



# International Society for Concrete Pavements

## What's New at ISCP

Quarterly E-Newsletter  
Vol. 2, No. 2

July 2005

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### CORPORATE MEMBERS



### Greetings From the President



Four weeks and counting! The stage is set, the players are ready, the program has been finalized and the proceedings have been printed. And the weatherperson has promised great weather. All that waits is for all of us to make our way to Colorado Springs by August 15 to participate in the premier concrete pavement technology event of 2005. Over 300 attendees from over 20 countries have already registered for the 8th International Conference on Concrete Pavements and we expect the final count to be over 400 attendees.

It is always a good feeling to see many months of planning and dedication come to fruition. Many members of the society have devoted a lot of time and effort to ensure that the conference meets with your expectation. I would like to take this opportunity to thank the Conference Steering Committee, led by Dan Zollinger, the Technical Program Subcommittee, led by Will Hanson and Norb Delatte, the Workshop Subcommittee, led by Dale Harrington, Purdue University conference division staff, led by Nona Schaler, our secretary/treasurer, Mark Snyder, for keeping us all on track, and many others who gave us their time and advise.

I would also like to thank our partners, the Federal Highway Administration, the Colorado Department of Transportation, the American Concrete pavement Association (ACPA), The Portland Cement Association, the Cement Association of Canada, the Concrete Reinforcing Steel Institute, the Transportation Research Board, Purdue University, and the Colorado-Wyoming Chapter-ACPA for the fine support that these organizations have provided.

Conference related details are provided elsewhere in the newsletter. I am sure you will agree that the conference program is one of the best in many years. And I urge you, if you have not yet registered, to consider attending.

Finally, I would like to take this opportunity to congratulate our co-editor, Erwin Kohler, I should say Dr. Erwin Kohler, for successfully completing the requirements of the Doctor of Philosophy program at the University of Illinois. Here is a proud Erwin on the day of the convocation. Erwin is now at the University of California, Davis, and will continue to serve as a co-editor with Jake Hiller.



Shiraz Tayabji, President, ISCP  
[stayabji@concretepavements.org](mailto:stayabji@concretepavements.org)

### ISCP Mid-Year Meeting Highlights

A mid-year meeting of the ISCP membership and board of directors was held at the Portland Cement Association in Skokie, Illinois, USA on July 6.

Many topics were discussed and action on most items was deferred until the upcoming board and membership meeting on Sunday, August 14 at the 8th International Conference on Concrete Pavements. Items discussed included:

- Final details for the upcoming 8th International Conference and associated workshops.
- Solicitation of nominations for officers and board members for the upcoming

elections.

- Staggering of board member terms to elect 7 new members every other year (beginning with the election this year of 7 members to 2-year terms and 7 to four-year terms, with four-year terms for all future elections).
- Establishment of a committee for international activities.
- Consideration of several relatively minor changes to the ISCP Constitution and By-Laws (these will be e-mailed to all current board members for further consideration and voting at the next meeting; board-approved changes to the constitution will be balloted to the entire membership).
- Voting on honorary member nominations.

### **ISCP Needs Your Help!**

The growth and success of ISCP depends upon its ability to provide its members with valuable services. To that end, the officers and board members are soliciting YOUR input to assist in identifying and prioritizing member needs and useful products and services.

Items that have been suggested include: an independent journal for technical papers (underway), periodic electronic newsletters (such as this one); a periodic magazine featuring technical articles and announcements (in addition to or in place of the journal); maintaining a "speaker's bureau" list of members and areas of expertise; scholarship programs and competitions for students; organization of multi-day seminar/tours of construction sites on various continents; and other activities.

Please take a few minutes to think about how ISCP can better serve the profession in general and the membership in particular! Then go to the ISCP website ([www.concretepavements.org](http://www.concretepavements.org)) and click on the "Forum" tab. Then click on the first discussion item ("Member Input to Improve Society Value"), read the original message, click "reply", and leave your message!

(NOTE: if you haven't yet registered, you will need to do so before you can participate in the Forum! See the article below in this newsletter for further instructions.)

All entries in the forum will be summarized and presented at the August board and membership meeting for further discussion.

