



Fall 2009

# CONCRETE impressions

## >>> MESSAGE FROM THE EXECUTIVE DIRECTOR

### Concrete Pavement Preservation the Answer for Our Transportation Industry

By now, most of you have heard that our lawmakers have decided to table the highway funding authorization effort for the next 18 months while they further "study the issue." This procrastination takes place at a critical time when most experts agree that that the United States should be spending nearly three times more on maintaining and improving its surface transportation systems than the \$80 billion a year now being spent. For those of us who have attended this dance before, it is no surprise that the transportation industry will be forced yet again to rely on continued pavement preservation and new technology to keep this great nation open for business while the powers that be come to agreement on the next highway authorization bill.

The IGGA has long offered a toolbox full of proven, long lasting and economical concrete pavement preservation techniques that create safe, smooth and quiet pavements, while being less expensive than asphalt repair alternatives. Additionally, the industry, in partnership with the South Carolina DOT, has developed a new, low-cost paving product that couples diamond grinding with Roller Compacted Concrete (RCC), which combines the low cost and durable characteristics of RCC with the safe, smooth and quiet ride of diamond ground concrete pavement. The industry is also currently involved in the field testing phase of its new, low noise PCC surface – the Next Generation Concrete Surface (NGCS) – in partnership with various transportation departments including Minnesota DOT, Illinois Tollway Authority, Wisconsin DOT, Oklahoma DOT and the Kansas DOT. We'll soon add Washington DOT and CALTRANS to the list. The road ahead may be a rough one but working together in partnership will most certainly help pave the way through these challenging times.

John H. Roberts  
Executive Director  
International Grooving  
& Grinding Association

## INSIDE:

- Project Spotlight: Pavement Restoration in Oklahoma City
- Sharing Best Practices



The blending of RCC and diamond grinding technologies provides agencies with new options

## First Competitively Bid Roller Compacted Concrete Diamond Ground Project A Success

**IGGA HAS ANNOUNCED** the completion of the first competitively bid roller compacted concrete (RCC) diamond grinding project on a U.S. route. The project, Richland Avenue/US-78 where it intersects with Highway 1 in Aiken, S.C., was completed by the South Carolina Department of Transportation (SCDOT). A 27,500-square-yard portion of this four-lane highway was identified for repair. Tests revealed that the road had an IRI of 200 to 300-inches per mile (a smooth road has an IRI of 85 inch/mile or less).

RCC is a durable paving material that carries heavy loads and is a stiff, zero-slump concrete mixture with the consistency of damp gravel. The mixture is placed and roller compacted with the same equipment used for asphalt pavement construction. The process requires no forms, finishing, surface texturing or joint sawing and sealing.

The project entailed the contractor milling out distressed and oxidized asphalt and placing back 10-inches of RCC in one pass. Diamond grinding was then used to improve smoothness, add longevity and provide surface texture. Full-depth asphalt overlay was considered but was not used because asphalt would require three lifts of paving and consume valuable time.

"RCC has a great deal of potential as an economical, rapid and durable paving material. However, it has not provided the ride

## TEAM MEMBERS

- South Carolina Department of Transportation (Owner)
- Penhall Company (Diamond grinding)
- Satterfield Construction (Prime contractor, asphalt contractor)
- Morgan Corporation (RCC subcontractor)

and surface texture the public expects for high volume, high speed traffic. By using grinding to achieve a smooth, quiet surface, we can use RCC in a much wider variety of situations without the added cost of a hot mix asphalt surface layer," said Andy Johnson, Head of Department of Materials, SCDOT. "We have used grinding on hundreds of miles of interstate concrete pavement to achieve a smooth, quiet ride. We are confident that grinding will provide us with the surface we want." SCDOT was very happy with the result and plans to use the method on future projects.

The project began July 16 and was completed on time and within budget by August 1, 2009. The result is a long-term fix that will last more than 20 years.

"The blending together of these technologies allows the agencies options they have never had before," said Matthew W. Ross, P.E., Penhall Company.

## >>> OWNER PERSPECTIVE

Shakir Shatnawi, Ph.D., P.E.

State Pavement Engineer  
Chief, Division of Pavement Management  
California Department of Transportation

### > What is the biggest challenge facing your organization?

The biggest challenge is keeping dedicated funding in this period of restricted funding. The Department of Transportation considers grinding a very important tool for rigid pavement preservation.



