Don’t Forget the Impact of Basic Principles on Asphalt Mix Durability

By Dr. Randy West, Executive Director, National Center for Asphalt Technology (NCAT)

In the past few years, many highway agencies have implemented specification changes to increase asphalt contents of mix designs. Some have reduced the target air void content or increased VMA limits in mix design. In general, reducing the target air void content by 0.5% or increasing the minimum VMA by 0.3% will add about 0.2% more asphalt to mixes. Increasing asphalt contents will generally improve durability and also make the mixes more compactible. However, there is another very basic element of mix design that has a big impact on the optimum asphalt of mixes - the aggregate blend bulk specific gravity (Gsb). Using a Gsb that is higher than its true value, either by error or intent, will result in a calculated VMA that is higher than it actually is, and the net effect will be a lower asphalt content for the mix. A small change in the blend’s Gsb can have a significant impact on VMA; for example, increasing Gsb by 0.029 (a change that is within the repeatability of the tests) can increase the calculated VMA by 1.0%. Therefore, it is incumbent on agencies to check the Gsb of materials used in both mix designs and mix production. The frequency of checking Gsb should be based on historical data for how much the Gsb values change over time for aggregate and RAP components.

It is also important to consider changes made to mixtures during production. In many quality assurance specifications, the air voids of lab compacted specimens have a greater impact on the contractor’s pay per lot of mixture than asphalt content. This encourages a reduction of asphalt content in order to maintain air voids (and VMA), which essentially sacrifices durability in favor of rutting resistance. Agencies can discourage this practice by limiting the reduction of the target asphalt content during mix production, forcing contractors to make other adjustments in the mix to (Continued Page 9)
Upcoming Events
(Click event for more information)

APAI Eastern Iowa Golf Outing
Date: June 28, 2016
Location: Brown Deer Golf Club
           Coralville, IA

NAPA Mid-Year Meeting
Date: July 13-15, 2015
Location: Denver, CO

APAI Summer Meeting
Date: July 21-22, 2016
Location: The Okoboji Commons
           Hotel
           Okoboji, IA

APAI Western Iowa Golf Outing
Date: August 30, 2016
Location: Majestic Hills Golf
           Course
           Denison, IA

APAI 61st Annual Convention
Date: November 30 -
       December 1, 2016
Location: West Des Moines
           Marriott

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**

back it up” applies in this case too. This year Iowa had three of the final four projects in the running for the Sheldon G Hayes Award (SGH). This award goes to the best paving project in the nation over 50,000 tons. It is measured over a two year period, with initial smoothness and Quality Control results determining the initial finalists, and a second profilograph the next year along with a personal visit to the project by national judges. Manatts, Inc., of Newton, IA, project on Highway 1 in Johnson, Linn and Jones Counties was the first finalist. Norris Asphalt Paving, Inc. of Ottumwa, IA had two projects in the final four, Highway 92 in Adair Co. and the winner of the 2015 Sheldon G Hayes Award, US Highway 34 in Montgomery and Adams Counties. Although this is impressive in and of itself, the history of Iowa’s Asphalt Contractors nationally is even more impressive. Since 1998, Iowa contractors have been finalists for the Sheldon G Hayes Award eight times. Iowa contractors have won the award four times, with Des Moines Asphalt winning in 1998 and 2006, and Norris Asphalt Paving winning in 2001 and 2015. In fact, since 2011, Iowa contractors have had at least one finalist, and often two, every year, including two recent finalists announced for the upcoming 2016 Sheldon G Hayes Award.

This success does not happen in a bubble. The designers, engineers and inspectors of the Iowa DOT and County Engineers deserve credit. The estimators, project managers, and contractor ownership; bid, manage, and empower their employees for success. Quality Control staff design the mixes and production personnel manage quality at the asphalt plant. The paving foreman and Superintendent drive the message of quality home to the crew. The crew utilizes the opportunities provided by all of these individuals to pave the smoothest, high-quality asphalt road in the nation.

