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High Performance Thin Overlays (HPTO): Preserving Iowa’s Infrastructure Investment

The use of an innovative pavement preservation treatment has entered the Iowa market. The High Performance Thin Overlay (HPTO), a highly-polymerized thin asphalt treatment less than two inches thick, has an Iowa DOT developmental specification (DS-15025). After a successful trial project on IA 93 in 2013, its application has expanded to the interstate. On I-35 in Warren County, Iowa DOT Pavement Management Engineer Dr. Scott Schram believes this treatment “is an ideal solution to extending life while restoring smoothness. We anticipate that the use of the HPTO gives us an opportunity to extend the life of our pavements another 5-10 years.”



to be Friction Type 4 for non-interstates and Friction Type 2 for interstate work. The use of RAP was not allowed. For construction, HPTO requires the use of a “trackless tack”, a temperature of 60° F and rising, and a Class II compaction with a steel drum roller.

The High Performance Thin Overlay is a pavement preservation tool. The HPTO should be considered when evaluating other pavement preservation options such as microsurfacing, cape seals, and chip seals. Nationally the term “Thinlay™” has been coined to describe these

thin overlay treatments. Jim Huddleston, P.E., retired Director of Asphalt Pavement Association of Oregon, describes this product, “Thinlays are designed with finer grading and use binders that result in a flexible, waterproof, skid-resistant preservation treatment that seals and protects the existing pavement while also improving smoothness and adding some structure... Thinlays can be expected to last two to three times longer than

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Tales from the Road



BREAKOUT SEASON

This was a big year for my eight year old son, Henry, and the 3rd-4th grade flag football team coached by yours truly. The “Cowboys” won the league championship last week over our league rivals the “Bills” and young Henry came into his own as a football player. This was his breakout season.

Henry has been playing organized football since he was five and always has been an “ok” player, but he struggled catching the ball or running to daylight and the competition kept getting better. Every week on our way to the game we would discuss what his goals were for that game and he would set the bar pretty high. “Four tackles, an interception, and two touchdowns,” he might say. “Those are high goals, Henry,” I would say. “You want to temper those down a bit?” “No,” he would say, “I can do it.” And then in week 3 he did it. It was an amazing game for him – he ran for a touchdown, threw for two more and made tackles all over the field. I was proud of him and proud for him. He had achieved his goal – and he never looked back. He helped our team get to the finals and win by effort, determination, and being a good teammate.

I believe the APAI has had a

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## Upcoming Events

(Click event for more information)

### APAI 60th Anniversary Annual Convention

**Date:** December 2-3, 2015  
**Location:** West Des Moines Marriott  
Click here to register.

### 2015 County Engineers' Conference

**Date:** December 8-10, 2015  
**Location:** Scheman Building, ISU

### APAI Holiday Open House

**Date:** December 17, 2015 (Thursday)  
**Location:** APAI Offices  
116 Clark Avenue, Suite C  
Ames  
**Time:** 3:00 p.m. to 8:00 p.m.

### NAPA Annual Convention

**Date:** February 7-10, 2016  
**Location:** La Quinta Resort & Club  
La Quinta, CA  
Click here for more information.

### 2016 Greater Iowa Asphalt Conference

**Date:** March 2-4, 2015  
**Location:** Holiday Inn Convention  
Center / Airport  
Des Moines, IA 50312

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

breakout season this year. We have been working very hard for the past seven years to achieve our goals and this year we saw many of them come to fruition. **The gas tax passed.** This was a goal of all the industries along with a myriad of our partners, including the IDOT for the past 15-20 years! **APAI hired Darwin Larson.** Darwin joins the APAI as our Municipal Field Engineer. Darwin was Chief Design Engineer for the City of Des Moines for twenty-plus years and gives the APAI a presence and an expertise in the municipal market. **I-Save Life Cycle Cost Analysis (LCCA) Program is Accepted.** The I-Save LCCA program developed by Drs. Buss and Williams has been successfully used to submit alternate bids for a federally-funded county road project. The I-Save program was reviewed by the FHWA and is available for all local agencies to use on alternate bids. **Perpetual Pavement for Dallas County.** Dallas County had traditionally been a PCC county, but the engineering staff

believed that the use of a full-depth asphalt section, with a perpetual pavement design, was the right choice for their reconstruction of County Road P-48. They were right. This project is a microcosm of the asphalt revolution that is moving through Iowa.



