TENNESSEE CONCRETE MAGAZINE

Winter 2011/12
VOL. 25, NO. 3

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TENNESSEE CONCRETE MAGAZINE

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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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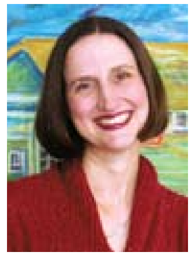

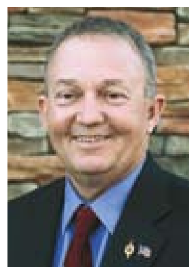

Andrea J. Childress
2011 TCA President

We have not only increased in strength and number, but we also continue to achieve goals that we set long ago.

PARTING THOUGHTS

—from Outgoing President Childress

We have come to the end of yet another incredible year with the Tennessee Concrete Association and I am proud to be a part of an organization that has now seen the completion of 25 successful years! As 2011 draws to a close, I find myself reflecting on the past year and all the wonderful things I have seen happen in our industry and in our association. I've had the pleasure to meet and talk with so many of you, and I hope that 2012 brings the opportunity to meet with many more before my term comes to an end. Our industry has dealt with many changes with the continued slowing and downward motion of our economy. But I am so honored to be a part of an organization that has not slowed or allowed difficult economic trends to stop our progress for the future. We have not only increased in strength and number, but we also continue to achieve goals that we set long ago. In addition, our community and industry related projects have become bigger and better as we continue to inform companies and individuals on the sustainability and uses of concrete. We have become an active group in and well beyond the state of Tennessee. These achievements are due to the ongoing support of our membership, board, committees and the innovative thinking of the TCA staff. Again, I am so incredibly proud to be a part of such an outstanding group of individuals and can only hope that 2012 brings us even more success!

One of the ways that we can continue to propel our association, and thereby our industry, forward is to emphasize the importance of being involved in every level of planning and leadership roles available. The best way for those of us who wish to help TCA continue to improve is to attend the Annual Convention. This year the Tennessee Concrete Association's Annual Convention will be held on February 16-17, 2012 at the Nashville Airport Marriott in Nashville, Tenn. For those that regularly attend the summer meetings & conventions, I would like to thank you. Please do all that you can to encourage your vendors, co-workers, customers, family and others to attend this year's convention. For those who have never been I personally would like to extend an invitation and welcome any questions you may have. I cannot stress how crucial these events are for the success of our industry, association, and local companies. Registration forms can be found at www.tnconcrete.com. Contact the TCA staff at 615-360-7393 for more details.

ADDITIONAL UPCOMING TCA ACTIVITIES:

- Pervious Concrete Technician Certification, February 2
- TCA Appointment of Committees & Committee Chairs, January-February 2012
- TCA Annual Convention, February 16-18
- TCA Committee Meetings, February 16
- TCA Board Meeting, February 16
- TCA Membership Meeting, February
- "We Are TCA" Luncheon, February 16
- TCA Executive Board & Officers Nominations/Elections, February
- TCA Awards Banquet, February

I would once again like to thank each member & all of the staff for your continued support & dedication to the association. I wish you all a safe & happy holiday season. I look forward to seeing you all in February at the TCA convention & if there is anything TCA or I can do for you please feel free to contact me at ajc@childressconcrete.com. Best wishes to you for a prosperous 2012. ❖

SOMEBODY SHOULD DO

Something about That…

Alan Sparkman
Executive Director

I am advocating for each of us to look around in our local community and find something we can do to make it better—and then do it!

One of the things I love about our industry is that it is filled with hard-working, innovative people who are willing to take responsibility for getting things done. We routinely take the lofty concepts shown on a set of drawings and turn them into reality, despite a multitude of obstacles. This unwavering determination to move forward and make progress is one of the greatest assets of our industry.

Contrast that 'Can-Do' attitude with our current crop of political leaders, and I would bet you are as frustrated as I am with our political leaders. There is no shortage of really important issues crying out for leadership and action, yet our politicians seem only o think in terms of sound bites and expediency as the 2012 elections grow near. Personally, I think we should clear out every single incumbent and impose strict term limits on all future federal legislators… but that's not the point of this column.