Iowa does have the best asphalt paving contractors in the nation. The quality and expertise these companies bring to the grade leaves no doubters. As Henry told me, “It isn’t bragging, if you can back it up.” Congratulations to the Iowa DOT District 4 and Norris Asphalt Paving for winning the Sheldon G Hayes Award for 2015 and Good luck to the 2016 Finalists!

Smother is Better.

Bill Rosener

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**THE FUTURE OF PAVEMENT DESIGN IS HERE...**

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The 2016 Greater Iowa Asphalt Conference (GIAC) drew record crowds for the sixth straight year at the Des Moines Airport Holiday Inn on March 2-4. “The popularity of this event is amazing”, said Bill Rosener, Executive Vice President of the Asphalt Paving Association of Iowa. “GIAC offers education, training, networking, new equipment and exposure to innovative ideas; sprinkled with a liberal dose of fun.”

The event began on March 2 with three Pre-Conference Workshops: Iowa DOT Technicians Certification Update, FHWA Tack Best Practices Workshop and Asphalt 101. The exhibit hall opened that evening for the Working Man’s Break featuring the Midwest’s top equipment dealers, beverages and brats, and the Iowa contractors’ famous camaraderie.

Thursday’s general session was highlighted by a keynote address from Chicago Bears Hall of Fame Linebacker, Dick Butkus.

Click here to read the whole story.
APA I Road Shows Truck Across Iowa

The APAI Road Shows trucked across Iowa in late March and early April delivering the Asphalt message to over 200 attendees in Fairfield, Clinton, Waterloo, Storm Lake, Council Bluffs, and Des Moines. “What I love about these events,” said Bill Rosener, Executive Vice President of the APAI, “is that both our contractors and local city, county, and consulting engineers share their asphalt construction success stories, and sometime failures, with a small group of engaged people eager to learn the what, how, and why to help build their next project. I personally come away from these events having learned a tremendous amount.”

The APAI staff and members would like to thank all of our speakers and attendees for making these Road Shows a great success.

Sign Up Now for APAI Golf Outings

This year’s APAI Golf Outings are returning to some of our favorite courses. Brown Deer Golf Club in Coralville, IA (1900 Country Club Drive) on Tuesday, June 28 will be the site of the Eastern Iowa outing. On Tuesday, August 30, the Western Iowa outing will be held at the Majestic Hills Golf Course in Denison, IA (2505 Boulders Dr.).

Registration will begin at 7:30 a.m. with a 9:00 a.m. shotgun start for the 4-Man Best-Ball Tournament. Registration is $75 per person and $300 per 4-person team. This cost includes golf, cart, practice balls, and lunch. Everyone is welcome to join us at these events.

There will be contests of skill to help fund the APAI Scholarships again this year, and if you feel the need for an extra edge, Scholarship Mulligans will be available. Last year’s events were near sell-outs so don’t delay signing up! Spaces will be limited to 36 teams at each venue. You may access the registration page by clicking here.

If you are interested in sponsoring the golf outings, please click here.
2015 APAI Quality Paving Awards

One of the inherent advantages of asphalt pavement is its smooth riding surface. Smoothness has long been recognized as a major factor in evaluating quality construction. As a result, the Asphalt Paving Association of Iowa, in conjunction with the Iowa Department of Transportation, pay special tribute to those contractors who produce the smoothest, highest quality asphalt pavements. It is this partnering effort of industry and agency that assures the quality of Hot Mix Asphalt remains at its highest.

2015 APAI AWARD WINNERS
QUALITY PAVING AWARDS

Commercial paving projects are an important part of an asphalt contractor’s work. This award recognizes high quality projects as judged by a group of peers and a special traveling team. Rated on items such as surface appearance, joints, edges, degree of difficulty and texture, these award-winning projects represent the best commercial projects in the state.

