# TENNESSEE CONCRETE MAGAZINE

Winter 2010
VOL. 24, NO. 3

## Deaderick Streetscape Improvement Project

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## Preliminary Findings: Life-Cycle Assessment of Pavements & Structures

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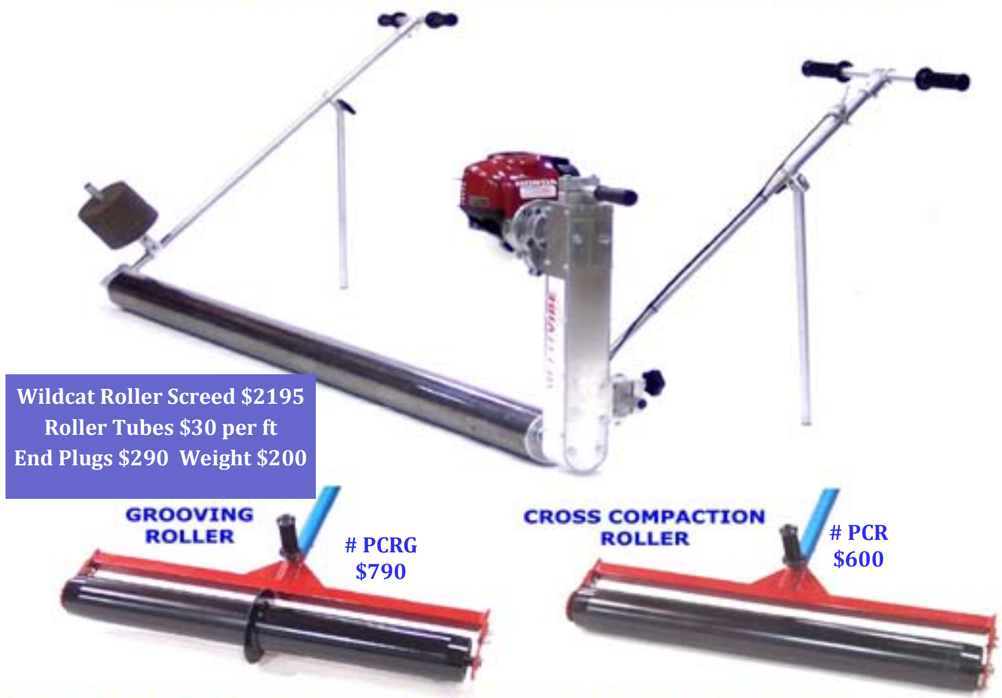


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Tennessee Concrete welcomes response and rebuttal and will make every effort to print these responses. Send comments to: Editor, Tennessee Concrete, 705 Fort Negley Court, Nashville, TN 37203.



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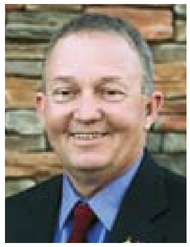








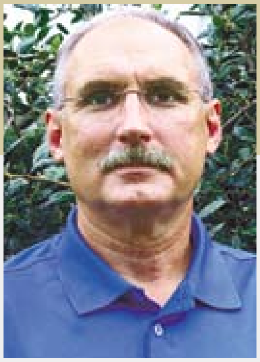






HUTTON HOTEL

# The Next Big Thing?



**Phillip Palczer**
*2010 TCA President*

TCA was awarded a 2010 GreenSite Award in the Demonstration Category for our Concrete Village in Nashville.

To continue a theme from the last edition of Tennessee Concrete magazine, "What is the next big thing?" Now that pervious concrete and SCC have become mainstream, what do we get behind next? There are constant innovations in concrete technology in the news and much of it seems like science fiction.

In no particular order, here are some of the items that caught my attention:

- Light–transmitting, or translucent concrete that uses embedded optical fibers to create a "see-through" effect. By using four to five percent of optical fibers, by volume, concrete can be made to even transmit colors.
- Self-healing concrete, which is able to repair its own cracks if they occur. One type uses a sodium-silicate agent embedded in the concrete, which forms a gel when ruptured that repairs the crack. Another type uses pelletized bacteria which react with water to form calcite, which repairs the crack. Still another bacterial solution uses bacteria that burrow into the crack and then produce calcium carbonate and a bacterial glue that hardens to the same strength as the surrounding concrete.
- Self-cleaning concrete, which utilizes cement with the ability to decompose organic and inorganic impurities into harmless salts using ultraviolet light. A test section of this is being poured in St. Louis on a highway project. This is the so-called "smog-eating concrete."
- Bendable concrete, or Engineered Cementitious Composite (ECC), an ultra-ductile, high-performance fiber-reinforced cementitious composite with a tensile strain capacity of 3-5%, which is 300 times that of normal concrete.
- Reactive Powder Concrete (RPC) or Ultra High Performance Concrete (UHPC) which can reach compressive strengths over 40,000 psi and flexural strengths of up to 7,000 psi. This product continues to evolve and has the potential to replace steel. It uses no coarse aggregate – instead various ultrafine powders are used, such as silica fume, quartz flour or silica sand, along with steel fibers.
- Concrete using photoluminescent aggregates, which are used in countertops, patios, etc. Glow in the dark concrete is also being used as a safety measure, on stairways and around pools, for example. Decorative concrete is only limited by the imagination and skill of the contractor.
- Concrete which has your choice of fragrance or scent embedded.

