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## Perpetual Asphalt Pavements on the Rise in Iowa

There is a famous parable that says, "Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime." This same sentiment can be applied to building streets and roads across the United States. Due to a lack of infrastructure funding, and ever increasing traffic loadings, roads across America have been built to fail. Long construction delays, poorly constructed



I-80 east of Newton: 52 year-old Perpetual Pavement

subgrades, thin pavement structures, and a lack of maintenance have left America's citizens doubtful of government and industry being able to resolve the traffic gridlock and constant need for more money. The solutions to this morass has been well known for nearly two decades. The solution is for Congress to properly fund the Highway Fund and then build Perpetual Asphalt Pavements.

### Defining Perpetual Pavements

The definition of the Perpetual Pavement is "an asphalt pavement that is designed and built to last longer than 50 years without requiring structural rehabilitation or reconstruction," and "needing only periodic surface renewal in response to distresses confined to the top of the pavement."<sup>1</sup>

To achieve this indefinite life-span, the Perpetual Pavement is designed thick enough to withstand the vertical shear forces of the highest anticipated loading without over-designing the pavement thickness. A study by Huber, et al. (2009) found that the 1993 AASHTO Pavement design guide typically over designed pavements in Indiana by 1.5 to 4.5 inches, which amounts to approximately 600 to 1800 tons of additional unnecessary material per lane mile.<sup>2</sup> The design of the Perpetual Pavement uses the Mechanistic Empirical Design Method (MEPDG) to build an asphalt

pavement structurally strong enough to withstand bottom-up cracking and a durable surface layer to withstand vehicle rutting. While the pavement is designed to handle the structural loading for over fifty years of life, the surfaces of the pavement will need to be periodically resurfaced within 20 years to improve friction, reduce noise, and mitigate surface cracking (Newcomb, et al., 2001).<sup>3</sup>

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## Tales from the Road



### Don't Call it a Comeback

My son Henry decided he wanted to play Little League this summer. Actually, I decided it would be good if he tried baseball this summer, and he agreed. He was drafted onto the 9-year-old Athletics by what turned out to be three amazing coaches. The spring started strong with great practices that built team camaraderie. As the season got under way, there were opportunities to try all positions, including an inning of pitching (2 earned runs and 3 strikeouts), Henry got his first hit, and then disaster – a broken wrist at his friend's roller skating birthday party. Henry was crushed. The doctor gave him a brace cast and told him no physical activity for the next 30 days – no bike riding, no trampoline jumping, and no baseball. We had some serious discussions within the family on what to do with baseball season, there were only five weeks left. The coaches and the team were the deciding factor. The positive environment created by the coaches, and the love of his teammates, made Henry want to stay involved. He attended the next month of games as the batboy, cheering section and scorekeeper. At home, we watched the Chicago Cubs and learned some of the nuances of the game. The A's continued to win and the month of inactivity passed by. After the follow-up x-ray showed the fracture was healed, Henry rejoined the line-up for

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## Upcoming Events

*(Click event for more information)*

### Highway 100 Perpetual Pavement Open House

**Date:** September 13, 2016

**Location:** LL Pelling Asphalt Plant on Edgewood Rd SW

[Click here to register](#)

### SAC Field Trip 2016

**Date:** September 27-28, 2016

**Location:** Southeast Iowa Overnight stop at Catfish Bend Spa – Burlington, IA

[Click here to register](#)

### APAI 61st Annual Convention

**Date:** November 30 - December 1, 2016

**Location:** West Des Moines Marriott

### County Engineers Conference

**Date:** December 6-8, 2016

**Location:** Scheman Bldg., ISU, Ames

### APAI 2016 Holiday Open House

**Date:** December 15, 2016

**Location:** APAI Offices (116 Clark Ave., Ste C; Ames)

### 2017 Greater Iowa Asphalt Conference & Equipment Expo

**Date:** March 1-3, 2017

**Location:** Des Moines Airport Holiday Inn Conference Center



*(Tales from the Road – Cont. from Pg. 1)*

the final game of the season. His teammates and player parents cheered for him when he came up to bat like he was the star of the team. There were no heroics – he walked once, struck out, and made a nice play in the field. His coaches celebrated his return and his teammates shouted encouragement throughout the game. I was proud of Henry's tenacity throughout his injury period, and I'm very proud of his willingness to keep working at getting better even when it would have been easier to quit.