Small Parking Lot (<500 Tons)

MUSCO SPORTS LIGHTING, OSKALOOSA, IA
Musco Lighting
Oskaloosa, IA
Norris Asphalt Paving Co.
Ottumwa, IA

Large Parking Lot (>500 Tons)

TARGET T1768, CEDAR RAPIDS, IA
Target / Colcon Corp.
Sullivan, IL
Larson Engineering
White Bear Lake, MN
L.L. Pelling Co., Inc.
North Liberty, IA

Parking Lot / Heavy Industrial

HILL PHOENIX, KEOSAUQUA, IA
Hill Phoenix
Keosauqua, IA
Norris Asphalt Paving Co.
Ottumwa, IA
Athletic Use: Recreational Trail Award

WRA SOUTHERN TIER INTERCEPTOR, PHASE 10, SEGMENT 15 &16, DES MOINES, IA
City of Des Moines
Veenstra & Kimm, Inc.
West Des Moines, IA
Des Moines Asphalt & Paving
A Division of Oldcastle Materials Group/Midwest
Ankeny, IA

Athletic Use: Tennis Courts or Running Track Award

SE POLK HIGH SCHOOL TENNIS COURTS, PLEASANT HILL, IA
SE Polk Community School District
Pleasant Hill, IA
FRK Architects
West Des Moines, IA
Grimes Asphalt and Paving Corp.
Des Moines, IA

Athletic Use: Tennis Courts or Running Track Award

MORNINGSIDE COLLEGE TENNIS COURTS, SIOUX CITY, IA
Morningside College
Sioux City, IA
Midwest Tennis & Track
Denison, IA
Knife River Midwest
Sioux City, IA

Special / Unique Paving Application

FRANKLIN C23 THIN OVERLAY PROJECT, FRANKLIN COUNTY, IA
Franklin County Engineering Dept.
Hampton, IA
Heartland Asphalt, Inc.
Mason City, IA
SMOOTHNESS AWARDS

Smooth riding surfaces are recognized by the traveling public as the most important aspect of a paved road. Smooth roads have been proven to last longer and provide better gas mileage to the traveling public. Each year the Asphalt Paving Association of Iowa, in conjunction with the Iowa Department of Transportation, pay special tribute to those involved in producing the smoothest, highest quality asphalt pavements.

**Airport Runway Resurfacing**
FORT DODGE RUNWAY 6/24 REHABILITATION, FORT DODGE AIRPORT, FORT DODGE, IA
Fort Dodge Airport
Fort Dodge, IA
McClure Engineering
Clive, IA
Fort Dodge Asphalt Co.
Fort Dodge, IA

**Municipal Street Resurfacing**
FORT DODGE 2015 STREET IMPROVEMENTS – PARKER DRIVE WEST, FORT DODGE, IA
City of Fort Dodge
Fort Dodge Asphalt Co.
Fort Dodge, IA

**Municipal Street Rehabilitation**
F.Y. 2015 ASPHALT OVERLAY PROGRAM – MITCHELL AVE. WATERLOO, IA
City of Waterloo
Aspro, Inc.
Waterloo, IA

**Municipal Street New Construction**
WEBSTER CITY 2015 STREET IMPROVEMENT NANCY LANE / CEDAR ST. / WEBSTER ST., WEBSTER CITY, IA
City of Webster City
Heartland Asphalt, Inc.
Mason City, IA
Secondary Road Resurfacing
FM-C035(74)--55-35, S25, FRANKLIN COUNTY, IA
Franklin County Engineering Office
Hampton, IA
Heartland Asphalt, Inc.
Mason City, IA

Secondary Road Rehabilitation
STP-S-C048(68)--5E-48, V77, IOWA COUNTY, IA
Iowa County Engineering Office
Marengo, IA
Mathy Construction Co.
Onalaska, WI

Secondary Road New Construction
STP-S-C007(132)--5E-07, V51 (CANFIELD RD.), BLACK HAWK COUNTY, IA
Black Hawk County Engineering Office
Waterloo, IA
Aspro, Inc.
Waterloo, IA

QUALITY MANAGEMENT ASPHALT (QMA) AWARDS
Building on the success of the Quality Management Asphalt Program, this award recognizes the great degree of work that goes into building a quality pavement on the primary and interstate system. Smoothness, quality control, density results, and physical appearance all go into the overall ratings for the projects submitted in these categories. The winning pavements are considered the best-of-the-best, indicating that they are not only smooth but exhibit characteristics that produce long-lasting hot mix asphalt pavements.

