditions that trigger the potential for early cracking. The table also includes keys to addressing cracking potential ... a quick guide to the combination of variants and triggers that together can signal cracking.

**Table 1 - Cracking Potential**

<b>Construction Variants</b>	<b>Trigger Conditions</b>
<p style="text-align: center;"><b>Late or shallow saw cutting</b></p> <p style="text-align: center;"><b>Inadequate curing</b></p> <p><b>High strength subbase material</b></p> <ul style="list-style-type: none"> <li>* Excessive strength (&gt;1000 psi)</li> <li>* High subbase restraint</li> </ul> <p>* Excessive base thickness (&gt;6-in)</p> <p>* Shrinkage cracks in subbase</p> <p style="text-align: center;"><b>Excessive panel sizes</b></p> <ul style="list-style-type: none"> <li>* Large length-to-width (&gt;1.25)</li> <li>* Panel size too large (&gt;5L)</li> </ul> <p><b>Materials prone to high shrinkage</b></p> <ul style="list-style-type: none"> <li>* High cement factor (&gt;4000 lbs.)</li> <li style="padding-left: 40px;">* High paste volume</li> <li>* Fly-ash and cool temperatures</li> <li>* Water reducing admixtures</li> <li>* Gap-graded with fine sand</li> </ul>	<p style="text-align: center;"><b>Large ambient temperature swings</b></p> <p style="text-align: center;"><b>Hot weather</b></p> <p style="text-align: center;"><b>High surface evaporation rate</b></p>

**Keys to addressing cracking potential...**

- >>> **Potential for Early Cracking:** Factor one construction variant + one trigger.
- >>> **High Potential for Early Cracking:** Factor two construction variants + one trigger.
- >>> **Definite Early Cracking:** Factor three or more variants + one trigger.

For more information about early cracking, refer to ACPA's "Early Cracking of Concrete – Causes and Repairs," ACPA catalog number TB016P.

The publication outlines factors that influence uncontrolled cracking, including: saw timing, cut depth, longitudinal joint construction, weather conditions, and concrete mixture.

A great reference for crew education and forensic evaluation, the technical publication provides a table of repair techniques and a detailed appendix on estimating the characteristics of concrete from the combined grading.



The cost of this publication is \$17.50. To order TB016P, go to [www.pavement.com](http://www.pavement.com); call toll-free 1-800-868-6733; or fax requests to 847-966-9666.



ACPA also has more information in a past issue of *Research & Technology Update*, "Stabilized Bases and Airfield Concrete Pavement Cracking."

The bulletin provides basic information about early cracking, subbase considerations, mix designs for concrete pavements on stabilized subbases.

Download this issue of R&T Update for no charge at ACPA's website, [www.pavement.com](http://www.pavement.com), or click [here](#) to download now.

## ACPA Product Showcase

### Concrete Pavement Repair Manual



The 70-manual is prepared in a user-friendly format with subject tabs. The pocket-sized field manual is an excellent resource for inspectors, engineers, contractor crews, and anyone involved with concrete pavement repair on both airfields and roadways. Numerous photos and diagrams depict repair scenarios.

The manual is an annotated reprint of the U.S. Department of Defense Tri-Services military manual UFC 3-270-04.

The cost of this publication is \$24.00. To order JP002P, go to [www.pavement.com](http://www.pavement.com) or access <http://www.pavement.com/ecommerce/main.html>; call toll-free 1-800-868-6733; or fax requests to 847-966-9666.

JP002P

## ***Best Practices for Airport Concrete Pavement Construction***

This 159-page manual is a compendium of construction and inspection practices that are intended to enhance long-term pavement performance of airport concrete pavements. A spiral binding and extra-durable paper allow this book to withstand field conditions.

The cost of this publication is \$11.00. To order JP007P, go to [www.pavement.com](http://www.pavement.com); call toll-free 1-800-868-6733; or fax requests to 847-966-9666.



## ***Concrete Pavement News Digest***

### **Industry Groups Evaluate Long-Term Concrete Pavement Research Plan**

A research plan was reviewed last month to provide a framework for innovative solutions to customer-driven concrete pavement performance requirements.

The research plan, called the "Long Term Plan for Concrete Pavement Research and Technology: The Strategic Road Map," is part of the Federal Highway Administration's (FHWA) Concrete Pavement Technology Program. The plan contains several objectives involving concrete pavement mixtures and materials, design, construction, and pavement management/business systems. The Strategic Road Map identifies research to develop new paving solutions and business practices that address significant national issues affecting the industry, including motorists' demands for smoother, quieter pavements and for fewer road closures and delays due to road work.

"This is a positive initiative that bodes well for the concrete pavement industry. ACPA supports this plan because it addresses tomorrow's needs today," commented Jerry Voigt, ACPA's Chief Operating Officer and Senior Vice President of Technical Services.