I believe Henry's broken wrist is an excellent microcosm of what Iowa's asphalt industry has been through for the past eight years. In 2008, the price of asphalt cement nearly doubled in under a year, the economy took a sharp downturn, and the Iowa DOT started reducing the amount of tons being let each year due to decreased buying power and major reconstruction projects in Sioux City and Council Bluffs. As Dickens wrote, "These are the times that try men's souls..." But Iowa's asphalt contractors didn't quit. Quite the contrary, Iowa's contractors got better: Quality improved; innovations in production, sustainability and rehabilitation were abundant, and the importance of the

team, Team Asphalt, became imperative. Team Asphalt includes Iowa's asphalt contractors, the APAI, Iowa and Iowa State



University, our fans at the Iowa DOT, and Iowa's county, city, and consulting engineers. These eight years have made Iowa's asphalt industry the envy of the national asphalt paving industry. The strong relationship with our partners in the Iowa DOT, increased market share in the County and City

markets, proven improved performance in the innovative rehabilitation methods introduced in the last decade, and a new gas tax increase have left Iowa's asphalt industry not only healed up, but stronger than before the "Great Recession."

Faith in the team, a mutual belief in our partners, and a willingness to work harder to get better has left Iowa's asphalt industry much like Henry's wrist, stronger, faster and more resilient than before!

Smoother is Better.

Bill Rosener

SMOOTH ROADS ARE SAFER ROADS

# DRIVABILITY MATTERS

"It doesn't matter if you're driving in a race, or taking your daughter to school; smoother roads are safer for you and your family. That's why almost all NASCAR tracks are asphalt, and why I prefer it, no matter my speed."

-Brian Scott  
Richard Petty Motorsports #44 | Father

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The Asphalt Pavement Alliance is a partnership of the Asphalt Institute, National Asphalt Pavement Association and the State Asphalt Pavement Associations.

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It's just one of the ways asphalt delivers drivability.

- SMOOTHNESS
- NOISE
- SAFETY
- SUSTAINABILITY
- CONSTRUCTION

## Palo Alto County Hosts Flexible Interlayer Open House

On June 13, 2016, Palo Alto County, in conjunction with Heartland Asphalt, hosted an Open House featuring a 1" flexible interlayer over existing PCC followed by 3" Hot Mix Asphalt (HMA). With rain hovering both to the North and South of the project, the Open House was successfully held and attended by County, City, Contractor and Supplier representatives.

After HMA patching of this 4-mile stretch of County Route B-14, two miles of the 4 miles were then widened from



20' to 22.5'. According to George Jessen, President of Heartland Asphalt, the

flexible interlayer was a 3/8" mix with 63% 3/8" chips and 37% washed sand. The Asphaltic Cement (AC) was a 64-34E (extra polymers) at between 7.9-8.2%. Voids had been averaging about 1% which met specification. According to Jessen, the



only problem with the job was a little less production due to pumping 8% AC into the mix. He said that this was pretty much as expected.

County Engineer Walter Davis-Oeth was impressed so far with the project and noted that it "looked good, rode good and laid well with no problems." He said, "That you could definitely notice the low voids and high asphalt content but was pleasantly surprised on how tough of a mix it was and how well it held up to traffic." He did say that the real proof will be "what will it look like in three years or so as far as for reflective cracking". This project will now be completed by adding 3" HMA, 1/2" mix, 58-28 AC with between 15-18% RAP.

Palo Alto is the third county in western Iowa, joining O'Brien County and Mills County, utilizing this process. The early success of these projects has led to heightened interest in this innovative rehabilitation process.

A special thanks to George Jessen, his staff and Walter Davis-Oeth for hosting this Open House.



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**61<sup>ST</sup> APAI  
ANNUAL CONVENTION**

**NOVEMBER 30 –  
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WEST DES MOINES, IOWA

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## Iowa County Hosts Asphalt Interlayer Open House



**T**hirty-two engineers and highway professionals gathered on August 10 to view the installation of a flexible asphalt interlay on Iowa County Route V38 from I-80 interchange 205 north to Victor. The existing 6" PCC pavement was not only very rough but was requiring annual patching that had become a financial burden to the county. Portions of the road also needed to be widened.

County Engineer Nick Amelon chose asphalt as the rehabilitation tool because of its speed of construction. "I simply could not close the road for the lengthy time required of other rehabilitation products". He chose the asphalt interlayer because of its ability to retard reflective cracks with less grade raise. He added "The finished roadway should be very smooth".

The original plan called for full depth asphalt patching followed by a 1" asphalt interlayer, 2 1/2" intermediate course and a

1 1/2" surface course. The route passed under the Interstate and that area called for a 2 1/2" milling of the concrete followed by the 1" interlayer and a 1 1/2" surface course in order to maintain a minimum clearance between the finished pavement and overhead structure.