Primary Highway Resurfacing – 2-Lane
STPN-002-7(38)--2J-04, IA HWY 2, APPANOOSE COUNTY, IA
Iowa Department of Transportation
District 5 Office, Fairfield, IA
Resident Construction Engineering Office, Chariton, IA
Norris Asphalt Paving Co.
Ottumwa, IA
Primary Highway Resurfacing – 4-Lane
NHSX-218-7(218)--3H-07, US HWY 218, BLACK HAWK COUNTY, IA
Iowa Department of Transportation
District 2 Office, Mason City, IA
Resident Construction Engineering Office, New Hampton, IA
Aspro, Inc.
Waterloo, IA

Primary Highway Rehabilitation – 2-Lane
NHSN-052-4(6)--2R-03 & NHSN-052-5(32)--2R-96, US HWY 52, WINNESHIEK / ALLAMAKEE / CLAYTON COUNTRIES, IA
Iowa Department of Transportation
District 2 Office, Mason City, IA
Resident Construction Engineering Office, New Hampton
Mathy Construction Co.
Onalaska, WI

Primary Highway New Construction
STPN-0140-2(17)--2J-75, IA HWY 140, PLYMOUTH COUNTY, IA
Iowa Department of Transportation
District 3 Office, Sioux City, IA
Resident Construction Engineering Office, Cherokee, IA
Tri-State Paving, Inc.
A Division of Oldcastle Materials Group/Midwest
Estherville, IA

Interstate Resurfacing
IMN-235-2[640]0--OE-77, I-235, POLK COUNTY, IA
Iowa Department of Transportation
District 1 Office, Ames, IA
Resident Construction Engineering Office, Jefferson, IA
Des Moines Asphalt & Paving Co.
A Division of Oldcastle Materials Group / Midwest
Ankeny, IA
These special awards recognize agencies and companies that have gone beyond the ordinary to push the limits of environmental stewardship, innovation and service to Iowa’s traveling public.

**ENVIRONMENTAL AWARD**

**STATIONARY PLANT, PLANT 17, CEDAR RAPIDS, IA**

L.L. Pelling Company, Inc.  
North Liberty, IA

**STATIONARY PLANT, BURLINGTON, IA**

Cessford Construction Company  
A Division of Oldcastle Materials Group / Midwest  
Burlington, IA

**INNOVATION IN CONSTRUCTION AWARD: HIGH PERFORMANCE THIN OVERLAY**

**IMN-035-2(446)58—OE-91, I-35, WARREN COUNTY, IA**

Iowa Department of Transportation  
District 5, Fairfield, IA  
Resident Construction Engineering Office, Chariton, IA

Manatts, Inc.  
Newton, IA

**SPECIAL AWARDS**

**METROPOLITAN PAVING PROGRAM (CITIES >10,000 POP.)**

City of Clinton  
Determann Asphalt Paving, L.L.C.  
Camanche, IA

These awards recognize a city’s commitment to provide smooth, safe streets for their taxpayers by developing a sustainable asphalt program.
MUNICIPAL PAVING PROGRAM (CITIES <10,000 POP.)

City of Woodward
Veenstra & Kimm, Inc.
West Des Moines, IA
Grimes Asphalt & Paving Corp.
Des Moines, IA

IOWA COUNTY PAVING PROGRAM

Johnson County Engineering Office
Iowa City, IA

This award recognizes exceptional counties that have shown due diligence by building safe, sustainable roadways out of asphalt.