The inability or unwillingness of our politicians to address critical issues doesn't change the fact that such issues need to be dealt with. The standard operating procedure to stir up political action is for various industries and special interest groups to take their case to Washington. The concrete industry's typical call for political action involves going to Washington and essentially asking for special treatment—relax this rule, impose this tariff, mandate use of our product in some way, give us a tax break—and our industry is no different from every other industry and special interest asking for the same type of special treatment for their constituency.

I would argue that this 'standard operating procedure' is essentially a waste of time in the current poisoned political atmosphere, and that in many ways this approach to advocacy contributed greatly to poisoning our political well. The persistent practice of advocating to gain special advantage for narrow interest groups—business, unions, environmental or other—while ignoring the impact on everyone else is inherently unhealthy.

Our current crop of political leaders on both sides of the aisle have existed in this "Me First!" atmosphere for so long that they have come to believe that leadership is exclusively about getting re-elected first, and discrediting the other party second. It's about choosing winners and losers and getting campaign contributions in return. The actual work of governing doesn't even make the Top Ten for most politicians….

I would offer that standard political advocacy in this environment is an exercise in insanity—doing the same thing we have always done and expecting a different result.

The fact is that our hope for the future lies in the power and province of the often misrepresented 'American people'. I am advocating for the 'Can-do' rank and file in our industry and all walks of our society to stop asking for special treatment and to stop waiting for Washington to make things better. I am advocating for each of us to look around in our local community and find something we can do to make it better—and then do it.

Because our industry is truly blessed with 'Can-Do' people, a lot of you are already doing this kind of thing. I can think of several examples where concrete industry companies have identified a need in their community and are even now investing time and resources to meet that need and to make things better for all of us. That investment probably doesn't make 'business-sense' in the MBA sense of the word because it has a negative impact on your bottom line—but I want to thank you for the investment you are making in our society, and the sacrifice that it requires on your part.

If we would engage this best part of who we are in our political arena, I believe our response to the current political challenges would be markedly different. Instead of the selfish, short-sighted, greedy behavior that defines our current political environment, I believe we would see the kind of response that Americans exhibited in the time of World War II, and that many of you are modeling in your community involvement.

I know that I am generalizing to some extent, but I think that most American families in the World War II era responded like my grandfather. Although he was past prime military age, he made the difficult decision to leave his young family and his business to volunteer for the Navy. His first thought wasn't about what was best for him—his first thought was about the responsibility he bore to our country and to protect those he loved. Americans of all stripes sacrificed to support a common cause and this powered our nation to become truly the greatest nation on Earth.

And here is where I stray back into politics…. I want to challenge you to apply that same unselfish spirit to your political thinking. And I would ask you to stop the rhetoric for a moment and consider some facts. As we in the construction industry well know, our transportation infrastructure is suffering because political leaders at both state and federal levels have refused for decades to raise the fuel taxes that fund both new construction and maintenance. We know that a tax increase is needed and justified in this area, but many of us are buying into the 'No New Taxes' rhetoric that is filling the air.

There are numerous other examples I could give, but the heart of the matter is this: We need to quit settling for sound bite answers that we know won't work, and we must let our politicians know that we are a lot smarter than they give us credit for. We—as individuals, as companies, and as industries—need to be asking how we can do our part to restore and invigorate our nation rather than seeking special treatment.

Let's change the debate in 2012 by asking what we can give instead of what we can get.

by L. K. Couch—

Four-Part Series

Help for Pervious PCC Producers

Part 4: Putting it All Together for a High Performance Pervious Concrete Mixture Design

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 final article, lessons from the previous articles are combined to produce high performance pervious concrete (HPPC) mixture designs.

What is HPPC? HPPC goals for this project were a minimum 3000-psi average compressive strength at 28-days and minimum average permeability 100-inches/hour. Further, common aggregates, supplementary cementing materials (SCMs), and chemical admixtures were required. Finally, the same light compaction used in parts 1 through 3 was required. The improvement in mixture performance had to be achieved through recent mixture design lessons. The researchers wanted to make HPPC attainable in the field for Tennessee Ready Mix Producers.