### **January 2006 Meeting Date: A New On-Line Poll**

The January 2005 Annual Meeting was held on the Saturday evening before the Annual Meeting of the Transportation Research Board in Washington, D.C., USA. While this meeting date and time seemed to work well, a Sunday evening meeting might be more convenient for many ISCP members.

Which meeting date would YOU prefer for 2006? Please vote NOW using the ISCP electronic forum (on the ISCP website at [www.concretepavements.org](http://www.concretepavements.org)). Votes will be tallied and considered at the August board and membership meeting, where the 2006 Annual Meeting date will be selected and announced.

(NOTE: if you haven't yet registered, you will need to do so before you can participate in the Forum! See the article below in this newsletter for further instructions.)

### **Register NOW to use the ISCP online electronic forum!**

The ISCP electronic forum provides members with an opportunity to share information, obtain up-to-date information on Society activities, to discuss technical issues and Society matters, and to vote on various issues. If you're not a registered user, you're missing out on one of the benefits of Society membership!

To register, do the following:

1. Go to the ISCP webpage at [www.concretepavements.org](http://www.concretepavements.org) and click on the "Forum" tab on the left side of the homepage.
2. Click on the "Register" link and follow the instructions for either a Global (access to any EZBoard message board) or Local (ISCP message board only) registration (either will work). Remember your selected login name and

password – you'll need it for all future visits to the forum.

3. After you complete the registration form, an e-mail will be sent to the address you provided. Click on the link within the e-mail to validate your registration.
4. That's all – you're ready to use the forum!

### **Nominating Committee Welcomes Suggestions for ISCP Board and Officers**

The ISCP Nominating Committee welcomes suggestions from the ISCP membership for candidates for the following positions:

- President
- Vice-President
- Secretary-Treasurer
- Director (fourteen positions)

The term of office for all of these positions will be for 4 years (from February 1, 2006 through January 31, 2010). All nominees must be members in good standing and should have significant professional experience in concrete pavement technology. Self-nominations are welcomed.

Nominations should include (as a minimum) the nominee's name, title, business address, and an indication of the nominee's willingness to serve. The nominating committee welcomes additional information on all nominees (e.g., the candidate's education, professional experience, affiliations, honors and awards).

Nominations should be sent electronically to the Nominating Committee Chair, Dr. Ernest Barenberg at [ejbm@uiuc.edu](mailto:ejbm@uiuc.edu) with a copy to [stayabji@ctlggroup.com](mailto:stayabji@ctlggroup.com). Hard copy nominations can be mailed to the following address:

ISCP Nominating Committee  
Attn: Dr. Ernest J. Barenberg  
1611 Titan Drive  
Rantoul, IL 61866 USA

Nominations may also be FAXed to Dr. Barenberg's attention at 217-893-0601.

Nominations must be received by August 15, 2005. This will allow for nominations to be made up through the second day of the 8<sup>th</sup> International Conference on Concrete Pavements. Contact Dr. Barenberg if you need further information (phone: 217-333-7311).

### **Call for Nominations of Honorary Members**

Honorary Members are individuals that have provided exemplary service to the International Society for Concrete Pavements and/or to the improvement of concrete pavement technology over his/her career. Currently, ISCP has designated 10 members this revered status.

Nominees for honorary membership in the ISCP must be:

- 1) individuals who have maintained ISCP membership for at least 5 years and who have provided exemplary service to the Society and/or at least 25 years of dedication to the improvement of concrete pavement technology; or
- 2) nonmembers who have dedicated at least 35 years of service to the improvement of concrete pavement technology.

Nominations for honorary membership may be submitted to the [ISCP Secretary](#) using the [standard nomination form](#) at any time by any ISCP member in good standing. On June 1 of each year, the ISCP secretary shall prepare copies of all nomination materials received during the previous 12 months and distribute them to the ISCP Board of Directors for consideration at their mid-year meeting. Honorary members will be inducted at the next annual membership meeting of the ISCP or at the next International Conference, whichever occurs first.