I have been at this long enough to remember when the use of fly ash was considered daring and anything other than a straight 5-sack mix was unnecessary. The evolution of concrete is remarkable. I recently read a statement in an article that had a huge impact on me – it said that the building and construction industry uses about 2.9 billion tons of cement and 30 billion tons of concrete every year, which makes them civilization's most widely used substances after water. Over 140 million tons of concrete are recycled every year, which greatly mitigates concrete's carbon footprint – another of concrete's many attributes is sustainability. I think that is what makes concrete so unique and yet so common at the same time. I don't believe any other construction material has been as adaptable and the subject of so much innovation as concrete. The possibilities are apparently endless and continue to come along regularly. Something extraordinary is being worked on somewhere right now and will be added to the list soon.

Lastly, if you haven't already heard, TCA won a 2010 GreenSite Award in the Demonstration category, presented by The Concrete Producer and its sister magazine *Concrete Construction*, for our Concrete Village in Nashville. Congratulations and thanks to our Executive Director Alan Sparkman for heading up this fantastic project and to the *Who's Who* list of member companies who were so generous with materials and labor to make it happen.❖

# Drawing to a Close —a Special 'Thank You'!

**Alan Sparkman**
*Executive Director*

Will you join me in striving to make a positive difference in your sphere of influence in 2011?

2010 is rapidly drawing to a close and it seems that January was only 11 weeks ago, not 11 months…. As 2010 draws to a close, I want to extend a special 'Thank You!' to all of our Regular Members, Board members, TCA Officers and our Committee Chairs who worked so hard to make 2010 a successful year for TCA. And I especially want to thank our TCA Staff members Sarah Egan, Darla Sparkman and Bernadine Hughes for all their work throughout the year. I would also like to thank all the CIM interns who worked with TCA this year—their hard work and our member's support with donated materials helped us accomplish great things at the TCA campus in 2010.

Great accomplishments often go unrecognized, but the combined efforts of all TCA members were recognized this year as the TCA campus won the Demonstration category of the 2010 GreenSite Awards. It was exciting to win this national competition and it is gratifying to see all of the hard work that is going into our TCA campus recognized at the national level. TCA's leadership role in sustainable building practices was also recognized by the Tennessee Environmental Council as they selected your Executive Director and our association to be the recipient of the 2010 Tennessee Sustainability Award, and TCA became the first (ever!) trade association to achieve the level of Partner in TDEC's Tennessee Pollution Prevention Partnership.

It was my honor this year to serve as the President of the Tennessee Society of Association Executives. This group provides association staff with resources for professional development and education, just as TCA seeks to provide these important resources to the Tennessee concrete industry. I was privileged in 2010 to do my part to serve my peer association and I would like to share part of my last President's column to the association community with my industry. I have modified the text slightly to make it appropriate for all organizations, not just associations….

"After more than a decade in the association world, I have learned much about non-profits (thanks in large part to the Tennessee Society of Association Executives!) and I have developed a much deeper appreciation for the unique role that organizations can play in advancing not only our individual agendas, but in improving our local communities and society at large.

Creating a positive impact on our society is not guaranteed for either associations or the businesses they serve. Associations, and businesses—like their individual members—have a choice when it comes to the type of impact they make upon the world. When any organization narrows its focus to expend resources and energy for their own exclusive benefit, there is great opportunity for harm to our common society. One needs only look to our nation's capital to see the endgame that occurs when all that matters is winning for your particular interest group. Regardless of political persuasion, I think most of us are disgusted by the extraordinary partisanship of our elected leaders, especially in a period of time that cries out for leadership instead of gamesmanship.

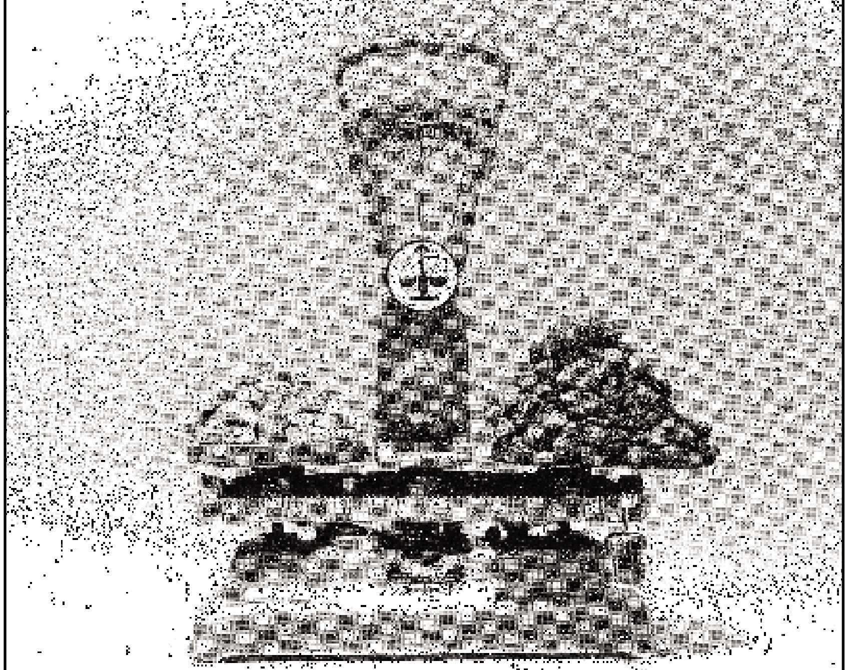
If they so choose, associations (and businesses and individuals) can be a great voice of reason in finding solutions to tough problems at every level of society. They (or You!) can be the influence that coaxes all sides to stop shouting from the various corners of the room, and then to take the first small steps back to the middle of the room where the best solutions reside—on the common ground that all of us share. I contend that we have a critical need for leaders at all levels who will put finding effective solutions to tough problems in front of crafting politically popular sound bites for whatever interest group they represent.

