Summer 2012 Vol. 31, No. 2

IRMCA News

Illinois Ready Mixed Concrete Association

Advancements for construction-related, life-cycle assessments

MIT findings position concrete for energy performance accountability

Illinois 53

This ultra-thin whitetopping project is the biggest of its kind on a state highway in Illinois

Concrete and the Olympics

How concrete was used in the building of London's Olympic Park

Projects

- Full Depth in Decatur
- Full Depth and Pervious in Normal
- Pervious in Champaign

IRMCA NEWS

Volume 31, Number 2 • Summer 2012

Illinois Ready Mixed Concrete Association

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Working together to create value, teach excellence, and produce quality.

Mission
To be the voice for the ready mixed concrete industry in Illinois. To promote the use of quality ready mixed concrete through innovative educational programs. To accomplish common goals as an organization that cannot be done individually.

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Cover photo is of Illinois Route 53 concrete overlay in Will County.

Start every day off with a smile and get it over with.
-- W.C. Fields

From the Director

Bruce Grohne

Product knowledge

Remember when customers used to ask us questions? Remember when all they could learn came from the material suppliers or the producers? Boy, are those days gone! Customers, whether contractors or owners, can find out just about anything about concrete by going online. They come at you (or me) loaded with facts they looked up and almost dare us to say something different. We all know the old adage that "a little knowledge can be dangerous" and we need to be ready to deal with that. My point is this: don't let a customer know more than you do about your products. Use the internet yourself and know what's out there. Learn from your suppliers. Attend the IRMCA Short Course to stay current. And take advantage of the resources available to you, including those we have highlighted on pages 15-20 of this issue. These great tools are offered by the American Concrete Paving Association (ACPA) and many of them are free.

Concrete parking lots

As I travel the state I am very pleased and encouraged by the number of concrete lots I see. I'm hearing that owners are almost always willing to hear about our product, its life-cycle appeal and especially its competitive price. Watch for opportunities; e.g. in the last month I have watched as 3 McDonalds in central Illinois were torn down and rebuilt/modernized, this time choosing concrete for their lots – think they learned something?

Colored, stamped, and stained concrete

Color suppliers are more than willing to help you and your contractors; at least the IRMCA members who sell color are. Take advantage of their expertise. I am seeing a lot of stained floors in new restaurants and bars, and they are more attractive and cleaner than carpet or wood.

Difficult situations

Each time you have a problem involving a producer, customer or supplier, try to approach the situation as an opportunity to teach or an opportunity to learn. No matter what the controversy, if we can cause it to not happen again, great. Watch for these teaching/learning moments and use them!

Promotion

Ready mixed concrete is, without question, the most versatile building material in the world. It is durable, sustainable and cost effective. The information in this issue, along with the many other publications available through IRMCA and affiliated organizations, can help you promote your product, so use them!

association news

New Members:

ANA Laboratories, Inc.
Scott Kegarise
716 Morse Avenue
Schaumburg, IL 60193
Phone: 847.352.6780
Fax: 847.352.8094
www.analaboratories.com

FiveCubits
John Mitchell
6400 Shafer Ct., Suite 150
Rosemont, IL 60018
Office: 630.936.4920
Cell: 847.767.3781
john.mitchell@fivecubits.com
www.trakitgps.com

Condolences to the family and friends of George Woods (brother of Jerry Woods).

Reception Sponsors:

Buzzi Unicem, Cemex, CMW Equipment, Con-Tech Manufacturing, Continental Cement, ESSROC, Hanson Material Service, Holcim (US), Illinois Cement, Lafarge North America, Lehigh Cement, McNeilus, Sika, St. Marys Cement, Vulcan Materials, W. R. Grace

Short Course

Join us at the PAR*A*DICE Hotel in East Peoria on January 7 & 8, 2013, for the annual Short Course.

"A person who aims at nothing is sure to hit it."