For more details on the Honorary Member procedures and details, please go to:

<http://www.concretepavements.org/Membership/honorary.htm>

### ***International Journal of Concrete Pavements Call for Papers***

In an effort to disseminate new information and provide on-going benefits to ISCP members in good standing, the Society is launching a new publication. The *International Journal of Concrete Pavements*, the new peer-reviewed electronic journal of the International Society for Concrete Pavements, continues the invitation for submittals of papers for review and possible inclusion in future issues of the Journal. For manuscript guidelines and editorial policies, please go to

[www.concretepavements.org/Membership/ejournalCFP.htm](http://www.concretepavements.org/Membership/ejournalCFP.htm)

Specific questions on the Journal can be directed to Norb Delatte at [n.delatte@csuohio.edu](mailto:n.delatte@csuohio.edu).

Updates on the *International Journal of Concrete Pavements* will be available in upcoming ISCP Quarterly E-Newsletters as well as on the [ISCP webpage](#).

### **Interested in ISCP Membership?**

We encourage all of our colleagues to contribute to the further advancement of the concrete pavements and materials professions by joining the International Society for Concrete Pavements. At US\$50/year, individual memberships are relatively inexpensive (and are offset by reduced registration rates at ISCP events). Student membership is only US\$25/year. Members also have online access to discussion forums, subscription to the *International Journal of Concrete Pavements*, and direct emailing of the ISCP Quarterly E-Newsletter among other resources. Attendees of the 8<sup>th</sup> International Conference on Concrete Pavements will receive a one year membership in ISCP. For more information on membership, contact Mark Snyder (Secretary-Treasurer) at [msnyder@concretepavements.org](mailto:msnyder@concretepavements.org).

## **Countdown to Colorado**

Occasion already passed!

### **Highlights of the Conference**

The 8<sup>th</sup> International Conference on Concrete Pavements is scheduled for August 14-18, 2005 in Colorado Springs, Colorado, USA at the Sheraton Colorado Springs Hotel. This conference will carry on the tradition of the first seven international conferences previously organized by Purdue University. As with the previous international conferences, the focus of the eighth conference will be to present information on new technologies related to design, construction, and rehabilitation of various types of concrete pavements. The theme of the conference will be *Innovations for Concrete Pavement: Technology Transfer for the Next Generation*.

The objective of the conference is to present the latest information on economical and practical aspects of hydraulic cement concrete pavement design, construction, materials, maintenance, performance, evaluation, and structural rehabilitation, which are essential for achieving long lasting, high-performance concrete pavements.



More than 70 papers will be presented excluding workshop presentations. Also, a limited number of papers will be selected for publication only. In previous conferences papers have been received from many countries (Argentina, Australia, Belgium, Brazil, Canada, France, Germany, Italy, Japan, Mexico, The Netherlands, South Africa,

Sweden, Taiwan, UK, and USA). Both paper copies and a CD will be distributed to each registrant at the conference.

## **8<sup>th</sup> International Conference on Concrete Pavement Awards**

Four awards will be bestowed on papers and posters at this year's international conference. The newest award is sponsored by the ACPA Concrete Pavement Education Foundation (CPEF) to honor the late Robert G. Packard and will be presented for the best paper on concrete pavement analysis and design.

In addition to the Packard Award, the 8<sup>th</sup> International Conference on Concrete Pavements will also continue sponsoring two other awards for technical papers: the Eldon J. Yoder Award for Outstanding Paper of the Conference and the Bengt F. Friberg Award for Outstanding Paper by a Young Author.

Finally, the International Society for Concrete Pavements will present the B.F. McCullough Award for the best student poster presentation at the 8<sup>th</sup> Conference's Research In-Progress poster session. More information on the Research In-Progress poster presentations can be found at the conference website below.