PERPETUAL DESIGN AWARD
DALLAS COUNTY F-59 & P-48

Dallas County Engineering Office
Adel, IA

The Perpetual Design Award recognizes agency designers that have realized the value to Iowa taxpayers in making a long-term investment in their roadways. The design and construction of a perpetual asphalt roadway enables the agency to do periodic surface restoration without the need for full reconstruction of the highway for sixty years or more.

ROBERT M. NADY AWARD

Robert M. Nady is a legend in Iowa’s asphalt history. His commitment to educating young engineers about the importance of quality asphalt materials and construction inspired generations of young people to excellence in design and construction. This award honors his memory by recognizing the best quality-constructed road in Iowa each year.

NHSN-052-4(6)--2R-03 & NHSN-052-5(32)--2R-96, US HWY 52, WINNESHIEK / ALLAMAKEE / CLAYTON COUNTIES, IA

Iowa Department of Transportation
District 2 Office, Mason City, IA
Resident Construction Engineering Office, New Hampton

Mathy Construction Co.
Onalaska, WI
IOWA ASPHALT REPORT

APAI CONSULTING ENGINEER OF THE YEAR AWARD

Andy Maysent
McClure Engineering
Clive, IA

Iowa’s consulting engineers are our partners in building and maintaining Iowa’s infrastructure and deserved to be recognized for the long hours and hard work they put into their jobs. Andy Maysent has been such a partner. His work in the Fort Dodge area, including the rehabilitation of the Ft. Dodge Airport in 2015, is impressive. His knowledge and expertise, coupled with the ability to bring owner and contractor together, make him a worthy recipient of this inaugural APAI Consulting Engineer of the Year Award.

2015 HMA HALL OF FAME

Mike Henningsen

Mike Henningsen is the President of Henningsen Construction of Atlantic, IA. Mike has been a tireless advocate for Iowa’s asphalt industry for over 40 years in his career. His service included serving as President of the APAI in 1982 and two terms on the APAI Board of Directors.

Award photos taken by: Alexander’s Photo of West Des Moines, IA.
For additional photos go to www.alexanderyphoto.com.

2016 Golf Outing
Sponsorship Opportunities Available

The APAI golf outings have become the “must-attend” events of the summer, and they are the “must-sponsor” events for your company! We are offering five levels of sponsorship opportunities for this year’s golf outings: Bring-a-Ringer sponsorship, Gold, Silver, Bronze and Hole sponsorships. All levels of sponsorship will receive signage opportunities, plus the additional incentives described below. Let us help you show your support of the industry and your gratitude to your clients.

To become a sponsor click here or contact Minnie Coree at the APAI office at 515-233-0015 with your selection.

Sponsorship levels are:

**“BRING A RINGER” SPONSORSHIPS (4 Available)**

$1500
A representative at a hole at each event plus a foursome at one event.

**GOLD SPONSORSHIPS (4 Available)**

$1,000
Includes a foursome at one event plus Beverage Cart Sponsorship at each event.

**SILVER SPONSORSHIP**

$750
Includes two golf registrations at one event plus sign at hole and sponsor recognition at each events.

**BRONZE SPONSORSHIP**

$500
Includes one golf registration at one event plus sign at hole and sponsor recognition at each events.

**HOLE SPONSORSHIP**

$300 / Both Events
Hole signs and sponsor recognition
Voids in Mineral Aggregate (VMA) is the volume of intergranular void space between the aggregate particles of a compacted paving mixture. It includes the air voids and effective volume of asphalt. It must be calculated using the Gsb of the aggregate blend.

Voids in Mineral Aggregate (VMA) is given by the formula:

\[
VMA = 100 - \frac{G_{mb}P_s}{G_{sb}}
\]

where

- \( VMA \) is the Voids in Mineral Aggregate
- \( G_{mb} \) is the Gyrating Mass
- \( P_s \) is the specific gravity of the solids
- \( G_{sb} \) is the specific gravity of the binder

and the appropriate binder grade is used, those states found that lower gyration levels improved mix designs without causing rutting problems. The NCAT Test Track has also proven that 65 gyration mixes can hold up to very heavy traffic conditions.