MATERIALS

A Class F fly ash meeting ASTM C 618 [1] was obtained from regional suppliers. Type I Portland cement [2] was obtained from a local ready mix producer's bulk storage. The ASTM C 33 [3] No. 8 limestone from Part 1 was used for the Middle Tennessee mixture. An ASTM C 33 [3] No. 8 limestone was obtained from an East Tennessee quarry. Fine aggregates were obtained from the same sources previously used in parts 1 through 3. The average results of washed sieve analysis [4, 5] conducted on the aggregates are shown in Table 1. Effective void sizes of the two aggregate blends are shown in Table 2. Chemical admixtures were provided by the local representative of an international chemical producer. Insofar as possible, leftover materials were used.

RESEARCH PLAN

The research team attempted to show that mixture design alterations described in Parts 1, 2 and 3 could be used to improve compressive strength and static modulus of elasticity while maintaining adequate effective voids and permeability. The two HPPC mixture designs, incorporating lessons from Parts 1, 2 and 3 are shown in Table 3.

TABLE 1. AGGREGATE GRADATIONS

Sieve Size (mm)	Middle TN No. 8 Limestone from Pt. 1	Middle TN River Sand	Middle TN Blend	East TN No. 8 Limestone Sand	Middle TN Manufactured Limestone Sand	East TN Blend
12.5	100	100	100	100	100	100
9.5	97	100	98	95	100	96
4.75	10	97	19	23	100	29
2.36	2	90	11	2	94	10
1.18	1	82	9	2	61	7
0.6	1	57	7	2	34	4
0.3	1	9	2	2	17	3
0.15	1	1	1	2	9	2
0.075	1	0.4	1	1	5.7	2

TABLE 2. AGGREGATE EFFECTIVE VOID (D_{10}) SIZES

Sieve Size (mm)	Middle TN No. 8 Limestone from Pt. 1	Middle TN River Sand	Middle TN Blend	East TN No. 8 Limestone	East TN Manufactured Limestone Sand	East TN Blend
D_{10} (mm)	4.7	0.3	1.8	3.0	0.2	2.4

TABLE 3. HIGH PERFORMANCE PERVIOUS CONCRETE MIXTURE DESIGNS

Component	HPPC F1 Middle Tennessee Mixture	HPPC F2 East Tennessee Mixture
Type I PC, lbs./CY	525	525
Class F Fly Ash, lbs./CY	54.5	54.5
Coarse Aggregate, SSD, lbs./CY	2341	2429
Fine Aggregate, SSD, lbs./CY	254	210
Water, lbs./CY	180	180
Percent Sand by Total Aggregate Volume	10	8
Hydration Stabilizer, oz./cwt.	4	4
Mid-range Water Reducer, oz./cwt.	5	5
Viscosity Modifier, oz./cwt.	2	2

TABLE 4. RESULTS AND GOALS FOR HIGH PERFORMANCE PERVIOUS CONCRETE MIXTURE DESIGNS

Component	HPPC F1 Middle Tennessee Mixture	HPPC F2 East Tennessee Mixture
Number of Cylinders	12	14
Mean Effective Voids (%)	26.9	29.4
Effective Voids Range of Individual Cylinders (%)	25.3–28.4	28.0–31.0
Mean Permeability (inches/hour)	222	187
Minimum Mean Permeability Goal (inches/hour)	100	100
Permeability Range of Individual Cylinders (inches/hour)	99–411	113–298
Mean Compressive Strength (psi)	3210	3055
Minimum Mean Compressive Strength Goal (psi)	3000	3000
Compressive Strength Range of Individual Cylinders (psi)	2755–3454	2658–3535
Mean Static Modulus of Elasticity (psi)	2.80×10^6	2.87×10^6
Static Modulus of Elasticity Range of Individual Cylinders (psi)	$2.62–3.11 \times 10^6$	$2.48–3.04 \times 10^6$

PROCEDURE

All pervious PCC batches were 0.33-cubic feet in size. Each batch was mixed in a one-cubic-foot capacity electric mixture. Four 4x8-inch cylinders were cast from each batch. Two of the cylinders were used for compressive strength determination and two were used to determine effective void content and permeability. All cylinders were cast in two layers in reusable metal molds. Each layer received 4 blows from an AASHTO T 245 Marshall Hammer [6]. 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 [7]. Compressive strengths were determined for each batch at 28 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 [8] and subsequently tested in accordance with ASTM C 39 [9] and ASTM C 469 [10]. The procedure used was as similar as possible to the procedure from Parts 1, 2 and 3.