-- Anonymous

Board update

The Board of the Illinois Ready Mixed Concrete Association met in the IRMCA offices on May 17, 2012. Items that may be of interest to the membership:

- Staff will be expanding our collection of promotional one-page publications.
- Staff is developing an electronic version of the *IRMCA News* and it will be available in 2013. Members can opt to receive the printed version, the electronic version or both.
- We are working to keep our website current and relevant. Watch for updates.
- IRMCA financials remain strong; however, the board was made aware of costly circumstances that are affecting the association bottom line.
- Jim Randolph reported on the progress of IRMCA-supported SB 3535. To see the progress of this attempt to change the 3 axel mixer weight laws you can go to www.ilga.gov and search under Bills and Resolutions.
- The board voted to change the IRMCA By-Laws to allow for more associate members on the board. All members will receive this proposed change soon and it will be voted on at the Short Course.
- Discussion was held and tabled on 2012 scholarship distribution decisions.
- As part of a membership drive, IRMCA will be issuing associate membership invitations to testing labs in the state.
- Bruce & John Albinger reviewed things learned from spring meetings with the 9 IDOT Districts and Springfield. IRMCA members involved are working on a report for the membership.
- Over 260 persons in Illinois have been certified as pervious technicians. Certification is good for 5 years and many are due for re-certification if they so choose. We are working on how to handle the re-certifications.
- Upcoming meetings were discussed: PCA Funding Partnership, July 30, 2012; Golf Outing, September 5, 2012; Short Course, January 7&8, 2013; Annual Meeting (w/WRMCA), March 10-13, 2013.
- Staff was directed to find a consultant able to review and make suggestions for updating the IRMCA Safety Manual.

one-page publications • one-page publications • one-page publications

We have produced 14 promotional one-page publications that are available in the office and at www.irmca.org, and we are in the process of producing hundreds more. Featured in the publications are a variety of members' past projects. Additionally, we would like to create publications featuring members' current and future projects. To that end we have decided that Jennifer Bedell, Special Projects Coordinator, will contact members twice a year to inquire about projects that could be featured in a one-page publication. Of course, you don't have to wait for a call. Let IRMCA staff know if you have a project to highlight. The project details we need are:

1. type of concrete (e.g., overlay, full depth, RCC);
2. type of project (e.g., parking lot, street); l
3. ocation of project;
4. owner of project;
5. year of completion;
6. and 2-3 project photos, which IRMCA staff is happy to obtain for you.

Full depth concrete in Decatur

When the City of Decatur approved a long-term renovation project for downtown, the extensive use of ready mixed concrete was prominent in the plans. The Main Street Streetscape Enhancement Project will, over a 3 year period, replace almost all of the sidewalks and curbs, create new parking areas, and in one case rebuild an entire block.

Phase One is well underway and, blessed with great late-winter and spring weather, contractor Feutz Contractor Inc. of Paris, Illinois, is making smooth progress. Illinois Ready Mixed Concrete Association member Grohne Concrete is supplying concrete to the project.

Full depth and pervious concrete in Normal

When remodeling/building Cardinal Court, the new, large student housing complex on the Illinois State University campus, developers took full advantage of the most versatile building material in the world: ready mixed concrete! All drives, parking areas, sidewalks, and curbs are concrete, and the planners incorporated pervious concrete to help with storm water control. The parking area in the rear slopes towards the building and a strip of pervious with ample storage below was constructed to absorb stormwater flowing down the slope.

The Cardinal Court complex includes indoor and outdoor recreation facilities, gathering and studying spaces, parking spaces for residents and visitors, etc. It was built as a public-private project in which the university provides oversight and maintenance and at the end of the specified term will claim ownership.

The developer-builders are American Campus Communities of Austin, Texas, and Weis Construction/Development. The concrete contractor was Scurto Concrete Construction, and concrete was supplied by Illinois Ready Mixed Concrete Association member Prairie Material.

Pervious concrete in Urbana-Champaign

The University of Illinois at Urbana-Champaign features miles of concrete walkways and drives and in the last several years has used concrete overlays to enhance its long range maintenance/renovation efforts. Now it has added pervious concrete to its growing list of uses for the world's greatest building material.

Ikenberry Commons Construction is a multiyear project, the purpose of which is to renovate the university residence area commonly known as the "6 Pack." An emphasis on green construction was mandated by the university oversight committee and is being carried out by contractor Turner Construction. Turner has experience in sustainable building and recommended that for this project the university consider designing rooms that are larger and greener, creating gardens and other large planting areas, and incorporating the use of pervious pavement.

The university has consented to the use of pervious in several areas of the project and the material has been placed in the large bike rack area of Phase One. Stark Excavating of Champaign placed the pervious that was supplied by Illinois Ready Mixed Concrete Association member Champaign Builders. The long range plans call for the use of considerably more pervious concrete.