This is no small task, and it cannot be accomplished without great investment of energy and, quite often, it comes with a considerable degree of personal risk. But it must be done… As we look toward a new year, I encourage each of you to lead your organization in contributing solutions that benefit both you, your customers and the public that we all ultimately serve. "

As we look forward to 2011, it is important for all of us to consider what we can do to make a positive difference in our community. I am increasingly aware of the great need for action on the part of individuals and organizations as we face the challenges of this present age. Having just endured the recent election cycle with all its outrageous and distorted claims on the part of both parties, we must realize that solutions to our biggest problems won't come from our government—they will come from passionate, dedicated people who forego rhetoric for action. Will you join me in striving to make a positive difference in your sphere of influence in 2011?







by L. K. Couch— *Four-Part Series*

# Help for Pervious PCC Producers

## Part 2: Chemical Admixtures for Pervious PCC

### INTRODUCTION

Tennessee Technological University (TTU) researchers have recently been exploring ways to improve conventional (compacted) pervious Portland cement concrete (PCC). The Tennessee Concrete Association (TCA) has provided materials and guidance for the research described in the articles. We hope you find the information presented helpful in producing improved pervious PCC mixtures. In the second article, chemical admixture choices for pervious PCC are explored. Parts 3 and 4 in the series will examine:

3. Fine Aggregate for Pervious PCC
4. Putting It All Together for a High Performance Pervious Concrete Mixture Design

Tennessee concrete producers are already familiar with some of the benefits of chemical admixtures. Former TTU Graduate Student Jason Phillips [1], whose primary research was SCM substitution rates for pervious PCC, also took a preliminary look at chemical admixture effects on pervious PCC effective voids, compressive strength, and paste drain down.

### MATERIALS

Type I Portland cement [2] was obtained from a local ready mix producer's bulk storage. An ASTM C 33 [3] No. 8 limestone was obtained from a local quarry. The average results of a washed sieve analysis [4] conducted in triplicate on the local limestone are shown in Table 1. Chemical admixtures were provided by the local representative of an international chemical producer.

### RESEARCH PLAN

The research team developed a pervious PCC mixture (see Table 2) to act as the control or standard for comparison for the project. Throughout the research, the volumes of paste, aggregates, and water were held constant for all variable mixtures. Chemical admixtures at a dosage chosen from the manufacturer's recommended dosage range were added to or subtracted from the control mixture design. Variable mixture designs are shown in Tables 3 and 4.The control mixture was replicated three times. All other mixtures were only produced one time. The research team assumed that in the future, more promising variable mixtures could be further investigated. In order to compare chemical admixture costs, the following cost per gallon assumptions were made: viscosity modifier $6, accelerator $8, mid-range water reducer $10, retarder $4, and hydration stabilizer $4.

### BACKGROUND

ASTM C 125 defines chemical admixtures as any material used in concrete or mortars other than water, aggregates, hydraulic cement and fiber reinforcement [5]. PCC producers are already familiar with ASTM C 494 [6] retarders, water reducers, and accelerators used in conventional PCC. Some of the less familiar chemical admixtures used in pervious PCC are briefly described in the following paragraphs. For more detailed information, contact a TCA member admixture representative. The TCA office can provide phone numbers, e-mail addresses, and websites.

*Viscosity-Modifying Admixtures (VMA)*

Viscosity modifying admixtures (VMAs) are designed to increase resistance to segregation and to improve the workability of a PCC mixture. VMAs are primarily used in self-consolidating concrete. However, research at Tennessee Technological University indicates that VMAs can be beneficial in preventing drain down of pervious PCC paste.

*Hydration Stabilizers*

Hydration stabilizers are made up of a two part chemical system. First, a stabilizer that behaves much like a retarder slowing down or even halting the hydration of cementing materials [7]. Next, an activator is sometimes added to re-establish normal hydration [7]. The stabilizer can suspend the hydration for up to 72 hours [7]. Observations made by TCA executive director Alan Sparkman indicate that hydration stabilizers can make unloading ready mix trucks easier and extend placement time available for pervious PCC.