RESULTS

The results of the project are shown in Table 4. The relatively small number of samples is due to remaining material availability.

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by L. K. Couch

Help for Pervious PCC Producers

Part 4: Putting it All Together for a High Performance Pervious Concrete Mixture Design

ANALYSIS OF RESULTS

Statistical comparisons of results of the project with the results of the Fine Aggregate for Pervious Concrete Study (Part 3 of the series) are shown in Table 5. All differences were found to be significant in paired t-tests at the ninety percent confidence level. Graphical representations of differences in effective void content, permeability, compressive strength, and static modulus of elasticity are shown in figures 1 through 4, respectively.

Table 6 shows results from several earlier TCA field pervious placements. Five of the placements received moderate compactive effort and two received high compactive effort. High compactive effort methods are shown in figures 5 and 6. Compressive strength and effective void contents of the high compactive effort placements are clearly superior to those of the moderate compactive effort placements. This study was an attempt to determine if mixture design innovations could at least partially compensate for lower compactive efforts. The answer to this question must be determined with field placements rather than laboratory placements. However, the laboratory results clearly indicate that mixture design innovations can significantly improve pervious concrete engineering properties.

HIGH PERFORMANCE PERVIOUS CONCRETE MIXTURE DESIGN - HELP SUMMARY

The research presented herein is exploratory in nature. Based on the results from this study, the following advice can be offered to pervious PCC producers.

1. Always make trial batches of the pervious concrete mixture to check for PC / SCM / admixture compatibility, compressive strength, effective voids, workability and paste drain down.
2. Large increases in compressive strength are possible with fine aggregate substitution for coarse aggregate; however, Tennessee concrete producers considering fine aggregate use are cautioned that a significant decrease in permeability is much more likely than a significant increase in compressive strength or static modulus of elasticity. Trial placements and testing are recommended to avoid producing pervious concrete with inadequate permeability.