[www.concretepavements.org/8th\\_Int\\_conf/default.htm](http://www.concretepavements.org/8th_Int_conf/default.htm)

## **Final Technical Program**

A final technical program schedule for the 8<sup>th</sup> International Conference on Concrete Pavements has been developed based on accepted papers from the peer review process. The technical program can be viewed at:

[http://www.concretepavements.org/8th\\_Int\\_conf/main\\_files/8thConcrete.pdf](http://www.concretepavements.org/8th_Int_conf/main_files/8thConcrete.pdf)

## **Airports and Alkali-Silica Reaction (ASR) Workshop**

A workshop on ASR in airport pavements will be held on Wednesday, August 17 from 2:00 to 8:00pm at the conference. This workshop is being held in conjunction with the 8<sup>th</sup> International Conference on Concrete Pavements.

ASR is a leading cause of poor pavement performance at many airports. It is a chemical process where alkali contained in the cement reacts with the silica in the aggregate in the presence of moisture. This causes concrete pavements to expand, eventually weaken, and deteriorate.

Topics to be discussed at the workshop will include an overview of ASR, the extent to which it is impacting airports, prevention, mitigation, de-icing chemicals and other current technical issues and concerns. Presentations will be made by experts from the American Concrete Pavement Association, Purdue University, Clemson University, Texas A&M University, the University of New Hampshire, the South Dakota Department of Transportation and the Federal Aviation Administration (to be confirmed).

A site visit to see airport ASR, first hand, at the Colorado Springs Airport is tentatively scheduled for Thursday, August 18, 2005 from 9:00 – 11:00am.

There are three options for registration for this workshop.

- Advanced Registration Option A: \$150 -
- On-site Registration Option A: \$200 -  
Both advanced and on-site registration includes the Airports and ASR workshop along with all ISCP conference activities held on Wednesday, August 17 beginning at 8:00 a.m. (i.e., technical sessions, lunch, workshop, and dinner).
- Option B: \$50 - For those who are currently registered for the full ISCP conference, this includes an additional charge and on-site registration.

To register on line, go to [www.conf.purdue.edu](http://www.conf.purdue.edu), click on <Programs Catalog>, and

then select <International Conference on Concrete Pavements>.

For additional information about this workshop, please contact Kevin Flynn at Kimley-Horn and Associates: 303.228.2313 or [kevin.flynn@kimley-horn.com](mailto:kevin.flynn@kimley-horn.com)

### 8th International Conference Workshop Sessions

One of the key features of the 8<sup>th</sup> International Conference on Concrete Pavements will be the focus on workshops. The fees for these workshops are included in the conference registration fee. Workshops are planned for Sunday and will be repeated again on Tuesday for interested individuals. The four main themes of the workshops are the following:

1. Pavement Design – the Mechanistic–Empirical Methodology.
2. Concrete materials and mixture design – new developments.
3. Concrete pavement construction – new tools.
4. Concrete pavement repair and rehabilitation strategies.

More details on these workshops, including workshop leaders, objectives, and agendas can be found at the following website (Select “Workshops” on the left menu):

[www.concretepavements.org/8th\\_Int\\_conf/default.htm](http://www.concretepavements.org/8th_Int_conf/default.htm)

### Area Attractions

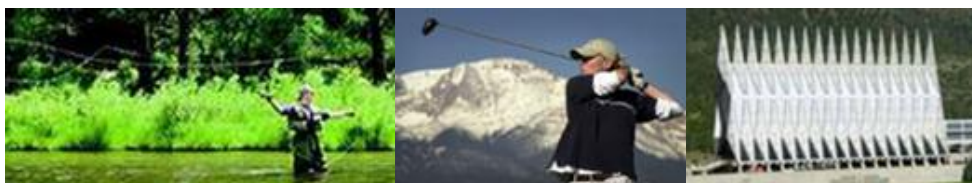


Area attractions include Pikes Peak, Garden of the Gods, Cave of the Winds, Seven Falls, Cog Railway, Royal Gorge Bridge, Manitou Cliff Dwellings, Air Force Academy, Peterson Air Force Base, U.S. Olympic Training Center, Pro Rodeo Hall of Fame and American Cowboy Museum, Miramont Castle, the Flying W Ranch, and the Cheyenne



Mountain Zoo.

Excursions are planned for conference attendees (at an additional cost) for the Pikes Peak Cog Train, the U.S. Air Force Academy, the Garden of the Gods, Old Colorado City, as well as a fly fishing expedition. Many outdoor activities are also available. See the [conference brochure](#) for more details.