City and county engineers are no longer bound to the old school asphalt is for rehab and PCC is for new. Asphalt is faster to pave, cheaper to construct and easier to maintain and rehabilitate.

**60th Anniversary Celebration.** The APAI turned 60 in 2015 and our events over the past year have been amazing successes. The Greater Iowa Asphalt conference added an equipment expo and about 100 new attendees, the Road Rehab Clinics were sell-outs in six cities across the state. The APAI has a new awards program and website, and the 60th Annual APAI Convention looks to be our biggest and best ever!

2015 has been our breakout year. It takes a team effort to accomplish these goals. The APAI staff of Larry Mattusch, Royce Fichtner, Darwin Larson and Minnie Coree work very hard; our partners at the Iowa DOT, Iowa State University, and the University of Iowa provide expertise, innovation, and determination; the local agencies and their engineers that we serve provide us with opportunities; and, the contractors of the APAI provide us the quality workmanship that is the driving force of all that we are able to accomplish.

I'm proud of Henry and his team. I am proud of the APAI and our team. It has been a breakthrough year for Iowa's asphalt industry. And we aren't ever going to look back.

Smoother is Better.

Bill Rosener

## Come and Join Us at the APAI Holiday Open House

**Hosted by:** Asphalt Paving Association of Iowa (APAI)  
515-233-0015

**Where?** APAI Offices  
116 Clark Avenue  
Ames, IA 50010

**When?** Thursday, December 17, 2015 at 3:00 p.m. – 8:00 p.m.

Save the  
Date!

## Thin Asphalt Overlays – A Recipe for Successful Production and Placement

By David Newcomb, P.E.

Thin asphalt overlays are popular approaches to pavement preservation primarily because of their ability to: 1) provide improved ride quality, 2) reduce pavement distresses, 3) maintain surface geometrics, 4) reduce noise levels, 5) reduce life cycle costs, and 6) provide long-lasting service. As with any preservation technique, thin overlays should be placed before the pavement deterioration has reached a critical stage where more extensive rehabilitation is required. Thin overlays can be expected to provide 10 years or more performance on asphalt surfaces and six to 10 years on concrete or composite surfaces. This article discusses the mix production and paving of thin asphalt overlays.

According to the National Cooperative Highway Research Program Synthesis (NCHRP) 464, most highway agencies consider thin overlays to be less than 2 inches thick with 37% of agencies using a thickness of less than 1 inch as their criterion. Mixes designed for use in thin overlays are essentially standard asphalt mixtures that have a small NMA stone. In that sense, they are not much different from what a plant produces on a daily basis. However, there are some peculiarities of production, placement, and testing that require special attention due to the behavior of small NMA mixtures and thin-lift construction.

### Production

Small NMA asphalt mixtures have a relatively minor amount, if any, coarse aggregate content. Thus, aggregates are taken out of one or two stockpiles for the most part. Usually, if multiple stockpiles are involved, it has to do with blending natural and manufactured sand. It is important that stockpiling be done correctly in order to maintain

the proper gradation. For instance, stockpile segregation from using a stacking conveyor can create gradation variability during production. Excessive gradation variability will create a corresponding volumetric variability leading to portions of the mix that may rut and others that may ravel.