Harvey Hagge Golf Outing

Wednesday, September 5, 2012
Pine Lakes Golf Club • Washington

Photo courtesy of TradeWinds Resorts.

Winter Meeting

March 10-13, 2013
TradeWinds Island Grand
St. Pete Beach, Florida

Co-hosted by the Illinois Ready Mixed Concrete Association and the Wisconsin Ready Mixed Concrete Association.

Illinois 53 project in Will County

Years in the Making, Days in the Paving

By Randell Riley, P.E.

"It usually takes 20 years to become an overnight success!"
--Anonymous

Sound familiar? You have probably heard the phrase or something similar. I am reminded of this little bit of wit now that the industry finally gets to see an Illinois Department of Transportation Ultra-thin Whitetopping project on the scale of the most current IL 53 project in Will County. From my point of view this project was 20 years in the making!

The project is the biggest of its type that has actually been let on a state highway in Illinois. Though some of our county jobs come close to matching it in sheer volume, none come close to the volume of concrete that actually got placed on northbound IL 53 the week of May 21st. The pace of the operation was astounding.

According to IRMCA Member Justin Ozinga of Ozinga Ready Mix, the company supplying the concrete, approximately 7400 cubic yards went out the gate at their plant located in Vulcan's quarry off of Laraway Road just south of Joliet. And this happened between roughly Monday morning and Friday afternoon of that same week.

D Construction, Inc., an Illinois Chapter, Inc.–American Concrete Pavement Association contractor member, placed approximately 61,000 square yards, just slightly more than 4 miles of 4-lane, 4-inch minimum thickness, 4-foot x 4-foot joint spacing concrete pavement containing 4 lbs./cu. yd. of Grace Construction Products Strux 90/40 synthetic structural fibers in a single 24 feet wide pass.

A number of factors contributed to the rapid execution of the project. Since it was an overlay project, and by its very nature a synthetic structural fiber reinforced system, it contains no steel. D's crews could pick up concrete at Ozinga's central mix plant in end dumps and discharge directly in front of the paver. There were no dowel baskets to worry about that had to be pinned to the grade. Just place the concrete and pave. But that is not all.

D Construction opted to use its Leica Geosystems 3D stringless system for paving. For a paving engineer who has tripped over his share of stringlines over the years and is forever worrying about tripping over his next one, this was nothing short of revolutionary! It speeds up delivery, makes finishing easier and in theory can build an even smoother product due to the tighter potential control compared to stringlines. Though there is some up front survey work that has to be done and some computer modeling to correct grades, there no longer is a crew staking the project, setting up the stringline and eyeballing to make sure there are a minimum of bumps and dips.

Though this project is commonly referred to as Ultra-thin Whitetopping , in more current jargon it is actually a bonded concrete overlay system on asphalt. The existing asphalt overlays of the old U.S. 66 alignment were milled to create what would be more correctly called an inlay. This is a true concrete "mill and fill" project and the first of its kind in Illinois on this scale.

Success of the project requires that the bond be maintained. No dried loose material is permitted on the milled asphalt that is likely to inhibit bond. A simple test of adequate cleanliness is to stick duct tape to the dry surface and then release it. If the duct tape comes up dirty the pavement needs to be blown clear with compressed air to make sure there is no sand residue. Mud would be required to be removed and the surface cleaned to ensure that the new concrete layer would stick. Also, no standing water puddles can remain as that too would inhibit bond. As temperatures rise, the asphalt may be misted or lightly sprinkled to aid in cooling the surface through evaporative cooling as long as no standing water remains.

Paving operations were fast and effective owing to the GOMACO GHP 2800 slipform paver. As usual with most projects of this type, there are initial concerns about the paver being able to manage the structural fibers that are intermixed with the concrete. Those concerns were largely over within the first two to three truck loads. Once vibrators hit the concrete it consolidates readily. Minimal balling of the fibers occurred initially and those were totally eliminated the second day with the addition of 15 seconds of mix time at the central mix plant and a little more manual effort in dispersing the fibers at the time of addition at the plant.

Finishing of the pavement was done with traditional hand finishing methods and these

Ozinga's central mix concrete plant batched 10 cubic yards at a time throughout the course of the project.