### Registration Information and Fees

- USD\$600 - Conference Registration after April 15, 2005; Registration includes breakfast, lunch, reception, dinner on August 15, 2005, proceedings, session attendance, and 2005 ISCP membership (a \$50 value).
- USD\$250 - Student Registration; Registration includes breakfast, lunch, reception, dinner on August 15, 2005, proceedings, session attendance, and 2005 ISCP membership (a \$25 value).
- USD\$100- Spouse Program. Registration includes reception Sunday, August 14, dinner Tuesday, August 16, breakfast and lunch in the exhibit area, and hospitality suite.
- U.S. Government Agencies, see the registration form for reduced rates.
- For year 2005 ISCP members (Year 2005 membership fee already paid), a \$50

discount (\$25 for students) will be available.

To register online, visit: [www.conf.purdue.edu/concrete](http://www.conf.purdue.edu/concrete)

## Industry Notes

### Blastrac Releases Literature for Milling Machine

Blastrac/ISP released a new brochure that describes the features and benefits of the BMP 6000 electric milling machine. The machine features different milling cutter configurations for concrete pavements and other applications. The BMP 6000 cuts a 14-in. wide path at depths ranging from 1/8-in. to several inches, depending on application.



The depth of cut is controlled in 1/8-in. increments using a precise, screw-down control that locks to maintain consistency. Three different cutter drums (coarse, fine, and flat) allow for a range of removal capabilities and finishes. Equipment and application training is available at the Blastrac Surface Preparation Academic Resource Center. For more information, call 800-256-3440 or visit [www.blastrac.com](http://www.blastrac.com)

Source: Concrete Pavement Progress. June 2005

### ACPA Unveils New Logo



ACPA has designed and implemented a new logo to usher in the Association's new direction and future initiatives.

The new logo reflects ACPA's bold, dynamic approach, while also symbolizing concrete pavements. Creation of the new logo is especially well-timed, given ACPA's new products to be released this summer; recent staff additions; and relocation of the Washington, D.C.-office. (Effective May 11, the office will be located at 1130 Connecticut Avenue, NW, Suite 1250, Washington, DC 20036. Phone: 202-887-8290. Fax: 202-887-8298. For additional information, contact Bill Davenport at 847-972-9810.

### ACPA Newsletter

The American Concrete Pavement Association publishes every month its newsletter called "Concrete Pavement Progress" which covers the latest information about concrete pavement technologies, as well as transportation industry news. The focus of the most recent editions are as follows:



- May 2005: Longevity and Durability of Pavements
- June 2005: Design and Construction of Streets & Local Roads
- July 2005: Sound at the tire/pavement interface

In addition to the main topic, each issue includes Tech Tips, A Look Back article, and Concrete Pavement News Digest. The newsletter archives, in pdf format, can be found at <http://www.pavement.com/ CPP/main.html>, where ACPA offers free online registration. The HTML versions can be found here.

<http://www.pavement.com/ CPP/2005/ CPP-May-05.htm>

<http://www.pavement.com/ CPP/2005/ CPP-June-05.htm>

<http://www.pavement.com/ CPP/2005/ CPP-July-05.htm>

Contact: Bill Davenport [bdavenport@pavement.com](mailto:bdavenport@pavement.com) (Editor)

### Achieving a High Level of Smoothness in Concrete Pavements without



## Sacrificing Long-Term Performance

The Federal Highway Administration has released a technical summary of the report "Achieving a High Level of Smoothness in Concrete Pavements without Sacrificing Long-Term Performance", which will be published by the FHWA later this summer. The research project was conducted to:

- Assess whether high initial smoothness translates into better long-term performance.
- Identify design features and material properties in PCC pavements that can cause an initially smooth pavement to exhibit detrimental long-term performance.
- Provide guidance on adjustments that can be made to materials properties, design features, and construction procedures in order to avoid these detrimental effects.
- Investigate early age changes in smoothness of PCC pavements.
- Provide recommendation and guidelines regarding smoothness testing

The full FHWA-HRT-05-068 report may be obtained from the FHWA Product Distribution Center by e-mail to [report.center@fhwa.dot.gov](mailto:report.center@fhwa.dot.gov), by fax to 301-577-1421, or by phone to 301-577-0818.