As construction began it was determined that the existing roadway was so rough that it would not be cost effective to use the asphalt interlayer as both a crack retarder and leveling course. It was decided to change the design to a 1" leveling course, then the 1" asphalt interlayer followed by a 2" intermediate and 1 1/2" surface courses.

The changes enhanced the Open House Demonstration as we were now able to show not only the use of the interlayer as a reflective crack retarder when placed directly over a PC pavement but also when used between asphalt layers along with over

longitudinal widening joints.

Those in attendance asked many questions and it was evident of the great interest in and future plans for the use of the interlayer.

Iowa county staff praised the work of the L.L. Pelling Company and how easy they were to work with as the project scope changed.

Brett Finnegan, Vice President of the L.L. Pelling Company stated, "The asphalt interlayer is an exciting new tool in the PCC rehabilitation tool box. This product provides longer performance for the HMA overlay through retarding the reflective cracking while also adding strength and smoothness to the roadway. This is a win-win for local agencies."

A special thanks to Brett Finnegan, Nick Amelon and their staffs for hosting this Open House.

*(Perpetual Asphalt Pavements on the Rise in Iowa – Cont. from Pg. 1)*

## Building a Perpetual Pavement

The design and construction of a Perpetual Pavement is exactly the same as a thick full-depth hot-mix (HMA) asphalt pavement with two notable exceptions: first, the design is calculated to withstand the shear vertical strain of the traffic loadings, and second, the asphalt base course is designed with low voids and higher asphalt cement content to provide a flexible, asphalt-rich base. To aid in the design thickness of a Perpetual Pavement, Dr. David Timm of Auburn University developed PerRoad, a high-volume Perpetual Pavement Design Guide and PerRoadXpress, for low-volume roadways. These programs are available free of charge and have been used to successfully design hundreds of projects over the past decade.

## Subgrade Preparation

The key to any successful pavement is a strong subgrade. Due to the expansive clays found throughout Iowa, the use of a stabilization agent may be necessary to provide a strong platform for the road construction. The use of subdrains is encouraged to keep the moisture away from the roadway base. The use of a modified subbase stone will insure a stable and drainable aggregate base for the asphalt construction. The preparation of the subgrade is crucial to the success of the pavement above - oftentimes poor subgrade is overlooked and unaddressed in the desire to get the asphalt paving underway. Although, the short-term performances of the pavement may be unaffected, the long-term performance of the pavement will suffer.



Dallas Co. Perpetual Pavement P53 Built in 2014

## Asphalt Base Layer

The construction equipment and compactive effort of the Perpetual Pavement is the same as traditional HMA construction. The bottom 3-4 inches of the pavement thickness needs to be designed with a dense, asphalt-rich base course with a target of 0%-3% voids, to help guard against fatigue cracking and infiltration of ground water from below.

## Asphalt Intermediate Layer

The intermediate course is designed to be strong and durable. This lift should feature high stone-on-stone content with a durable PG grade of asphalt cement to provide strength and low-temperature crack resistance.

## Asphalt Surface Layer

The surface course of the Perpetual Pavement is designed to be the renewable rut-resistant wearing course. The top 3-4 inches of the Perpetual Pavement should be a high-friction, durable surface course utilizing a polymerized asphalt cement (if necessary) to withstand any shoving or rutting at high temperature and high-traffic volumes.

## Benefits of a Sustainable Pavement

The benefits of Perpetual Pavements being sustainable, renewable, and economical are undeniable. Recycled asphalt pavement (RAP) is created when milling off the top 3-4" of the Perpetual Pavement's surface. This RAP is then recycled back into the new surface course of the pavement at a rate of 20-25%. The value to the contracting agency is the future value of the recycled asphalt, as well as, the reduction of the use of local aggregate and asphalt cement resources. It is truly a win-win for the agency. Regarding the value of a perpetual pavement when doing a life cycle cost analysis, a wise local contractor recently asked the question, "How can you do a life cycle cost analysis on a perpetual pavement, if it has no end of life?"