With many pavements in California built in the late 1950s and early 1960s, there is a huge need to rehabilitate and preserve our roadways. We are at a critical point in which we need to respond with the most efficient and cost effective strategies. We need to face our challenges such as urban congestion, traffic noise, pollution and the decrease in our natural resources.

### > What do you see as the biggest advantage of diamond grinding and grooving as well as PCC preservation and restoration markets?

The biggest advantage is for the public: Grinding provides a smooth, quiet, pleasant surface for them to drive over. Diamond grinding results in surface that looks like silk and feels like velvet. The public loves our ground concrete pavement! Grinding also extends the life of the pavement. The elimination of surface roughness and step-faulting reduces dynamic load impact on pavement structure.

### > Can you dispel any myths or misconceptions about diamond grinding and grooving as well as PCC preservation and restoration markets?

Perhaps the biggest myth is that grinding does not last very long. A recent Caltrans study showed that ground surfaces last about 17 years on the average. Thus, grinding exceeds the design life of most preservation strategies.

Another misperception is that grinding residue is a hazardous material. This is not true. The pH of the residue can be very high, but we have found that when the residue dries, the pH is not of concern.

### > Can you give us an example of an innovative solution you are exploring for Caltrans?

We are about to embark on deploying the Next Generation Concrete Surface (NGCS). This strategy fits under our efforts to reduce traffic noise through the Caltrans Quiet Pavement Program.



## >>> PROJECT SPOTLIGHT

The final stage of rehabilitation on I-44 between I-40 and I-35 in Oklahoma City is now complete. The final 22.4-lane mile section opened this summer. This is the culmination of five projects on the roadway since repairs began in 2004. The Oklahoma City section of the highway ranges from six to eight lanes and overlaps I-35 for a short time. Approximately 125,000 to 135,000 vehicles travel this roadway each day.

According to Tom Hubbard, P.E., Resident Engineer, Oklahoma Department of Transportation (ODOT), a survey revealed severe panel damage and faulted pavement. The transverse joint faulting was in the 1/4-inch to 3/8-inch range with isolated 1/2-inch to 5/8-inch faults and variable 1/4-inch to 3/4-inch faulting at the longitudinal joints. Due to the high level of traffic and poor road conditions, a fast-track yet long-term solution was needed. ODOT selected Concrete Pavement Restoration (CPR) because of previous success with this method.

In 2004, ODOT initiated repairs for all eastbound and westbound lanes, including auxiliary and ramp lanes on I-44. Dowel bar retrofit (DBR), diamond grinding, joint sealing, selective panel replacement and base repair were used on the project for all lanes in both directions. DBR restores load transfer across the pavement joints to prevent future roughness from occurring and then the entire surface is diamond ground, which produces an exceptionally smooth and quiet ride.

"In the past decade, many DBR and diamond grinding projects have been completed in the Oklahoma City metro area. In each case, user costs were minimized by performing the work during night-time hours. The cost effective nature and minimized user costs are key in the success of pavement restoration," said Hubbard.

"The original pavement, built in 1976, has served the public well and with the improvements made to the roadway, we may see another decade or two of service," said Brent Burwell, Executive Director of the Oklahoma/Arkansas Chapter, American Concrete Pavement Association.

The total cost of all five projects was \$11.3 million and the repair is expected to offer another 15 years of service life.

### TEAM MEMBERS

- Oklahoma Department of Transportation, District IV, Edmond Office (Owner)
- Penhall Company (Prime contractor, diamond grinding, dowel bar retrofit, joint resealing)
- Norton Pro Diamond Products (Blade supplier for diamond grinding)

## New Methods Presented for Measuring Road Roughness

Pavement smoothness has been a vital component of our industry since the beginning of transportation. The 1958-1960 American Association of State Highway and Transportation Officials (AASHTO) test noted that users judge a roadway primarily by its ride qualities, which has been the basis for pavement design for decades since.

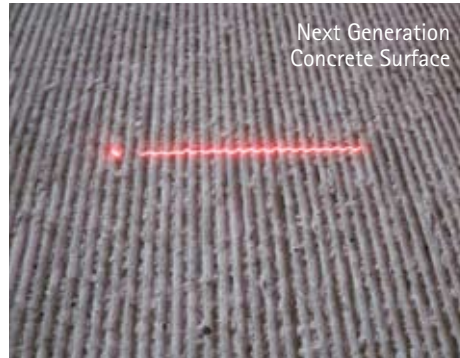
Recently, this topic has surfaced again with discussions at the AASHTO Subcommittee on Materials meeting in Anchorage, Alaska. Four new provisions related to measurement of surface characteristics were balloted and accepted by the committee, paving the way for a new generation on smoother, quieter and safer pavements for the future.