Source: <http://www.tfrc.gov/pavement/pubs/05069/05069.pdf>

FHWA Contact: Peter Kopac, 202-493-3151

## NCHRP Recent Publications

The following publications are now available from the TRB's National Cooperative Highway Research Program.

***LTPP Data Analysis: Influence of Design and Construction Features on the Response and Performance of New Flexible and Rigid Pavements*** (NCHRP Web Document 74)

This report includes analysis of the SPS-2 experiment, entitled *Strategic Study of Structural Factors for Rigid Pavements*, which is one of nine special pavement studies in the LTPP program. The main objectives of this experiment are to determine the relative influence and long-term effectiveness of the structural factors affecting performance of jointed plain concrete pavements (JPCP). These factors include PCC slab thickness, base type, in-pavement drainage, PCC flexural strength and lane width.

Analytical investigations were performed to identify relationships between design and construction features, site factors, and performance. While the report supports the existing understanding of pavement performance, the methodology in the study offers a systematic outline of the interactions between design and site factors as well as new insights on various design options.

The report is available at

[http://trb.org/publications/nchrp/nchrp\\_w74.pdf](http://trb.org/publications/nchrp/nchrp_w74.pdf). (700 pages, 4.90Mb)

A summary of the research scope can be found at

[http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+20-50\(10&16\)](http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+20-50(10&16)).

***State Construction Quality Assurance Programs*** (NCHRP Synthesis 346)

Synthesis 346 examines current quality assurance practices of state and federal departments of transportation with regard to highway materials and construction. The report focuses on the strategies and practices used by agencies to ensure quality. On Chapter 6, the report covers quality assurance programs for Portland cement concrete paving.

Statistically based QA programs for PCC paving (PCCP) are



not used by as many agencies as for HMA; however, such use has increased in the last decade. As an example, the Washington State DOT has developed QA specifications to resist the stresses at urban intersections. The use of performance-related specifications for PCCP is on the increase and appears to be ahead of the use of this type specification for HMA.

The report is available at

[http://trb.org/publications/nchrp/nchrp\\_syn\\_346.pdf](http://trb.org/publications/nchrp/nchrp_syn_346.pdf)



## Research News

### **Workshop on Fracture Mechanics for Concrete Pavements: Theory to Practice**

A workshop on the utilization of fracture mechanics in concrete pavements will be held on August 10-12 in Copper Mountain Colorado, USA just before the 8<sup>th</sup> International Conference on Concrete Pavements.

The objective of this workshop is to bring together leading scholars in concrete pavement research and fracture mechanics in order to develop recommendations for research needs in the development of advanced fracture mechanic concepts for concrete pavements. Based on participant presentations and discussions at the workshop, a research needs document will be written and submitted by the workshop organizers to the following organizations which can support concrete pavement research including NSF, TRB, NCHRP, FHWA and ISCP.

Each participant will make a short presentation (20 minutes) followed by a round table discussion. Two keynote speeches on concrete fracture mechanics will also be presented by Prof. Surenda Shah of Northwestern University and Prof. Tom Scarpas of Delft University of Technology

Each participant will receive CD proceedings of the papers and recommendations to the 8th International Conference on Concrete Pavements will be discussed and voted on.

The USD\$625 workshop fee includes 3 nights hotel accommodation at the Copper Mountain Resort in Copper Mountain, Colorado, USA (Aug. 10-12)

<http://www.coppercolorado.com/>

Breakfast (2), Lunch (2), and Dinner (2) on Thursday and Friday as well as the Wednesday night reception are also included in the workshop fee. Registration can be done online at

[www.conf.purdue.edu/concrete/workshop](http://www.conf.purdue.edu/concrete/workshop)

For more information on this workshop, please contact:

Prof. Jeff Roesler	or	Prof. Lev Khazanovich
Phone: (217) 265-0218		Phone: (612) 624-4764
Email: <a href="mailto:jroesler@uiuc.edu">jroesler@uiuc.edu</a>		Email: <a href="mailto:khaza001@umn.edu">khaza001@umn.edu</a>

### **European Airport Pavement Workshop Supplies a Need**



On May 11 and 12, 2005, the first European Airport Pavement Workshop took place at Schiphol-Oost, Amsterdam. Over one hundred participants from all around the world came to the Netherlands to discuss airport pavements. 31 papers were presented in two days. They were divided roughly in two subjects: design & construction and measurements & maintenance. The international character of the workshop and the presentations from different countries was highly appreciated.