### PROCEDURE

All pervious PCC batches were 0.65-cubic feet in size. Each batch was mixed in a one-cubic-foot capacity electric mixer. Ten 4x8-inch cylinders were cast from each batch. Eight of the

### TABLE 1. COARSE AGGREGATE USED FOR THE PROJECT

| Sieve Size | Sieve Size (mm) | Project Coarse Aggregate (% finer by mass) | ASTM C33 No. 8 Coarse Aggregate Requirements for % finer by mass |
|---|---|---|---|
| 1/2 inch | 12.5 | 100 | 100 |
| 3/8 inch | 9.5 | 97 | 85–100 |
| No. 4 | 4.75 | 10 | 10–30 |
| No. 8 | 2.36 | 2 | 0–10 |
| No. 16 | 1.18 | 1 | 0–5 |

### TABLE 2. CONTROL PERVIOUS PCC MIXTURE DESIGN

| Component | Amount |
|---|---|
| Type I PC, lbs./CY | 600 |
| ASTM No. 8 Limestone Coarse Aggregate, SSD, lbs./CY | 2600 |
| Water, lbs./CY | 180 |
| Mid-Range Water Reducer, oz./cwt. (oz./CY) | 5 (30) |
| Viscosity Modifier, oz./cwt (oz./CY) | 2 (12) |

### TABLE 3. VARIABLE PERVIOUS PCC MIXTURE DESIGNS WITH ADMIXTURE SUBTRACTIONS

| Component | Minus Mid-Range Water Reducer | Minus Viscosity Modifier |
|---|---|---|
| Type I PC, lbs./CY | 600 | 600 |
| ASTM No. 8 Limestone Coarse Aggregate, SSD, lbs./CY | 2600 | 2600 |
| Water, lbs./CY | 180 | 180 |
| Mid-Range Water Reducer, oz./cwt. (oz./CY) | 5 (30) | 5 (30) |
| Viscosity Modifier, oz./cwt (oz./CY) | 2 (12) | 0 |

### TABLE 4. VARIABLE PERVIOUS PCC MIXTURE DESIGNS WITH ADMIXTURE ADDITIONS

| Component | Plus Retarder | Plus Accelerator | Plus Hydration Stabilizere |
|---|---|---|---|
| Type I PC, lbs./CY | 600 | 600 | 600 |
| ASTM No. 8 Limestone Coarse Aggregate, SSD, lbs./CY | 2600 | 2600 | 2600 |
| Water, lbs./CY | 180 | 180 | 180 |
| Mid-Range Water Reducer, oz./cwt. (oz./CY) | 5 (30) | 5 (30) | 5 (30) |
| Viscosity Modifier, oz./cwt (oz./CY) | 2 (12) | 2 (12) | 2 (12) |
| Retarder, oz./cwt. (oz./CY) | 4 (24) | 0 | 0 |
| Accelerator, oz./cwt. (oz./CY) | 0 | 10 (60) | 0 |
| Hydration stabilizer, oz./cwt. (oz./CY) | 0 | 0 | 4 (24) |

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by L. K. Couch

# Help for Pervious PCC Producers

## Part 2: Chemical Admixtures for Pervious PCC

cylinders were used for compressive strength determination and two were used to determine effective void content and to asses drain down of the paste. All cylinders were cast in two layers in reusable metal molds. Each layer received 4 blows from an AASHTO T 245 Marshall Hammer [8]. The Marshall Hammer is one of the compaction devices being considered by the ASTM Pervious PCC Standard Test Method Subcommittees. Following casting, each cylinder was covered with plastic and allowed to cure for approximately 24 hours. The next day, the cylinders were de-molded and placed in a lime-water immersion tank. On the seventh day, the two effective voids cylinders were removed from the curing tank and dried at 230˚F for seven days. Effective void contents were then determined as per ASTM D 7063 [9]. Paste drain down was determined by visual inspection. Compressive strengths were determined for each batch at 7, 28, 56, and 91 days using a pair of cylinders. On the day of a scheduled break the pair of cylinders was removed from the curing tank and capped with sulfur mortar as per ASTM C 617 [10] and subsequently tested in accordance with ASTM C 39 [11].

### RESULTS

Average results are shown in this article, for more detailed information see Phillips [1]. Table 5 shows average effective void contents. No paste drain down was observed in any of the chemical admixture variable mixtures. Control compressive strength results are shown in Figure 1. Similarly, chemical admixture variable mixture compressive strength results are shown in Figure 2. Each result is the average of two compressive strength cylinders at the prescribed age.

## FLY ASH MIXTURES

### ANALYSIS OF RESULTS

*Effective Void Content*

The variation in effective void content was small for the project. The small standard deviation suggests that there is no difference for results between 31.2 and 33.5 percent [1]. All results fell within this range.

*Compressive Strength*

Table 6 shows the average compressive strength of each chemical admixture variable mixture as a percentage of the average compressive strength of the control mixture at the same age. Since each variable mixture was only produced once, insufficient data was available for t-test comparisons to determine if differences observed were significant. Therefore, a ten percent difference from the average control mixture at that age was considered significant for this project. Table 6 is color coded for easier analysis: red shading indicates a twenty percent or more decrease in compressive strength; orange indicates a ten percent decrease; yellow indicates that the variable mixture strength is less than ten percent different from the average control compressive strength; Blue indicates a ten percent increase; and green indicates a twenty percent or more increase in compressive strength compared to the average control.