Perpetual Pavements have been proven to have the following benefits:

- They provide a more efficient design, eliminating costly overly-conservative pavement sections.
- They eliminate reconstruction costs by not exceeding a pavement's structural capacity.
- They lower rehabilitation-induced user delay costs.
- They reduce use of non-renewable resources like aggregates and asphalt cement.
- They diminish energy costs while the pavement is in service.
- They reduce the life-cycle costs of the pavement network.<sup>4</sup>

## Perpetual Pavements on the Rise in Iowa

Although the construction method has changed over the last twenty years, the history of Iowa's Perpetual Pavements is strong. There are three sections of Interstate 80 constructed in Jasper, Johnson, and Cedar Counties between 1962-64 that are still in use over fifty years later. These sections were not designed with the asphalt-rich base course, but they were designed with a structural thickness to withstand the bottom-up fatigue cracking that destroys pavements prematurely. These three sections of I-80 are the only remaining sections of the original interstate construction, and they are not in the Iowa DOT long-range plans to rehabilitate. The remaining sections of I-80 that were constructed in PCC, have all been removed and reconstructed.

## Iowa DOT

In 2015, the Iowa DOT let its second Perpetual Pavement design in its history with the 4.5 mile section of Highway 100

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*(Perpetual Asphalt Pavements on the Rise in Iowa – Cont. from Pg. 5)*

being built west from Edgewood Road in Cedar Rapids, IA. The project is a 12.5" asphalt four-lane highway design being built with a Perpetual Pavement design. The construction of the project is currently underway with nearly two miles of the asphalt-rich base course already in place. "The Highway 100 project will be a testament to the long-life asphalt pavements that can be built in Iowa," said Dr. Scott Schram, IDOT Pavement Management Engineer. The project has attracted the attention of several other IDOT/FHWA initiatives including the use of the Infrared (IR) bar, the use of e-ticketing and the Everyday Counts FHWA Intelligent Compaction initiative.

## Dallas County, Iowa

Dallas County, a traditionally strong PCC County, has shifted to constructing Perpetual Asphalt Pavement sections for its last two reconstruction projects. In 2014, Dallas Co. began the reconstruction of a seven mile stretch of P48 and F59 between Dexter and Redfield, Iowa. The project included the removal and crushing of six inches of existing PCC, regrading of the subgrade and placement of an eight inch Perpetual Asphalt Pavement. "The costs for the concrete and asphalt options were about the same," said Bryan DeJong, Dallas Co. Asst. to the Engineer, "but the longevity of the Perpetual Pavement convinced Dallas Co. to choose asphalt for the job." "A total replacement of the road is not an easy process," DeJong said. "In the future, we look forward to doing a mill and replace with a much



City of Des Moines E. Court Ave Full-depth Asphalt Project

more limited scope of project, along with less cost and interruption for the traveling public."<sup>5</sup> The project's success led to the latest Perpetual Pavement project beginning in early 2016, the six-mile stretch of F31 into Minburn, IA. "This project was different in that it was 4" and 5" PCC overlay constructed in 1981, over thin asphalt sections placed in 1960 and 1969. We were able to pull the failing PCC overlay off the asphalt and haul it away to be crushed. We installed subdrains to remove moisture and used full-depth reclamation (FDR) along with fly-ash to incorporate the remaining asphalt into the subgrade. This will give us a very strong base to build our Perpetual Pavement section upon," said Andy Case, Dallas County Asst. Engineer. "I am a young engineer, I want to build this road so that no major reconstruction or replacement is needed in my lifetime."

## Des Moines Perpetual Streets

The municipal full-depth asphalt market has been growing exponentially over the past several years. **The growing need for sustainable, renewable streets has led many municipalities to reexamine the age-old philosophy that new construction needs to be PCC.** The City of Des Moines has focused its reconstruction dollars on hot-mix asphalt (HMA) in 2016. "The City of Des Moines has had a history of successfully designing and constructing full depth asphalt pavements," said Dave Kemp, City of Des Moines Chief Design Engineer. "E. Court Avenue is a heavy truck route that required a durable, long lasting pavement, which needed to be constructed relatively quickly to reduce the closure time."

The reconstruction of E. Court Avenue from Johnson Court (E. 15th Street) to Redhead Road by Grimes Asphalt is a good example of how fast an HMA reconstruction can be accomplished. Once the grade has been prepared, and the PCC curb and gutter has been placed, the HMA base course can be laid and residents can readily access their homes. This allows the contractor to backfill the curbs from the base course prior to placing the intermediate and surface courses. These pavements are generally not officially Perpetual Pavements, but are designed thick enough to act as such. If desired, local agencies can use PerRoadXpress to determine the design depth for local roads, and by specifying the low-void base course it is easy to build a Perpetual Street. **The true advantage of a full-depth or Perpetual asphalt street lies in the rehabilitation phase of the pavement life.** According to the Iowa DOT pavement performance curves, the first rehabilitation for a full-depth asphalt road occurs at year 26, PCC's first rehabilitation is at year 29.<sup>6</sup> When rehabilitating a PCC pavement, you are facing costly full-depth PCC patching, with an asphalt overlay to restore the ride. The full-depth asphalt street will need a simple 3" mill and fill that can be done while the street's residents are at work, or while they sleep.