Each country has its own problems and solutions and exactly this diversity and the possibility to share experiences have made the workshop a success.

A CD-ROM of the proceedings and presentations will be available from CROW in September 2005. More details on this workshop can be found at

[http://www.crow.nl/engels/\\_t0\\_p0\\_m7\\_i3148.htm](http://www.crow.nl/engels/_t0_p0_m7_i3148.htm)

Source: <http://www.crow.nl/engels/>

## Featured Thesis Abstract

Every issue, the ISCP Quarterly E-Newsletter features a recent thesis or dissertation relating to concrete pavements and materials from around the world. Interested individuals should submit their abstract, former university affiliation/advisor, and current position information to [newsletter@concretepavements.org](mailto:newsletter@concretepavements.org). This quarter, we have a featured abstract from Dr. Thomas Voigt.

### **The Application of an Ultrasonic Shear Wave Reflection Method for Nondestructive Testing of Cement-Based Materials at Early Ages - An Experimental and Numerical Analysis -**

Dr. Thomas Voigt

Currently working as a Post-doctoral Fellow  
at the Center for Advanced Cement-Based Materials  
Northwestern University

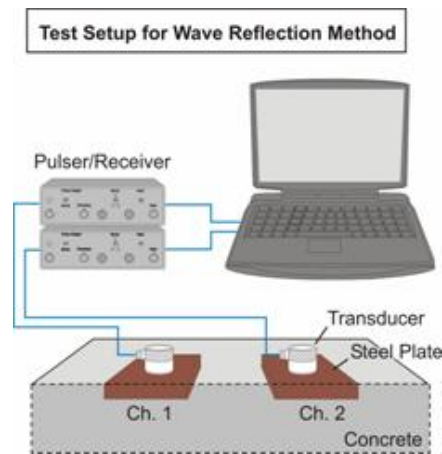
Ph.D. in Civil Engineering at University of Leipzig in Germany(2004)

Thesis Advisors: Professor Stefan Winter (University of Leipzig, Germany)  
and

Prof. Surendra P. Shah (Northwestern University, USA)

A very significant portion of today's civil infrastructure is partially or completely made out of cementitious materials, such as concrete. Repeated failures of concrete structures during construction have shown that the early-age period is one of the most critical periods in the life span of concrete, making the availability of information about early-age concrete properties most essential.

In this context, this thesis introduces an ultrasonic wave reflection method that measures the reflection loss of high-frequency shear waves at the interface of a steel plate and hydrating cementitious materials. The reported investigations are devoted to the fundamental relationships among evolving microstructure, mechanical properties, and reflection loss. A wide range of material properties of different cement pastes, mortars, and concretes was evaluated by starting from phenomenological parameters, such as setting, and then moving to defined physical and physico-chemical properties, such as elastic moduli, degree of hydration, and porosity. To complement the experimental work, two numerical models - HYMOSTRUC3D and CEMHYD3D - for simulating the cement hydration process were employed.



The conducted investigations have shown that the reflection loss is closely related to parameters describing the tested materials on a macroscopic level, such as setting or compressive strength. In fact, a bilinear relationship between compressive strength and reflection loss for early-age concrete has been identified. Based on this relationship, field tests with the wave reflection method were conducted in a precast production plant. After adjustments to the used concrete mix proportion, the wave reflection method could successfully be used to predict the in-situ compressive strength of full-size precast elements at early ages under field conditions.