It must also be recognized that fine aggregate usually contains much more moisture than coarse aggregate, and good stockpiling practices should be used to control moisture. These include: 1) paving underneath the stockpile, 2) sloping the pad away from the plant to drain water, 3) building the stockpile from the wet side and taking from the dry side for truck built piles, and 4)

operations because less fuel will be required to heat the aggregate and this will help increase production. It should be remembered that there is about a 10 percent savings in fuel with every one percent decrease in moisture content. This is an instance where warm mix technology might be used to decrease plant temperatures while maintaining quality.

If RAP is to be added to the mixture, then it should be processed for size and consistency. Crushing and screening of the RAP should ensure that the maximum RAP size does not exceed the NMA of the mixture. The asphalt content of the RAP and the gradation of the RAP should be measured



FATIGUE CRACKING



SLIPPAGE CRACKING



DEBONDING

*Possible Thin Overlay Failures which Result from Lack-of-Bond*

covering the stockpile if necessary to protect it from precipitation.

The plant is generally run slower for small NMA mixtures than those having larger stone. The reasons for this are: 1) coating the fine aggregate which has a greater surface area requiring more asphalt, 2) generally higher moisture content in fine aggregate requiring a longer drying time, and 3) a thicker aggregate veil in the drying or production drum. Removing moisture in the stockpile will benefit plant

and checked to make sure they are consistent. The lower the variability of the RAP material is for these measures, the greater the quantity of RAP that can be used in the mixture.

Warm mix asphalt technologies may be especially advantageous in the production and construction of thin-lift asphalt mixtures. These technologies make asphalt mixtures more workable and compactable at lower temperatures than traditional hot mix asphalt. Warm

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## APAI 60th Annual Convention Program at a Glance

Wednesday, December 2, 2015

ASSOCIATION DAY / Members Only

- 8:00 a.m. - 4:00 p.m. Registration
- 8:00 a.m. Final 2015 Board Meeting
- 10:00 a.m. **COMMITTEE MEETINGS**
- 12:00 Noon Associate Members Meeting  
Address by Doug Clement,  
Chairman Associate Committee
- 12:00 Noon Buffet Lunch
- (12:30 p.m.) **60th Anniversary**  
**Address by:**  
Terry Rich,  
Iowa Lottery Commission



- 1:30 p.m. - 4:00 p.m. **ANNUAL BUSINESS MEETING**  
Presentations by:
- Dr. Chris Williams, ISU
  - Dr. David Lee, U of Iowa
  - Incoming President – Steve Leonard
  - New Member Introductions
- 4:00 p.m. - 4:30 p.m. 1st 2016 Board of Directors' Meeting
- 7:00 p.m. - 11:00 p.m. **ASPHALT VEGAS**
- 11:00 p.m. - 1:00 a.m. Karaoke

Thursday, December 3, 2015

GENERAL DAY / Non-Members Welcome

**Registration Open: 7:00 a.m. - 4:00 p.m.**

- 8:00 a.m. Introduction by APAI EVP Bill Rosener  
Color Guard / National Anthem

**INVITED SPEAKERS:**

- 8:15 a.m. Paul Trombino III, Director, Iowa DOT  
**"Iowa DOT Perspective 2016"**
- 8:45 a.m. Scott Schram, Pavement Management Engineer,  
Roger Boulet, Iowa DOT Dist. 6 Materials Engineer  
**"SimSpec / Iowa DOT Update"**
- 9:15 a.m. Randy West, Director, NCAT  
**Iowa –NCAT Connection**
- 9:40 a.m. Mike Acott, Director & Kevin Kelly, Incoming  
Chairman, NAPA  
**"NAPA Update"**
- 10:00 a.m. BREAK

- 10:30 a.m. Dick Butkus, Former Chicago Bear  
**"Tales of a Football Great & Q/A"**
- 11:15 a.m. Break for photos & Autographs
- 11:30 a.m. Depart for: [12 Noon – 2 p.m.]  
Ladies Luncheon