**In-Place Density**

Achieving a high relative density of each asphalt layer during construction is perhaps the most important factor that impacts long-term pavement performance. Therefore, most highway agencies use in-place density as a key pay factor in acceptance testing. The specified minimum density level is typically 92 to 93% of Gmm. It is generally understood that pavements with densities below that level tend to be permeable to water. However, the relationship between density and permeability is also greatly influenced by other simple gradation characteristics: nominal maximum aggregate size (NMAS) and the relative coarseness or fineness of the gradation. Figure 1 shows regressions between in-place air voids and permeability for different NMAS and coarse/fine gradations. From this graph it can be seen that 9.5 mm and 4.75 mm mixes are relatively impermeable at 8% air voids (92% of Gmm), whereas coarse-graded 12.5 mm mixes are on the cusp of a dramatic increase in permeability at 7% air voids, and 19.0 mm mixes are highly permeable to water at 7% air voids.

This illustrates the advantage of smaller NMAS mixes for reduced permeability and the obvious need for higher density target levels when coarse mixes are used. When water is kept out of the pavement layers they will obviously be much more resistant to freeze-thaw, moisture damage, and age-hardening. Some asphalt experts have suggested that the industry should test in-place permeability rather than density. However, more work is needed to refine permeability testing before that can be seriously considered.

Thickness of the layer is a critical factor that affects a contractor’s ability to adequately compact the material. NCHRP Report 531 recommends that fine-graded mixes be constructed at a minimum of three times the mixture’s NMAS and coarse-graded mixes be constructed at least four times the NMAS. Trying to compact mixes below these thresholds is very challenging. This is a common problem for thin overlays on an existing pavement with a variable profile.

Other important aspects of in-place density specifications deal with how density is measured and how frequent measurements are obtained to determine specification compliance. Some agencies use nuclear density gauges and others use roadway cores. Although there are advantages and disadvantages with both approaches, most asphalt experts consider cores to be the preferred method. If we consider that each core and nuclear density test represents areas of about 0.2 to 1.0 square feet, respectively and one test is taken every 1000 feet of pavement, then we are only sampling approximately 0.0016% to 0.0083% of the paved area. With this miniscule proportion of testing it is easy to miss areas of segregation and low density. It is in those missed areas where pavement performance problems likely begin. A greater frequency of in-place density testing should be considered in future

![Figure 1: Relationship between air void content and permeability of various NMAS mixes (based on data from NCHRP Report 531 and NCAT Report 11-01).](image)
specifications.

Another density measurement issue is the amount of water absorption of cores when using AASHTO T 166 or ASTM D2726. These methods use Archimedes' principle to determine the volume of a compacted asphalt sample, in this case a roadway core. The problem with this technique is that when cores with large voids are submerged, some of the water that enters those voids drains out of the core before the surface water is dried with a damp towel. This causes an error in the saturated surface dry (SSD) mass and the volume determination. The result is a higher calculated density (bulk specific gravity) than what the core actually has. In other words, AASHTO T166/ASTM D2726 is not accurate for density determination of some coarse-graded mixtures, particularly when water permeable voids are interconnected. The current AASHTO and ASTM standards recommend a slightly different solution to this error by requiring that samples with greater than 2% water absorption be tested with different alternative methods. For T 166, the alternative method is the paraffin coating method, AASHTO T 275. The ASTM method allows either the paraffin method, ASTM D1188, or the vacuum sealing method, ASTM D6752.

NCAT research has shown that the most accurate alternate method is the vacuum sealing method, and it should be used when water absorption exceeds 1.0% rather than the current limit of 2%. Data has shown that calculated in-place air voids are approximately 1.0% higher on average for coarse-graded mixtures when using the vacuum-sealing method in place of AASHTO T 166/ASTM D2726. Therefore, changing to the vacuum-sealing method for acceptance testing of in-place density results in lower density results than those typically obtained in current practice for coarse-graded mixes.