## Perpetual Pavements are the Best Value

The construction of Perpetual Pavements in Iowa continues to rise with strong growth at the State and County levels. The use of full-depth deep strength pavements by Municipalities continues to rise as public works directors and city administrators conclude that fully reconstructing a roadway every 40-50 years is not viable economically for a city's infrastructure plan. The notion that new construction needs to be PCC, "because it lasts longer", is no longer true. Full-depth, Perpetual Asphalt streets and roadways are faster to construct, easier to maintain, and are smoother, quieter and last longer than PCC roadways. Challenge the status quo in your city or county. Asphalt is the sustainable choice for Iowa's infrastructure.

<sup>1</sup> Asphalt Paving Alliance, 2002

<sup>2</sup> Huber, Gerald, David Andrewski and Victor Gallivan. 2009. Design and Construction of Highways for Very Heavy Trucks. Proceedings. Intl. Conf. of Perpetual Pavements. Ohio University. Columbus. CD-ROM.

<sup>3</sup> Newcomb, D.E., M. Buncher, and I.J. Huddleston. 2000. Concepts of Perpetual Pavements. Transportation Research Circular No. 503. Perpetual Bituminous Pavements. Transportation Research Board. Washington, DC. pp. 4-11.

<sup>4</sup> Timm, D.H. and D.E. Newcomb. 2006. Perpetual Pavement Design for Flexible Pavements in the U.S. Intl. Jn. of Pavement Engineering, Vol. 7 No. 2. Taylor and Francis Ltd. New York. pp. 111-119.

<sup>5</sup> Midwest Contractor, Henningsen Construction and Dallas County Partner for Repaving Project, Nov. 2015

<sup>6</sup> "DTIMS Iowa DOT Final Report, Deighton Associates, 2012"

## Dallas County Open House Showcases Perpetual Asphalt Pavement

On August 25, the APAI, in conjunction with Dallas County Engineering and Manatts, Inc., conducted an open house on the Co. Road F31 project, east of Minburn, IA. The four mile project was an interesting case study of multiple construction operations combined to create a successful project. The project started with the removal of a five inch PCC whitetopping that included hauling the PCC off-site to be crushed for shoulder material. The remaining asphalt below the whitetopping was reclaimed into the existing aggregate base to a depth of 12 inches with 18% fly-ash added to stabilize the base. The prepared subgrade was then



trimmed with a 12 foot milling machine to achieve desired slope and grade. The Open House highlighted the strength of the full-depth reclamation (FDR) process in creating a stable and homogenous platform to pave upon. The project was



designed as a seven inch Perpetual Asphalt Pavement that was to be paved without a longitudinal cold joint. To achieve the Perpetual Pavement designation, Manatts, Inc. designed and placed the three inch base course with target voids at 0%-3% and paved the material full-width at 27 feet. The intermediate and surface courses will also be paved full-width to create a seamless flexible pavement that will require periodic surface renewal with a simple mill and fill, but should never need to be fully reconstructed. Thank you to Al Miller, Andy Case and Bryan DeJong of Dallas County Engineering and the management and crews of Manatts, Inc. for the excellent example of building long-lasting quality pavements from the base to the surface.



## APAI Welcomes New Members

APAI continues to add new members. At their last Board Meeting, the Board of Directors elected one Associate Member to the Association. Thank you to those who have helped recruit this new member.



Located in St. Louis, MO and in Bullard, TX, Missouri Petroleum Products Co. produces products designed to extend the life of highways, arterial roads and residential streets with a minimum amount of downtime. Maintenance treatments produced include: Chip Seal, Micro-Surfacing, Slurry Seal, Underseal, and Paving Fabrics which will help protect the investment in the infrastructure.

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They manufacture cutback asphalt and supply high-performance cold-patch, calcium chloride, crack sealers and geotextiles at their Woodson Road Facility in St. Louis. A wide variety of emulsions and driveway sealers are manufactured at their Bi-State Emulsions facility also in St. Louis.

Missouri Petroleum Products and its subsidiary, Bi-State Emulsions are part of Lionmark Construction Companies, a St. Louis-based company with over 80 years of experience in road construction and materials production.

Please welcome this new member and show your support for them, by contacting them and utilizing their services. To find contact information for this member, go to <http://www.apai.net/associate-members.aspx>.

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### AFFILIATE MEMBERS

Scott County Engineering