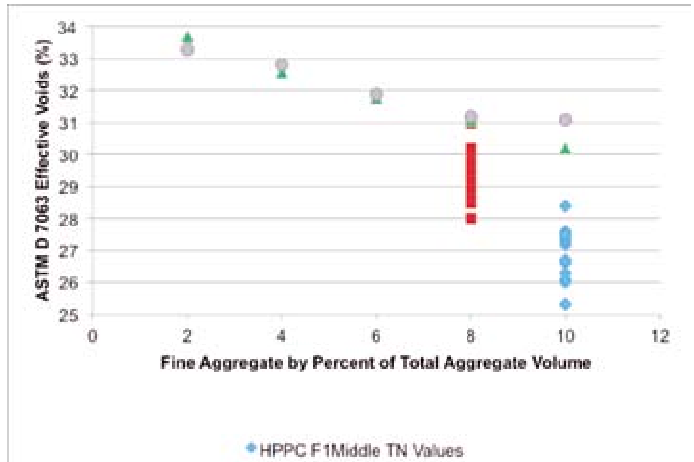

FIGURE 1. COMPARISON OF HPPC EFFECTIVE VOID RESULTS WITH EARLIER RESULTS

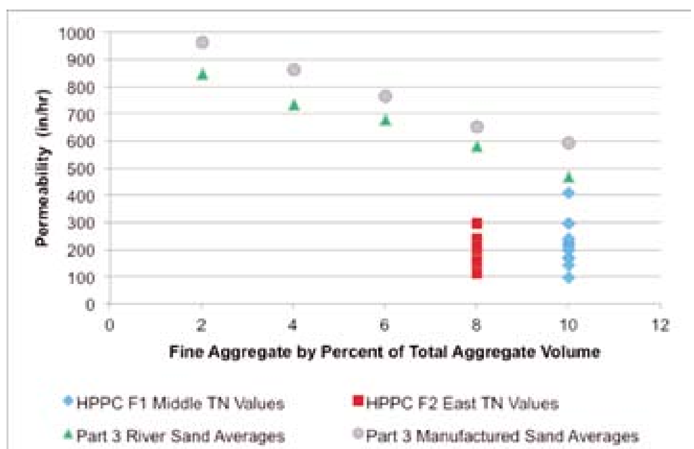

FIGURE 2. COMPARISON OF HPPC PERMEABILITY RESULTS WITH EARLIER RESULTS

REFERENCES

1. ASTM C 618-03. "Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete." American Society for Testing and Materials. **Annual Book of ASTM Standards**. Vol. 04.02. 2006. pp. 326-328
2. ASTM C 150-04a. "Standard Specification for Portland Cement." American Society for Testing and Materials. **Annual Book of ASTM Standards**. Vol. 04.01. 2005. pp. 144-151.
3. ASTM C 33-03. "Standard Specification for Concrete Aggregates." American Society for testing and Materials. Vol. 04.02, 2006, pp. 10-20.

TABLE 5. STATISTICAL COMPARISON OF HPPC MIXTURE RESULTS WITH PART 3 MIXTURE RESULTS

Component	Difference in Means	Percent Difference in Means	Statistically Significant?
HPPC F1 vs. RS 10 Compressive Strength	+250 psi	+8.4	Yes
HPPC F1 vs. RS 10 Static Modulus	+5 x 10^5 psi	+21.7	Yes
HPPC F1 vs. RS 10 Permeability	-246 in/hr	-52.6	Yes
HPPC F2 vs. MS 8 Compressive Strength	+330 psi	+12.1	Yes
HPPC F2 vs. MS 8 Static Modulus	+5 x 10^5 psi	+21.3	Yes
HPPC F2 vs. MS 8 Permeability	-465 in/hr	-71.3	Yes

TABLE 6. RESULTS OF TCA FIELD PLACEMENTS

Core Set	Number of Cores	Mean Effective Voids (%)	Effective Voids Range (%)	28-day Mean Compressive Strength (psi)	Compressive Strength Range (psi)
Chattanooga	18	32.0	28.5–35.8	1230	940–1760
Williamson C	5	25.9	25.922.2–28.5	2200	1870–2600
Williamson F	6	28.2	24.8–31.4	1300	970–1570
Knoxville	10	28.3	25.9–32.9	1370	530–2400
Erwin	5	28.5	19.7–41.3	1790	330–2860
Average Moderate Compaction Field Values	44	29.6	19.7–41.3	1445	330–2860
Burgess Falls	5	27.2	24.7–29.2	2790	2260–3500
Kingsport	6	23.6	21.9–25.4	2980	1950–3790
Average High Compaction Field Values	11	25.2	21.9–29.2	2894	1950–3790