- Noon **ANNUAL AWARDS LUNCHEON**  
Special Guest Speaker: Gov. Terry Branstad
- Presentation of the Quality in Paving,  
Smoothness, and QMA Paving Awards.  
Hall of Fame Roll Call  
2015 Iowa Hot Mix Hall of Fame
- 2:00 p.m. - 4:00 p.m. **Five Things You Need to Know  
in the Next Five Years**  
Dr. Jeramy Ashlock, Assistant Professor, ISU  
**"Non-Destructive Testing"**  
Dr. Chris Williams, Professor, ISU  
**"New Design Limits"**  
Dr. David Lee, Professor, U. of Iowa  
**"Rejuvenators"**  
Steve Rooney, Manatts Inc. & Greg Mulder, Director,  
Construction & Materials, Iowa DOT  
**"Paperless Tickets"**  
Jeff Steinkamp, Manatts, Inc., & Scott Schram,  
Pavement Management Engineer, Iowa DOT  
**"HPTO: High Performance Thin Overlay"**

- 6:00 p.m. **Reception & Silent Auction**
- 7:00 p.m. **PRESIDENT'S BANQUET\***  
Dinner / Auction / Dancing
- 8:15 p.m. **Johnny Holm Band**  
Followed by fellowship & karaoke

\*FORMAL BUSINESS ATTIRE REQUESTED.



(Thin Asphalt Overlays – Cont. from Pg. 3)

mix offers the opportunity to potentially: 1) increase the haul distances, 2) pave in slightly cooler temperatures even with thinner lifts, 3) achieve density at lower temperatures, 4) extend the paving season, and 5) pave over crack sealing material while minimizing bumps often associated with these types of overlays.

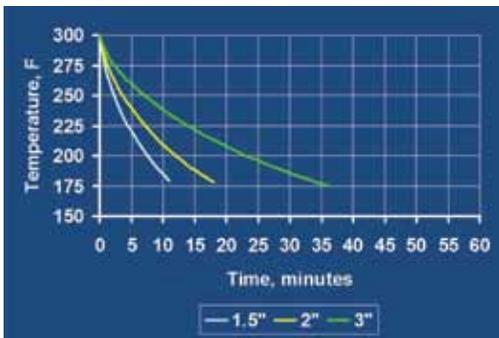
## Paving

One of the chief concerns of thin lift overlay performance is the bond between the old pavement and the new overlay, and this means that special attention needs to be paid to the surface preparation of the old surface and the application of the tack coat. Beyond this, paving and compaction operations can proceed normally, although the screed control is critical to ensuring the proper mat thickness on layers this thin and temperature control becomes more critical as ambient temperatures fall.

Where it can be done, milling of the old surface will help to remove defects that could reflect through the new overlay and provide the opportunity to achieve better ride quality by paving on a smoother surface. It will help roughen the surface which will provide a greater degree of shear resistance to the pavement surface so it will not be as likely to shove and debond. Using automated grade controls and operating the milling machine at the correct speed will improve the smoothness. Milling will also provide material that can be recycled into new asphalt mixtures. The milling machine should be sized appropriately for the project. Large milling machines traveling over light pavement structures may actually harm

the pavement structure by overloading it. Once the milling is complete, the old pavement surface should be swept clean of all debris and dust in order to facilitate bonding.

The tack coat is crucial to bonding the new overlay to the old pavement, especially on unmilled surfaces. Because the overlay is thin, the interface between the old and new pavement is in close proximity to the shear forces created by vehicles during braking and turning movements resulting in premature failures like those shown in the picture below. Most specifications require a heavier-than-normal application of tack coat. Some agencies require the use of polymer modified emulsions,



Graph of Mat Cooling Times for 1.5, 2, and 3 Inch Mat Thickness when the Ground Temperature = 30°F, Air Temperature = 40°F, and Wind Speed = 15 mph.

while others such as Minnesota use non-modified emulsions. Georgia requires the use of a PG 67-22 hot asphalt for tack applications which avoids issues with breaking. Excellent guidance on tack coats may be found in the NAPA publication QIP-128.