D Construction's GOMACO GHP 2800 goes through a lot of concrete very fast when paving 24-feet wide and only 4-inches thick. Paving proved to be easy for this type of equipment. The apparent stiffness of the concrete in front of the paver due to the fibers is not a factor once the vibrators hit the concrete and it becomes fluid.

Hand tining of the surface was accomplished behind the paver. Though the surface looks slightly different compared to standard tined pavement, there were no particular problems once finishers got the hang of it.

were eased significantly by the lack of having to work around, over, and occasionally under the stringline. There were initial concerns about the ability to tine the surface given the incorporation of the fibers, but a test placement completed the prior week at D's yard proved the concerns largely unwarranted. There was no unusual difficulty finishing or tining the surface. Curing was applied immediately upon completion of the tining operations prior to jointing the pavement.

Jointing is essential on thin pavements, which are prone to curling due to temperature and hydration shrinkage stresses that have the potential to develop. Excessive curl could contribute to delamination from the underlying asphalt which could change the stress transfer characteristics of the system and create localized premature corner breaks. Controlling these stresses is primarily the reason for the extensive sawing operations used on the slab. And this is no small operation!

Given that the joints are set up in a 4-foot by 4-foot saw pattern, a little quick math will tell you that every mile of pavement built 24-foot wide requires roughly 11 miles of joint sawing every day that you are paving. Saw crews usually started about the middle of the day and worked through the afternoon, night and early into the next day to keep pace with the paving operation. It was one heck of a job and I have to hand it to Jim McClellan of Tough Cut Concrete Services, Inc. and his people for keeping the work going through the night and keeping the saw cuts straight. Early entry saws were used for most of the cutting on the project.

By the time you read about this project it will likely be complete. D Construction expects to finish the remaining portion, the southbound section, by the end of June. That section is essentially identical in geometry and structure to the already completed northbound section. Assuming weather cooperates, I would expect similar results.

If you would like more information on concrete inlay or overlay techniques for projects large or small, contact Illinois Ready Mixed Concrete Association or Illinois Chapter, Inc. – American Concrete Pavement Association. We would be happy to assist you in getting yours started. But please, let's not take 20 years to do so!

Randell Riley is the Executive Director/Engineer for Illinois Chapter – ACPA, and a consultant to Illinois Ready Mixed Concrete Association. He can be reached at 217-793-4933 or pccman@ilacpa.com.

Sawing on a project like this means roughly 11 miles of walking behind the saw for every mile of pavement placed. Note the saw cut lines transversely and longitudinally.

IL Chapter's Jimie Wheeler demonstrates the "duct tape" test for an indication of the amount of surface debris that might inhibit bond. This section is in pretty good shape as it will receive one more pass with an air blast just prior to paving.

A view to the south of the overlaid northbound section of Illinois 53 in Will County.

Photo Courtesy of Lester Cheney, D Construction, Inc.

Tell It Like It Is

By John Albinger

What's important?

Before I get on my soapbox, my 68-year-old soapbox, I would like to thank Bruce for letting me write about almost anything I choose. Of course, he and I are about the same age so we tend to think alike. You know, like old people. On to my soapbox.

I started to write this column on a Sunday afternoon after being "inspired" while attending church that morning. Jeanie and I sat behind the same family as the week before: parents, a boy about 7 or 8, and a girl about 4 years old. And as they did the week before the boy sat through the entire service with his headset on playing video games while his sister played with the 6 or 8 small toy dolls she brought. As older people do, I thought about the way it used to be – paying attention, being quiet, sitting up straight.

The preceding Saturday Jeanie and I attended the annual ACI, Illinois Chapter, dinner. Eighty-eight people attended, I counted, and 12 were older than 60. Although I knew most of those in attendance, I spent a great deal of time talking to the more mature attendees - not because we could commiserate - it's just that I don't see them as often and we enjoy catching up. The real reason they were there was because concrete is in their blood. Concrete was and is an important part of their lives.

No doubt life is not the way it used to be. We, the more mature, know and accept that and realize that we never lived the life of today's young professional, someone who worries about how secure his job is or how he stays involved in his kids' activities or how can he afford to send his kid to college. I am continually amazed at how different my sons-in–law's lives are than mine.