Recognizing that smooth roads have been shown to extend pavement life, reduce user cost and delays, improve gas mileage, as well as increase highway safety, the measurement of pavement smoothness is key. Although the introduction of profile measurement equipment using spot lasers significantly improved the ability to more accurately measure and evaluate smoothness, spot sensors often erroneously report excessively high readings -- most notably on longitudinally grooved/tined and diamond ground surface textures. Improved sensor technology will undoubtedly provide more accurate measurement of pavement smoothness, resulting in improved pavement management data collection and a more accurate distribution of smoothness incentive payouts.

Several manufacturers have developed a new generation of line lasers that operate at highway speeds. These new sensors cover a broader footprint of the pavement surface with a much higher resolution, providing a more accurate representation of what the tire senses when in contact with the pavement. In 2005, the line laser was introduced to improve profiler accuracy. The line laser uses a footprint size of 100-mm-by-1-mm to sense the texture height and to account for the surface features that do not contribute to roughness. In an American Concrete Pavement Association (ACPA) profiler evaluation that same year, the International Roughness Index (IRI) difference between four different profiler devices on a diamond ground pavement was as much as 18 inches per mile. The profilers utilizing the line laser will more accurately and repeatedly measure actual ride comfort (smoothness).

The first line laser sensors that became available operated at 1,000 Hz frequency and this limited the travel speed at which they could be successfully operated. However, two equipment suppliers recently introduced 3,000 Hz laser sensors that can be operated at highway speeds. The high speed operation now allows for the use of either a lightweight profiler or a high speed profiler. High speed profilers enable smoothness measurements to be obtained without traffic control at some locations.

With the ever increasing importance of pavement smoothness, it is vital that measurement devices provide precise data that allows agencies to make the best decisions possible. Additionally, with the increasing number of smoothness incentive based contracts used in the U.S., it is imperative that accurate data be used to ensure proper incentive payment based on the contractor's performance.



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### >>> SHARING BEST PRACTICES

The Virginia Department of Transportation now requires diamond grinding on precast pavement to match the existing pavement. Following is their specification:

"The precast panels shall be tied into the existing pavement. The top surface of the precast pavement shall be no more than 1/4 inch above or below the surface of the existing pavement. Diamond grinding shall be used to bring the top surface of the existing pavement and precast pavement into tolerance if necessary. A single pass of diamond grinding has been specified on the plans for the entire length of the precast concrete slab placement area as well as an additional 50-feet on either end. All grinding required to achieve a smooth transition between the precast concrete slab and the existing pavement and to meet the requirements of the special provision for rideability shall be included in the price bid for diamond grinding. A maximum of one pass of diamond grinding will be paid."

The IGGA has long promoted the use of precast repair panels where time and traffic constraints make precast the preferred repair option. Combining this innovative repair technology with the long recognized benefits of diamond grinding is a natural progression in this environment where safe, smooth and quiet pavement surfaces are a must. Additionally, diamond grinding will minimize the dynamic loading of the newly placed panel providing increased durability and ride comfort over time. To learn more about precast pavement and diamond grinding, visit [www.igga.net](http://www.igga.net).

### ASSOCIATION NEWS

The IGGA would like to welcome the newest additions to the concrete industry's promotion team: **Frank Russenberger** – Promotional Director of the Oklahoma / Arkansas Chapter ACPA, **Richard Barezinsky** – Director of Engineering of the Missouri / Kansas Chapter ACPA and **Jerry Reece** – Executive Director of the North Carolina Concrete Pavement Association. We wish them the best of luck in their new roles and look forward to working with them all in the future.

IGGA would also like to announce that **Gary Aamold** has joined the team to help with promotion and technical efforts. Before retiring at the end

of last year, Gary was a Vice President with the Highway Services Division of the Penhall Company. An Honorary Lifetime Member of the IGGA, Gary took an active leadership role in advancement and promotion of concrete pavements throughout his career.

"Gary has a great deal of experience and so much to offer the industry in terms of knowledge and expertise," said John Roberts, IGGA Executive Director, "it simply made sense to ask him to help with some of our key initiatives. Such initiatives include specification development, educational material development, surface characteristic research and most recently, our grinding slurry research initiative."