As mentioned above, thin-lift asphalt mixes are usually produced and placed at a higher temperature than larger NMAS mixes. This is because the thin-lift cools much quicker and the material can lose its workability and compactability. A 1.5-inch mat will cool from 300 to 175oF three times as fast as a 3-inch mat as shown in the graph, substantially reducing the time available to achieve compaction. The software MultiCool can help predict the rate at which cooling occurs and can be downloaded for free from NAPA's website, [www.hotmix.org](http://www.hotmix.org). However, caution must be exercised to not overheat the mix. Overheating a mix can result in a brittle pavement surface which will age faster and potentially crack early in

its life. Thin overlay paving is a situation where warm mix asphalt technology can be a definite benefit. Because the mix starts out cooler, it takes longer for the material temperature to drop a comparable amount allowing additional compaction time.

The goal for compaction of a thin lift asphalt surface should be to increase the stability of the mat and to seal the voids in the material to make it as impermeable as possible. With a small NMAS mix, this can be achieved at a lower density than with a larger stone mixture. Mat density is best achieved in thin lifts using a static, steel wheel compactor, and many specifications call for these only. Vibratory rollers should not be used on thin lifts that are less than about one inch because they may cause roughness or tearing of the mat.

## Conclusion

In an era when government budgets are tight at all levels, engineers are seeking ways to preserve their pavement systems in order to keep them as functional as possible for the least amount of money. Thin asphalt overlays provide improved smoothness, improved performance, lower noise, and maintain roadway geometrics at a low cost. Although similar to the production of larger stone mixes, mixes for thin overlays require special consideration in the handling of the aggregate as well as the plant operations. While paving practices are also similar to larger aggregate mixtures, thin overlays merit special attention to bonding to the existing pavement as well as the temperature at which paving is done.

*Reprinted with permission: Texas Asphalt, Summer 2015, pg 14.*

*Dave Newcomb is the Head of the Materials and Pavement Division of the Texas A&M Transportation Institute. Previously he was the Vice-President for Research and Technology for the National Asphalt Pavement Association and the Miles Kersten Chair in the Department of Civil Engineering of the University of Minnesota.*

## APAI Welcomes New Members

APAI continues to add new members. At their last Board Meeting, the Board of Directors elected two Associate Members and one Associate Member: Consulting Engineers to the Association. Thank you to those who have helped recruit these new members.



Corrective Asphalt Materials, CAM, LLC was established in the mid 1980's as a manufacturer and distributor of the then Golden Bear Products, RECLAMITE® Preservative Seal, CRF® Restorative Seal and COHEREX® Dust Control.

The owner's long standing involvement with the construction industry enlightened him on the many advantages of providing their asphalt pavement owners with a comprehensive pavement preservation program. It was recognized how valuable pavement preservation was for the private sector and services were extended to the public sector as well. From this CAM, LLC was born, a whole company committed to providing optimal pavement preservation techniques and products. CAM, LLC is the sole manufacturer and distributor of Reclamite Preservative Seal, CRF Restorative Seal and COHEREX Dust Control in the Midwestern Region. Their pavement preservation products and services currently provide cities, villages, townships, counties and states with cost effective pavement maintenance.



Go Big Promotions & Apparel was originally Advantage Printing & Promotions. In 2014 the owner changed the name because apparel had become a substantial part of the business.

On Go Big's website (GoBigPromApparel.com) there are two main areas; the promotional products catalog and the apparel catalog. The promotional product catalog includes Bic pens, Koozies, portfolios, and many more promotional products. All the promotional products are custom printed.

The apparel portion of the website shows a variety of golf shirts, tee shirts, sweat shirts, etc. All these products can be decorated using such techniques as embroidery, screen printing, and transfers.