Priorities don't seem to be what they used to be? I always thought they were: God, family and job. Some of you may think just God and family are important. Others may think the list should be longer, maybe include money, job title, happy kids, social involvement, or whatever people, places and activities you put the most time and effort into. Whatever comprises your list, common sense tells you that you will be most successful at what you put the most time and effort into. The question becomes, *can you put too much time and effort into any one thing*? The answer is personal, but what I do know is that the word "priority" means you assign a value to things and things lower on your list get less attention.

I believe there are *now* priorities and there are *forever* priorities. For the family in church, the now priority was keeping their kids occupied. Teaching them respect may not even have been on their list. Is it that simple? Probably not. Is respect a priority in their life? I am going to say, probably not.

So what about the more mature guys at the ACI dinner? Like today and like always we have *now* priorities and *forever* priorities, but back in "our day" priorities may not have been as succinct as they are today. Maybe we were the original multi-taskers. First came God and then came a conglomerate of family-job-success-children-social activity-friends. That's why the more mature guys were there, because of their all-encompassing concrete life. Ask our spouses and our children. They know all about concrete and our concrete life.

The questions we mature folk ask ourselves (and have asked since time began) are: Was it better the way it used to be? Or is it better now? Or is it just the way it is? I know one thing: wherever you are when you are mature, you got there because of your priorities, the now priorities and the forever priorities.

Thanks again, Bruce. I feel so much better.

"I believe there are *now* priorities and there are *forever* priorities."

CONCRETE

AND

THE OLYMPIC GAMES

July 27 – August 12, 2012, in London, England

Compiled by Jennifer Bedell

1 More than 6500 cubic meters of crushed concrete, recycled from other parts of the Olympic Park were spread to provide a suitable ground condition for the Olympic Stadium.

2 For the Aquatic Center, power lines were switched from overhead to tunnels up to 30m underground. Two tunnels were dug beneath the Aquatics Center site to allow power to run through them. A 3000-ton concrete bridge was then built to protect these underground tunnels.

3 112 steel rakers and 12,000 pre-cast concrete terracing units hold the Olympic Stadium spectator seating in place.

4 The Handball Arena has 30 concrete walls supporting the upper tiers of seating. The 10 meter high walls sit on top of a 300 ton concrete slab. Two hundred concrete columns were drilled 25m into the ground to form the foundations, with 55 pile caps and 550m of concrete ground beams.

5 The wave-like Aquatic Center roof weighing more that 2500 tons is supported only on two concrete supports and a single wall.

6 Sustainable mixes were developed for the Olympic Park. This resulted in approximately 170,000 tons (almost 22%) of recycled and secondary aggregate, a saving of approximately 30,000 tons (24%) of embodied carbon and elimination of over 70,000 road vehicle movements.

7 Aggregate Industries UK set up a concrete plant on Olympic Park to supply contractors. All contractors were contractually required to use the on-site concrete supplier.

8 There were approximately 30 main types of concrete used for the Olympic Park.

9 Concrete was the second most widely used material for the Olympic Park after engineered fills.

10 The Aquatic Center's unique Zaha Hadid designed curved concrete dive tower underwent five months of trials in the laboratory and on site. The complex six-board tower was built with 462 tons of high-tech self-compacting concrete poured into glass-fiber reinforced plastic molds, computer cut from a 3D model, around a skeleton of steel bars to make the distinctive shape.

11 25,000 cubic meters of precast concrete was used on the Olympic Park site, about five percent of the total concrete used.

12 The planners of the Olympic complex asked for 10-5mm recycled aggregate, a very clean specification.

13 More than 5000 reinforced concrete columns were installed into the ground, up to 20m deep, to provide the foundations to support the Olympic Stadium structure.

14 Over 1 million tons of aggregate fill materials were delivered to the Olympic Park, in addition to the aggregates required for concrete production.

15 400,000 cubic meters of ready-mix concrete were used in the Olympic Park.

Additional Olympic facts:

- **26 sports**
- **39 disciplines**
- **34 venues**
- **8.8 million tickets**
- **10,490 athletes**
- **302 medal events**
- **21,000 media/broadcasters**
- **19 competition days**
- **2,961 technical officials**
- **204 National Olympic Committees**
- **5,770 team officials**
- **5,000 anti-doping samples**
- **1,000,000 pieces of sport equipment**

"The construction of the [Olympic] Park and venues will need a huge amount of concrete, both in terms of volume and weight, so this will also be key to meeting our sustainability aspirations. Aggregate Industries demonstrated a clear commitment to meeting and exceeding targets, including using recycled materials and transportation by rail."