The compressive strength results shown here are from samples continuously cured in lime-water. Since adequate moisture and temperature for curing are not guaranteed in the field, it would take much longer for pervious PCC samples in the field to reach a 56 or 91 day laboratory curing level, if they ever reached that level. Seven and 28 day levels of laboratory curing are much more achievable in the field. Except in rare circumstances, pervious PCC producers should concentrate on the 7 and 28-day compressive strength results.

Three of the chemical admixtures, retarder, accelerator and viscosity modifier, had no significant effect on compressive strength. Having no significant difference is not necessarily a bad result, as chemical admixtures may perform functions other than increasing compressive strength (more in the following paragraphs). Leaving out the mid-range water reducer had the most significant detrimental effect on compressive strength. Average compressive strength results were 11 to 14 percent below the average control compressive strength at all four ages. The addition of a hydration stabilizer had the most significant beneficial effect on compressive strength. Seven and twenty-eight day average compressive strengths, the most important compressive strengths, were significantly higher.

*Chemical Admixture Cost*

Table 7 shows the chemical admixture costs based on the earlier stated cost-per-gallon assumptions (viscosity modifier $6, accelerator $8, mid-range water reducer $10, retarder $4, and hydration stabilizer $4). Table 7 is color coded for easier analysis: red shading indicates a twenty percent or more increase in cost; orange indicates a ten percent increase; yellow indicates

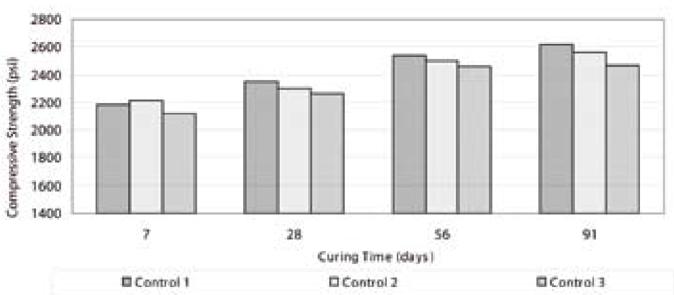


**Figure 1. Control Mixture Compressive Strength Development**

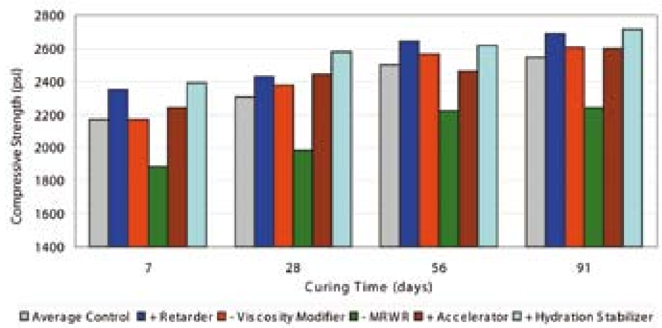


**Figure 2. Compressive Strength Development of Class F Fly Ash Mixtures**

## TABLE 5. AVERAGE EFFECTIVE VOID CONTENT FOR PERVIOUS PCC MIXTURES

| Mixture | Average Effective Void Content (%) |
|---|---|
| Average Control | 33.3 |
| Control + Retarder | 31.2 |
| Control + Hydration Stabilizer | 32.1 |
| Control + Accelerator | 33.4 |
| Control – Mid-Range Water Reducer | 33.5 |
| Control – Viscosity Modifier | 33.5 |

## TABLE 6. PERCENT OF AVERAGE CONTROL COMPRESSIVE STRENGTH AT SPECIFIED AGE

| Tertiary Mixture | 7 Days | 28 Days | 56 Days | 91 Days |
|---|---|---|---|---|
| Control + Retarder | 108 | 105 | 106 | 106 |
| Control + Hydration Stabilizer | 110 | 112 | 105 | 107 |
| Control + Accelerator | 103 | 106 | 99 | 102 |
| Control – Mid-Range Water Reducer | 87 | 86 | 89 | 88 |
| Control – Viscosity Modifier | 100 | 103 | 103 | 102 |

## TABLE 7. CHEMICAL ADMIXTURE COST PER CUBIC YARD ($)

| Mixture | |
|---|---|
| Control | 2.91 |
| Control + Retarder | 3.65 |
| Control + Hydration Stabilizer | 3.65 |
| Control + Accelerator | 6.69 |
| Control – Mid-Range Water Reducer | 0.57 |
| Control – Viscosity Modifier | 2.34 |

| | | | | |
|---|---|---|---|---|
| **20% or more less than control** | **10% or more less than control** | **Less than 10% different from control** | **10% or more greater than control** | **20% or more greater than control** |

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by L. K. Couch

# Help for Pervious PCC Producers

## Part 2: Chemical Admixtures for Pervious PCC

that the variable mixture cost is less than ten percent different from the control cost; blue indicates a ten percent decrease; and green indicates a twenty percent or more decrease in cost compared to the control cost. Hydration stabilizer was the clear winner in compressive strength increase per dollar. Mid-range water reducer was second. Mid-range water reducer actually had a greater impact on compressive strength but cost more per gallon.

*Other Chemical Admixture Functions*

This article provided a preliminary examination of chemical admixture choices for pervious PCC. The evaluation was based on measureable quantities such as effective void content and compressive strength. Albert Einstein said "Not everything that can be counted counts and not everything that counts can be counted." The following paragraphs describe some chemical admixture applications that would be hard (if not impossible) to accurately quantify.