Go Big Promotions & Apparel is located in Des Moines Iowa. The products can be shipped anywhere in the United States. Go Big Promotions & Apparel is registered with the State of Iowa as a Targeted Small Business. Go Big Promotions & Apparel is also registered with Iowa State University as a vendor for internal use.

For more information concerning the services and products offered by Go Big Promotions & Apparel, please call 515-270-8282 or email beth@gobigpromoapparel.com.



Earthwave Technologies offers contractors Fleetwatcher, a proprietary wireless fleet tracking solution for both company-owned and third-party Materials Delivery trucks to help optimize cycle times and reduce trucking costs. The solution addresses the common problems of over-trucking in construction companies (or in some markets, under-trucking). Using their application, they help you identify bottlenecks and inefficiencies at the plant and/or paver by providing real-time graphics and animation to quickly spot undesirable behavior and hold drivers accountable for their performance. The solution can enable their customers to replace manual ticketing methods many companies use to pay drivers with their Virtual Shift Ticket. This has helped contractors to significantly reduce overtime and payroll costs by automating the capture of total work hours using the data straight from their solution.

Additionally, Fleetwatcher offers an industry leading solution for tracking and managing their customers' off-road fleet of assets.



Since 1958, Troxler has been the worldwide leader in precision quality control and measurement equipment for the highway and construction industries. They are dedicated to providing full service training, and maintenance support for all our products through our international sales and support offices in the US, Canada, Germany, and through our 50 distributors around the world.

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

*(High Performance Thin Overlays – Cont. from Pg. 1)*

**conventional preservation treatments, making them very attractive on a life-cycle basis.”<sup>1</sup>**

## **The Iowa High Performance Thin Overlay Project – Warren Co. I-35**

The Iowa DOT let the first HPTO project in the June 2015 IDOT letting. The project is located 1.4 miles north of IA 92 going four miles north along the northbound (NB) and southbound (SB) lanes of I-35. The project called for milling and resurfacing to a depth of 1.5" NB and 1.0" SB over the mainline sections of the roadway. Shoulders were to be left intact.

This stretch of I-35 was originally constructed in 1958 using continually-reinforced concrete. The pavement



showed problems almost immediately upon completion of the project and had to be overlaid with asphalt after only eleven years. The project has been overlaid an additional three times since 1969 and has also averaged a yearly full-depth PCC patching job.

“Our goal on this project was to provide the district with a holding strategy until this section could be programmed and funded for reconstruction,” said Dr. Schram. “We expect the HPTO to maintain serviceability for five years and reduce the annual PCC patching. If we are able to achieve these goals on this stretch of

road, the High Performance Thin Overlay will work anywhere.”

Manatts, Inc. of Newton, IA was the low bid on the project and began construction in mid-September. Manatts utilized a new 12.5' full-width mill for the pavement scarification and provided an extremely smooth platform for the thin overlay. After the milling and cleaning, a “trackless tack” was applied. Dr. Schram indicated that the nature of the HPTO requires that there is a very strong bond between the existing surface and the thin overlay. At the plant, the use of the highly-polymerized PG 76-34 asphalt cement (AC) caused a few problems with production. The HPTO specification called for an elastic recovery of 90%. This caused the asphalt cement pumps to work hard at the plant and limited the anticipated production in the field. Talks have already been underway to experiment with different polymers that will reduce the binder’s viscosity and improve production on the next project.

“The paving of the High Performance Thin Overlay went smoothly,” said Jeff Steinkamp, Project Manager for Manatts. “It is a very strange mix. We started by just using static rollers – with 7.5% AC we were not worried about density, but we shifted to vibrating the mix with three passes and it improved the ride. The asphalt took a long time to cool. It was a very fine mix, acting both stiff and tender until it cooled.” When pressed about what he would do to improve the process, Steinkamp said, “We are not afraid to pave the HPTO again, but I would like to see the specification allow the use of RAP to help decrease the price of the product.”