--Olympic Delivery Authority Chief Executive David Higgins

Photos courtesy of the London Organising Committee of the Olympic and Paralympic Games (LOCOG).

MIT findings position concrete for energy performance accountability

Two studies from the Concrete Sustainability Hub at the Massachusetts Institute of Technology represent major advancements for construction-related, life-cycle assessments (LCA), as they quantify cradle-to-grave cost and environmental impacts for buildings and pavements. Released in August as part of the Concrete Sustainability Hub's 2011 Industry Day on the MIT Cambridge campus, they factor costs and embodied carbon dioxide levels at initial construction plus those of use and operations phases – based on energy consumption, maintenance and traffic delays – not fully accounted for in most LCAs.

Life-cycle costs and CO2 emissions are playing an increasingly important role among architectural and engineering professionals, along with their building and transportation project customers, as an extension of the initial-construction criteria to which the U.S. Green Building Council's LEED rating system is confined. LCA is a charter research topic for the Concrete Sustainability Hub, which the RMC Research & Education Foundation and Portland Cement Association launched in October 2009.

In *Methods, Impacts and Opportunities in the Concrete Building Life Cycle,* MIT faculty and students quantify the relative CO2 contribution from buildings across all life cycle phases. This rigorous analysis, with a similar study of whether the best environmental strategy was beneficial economically, will the allow the construction industry to improve the accuracy and transparency of existing and future LCA, providing legislators, code-making bodies and building design professionals with a comprehensive and unbiased model.

Hub participants also used this life-cycle approach to evaluate the real cost of a pavement throughout a 50-year lifetime, netting *Methods, Impacts and Opportunities in the Concrete Pavement Life Cycle*. Researchers started with the Federal Highway Administration's "Life-Cycle Cost Analysis in Pavement Design Interim Technical Bulletin," a process that accounts for both initial construction and future rehabilitation. What the FHWA procedure fails to account for, however, are changes in the prices of building materials over the life of the pavement.

MIT's research showed that during a 50-year timeframe, the mean real price of concrete decreases by 20 percent, while the mean real price of asphalt increases by 95 percent. To allow states to address this, the Institute released *The Effects of Inflation and Its Volatility on the Choice of Construction Alternatives,* offering tools departments of transportation can readily adopt to account for inflation.

Researchers found that while concrete pavements are already sustainable in many ways, their carbon footprint can be further reduced. First, faculty and students developed a comprehensive methodology outlining the best practice concepts that should be followed when conducting any pavement LCA. Specifically, any complete LCA should include the use and rehabilitation phases which can account for 33-44 percent of the CO2 emissions for interstate highways.

Next, the Hub researchers applied these concepts to evaluate strategies to lower a concrete pavement's carbon footprint and overall environmental impact. A major advancement was the incorporation of a cost-effective analysis to determine whether or not a given environmental reduction strategy made sense economically. Among the strategies evaluated, the two that reduced embodied emissions – increased fly ash and reduced overdesign due to better designs – were found to lower the CO2 emissions by approximately 10 percent and 17 percent, respectively, while also saving upfront costs.

Pavements that deflect or bend slightly under traffic loads cause cars and trucks to run in a slight depression that increases fuel consumption. Pavements with greater stiffness, MIT finds, mean better fuel economy for vehicles that travel on them. As an example of the initial results, MIT looked at typical material properties for concrete and asphalt pavements and found that for the same stiffness and fuel consumption, an asphalt pavement had to be up to 60 percent thicker than the concrete pavement. With fuller development of this model, it will be possible to include the impacts of pavement properties and on fuel usage in both the environmental and cost analyses.

Finally, researchers reviewed fuel economy from a unique perspective. Instead of focusing on the efficiency of cars and trucks, they analyzed how pavement properties affect fuel economy. MIT developed the first-ever mechanistic pavement vehicle interaction model that relates fuel consumption to pavement material and structural properties. This model provides realistic estimates of changes due to deflection.

The full *Buildings, Pavements and Inflation* studies can be downloaded from http://web.mit.edu/cshub/.

This article, originally published in the September 2011 issue of Concrete Products, is reprinted here with the permission of Mining Media International.