Contractors and highway departments should examine Gmb data for cores from recent projects to determine how often the cores absorb more than one percent water. Cores for longitudinal joint tests should especially be scrutinized. Even projects using nuclear density gauge tests should examine data for cores from test strips used to establish bias (correction) factors or equations. If more than 10% of cores have greater than 1.0% water absorption, then the highway agency should strongly consider adopting the vacuum sealing method when the 1.0% limit is exceeded. Greater attention to this detail could reveal that the adequate in-place density results that we think we have been getting on projects actually have a significant percentage of results below the target levels.

In effect, using the vacuum sealing method to determine core densities could mean that better field compaction methods are needed to reach appropriate in-place density targets. However, if other details described in this article are implemented at the same time, such as adjusting volumetric mix design criteria, correcting Gsb values, and lowering Ndesign, then achieving higher density levels should be attainable. There are also several other new tools and technologies available today that can help improve in-place densities: warm-mix asphalt (WMA), infrared mat temperature mapping, and intelligent compaction. Many contractors across the U.S. are using WMA because these technologies can help improve the compactability of mixes. Infrared mat temperature systems are an excellent tool to help identify areas with temperature segregation, which can be challenging to achieve uniform densities and smoothness. Finally, intelligent compaction systems that map out roller passes are available to provide roller operators with a visual guide to compacting every part of the asphalt mat.

**RAP and RAS**

Using RAP and RAS can be an important part of the industry's effort to be more sustainable and cost-effective if good practices with these recycled materials are followed. Although a complete review of the best practices for handling these materials is beyond the scope of this article, there are a few key points to emphasize.

There is still considerable debate about exactly how much RAP and RAS binders are activated as effective asphalt, but most research indicates that we can assume that all of the RAP binder is effective. NCHRP Report 752 recommends that when the RAP binder exceeds 25% of the total binder in the mix, the virgin binder grade should be selected based on a blending equation. In effect, softer grades of virgin binder are often needed for high RAP content mixes, and several studies have shown that softer binders are effective in improving their cracking resistance.

Since RAS binders are much stiffer than RAP binders, all of the RAS binder may not be initially activated during mix design or mix production, particularly for post-consumer (tear-off) RAS. Therefore, the growing consensus is that the RAS binder availability factor be set in the range of 0.7 to 0.85, meaning that only 70 to 85% of the RAS binder should be considered effective.

Currently, there is not a proven method on how to determine the availability factor; rather, most asphalt technologists with experience in production and placement of mixes containing RAS recognize that the effect of using a factor of 0.7 to 0.85 is to increase the virgin binder content by 0.3% to 0.15%, respectively, which helps improve placement, compaction, and durability of the mixes. There are several factors that are likely to affect how much RAS binder is effective in a given mix. Smaller grind size (essentially the nominal maximum particle size) of the recycled shingle material is generally considered to help improve blending of the RAS and virgin binder. Lower moisture contents of RAS being fed into a plant is also desired, since less energy is needed to drive off the moisture and more heat energy is available to raise the RAS binder to its melting point. Longer mixing times and silo storage times are also believed to be helpful in activating more RAS binder.

There are different views on how to make mixes containing RAS more resistant to cracking, partly because different studies have used different tests to evaluate cracking resistance. Presently, there are about a dozen different tests that have been used to evaluate the different modes of cracking for asphalt pavements: fatigue cracking, low-temperature cracking, reflection cracking, and top-down cracking. Many believe that the single greatest research need in the asphalt paving industry is to validate the cracking tests and their criteria using correlations to field performance. It will take a concerted effort and several more years to meet this need. In the meantime, we need to revive the basic principles of mix design, testing, and construction described above to help improve the durability of asphalt mixes in the field.
APAI Welcomes New Members

APAI continues to add new members. At their last Board Meeting, the Board of Directors elected one Contractor – Non-Producer Member and one Associate – Consulting Engineering Member to the Association. Thank you to those who have helped recruit these new members.