Retarders and hydration stabilizers alter set times and provide more time for placement of pervious PCC in the field. Pervious concrete typically sets within a couple of hours due to a low w/cm ratio and high contents of cementing materials. Therefore, in order to delay setting time retarders or hydration-stabilizing admixtures are commonly used [12]. Accelerators may increase the reaction rate and reduce set time. Therefore, accelerators have been used in cold weather placements of pervious PCC [13]. However, in warm weather accelerators may reduce transport and placement time. Observations from TCA executive director Alan Sparkman indicate that hydration stabilizers can make pervious PCC mixtures easier to unload from ready mix trucks. ACI 522 [13] indicates that retarding admixtures also assist in the placement of the pervious PCC by acting like a lubricant between interlocking aggregates [13].

The effect of chemical admixtures on compressive strength and effective voids of pervious PCC is certainly important. However, these two criteria are not a sufficient basis for selecting chemical admixtures for pervious PCC. Chemical admixture selection for a particular pervious PCC mixture requires much more information. Factors such as weather conditions, placement conditions must be considered.

### CHEMICAL ADMIXTURES FOR PERVIOUS PCC - HELP SUMMARY

The research presented herein is exploratory in nature, additional batches of the more promising mixtures should be produced to confirm the results obtained. Based on the results from this study, the following advice can be offered to pervious PCC producers.

1. Always make a trial batch of the pervious PCC mixture to check for PC/ SCM / admixture compatibility, compressive strength, effective voids, workability and paste drain down.
2. Always use a water reducing admixture to improve compressive strength and make unloading easier.
3. If it is not cold at the time of placement, use a hydration stabilizer. The hydration stabilizer improves compressive strength, makes unloading easier, and can extend placement time. Use a retarder if a hydration stabilizer is not available.
4. Viscosity modifiers increase the mixture cohesion and provide additional resistance against paste drain down and segregation.
5. If it is not cold at the placement, do not use an accelerator. If an accelerator is used exercise extreme caution. Pervious PCC already sets rapidly due to the high cementing materials content and low w/cm ratio.
6. The author recommends using a water reducer, hydration stabilizer and viscosity modifier in a typical pervious PCC mixture for Tennessee. Start with a dosage near the manufacturer's recommended minimum or get advice from a TCA member admixture representative.
7. Exercise caution with the water reducer dosage—especially if using a high range water reducer. In the opinion of the author, mid range water reducers are powerful enough and more forgiving than high range water reducers.

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## AUTHOR INFORMATION

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# PROJECT PROFILE:

## DEADERICK STREETSCAPE IMPROVEMENT PROJECT

What was once just another busy Downtown Nashville street lined with outdated bus shelters and a few dying trees, Deaderick Street has now been transformed into Tennessee's first "Green Street." Located between Legislative Plaza and the new Public Square, Deaderick Street has completed a host of new improvements and replaced the old worn out features with new enhanced streetscape amenities.

Architects Hawkins Partners and the construction team from Roy T. Godwin Contractors worked closely with Mayor Karl Dean and Metro Public Works to incorporate several new "green" concepts into the project. Among the many environmentally friendly goals planned for the area included the construction of rain gardens. The rain gardens were designed as a way for rainwater to be collected and used for irrigation of the street's new landscaping. By using pervious concrete, rainwater from the street is captured, filtered, and channeled to the root zones of the newly planted trees and shrubs. By utilizing pervious concrete and rain gardens, it is also expected that 1.2 gallons of storm water will be diverted from the Cumberland River per year.

For the project, 1,441 cubic yards of concrete provided by Metro Ready Mix, were placed. In addition to pervious concrete, the sidewalks also contained exposed chip and regular broom finishes. The other enhancements of the street included new LED lighting, solar powered parking meters, and the use of recycled materials in light poles, signage, and trash containers. The city of Nashville can be very proud of the new streetscape improvements made to Deaderick Street.

# PRELIMINARY FINDINGS RELEASED BY CSH ON LIFE-CYCLE ASSESSMENT OF PAVEMENTS & STRUCTURES

*By Julie Garbini, RMC Foundation Executive Director*

## OVERVIEW

Ongoing research at the Massachusetts Institute of Technology (MIT) Concrete Sustainability Hub (CSH) is positioned to set a new standard in life-cycle assessment (LCA) modeling. MIT CSH's two interim reports discuss initial findings on the life-cycle environmental costs of paving and building materials. The results will provide a rigorous means of testing the relative environmental impact of paving and building materials and design alternatives. In 2011, MIT CSH will combine the environmental LCAs with life-cycle cost analyses (LCCA) providing tools to accurately measure the environmental and economic costs of building and paving materials.

## LIFE-CYCLE ASSESSMENT (LCA) OF HIGHWAY PAVEMENTS

MIT CSH's ongoing LCA of highway pavements will significantly improve the understanding of paving materials' life-cycle performance. To date, the research team at MIT CSH has made considerable progress towards creating a new life-cycle model to capture the cradle-to-grave carbon emissions of paving materials. A comparative analysis of the carbon emissions of asphalt and concrete pavements over a 50-year lifetime has been conducted, with a focus on the operating, or "use phase," of the life-cycle. Research in this study has shown that the use phase of the pavement life-cycle can account for up to 85 percent of carbon emissions. The use phase emphasis sets the current MIT CSH research apart from the majority of previous LCAs on paving materials.