ACPA Software

TITLE	APPLICATION	KEY FEATURES	DESIGN METHOD
STREETPAVE 12	• Highways • Streets and Roads	Thickness design and evaluation of concrete pavements, overlays, and asphalt pavements. Includes sensitivity and life-cycle cost analysis.	Uses mechanistic-empirical design for fatigue and erosion based on the PCA method and updated by ARA.

Available April 30, 2012

TITLE	APPLICATION	KEY FEATURES	DESIGN METHOD
PERVIOUSPAVE	• Highway Shoulders • Parking Lots • Streets and Roads	Thickness design for a pervious pavement and reservoir system optimized for both structural and storm water management requirements.	Uses mechanistic-empirical design for fatigue and erosion based on the PCA method and updated by ARA.

TITLE	APPLICATION	KEY FEATURES	DESIGN METHOD
AIRPAVE 11	• Airport Pavements	Thickness design and stress ratio calculation for airfield pavements.	Uses mechanistic design based on Westergaard stress equations.

TITLE	APPLICATION	KEY FEATURES	DESIGN METHOD
WINPAS 12	• Highways • Streets and Roads	Thickness design for concrete and asphalt pavements. Includes a life cycle cost analysis module.	Uses the AASHTO 93 mechanistic-empirical design.

Available April 30, 2012

All ACPA software is available for purchase through the ACPA bookstore: http://www.acpa.org/bookstore

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- Bonded Concrete Overlay on Asphalt (BCOA) Calculator
- Can Pav™
- COMPASS
- Compression Seal Joint Width Calculator
- Concrete Helper Web Apps
- Concrete Mixture Proportioner
- Concrete Temperature Calculator
- CPR Specifications
- DARWin-ME™
- Dowel Bar Alignment Calculator
- DowelCAD
- Evaporation Rate Calculator
- EverFE
- FAARFIELD
- Friberg Group Dowel Analyzer
- Friberg Single Dowel Analyzer
- Gradation Analyzer
- Green Streets Calculator
- Highway Specs for Airfields Lookup
- HIPERPAV®
- Holcim's Evaporation Rate Forecaster
- Joint Movement Estimator
- Joint Noise Estimator
- *k*-Value Calculator

Continued on reverse side ...

http://www.apps.acpa.org

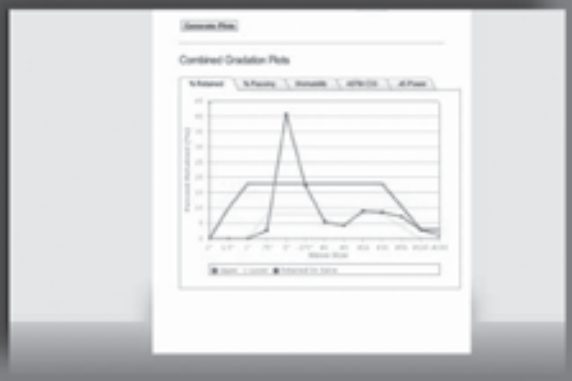
Snap this datamatrix with your smartphone to jump to the ACPA Application Library.

http://apps.acpa.org

Need a gradation plot? There's an app for that.
Need to calculate evaporation rate? There's an app for that.
Want to explore what other agencies are doing? There's an app for that.
Want to make asphalt better? There's no app for that.

Continued from previous side ...

- Maturity Calculator
- Maximum Joint Spacing Calculator
- M-E Tie Bar Designer
- National Concrete Overlay Explorer
- National Highway Specifications
- Online Glossary
- Online StreetPave Thickness Designer
- PCASE
- PerviousPave
- ProVal
- Radius of Relative Stiffness Calculator
- Rate of Delivery Calculator
- RCC-Pave
- RealCost LCCA
- Staking Interval Calculator
- Relative Cost Analyzer
- Staking Cost Estimator
- State DOT Search Engine
- StreetPave
- Strength Analyzer
- Strength Converter
- Subgrade Resilient Modulus Calculator
- Taper Length Calculator
- TCPavements® Optipave
- Total ESAL Calculator
- Units Converter
- Westergaard Stress & Deflection Solver
- WinPAS



ACPA Free Technical Resources UPDATE

Spring 2012

The **Quick and Direct (QD)** publication series was introduced in 2006 as a means to satisfy a demand by both the general public and transportation professionals for quick and direct semi-technical information about concrete pavements. All of the QD publications are available for free at www.pavements4life.com. Here are a few of the most recently released QD's:

QD032 - Concrete Overlays
The increased use of concrete overlays might have you asking some questions. Here are some facts about concrete overlay trends and a list of useful resources.