“Pavement should shed water like a roof, to the Drain.” Words of wisdom from William Wilcox, President of Advanced Asphalt / Concrete. In Spring 1997 Advanced Asphalt striped their first traffic line. They focused their business direction to maintenance of parking lots. In line with this direction asphalt paving, patching, milling, GSB-88 Asphalt sealer rejuvenator, crack sealing, curbing, sweeping and traffic lines have been added to their repertoire of services.

The foundation of DGR Engineering began in 1952. That’s when a young electrical engineer named John DeWild quit his job at Rock Rapids Utilities to pursue his dreams. Soon after, he met with electrical engineer Dick Grant. It took just a simple handshake to build a business and partnership that would last for decades. In 1954 Bob Reckert was added to the expanding engineering firm, and together they made DeWild Grant Reckert and Associates Company, today known as DGR Engineering.

Sixty years after that single handshake, DGR maintains the same spirit of passion, advancement and partnership that the company was built on. With almost 100 employees, who together co-own the firm, and four locations in the upper Midwest, DGR looks forward to many more decades of helping businesses, schools and communities grow, and building the foundation for every day. With offices in Rock Rapids, Sioux Falls, and Ankeny, DGR’s almost 100 employees look forward to fulfilling the aviation, civil, electrical power, surveying, wastewater and water designs of businesses, schools and communities.

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.

APAI Awards Scholarships for 2016-2017

Scholarship recipients for the 2015-2016 Academic Year were selected by the APAI Scholarship selection team from qualified applicants at the three Iowa Regent Universities and the Des Moines Area Community College. Scholarships totaling $35,750 were given to thirty-one students. The awarded scholarship, the recipients, and their universities are shown below.

<table>
<thead>
<tr>
<th>Iowa State University Scholarships &amp; Recipients:</th>
<th>University of Iowa Scholarships &amp; Recipients:</th>
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<tbody>
<tr>
<td>RONALD D. KENYON SCHOLARSHIP</td>
<td>ASPHALT PAVING ASSOCIATION OF IOWA SCHOLARSHIP</td>
</tr>
<tr>
<td>Scholar in Civil &amp; Construction Engineering</td>
<td>Ashkan Bozorgzad, Tehran, Iran</td>
</tr>
<tr>
<td>John DeVries, Boone, IA</td>
<td>Ali Mokhtari, Babolsar, Iran</td>
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<td>John Langa, Chesterfield, MO</td>
<td>David Braun, Grayslake, IL</td>
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<td>Matthew Manzer, West Des Moines, IA</td>
<td>Anthony Hemann, Charles City, IA</td>
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<td>Noelle Weaver, Anthon, IA</td>
<td>Dillon Hain, Paulina, IA</td>
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<td>FRED CARLSON COMPANY SCHOLARSHIP</td>
<td>ROBERT &amp; SHERI HORNER SCHOLARSHIP</td>
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<td>Dillon Hain, Paulina, IA</td>
<td>Cody Johnson, Naperville, IL</td>
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<td>Bryce Hallmark, Ankeny, IA</td>
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| Ali Mokhtari, Babolsar, Iran                   |
| David Braun, Grayslake, IL                     |
| Anthony Hemann, Charles City, IA               |
| Dillon Hain, Paulina, IA                       |
| ROBERT & SHERI HORNER SCHOLARSHIP              |
| Cody Johnson, Naperville, IL                   |
| Andrew J. Ventra, Naperville, IL               |
| TOM MANATT MEMORIAL SCHOLARSHIP               |
| Taylor Claybon, Plano, TX                     |
| HAROLD & MERCEDES CESSFORD MEMORIAL SCHOLARSHIP |                                               |
| Kara Keifer, Ogden, IA                        |
| ROBERT M. NADY SCHOLARSHIP                    |
| MacKenzie McCoy, Ottumwa, IA                  |
| Scott Dillavou, Ames, IA                      |
| ASPHALT PAVING ASSOCIATION OF IOWA SCHOLARSHIP |                                               |
| Bryce Hallmark, Ankeny, IA                    |

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Please join in congratulating and encouraging these young scholars in their academic endeavors.
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