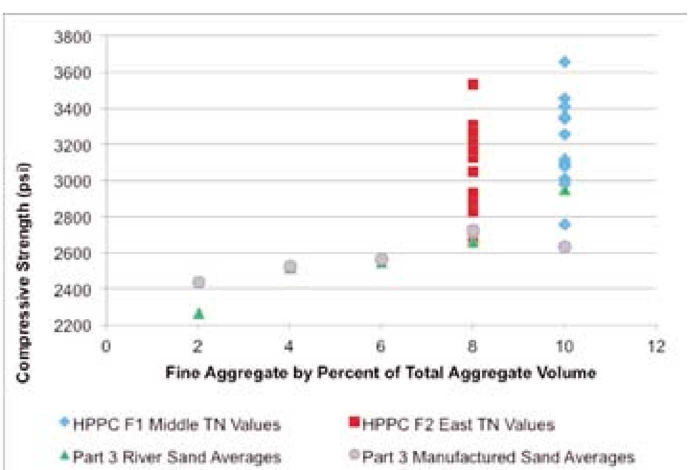

FIGURE 3. COMPARISON OF HPPC COMPRESSIVE STRENGTH RESULTS WITH EARLIER RESULTS

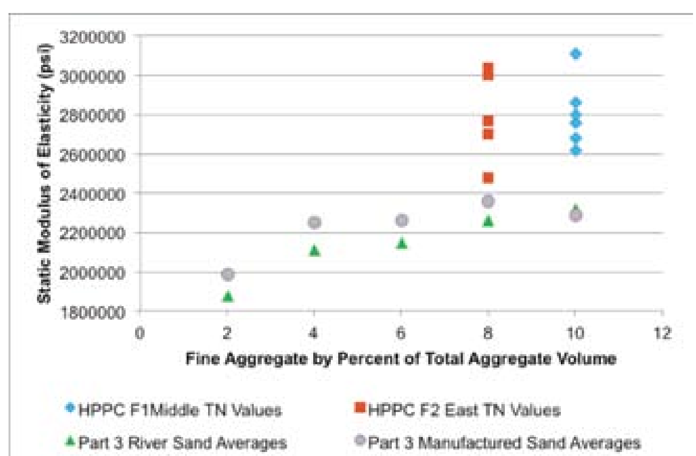

FIGURE 4. COMPARISON OF HPPC STATIC MODULUS OF ELASTICITY RESULTS WITH EARLIER RESULTS

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by L. K. Couch

Help for Pervious PCC Producers

Part 4: Putting it All Together for a High Performance Pervious Concrete Mixture Design

FIGURE 5. VIBRATORY PLATE COMPACTION AT BURGESS FALLS STATE PARK APRIL 19, 2005

FIGURE 6. HEAVY HAND ROLLER COMPACTION AT KINGSPORT GREENWAY, 2001

—Continued on page 18

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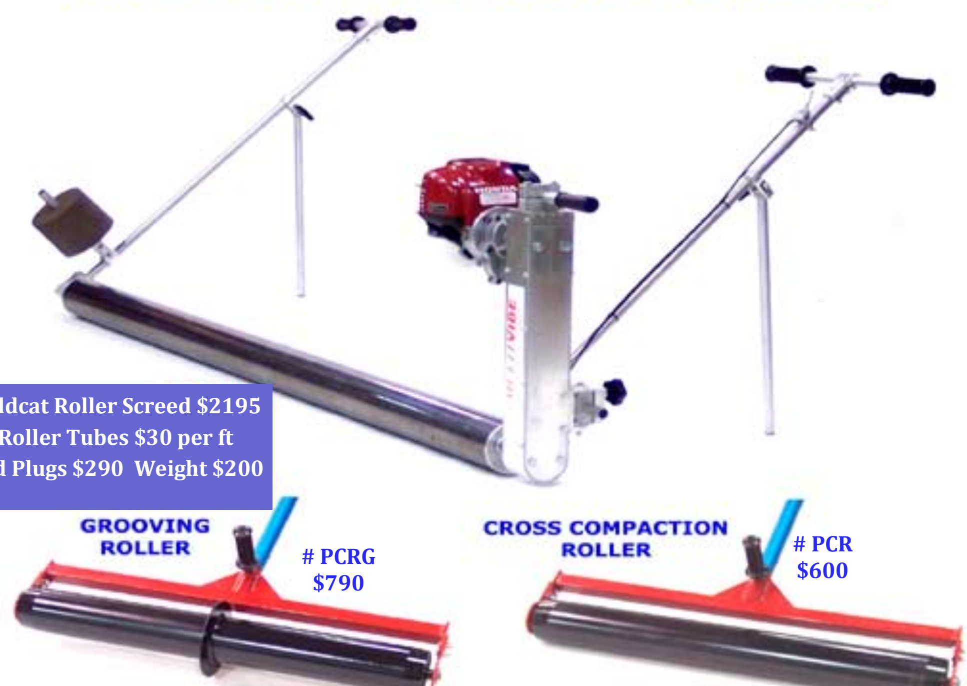

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Jack Daniel's RCC Story

Photo left to right: John Curtis, Bill Spraggins, Jim Jeffries, and Lee Adcock

If you have never been to Lynchburg, Tenn., it's worth the trip. Located about 70 miles southeast of Nashville, in yet another part of beautiful rural Tennessee, Lynchburg features a historic town square with lots of shopping, eating and friendly visiting opportunities. Lynchburg also happens to be home to the world-renowned Jack Daniel's Distillery.