QD031 - Life-Cycle Costs of Streets and Roads
Explore the basic considerations used to determine the objective life-cycle costs of pavement systems.

QD029 - Cost and Performance of Streets and Roads
In addition to costs and performance considerations, this literature also cites some surprising aesthetic considerations that may have a dramatic effect on downtown revitalization plans.

QD030 - Sustainability Considerations for Streets and Roads
Learn about some important sustainability considerations when considering pavement type in urban, suburban, and exurban settings

To download ***free*** copies of these and other *Quick and Direct* publications, visit the link in the "How to Download" section on the back of this flyer.

The **Research & Technology Update (R&T Update)** publication series moved to a strictly digital format starting in 2008. All of the 65 R&T Updates released since its inception in 2000 are available on the ACPA website. Here are a few of the most recently released R&T Updates:

Update #11.01 - Mitigating Deicer Induced Distress Potential A Revision of an Interim Procedure

Update #10.01 - Plate Dowels - An Innovation Driven by Industrial Concrete Paving

Update #9.01 - StreetPave's Equivalent Design of Asphalt - Proof of the Accuracy of StreetPave's Asphalt Module

Update #8.04 - The Joint Slap Effect: Results from the Purdue Tire Pavement Test Apparatus (TPTA) and Discussion of Preliminary Field Validation Testing

To download ***free*** copies of these and other *R&T Updates*, visit the link in the "How to Download" section on the back of this flyer.

The **Technical Series (TS)** publication series was introduced in 2008 to provide quick descriptions of detailed technical topics that are included in more comprehensive Engineering Bulletins (EB's). Most of the completed TS's are from EB204P, "Subgrades and Subbases for Concrete Pavements". Here are a few of the TS's from that publication:

TS204.1P - Uniform Support in Concrete Pavement Structures

TS204.5P - When to Use a Subbase

TS204.10P - Permeable Subbases: Reasons to Avoid Their Use

To download ***free*** copies of these and other *Technical Series* publications, visit the link in the "How to Download" section below.

The **Innovative Pavement Research Foundation (IPRF)** publishes several publications each year that are released as Joint Products (JP's) through the ACPA. Here are a few of the most recently released IPRF JP publications:

JP021P - Airfield Marking Handbook

JP020P - Constructing In-Pavement Lighting, Portland Cement Concrete Pavement

JP018P - Accelerated Practices for Airfield Concrete Pavement Construction Volume I: Planning Guide & Volume 2: Case 6tudies

To download ***free*** copies of these and other *Innovative Pavement Research Foundation* publications, visit the link in the "How to Download" below.

How to Download

To download free copies of Quick and Direct (QD), Research & Technology Update (R&T Update), or Technical Series (TS) publications visit:

http://www.acpa.org/Concrete_Pavement/Technical/Downloads/

To download free copies of Innovative Pavement Research Foundation (IPRF) publications visit:

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Pavements 4life

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Technical resources wherever and whenever you need them most.

Area and Volume Calculator

This tool allows you to quickly calculate plan area and volume of material based on a pavement or subbase/subgrade layer's thickness, width, and length.

Concrete Mixture Proportioner

This app provides a method of proportioning a concrete mixture using the absolute volume method in substantial conformance with ACI 211.1-91, *Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete*.

Joint Noise Estimator

This tool was developed to allow designers to estimate the impact of various joint geometries and condition on the overall tire-pavement noise level. It may also be used to guide pavement maintenance efforts in terms of the noise-related benefits attainable from sealing joints.

Maximum Joint Spacing Calculator

This calculator can be used to determine the maximum allowable joint spacing or slab length based on the slab thickness and the subgrade/subbase used.

Staking Interval Calculator

This app is used to determine the appropriate interval between stakes when setting stringline.

Evaporation Rate Calculator

Using this tool, you can quickly calculate the evaporation rate based on the concrete temperature, the air temperature, the ambient relative humidity and the wind velocity.

For more information, contact ACPA at 9450 W. Bryn Mawr Ave., Suite 150, Rosemont, IL 60018.
847.966.2272 | www.acpa.org | http://apps.acpa.org

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