The research team's initial findings indicate that concrete pavements can lead to potentially significant vehicle fuel efficiency savings over asphalt pavements. These fuel efficiency savings could result in substantially lower life-cycle carbon emissions for concrete pavements compared to asphalt pavements. MIT CSH researchers will further analyze fuel consumption in 2011 to provide additional data and confirm findings of fuel savings associated with pavement design.

In 2011, the LCA environmental findings will be combined with a comprehensive economic costing. In addition to providing similarly illuminating data on the economic side of pavements, the LCCA will identify practices which both save money and mitigate environmental impact.

## LIFE-CYCLE ASSESSMENT (LCA) OF BUILDINGS

The LCA of Buildings analyzes the environmental impact of commercial and residential building materials. Both the residential and commercial building LCAs utilize a comprehensive 75-year analysis period that highlights the operational energy demands of buildings in addition to construction, maintenance, and disposal costs associated with materials. For commercial buildings, MIT CSH's research team has conducted a comparative analysis of concrete and steel. For residential buildings, homes constructed with insulated concrete forms (ICF) are compared to those constructed with wood frames.

For residential buildings, MIT CSH researchers have found that more than 90 percent of the life-cycle carbon emissions are due to the operation phase, with construction and end-of-life disposal accounting for less than 10 percent of the total emissions. The research also shows that in residential structures, the use of ICFs instead of code compliant wood-framed construction can produce operational energy savings of 20 percent or more, with the highest energy savings occurring in colder climates.

For commercial buildings, based on initial research, which compared 12-story structures in both warm and cold climates, the added thermal mass afforded by the use of concrete when compared to steel yields annual heating, ventilation, and air conditioning (HVAC) energy savings of between 5 percent and 6 percent depending on the climate.

Since HVAC energy savings directly translate to cost savings, much of the economic studies to come will build upon existing findings and highlight additional economic life-cycle attributes of commercial and residential building materials.

In 2011, MIT CSH will expand the current research on residential and commercial buildings to additional climatic zones and building materials, such as concrete masonry.

To view the MIT CSH interim LCA findings, link from the Foundation's home page at www.rmc-foundation.org.

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# ALAN SPARKMAN TENNESSEE CONCRETE ASSOCIATION ............... WINS THE TENNESSEE ENVIRONMENTAL COUNCIL'S 2010 TENNESSEE SUSTAINABILITY AWARD

The Tennessee Environmental Council presented the 2010 Tennessee Sustainability Award to Alan Sparkman, Executive Director of the Tennessee Concrete Association, at a ceremony held on December 7. Sparkman was recognized for the commitment of Tennessee Concrete Association to plant 100,000 trees as part of the Council's Tennessee Tree Project as well as for his inspiring commitment to showcasing the role concrete plays in building environmentally sound projects.

Sparkman announced Tennessee Concrete Association's goal of planting 100,000 trees in February 2010, saying, "TCA members strive to be good citizens in their local communities and an important part of citizenship is stewardship of our natural resources. Trees offer many environmental and economic benefits and trees are an integral part of great, livable communities. The Tennessee Tree Project (www.tectn.org/tree) provides TCA members with another venue to help make their local communities even better places to live." A single tree can provide over $100,000 of value including oxygen, air pollution control and storm water drainage, so TCA's commitment of 100,000 trees could provide more than 10 billion dollars of benefits to our state over a 50-year period.

Sparkman was also recognized for his longstanding and broad range commitment to the environment. Among his many credentials and certifications, Sparkman has achieved LEED (Leadership in Energy & Environmental Design) certification—an internationally recognized green building certification program. Sparkman has engaged in a variety of activities to highlight how concrete can be used to benefit the environment. In 2004 he organized a cross-country fundraiser, "Count on Concrete Bike Ride—Building Access for All Americans," which raised money & awareness for greenway & trails projects including the White's Creek Greenway in Tennessee. Alan received the prestigious Kodak American Greenways Awards in 2004 for this effort. Tennessee Concrete Association (TCA) is a Partner in the Tennessee Pollution Prevention Partnership (TP3) and winner of Concrete Construction magazine's GreenSite Award – Commercial category for TCA's campus site development.

## Plan for Success in 2011

*Join us at our Annual Convention*

HUTTON
HOTEL

FEBRUARY 18, 2011

(See page 22 for more details.)

# TCA TESTIMONIAL:

## A CONTRACTOR MEMBER GETS MORE THAN EXPECTED

*by Kevin Baltz of Baltz & Sons Concrete*



My name is Kevin Baltz. I am president and owner of Baltz & Sons Concrete, in Memphis, Tennessee. I have been a member of the Tennessee Concrete Association since 2007, and while a relatively new member, I have already enjoyed tangible benefits from my involvement in this great association.

I wanted to take an opportunity to share with you and your readers an important experience I had this past year. All too often, members of our industry fail to recognize the intrinsic value that the TCA can bring them. Particularly for contractors such as myself, membership may not seem like a worthwhile venture—but I can attest that it is, and on many levels. My involvement in the TCA has exceeded my expectations, and the counsel, insight, and business and networking opportunities that have resulted from my membership far exceed the expense.