ACPA participated in the meeting which was held at the FHWA's Turner-Fairbank Facility in Washington, D.C. Other attendees included Federal Highway Administration and state DOT representatives, consultants, and ACPA-affiliated Chapter/State staff members.

### **Florida Concrete & Products Association Offers Whitetopping Video**



The [Florida Concrete and Products Association](http://www.fcpa.org) is offering a DVD that covers the design and construction of an award-winning whitetopping project at the Fernandina Beach Municipal Airport, Fernandina Beach, Fla.

The DVD, called "Whitetopping: Concrete Overlays for General Aviation Airports," features two different videos. One video is a nine-minute feature intended to inform airport executives and managers of the benefits of whitetopping for general aviation airports.

The other is an 18-minute video that provides detailed information on the design and stages of construction. Designed for contractors, airport engineers, consultants, and students, the video describes the process from conception to completion. It also features interviews of Florida DOT aviation personnel.

The cost of the DVD is \$30 and can be ordered through the FCPA. To order the video, contact [Brandie Tapscott](#) at 800-342-0080.

### **Company Offers Free Guide on Surety Bonds**

The [Surety Information Office](#) (SIO) is offering free copies of a CD-ROM that provides information on the bonding process and developing and maintaining the surety relationship.

The CD, called "*Surety Bonds: A Guide for Contractors*," features three narrated presentations that address obtaining surety bonds, developing a surety relationship, and bonding subcontractors.



It also provides access to SIO's online publications, as well as links to related websites. For a free copy of the CD, visit [www.sio.org](http://www.sio.org) or call 202-686-7463.

### **Research Board Names Tayabji Member Emeritus**

Shiraz Tayabji, P.E., Regional Manager, [Construction Technology Laboratories](#), Inc., recently was appointed as a Member Emeritus of the [Transportation Research Board](#) (TRB) Committee on Rigid Pavement Design.

TRB established the emeritus membership category to recognize the significant and long-term contributions of individuals who have provided outstanding service through participation in TRB's standing committees.

Tayabji was previously elected as a Member Emeritus of the TRB Committee on Pavement Rehabilitation. For more information, contact Tayabji at [stayabji@ctlgroup.com](mailto:stayabji@ctlgroup.com).



**Shiraz Tayabji**

### **ACPA Announces Annual Reception at Research Board Meeting**

ACPA will host its 9th Annual "TRB-Willard Reception" during the 84th Annual [Transportation Research Board](#) (TRB) Meeting in the Crystal Room at the Willard InterContinental, 1401 Pennsylvania Ave., Washington, D.C., on January 10 at 5:00 - 7:30 p.m.

The Association invites transportation professionals to join us for an evening of refreshments and conversation with other professionals representing every quarter of the transportation and transportation-research community. Guests are kindly asked to RSVP on or before January 3, via e-mail at [TRB2005@pavement.com](mailto:TRB2005@pavement.com).

Transportation to the reception is provided at no cost from the Marriott Wardman Park at the 24th Street entrance. Buses depart the Marriott Wardman Park at approximately 5 p.m., and return from the Willard Intercontinental between 7 and 7:30 p.m. For users of public

transportation, the Metro stop for the Willard Intercontinental Washington is "Metro Center" at 12th and F Streets.

### **Society for Concrete Pavements Seeks Papers for Conference**

The [International Society for Concrete Pavements](#) (ISCP) is calling for papers to be presented at the 8th International Conference on Concrete Pavements in Colorado Springs, Colo.



The event, co-sponsored by ACPA, will be held August 13 - 18, in Colorado Springs, Colo. The conference, themed "Innovations for Concrete Pavement: Technology Transfer for the Next Generation," is focused on federal, state, and municipal engineers; consulting engineers; contractors; materials suppliers; and academia. For more information, contact Jason Weiss, Purdue University, at [iscp8@ecn.purdue.edu](mailto:iscp8@ecn.purdue.edu).

### **ACPA to Participate in ConExpo-Con/Agg 2005**

ACPA will represent the concrete pavement industry again at the international trade show for the construction and materials industries, [CONEXPO-CON/AGG 2005](#).

One of several supporting organizations of the event, the Association will feature the latest information about products and services. Stop by and visit us at booth number 80136.

Scheduled for March 15 - 19 at the Las Vegas Convention Center, [CONEXPO-CON/AGG](#) is one of the world's largest international trade shows for the construction and materials industries.

More than 100,000 visitors from 120 countries are expected to attend. The show will feature more than 2,000 exhibitors showing new construction equipment, materials, and more. It's a one-stop marketplace for exhibits, networking, and education for our industry. Click [here](#) for information or visit [www.conexpoconagg.com](http://www.conexpoconagg.com).



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