Furthermore, it was found that the reflection loss is directly related to the degree of hydration, the gel-space ratio and the parameters describing the connectivity of the hydrating cement particles. The experimentally and numerically obtained relationships were used to develop a constitutive model that allows the determination of the mortar compressive strength from the measured reflection loss only. This model requires no further calibration for w/c-ratio or curing temperature if it is applied to plain Portland cement mortar. The extension of this model to compressive strength predictions of concrete containing mineral admixtures was identified as an important subject of future work to ensure an effective application of the wave reflection method.

## Upcoming Events

### **Workshop on Fracture Mechanics for Concrete Pavements: Theory to Practice**

August 10-12, 2005 in Copper Mountain, Colorado, USA

[http://www.concretepavements.org/8th\\_Int\\_conf/default.htm](http://www.concretepavements.org/8th_Int_conf/default.htm)

### **8th International Conference on Concrete Pavements**

August 14-18, 2005 in Colorado Springs, Colorado, USA

[http://www.concretepavements.org/8th\\_Int\\_conf/default.htm](http://www.concretepavements.org/8th_Int_conf/default.htm)

### **Concrete Cracking Workshop**

August 18-19, 2005 in Evanston, Illinois, USA

<https://acbm.northwestern.edu/ccw.html>

### **Third International Conference on Construction Materials (ConMat05)**

August 22-24, 2005 in Vancouver, British Columbia, Canada

<http://www.civil.ubc.ca/conmat05/index.html>

### **Fourth International ACI/CANMET Conference on Quality of Concrete Structures and Recent Advances in Concrete Materials and Testing**

September 6-7, 2005 in Olinda, Pernambuco, Brazil

<http://www.furnas.com.br/hpc2005/>

### **2<sup>nd</sup> International Symposium Treatment and Recycling of Materials for Transport Infrastructure (TREM TI)**

October 24-26, 2005 in Paris, France

[http://www.tremti.org/english/index\\_en.html](http://www.tremti.org/english/index_en.html)

### **SCC 2005**

October 20-November 2, 2005 in Chicago, Illinois, USA

[www.scc2005.info](http://www.scc2005.info)

### **International Conference on Concrete Repair, Rehabilitation, and Retrofitting**

November 21-23, 2005 in Cape Town, South Africa

<http://www.civil.uct.ac.za/icrrrr/>

### **10th International Symposium on Concrete Roads**

September 18-22, 2006 in Brussels, Belgium  
<http://www.concreteroads2006.org/>

**XXIIIrd World Road Congress**

September 17-21, 2007 in Paris, France  
<http://www.paris2007.route.equipement.gouv.fr/index.en.html>

If you wish to submit an upcoming conference, meeting, or call for papers for the next ISCP quarterly newsletter (September 2005), please contact us at [newsletter@concretepavements.org](mailto:newsletter@concretepavements.org).

The ISCP Quarterly Newsletter is edited and maintained by Jake Hiller and Erwin Kohler. Any suggestions or additions to future newsletters are welcomed at [newsletter@concretepavements.org](mailto:newsletter@concretepavements.org).

<p><b>ISCP President:</b>            Shiraz D. Tayabji, Ph.D., P.E.            CTLGroup            5565 Sterrett Place, Suite 312            Columbia, Maryland, USA 21044            Phone: 410-997-0400            Fax: 410-997-8480            Email:  <a href="mailto:stayabji@concretepavements.org">stayabji@concretepavements.org</a></p>	<p><b>ISCP Vice President:</b>            Dan G. Zollinger, Ph.D, P.E.            Texas A&amp;M University            CE/TTI Building, Rm 503e            College Station, Texas, USA 77843            Phone: 979-845-9918            Fax: 979-845-0278            Email:  <a href="mailto:dzollinger@concretepavements.org">dzollinger@concretepavements.org</a></p>	<p><b>ISCP Secretary and Treasurer:</b>            Mark B. Snyder, Ph.D., P.E.            6305 Oyster Bay Court            Bridgeville, Pennsylvania, USA 15017            Phone: 412-221-8450            Fax: 412-221-8450            Email:  <a href="mailto:msnyder@concretepavements.org">msnyder@concretepavements.org</a>  <b>(Contact for membership inquiries)</b></p>
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