The following example is a perfect demonstration of some of the "hidden" benefits of TCA membership—benefits that are available to all of us, but not always utilized, and even less frequently acknowledged. This chain of events also demonstrates how instrumental a role the Tennessee Concrete Association can play in helping to develop and influence concrete market segments on a state and even national level

In February of 2010, Forcum Lannom Contractors, based out of Dyersburg, Tenn., approached Baltz and Sons Concrete of Memphis to handle the placement and finishing of the pervious portions of a new bank construction project they were developing in Martin, Tenn. The project in question called for nearly 5,000 sq. ft. of pervious concrete parking area, and was designed to handle the run-off of a significant portion of the impervious portions of the parking lot utilizing both a considerable detention area, as well as a large water garden that would receive the pervious-filtered overflow. As Forcum Lannom contractors had no previous experience with pervious concrete, the design was met with some cynicism—if not outright resistance—but the designing engineer was adamant that the use of permeable pavement be considered.

Having been previously encouraged by, and ultimately earning my national NRMCA Pervious Technician certification through the TCA, I was prepared to meet with Forcum Lannom contractors, answer their questions, and address their concerns about a product they had not yet encountered. As a result of this initial meeting, Forcum Lannom was confident enough to award the subcontract to Baltz & Sons Concrete and proceed with the pervious installation.

I in turn went to the TCA for a recommendation for potential suppliers, and ultimately selected association member Southern Concrete out of Union City. We then met with Shane Brockwell, of Southern Concrete, who also turned to the TCA as an invaluable resource. Not only did the TCA help develop a mix design for the project, but they also helped connect experienced industry members to association members both at the batching plant and at the project site. As a cost-free service to its members,

the TCA's involvement was to support, promote experience, and ensure success of the supplier, the installer, and ultimately the property owners.

In a later conversation, the engineer for the project indicated that he had first encountered and embraced pervious concrete as a result of information distributed by the TCA. Thus, working both behind the scenes and in the forefront, the TCA had influenced this project from inception to completion—connecting the industry's innovations to the designing engineer, training and certifying the installer, sourcing the supplier, and even providing hands-on support and manpower to ensure a smooth operation and successful outcome—a perfect demonstration of how the Tennessee Concrete Association helped to further grow an important market segment for Tennessee's concrete industry, and promote the success of its members.

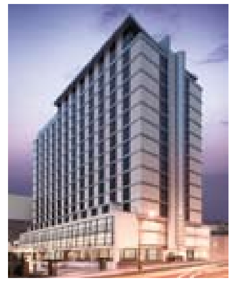
This is only one example of the many benefits my company, as well as I personally, has enjoyed through our Membership in the TCA, and I look forward to a continued prosperous relationship with this association. ❖

*by Dr. Heather J. Brown*

## TURNER UNIVERSAL AWARDED MTSU CIM PROJECT

The Concrete Industry Management program is building a facility solely to house their program on the campus of MTSU. The CIM's building campaign is for construction of a 24,000 square foot, two-level facility which will include laboratories, classrooms and administrative offices. This building will showcase many concrete applications throughout the building including concrete foundations, exposed walls and floor systems, CMU, precast, stamped and stained floors, pervious parking, RCC drive lanes and even translucent concrete. Ground breaking is planned for late 2011 which will help MTSU celebrate its 100th year anniversary. Turner Universal was announced by Tennessee State Building Commission as the CM/GC for a zero percent fee on October 15, 2010. The building campaign is a $7.2 million dollar fundraising effort to include material, labor and monetary gifts. We have currently secured $1.1 million in support and are actively seeking more assistance to achieve our goal. CIM is currently graduating nearly 80 undergraduate students per year with plans to become a stand alone department in 2011 and offer a MBA in CIM in 2012. Big plans call for a space that can take CIM to the next level of success. CIM appreciates all the support and vision that Tennessee producers, suppliers and contractors have given towards the program.

## 2011 ANNUAL CONVENTION
## Hutton Hotel in Nashville
## FEBRUARY 18, 2011



HUTTON HOTEL

## 2011 Tennessee Concrete Association

### SCHEDULE OF EVENTS:

**GENERAL SESSION, VISTA BALLROOM A**

**8:00 – 9:00 a.m.**
Tennessee Home Building Outlook

**9:00 – 10:00 a.m.**
Successful Efforts: Selling a Pervious Parking Lot

**10:15 – 10:45 a.m.**
ICF Case Studies: How to Sell a Job in Your Market

**10:45 – 11:15 a.m.**
NRMCA Update

**11:15 – 11:30 a.m.**
CIM Program Update

**11:30 – 11:45 a.m.**
TCA Membership Meeting

**LUNCH AT TN CONCRETE ASSOCIATE SITE**
Lunch sponsored by CEMEX. Please join up at the TCA site for networking and lunch. Exhibitors present, so be sure to visit their booths!

**2:00 p.m.**
Truck Rodeo

**EVENING EVENTS**

**6:00 - 7:00 p.m.**
Awards Reception, Vista Ballroom C

**7:00 p.m.**
Awards Banquet, Vista Ballrooms A & C

# Info Link

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