The Jack Daniel's Distillery is the main attraction for most folks who visit Lynchburg. It is the oldest registered distillery in the United States (dating back to 1866) and it is surrounded by a rich history of stories and legends, all intermingled with the distinctive taste of Jack's Tennessee whiskey. The Jack Daniel's campus (actually three separate tracts of land in and around Lynchburg) consists of about 1600 acres. Much of this space is devoted to warehouses where the world-famous whiskey is stored and aged (about four years) until it is deemed ready to sell by the master tasters who sample the product before it is bottled and distributed.

Those warehouses see a steady flow of barrels coming in for aging and going out for bottling. That means a lot of truck traffic and a lot of infrastructure that has to be built and then maintained for coming decades of production. And that's where concrete enters this story.

Jack Daniel's has always used asphalt paving for the roads leading to the warehouses and for the paving adjacent to the warehouses. And they are used to spending money every year (typically in the spring) to maintain their asphalt infrastructure by repairing potholes, patching and overlaying. In some areas where they have heavy traffic and lots of twisting and turning, concrete had been used to replace asphalt pavement that was quickly failing under such service conditions.

So when contractor Lee Adcock suggested that Jack Daniel's might want to consider Roller Compacted Concrete (RCC) as an alternative to traditional asphalt pavement on a new warehouse, Jim Jeffries and Bill Spraggins, Jack Daniel's Engineering and Maintenance Department, were open to learning more about RCC.

Lee Adcock Construction had done a lot of work for Jack Daniel's over the years, including the construction of several warehouses. Lee is no stranger to concrete and his company

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Jack Daniel's RCC Story

Continued from page 15—

is used to producing high-quality work for the warehouse floors.

Lee was familiar with RCC, thanks to the sales team at IMI Tenn., Sales Manager Tonya Alexander, and Lee's local representative Mark Deason. They had discussed RCC with Lee previously and Lee had taken the initiative to learn more about the product on his own. Lee felt that RCC would bring some important advantages to his client, Jack Daniel's. Plus, Lee knew that RCC could be competitive on a first-cost basis with asphalt.

Before committing to using RCC, Jim and Bill wanted to do some research. With the help of Lee, Tonya and other concrete industry folks with RCC experience—like Mark Niemuth and Tim Langelier of Lafarge and Frank Lennox of Buzzi-Unicem—background and technical information was provided to the Jack Daniel's engineers, along with assistance on the structural design for the RCC alternate. The industry team also arranged a tour of several RCC projects in Tennessee, including RCC pavement at the new Volkswagon plant near Chattanooga, an industrial manufacturing facility, and RCC pavement that had been installed at one of IMI's concrete plant locations (and subject to very heavy truck traffic for several years).

As they learned more about RCC the Jack Daniel's team felt that RCC would provide excellent service for their application and that the use of RCC for their pavements would dramatically reduce their maintenance costs going forward. The initial bid for the RCC (provided by Robert Smith Contracting of Chattanooga, Tenn., another valuable team member in the education process) was essentially equal to what Jack Daniel's had been paying for asphalt pavement. Even though the asphalt contractor reduced their price after learning that RCC was being considered, the Jack Daniel's team was convinced that RCC remained their best option and they choose concrete for their project.

Jack Daniel's decision to use RCC reflected the company's investment mindset, and it fit in perfectly with a strong commitment to sustainable operations held by Jack Daniel's corporate owner, the Brown-Forman Corporation (Brown-Forman has owned Jack Daniels since 1956). Using RCC meant not using an imported foreign product like asphalt, and RCC (like all concrete pavements) provided other environmental benefits like cleaner stormwater runoff and better nighttime visibility, in addition to the reduced maintenance costs.

With the decision made to use RCC, the team moved forward to the construction phase. The RCC section to be built was a five-inch thickness of RCC on a six-inch thick compacted DGA base. This replaced the typical asphalt section of six inches of compacted DGA, three inches of asphalt binder and two inches of asphalt finish course. Over 18,000 square yards of pavement was placed in one week and IMI supplied 2,537 cubic yards over a five-day period for the project.