“The final results are impressive.” said IDOT District 5 Resident Engineer, Jim Armstrong, “The project was completed in just three weeks and the smoothness achieved was nothing short of fantastic.”



## **The Future of High Performance Thin Overlays**

The future of the HPTO appears bright. When compared to the cost of a microsurfacing or chip seal project, it brings tremendous value. Dr. Schram feels that the future of the HPTO is now. “We know that High Performance Thin Overlays are fulfilling a need. It has already gained popularity for future IDOT lettings – just like the asphalt interlayer (click here for asphalt interlayer story) did two years ago. You get the performance of a two inch overlay at the quantity of a one inch overlay.” He continued, “Given the success they have had in New York City and nationally with HPTOs, the applications for this product could multiply, including a wearing surface for municipal and local system streets and roads. It’s even been used to provide a waterproof wearing course for bridge decks.” A revision to the specification has already been made to allow RAP and reduce the friction aggregate requirements for interstates.

For more information on High Performance Thin Overlays, please contact the Asphalt Paving Association of Iowa at [apai@apai.net](mailto:apai@apai.net) or at 515-233-0015.

<sup>1</sup> *Asphalt Pavement Magazine, March/April 2014, “Thinlays for Pavement Preservation”*

## APAI Members

### CONTRACTOR MEMBERS

Aspro, Inc., Waterloo  
 Barkley Asphalt, Sioux City  
 Blacktop Service Company, Humboldt  
 Determann Asphalt Paving, L.L.C.,  
 Camanche  
 Duinink Inc., Prinsburg, MN  
 Fort Dodge Asphalt Company, Fort Dodge  
 Gee Asphalt Systems, Inc., Cedar Rapids  
 General Asphalt Construction Company,  
 Davenport  
 Grimes Asphalt & Paving Corp., Grimes  
 Hansen Asphalt, Inc., Iowa City  
 Heartland Asphalt, Inc., Mason City  
 Henningsen Construction, Inc., Atlantic  
 Illowa Investment, Inc., Blue Grass  
 Kluesner Construction, Inc., Farley  
 Knife River Midwest, L.L.C., Sioux City  
 Koss Construction Company, Topeka, KS  
 Manatt's, Inc., Brooklyn  
 Mathy Construction Company, Onalaska, WI  
 River City Paving, Dubuque  
 McCarthy Improvement Company, Davenport  
 Midstate Reclamation, Inc., Lakeville, MN  
 Norris Asphalt Paving Company, Ottumwa  
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 Cessford Construction Company, LeGrand  
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 Des Moines  
 Omni Engineering, Omaha, NE  
 Tri-State Paving, Inc., Estherville  
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 Shamrock Construction Company, L.L.C.,  
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 Concrete Materials Co., Sioux Falls, SD  
 L. G. Everist, Inc., Sioux Falls, SD  
 Hallett Materials, Des Moines  
 Martin Marietta, Des Moines  
 Schildberg Construction Company,  
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 Wendling Quarries, DeWitt