Also of note on this project was IMI's ability to convert their local dry-batch concrete plant for RCC production through the use of a portable twin-shaft mixer developed by Stephens Manufacturing for exactly this type of application. According to IMI, it took only four hours to 'plug in' the twin-shaft unit to use the existing plant's batching and scale equipment. The twin-shaft unit was fed by the existing plant and then was able to load the RCC mix directly into dump trucks for hauling to Robert Smith Contracting's high-density paver on the job site. One bonus from the twin-shaft conversion was that it actually increased the plant's hourly output from about 60 cubic yards per hour to nearly 100 cubic yards per hour.

The job was completed in five days and the total amount of concrete delivered to the jobsite was within one percent of the estimated quantity—a testament to both Robert Smith's and IMI's quality control throughout the production phase.

The completed warehouse has been in service for about two months and is already about half full of those special oak barrels containing that unique Tennessee whiskey. And now Roller Compacted Concrete has a small role in producing that unique Tennessee treasure known as Jack Daniel's Tennessee whiskey.

CIM UPDATE

by Dr. Heather J. Brown

GLOBAL MBA for the Concrete and Construction Industry

MTSU

Concrete Industry Management will offer a unique MBA degree for the concrete and construction industry after years of close collaboration between CIM and the industry. This degree is going through TBR approval which will solidify its place as a distance learning, executive style accredited MBA catered to this industry. Recruits from construction, concrete, architecture, civil engineering, city planning, business and other related fields are the target groups. This program will be an 18-month, 10-week semester format with four onsite meetings for classroom and professional activity. A candidate will have five years industry experience and hold at least entry level managerial or supervisory position in their respective organization. A cohort of 25 students will be recruited annually to begin in August of each year. Applications will be available beginning January 1 at www.globalmba-cim.com as well as further information about the degree requirements and planned curriculum. For more information please contact Ayaz Ahmed at ayaz.ahmed@mtsu.edu.

Continued from page 12— ***Four-Part Series***

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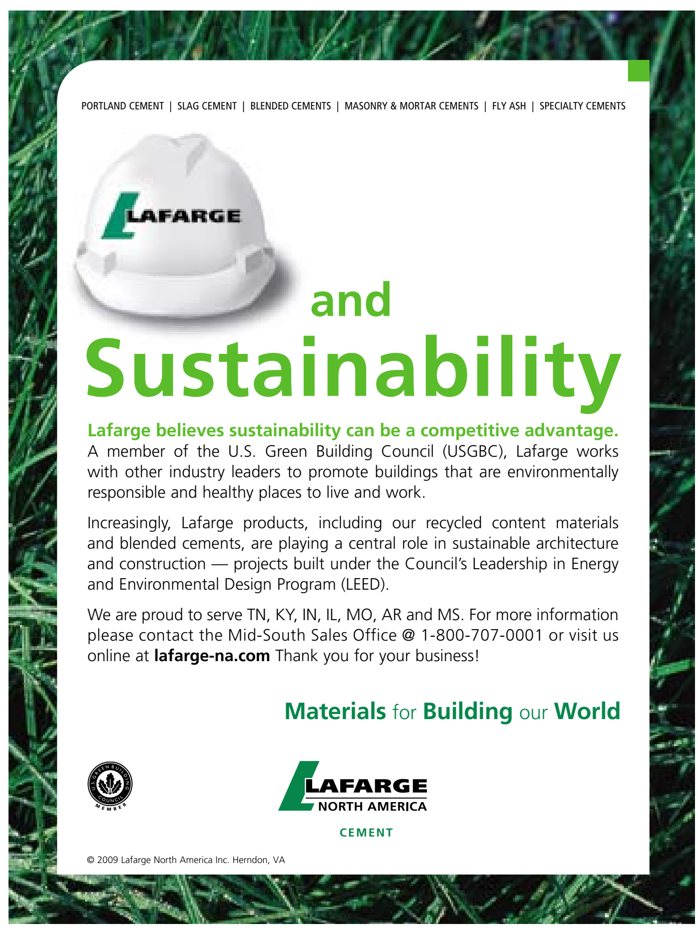

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