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 Burroughs Consulting Group, Hiawatha  
 Capital City Equipment Co., Des Moines  
 Central Service & Supply, Inc., Ankeny  
 Clarence Richard Company, Minnetonka, MN  
 ClimaPatch – LJ L.L.C., Alleman  
 Coleman-Moore Company, Des Moines  
 Construction & Aggregate Products,  
 Des Moines  
 Construction Materials Testing, Des Moines  
 Corrective Asphalt Materials,  
 South Roxana, IL  
 Cryogenic Engineering, Cedar Rapids  
 CWMF, Corp., Waite Park, MN  
 Cylosoft, Inc., Ames  
 Denco Highway Construction, Mingo  
 Dynapac (Atlas Copco), Andover, KS  
 J.D. Donovan, Inc., Rockville, MN  
 Earthwave Technologies, Indianapolis, IN  
 Elite Flagging, Inc., Cedar Rapids  
 Flagger Pros USA, L.L.C., Ames  
 Arthur J. Gallagher, Des Moines  
 Gencor Industries, Inc., Orlando, FL  
 Glendandy Marketing & Advertising, Ames  
 Go Big Promotions & Apparel, Des Moines  
 Heuss Printing, Inc., Ames  
 Holmes Murphy & Associates,  
 West Des Moines  
 Housby / VOCON, Des Moines  
 Humboldt Manufacturing Company,  
 Schiller Park, IL  
 Iowa Parts, Inc., Cedar Rapids  
 Iowa Plains Signing, Slater  
 IronPlanet, West Des Moines  
 Jerico Services, Inc., Indianola  
 Jim Hawk Truck Trailers, Inc., Altoona  
 Kwik Trip, Inc., LaCrosse, WI  
 La Mair-Mulock-Condon Company,  
 West Des Moines  
 Logan Contractor Supply, Urbandale  
 Manhole Adjustable Riser Company, Oskaloosa  
 MeadWestvaco Corporation,  
 North Charleston, SC  
 Merchants Bonding Company, Des Moines  
 Mid-Iowa Enterprises, Inc., Ames  
 Midwest Tennis & Track, Denison  
 Ron Monson and Sons, Britt

Murphy Tractor & Equipment Company, Inc.,  
 Wichita, KS  
 National Minerals Company, Eagan, MN  
 Principal Financial Group, West Des Moines  
 Quality Striping, Inc., Des Moines  
 Quality Traffic Control, Inc., Des Moines  
 Quick Supply Company, Des Moines  
 R2R Recycling, L.L.C., West Des Moines  
 Rexco Equipment, Inc., Cedar Rapids  
 Ritchie Bros. Auctioneers, Medford, MN  
 Road Machinery & Supplies, Des Moines  
 RoadSafe Traffic Safety, Inc., Des Moines  
 Roadtec, Inc., Chattanooga, TN  
 Sakai America, Inc., Adairsville, GA  
 Save and Pave, Sioux City  
 Save Our Sewers, Inc., Cedar Rapids  
 Scott Van Keppel, Cedar Rapids  
 Soil-Tek, Grimes  
 Star Equipment, Ltd., Des Moines  
 S.T.A.T.E. Testing, L.L.C., East Dundee, IL  
 Tarmac, Inc., Blue Springs, MO  
 Titan Machinery, Des Moines  
 Troxler Electronic Laboratory, Research  
 Triangle Park, NC  
 Unique Paving Materials, Cleveland, OH  
 Valley Distribution Corp., West Burlington  
 Valley Environmental Services, Newton  
 Walker Construction Company, Emporia, KS  
 Waste Commission of Scott County, Buffalo  
 Weiler, Knoxville  
 Wells Fargo Bank, Des Moines  
 Whitfield & Eddy, P.L.C., Des Moines  
 Wirtgen America, Inc., Antioch, TN  
 Ziegler, Inc., Des Moines

### CONSULTING ENGINEERS

Anderson-Bogert Engineers & Surveyors, Inc.,  
 Cedar Rapids  
 Bolton & Menk, Ames  
 Calhoun-Burns Associates, West Des Moines  
 Clapsaddle-Garber Associates, Marshalltown  
 FOTH, Cedar Rapids  
 Fox Engineering Associates, Ames  
 French-Reneker-Associates, Fairfield  
 HGM Associates, Inc., Council Bluffs  
 I & S Group, Storm Lake  
 IIW, P.C., Dubuque  
 JEO Consulting Group, Inc., Carroll  
 McClure Engineering, Clive  
 Terracon, Cedar Rapids  
 Thiele Geotech, Inc., Omaha, NE  
 Veenstra & Kimm, West Des Moines

### AFFILIATE MEMBERS

Scott County Engineering