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Features

National Center For Asphalt Technology
NCAT
AT AUBURN UNIVERSITY

Contents

Message from the Director

Old Test Sections

I may be showing my age by getting nostalgic about old test sections. One of my first pavement engineering experiences was putting down four paving fabrics and geo-composite membranes to mitigate reflection cracking on Magnolia Avenue on the northern edge of Auburn's campus. I was a senior civil engineering student and had been working in the asphalt lab before there was such a thing as NCAT.

Dr. Frazier Parker asked if I would be interested in doing a field experiment to evaluate the products aimed at slowing or stopping reflection cracking. It was a memorable experience, especially when it started raining, and a truck hauling mix hit the brakes too hard on a little hill, and the geotextile that we had carefully placed on the heavy tack coat slipped badly and "bunched up" the fabric. By the time the supplier's representative and I finished pulling up the fabric by hand, I was covered head to toe in asphalt and looked like Uncle Remus's tar baby.

Ever since then, I've had a strong affinity for the black sticky stuff and a love for building test sections. A few years later, as a young engineer with the Florida DOT, I was fortunate to be involved in constructing and evaluating a series of test sections with ground tire rubber (GTR) in open-graded friction course mixtures on State Road 16 north of Starke, Fla., and then later with several more GTR demonstration projects across the state. Those early trial projects were instrumental in FDOT's specifications for using GTR in both dense- and open-graded mixtures for many years.

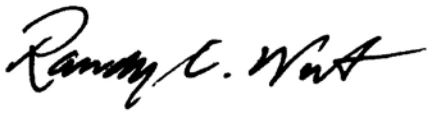
Roughly 10 years later, while working for APAC Inc., I was back in Florida and made my way over to Starke to check out the almost forgotten GTR test sections. Not surprisingly, the test section with the highest rubber content had the least amount of cracking and was noticeably darker than the other test sections. The proof that the higher GTR content test section was superior was more meaningful to me than the experience of building the test sections.

Throughout my career, I've been involved in the construction and evaluation of numerous test sections, including field experiments with glasphalt, Gilsonite, warm-mix asphalt, recycled shingles, fibers of different types, 50% RAP mixtures, 4.75 mm NMAS mixtures, and recycled plastics. Recently, while working on a literature review on longitudinal joints, we found reports from about seven states that had built longitudinal joint field experiments. Unfortunately, none of the experiments were evaluated for more than just a few years, and the reports lacked conclusive evidence about which methods were really best.

It's disappointing that agencies and researchers put forth a significant effort to build field test sections and then forget about them within a few years. The real value of field test sections comes when we can assess what works best over the long term. That's the motivation behind the Long-Term Pavement Performance (LTPP) program. I think it's time that we rekindle the LTPP spirit to help us better assess BMD tests and mixture aging procedures.

If you are in the second half of your career, encourage young people you work with to explore new technologies to make better pavements for the future. Opportunities to make a difference are often a spark to jump-start a career.

If you've been involved in test sections in the past, go back to see how they are doing. If you are in the early part of your career, I encourage you to get involved in building and evaluating test sections that will provide meaningful results to help determine if something new is truly better.



Randy C. West, Ph.D., P.E.
NCAT Director and Research Professor

Friction: Dynamics of Macro-Texture related to Friction

Pavement surface texture plays a significant role in maintaining safe roadways.

Increased texture typically yields safer pavements by providing larger channels, or "valleys", for water to be displaced between the exposed surface aggregates as vehicles pass over. This reduces the overall film thickness of the sheet of water running off the pavement during rain events and exposes more aggregates to improve friction between the tires and pavement, especially at high speeds.

Gradation and type of asphalt mix directly affect the surface texture of the pavement. Gradation and mixture type are the two most effective options for targeting certain levels of texture. For example, coarser mixes will have taller "peaks" and deeper "valleys" due to the increased amount of coarse aggregate particles. Gradation and mixture type selection are the two most effective options for targeting certain levels of texture.

The Primary Control Sieve Index (PCSI) is a simple index to describe the overall fineness of a gradation. Specifically, the PCSI is defined as "the difference in percentage passing between the given gradation and the point on the maximum density line (MDL) at the primary control sieve (PCS)" (Leiva and West, 2021).

Fine mixes have positive PCSI values and coarse mixes have negative values. For 12.5 and 9.5 mm NMAS mixtures, the primary control sieve is the 2.36 mm (#8) sieve.

Although other methods of describing gradations with a single value exist, the PCSI describes gradation in a simple manner and has been used effectively to explain other asphalt mixture characteristics like surface texture, permeability, compactibility, and volumetrics.

The relationship between the PCSI and as-built surface texture is demonstrated below in Figure 1.

The data shown represent the as-built mean profile depth (MPD) measured by the Automatic Road Analyzer (ARAN) van on the NCAT Test Track after construction of the 2000, 2003, 2006, and 2009 NCAT Test Tracks versus the PCSI calculated from Quality Control (QC) data during construction. The data from 2000 were taken one month after traffic began and the data from the other Track cycles were measured before traffic was applied.

The sections are divided into three mixture types: Dense-graded asphalt (DGA), Open-graded surface courses (OGFC), and Stone Matrix asphalt (SMA). Every section represented in Figure 1 is either a 9.5 mm NMAS or a 12.5 mm NMAS.

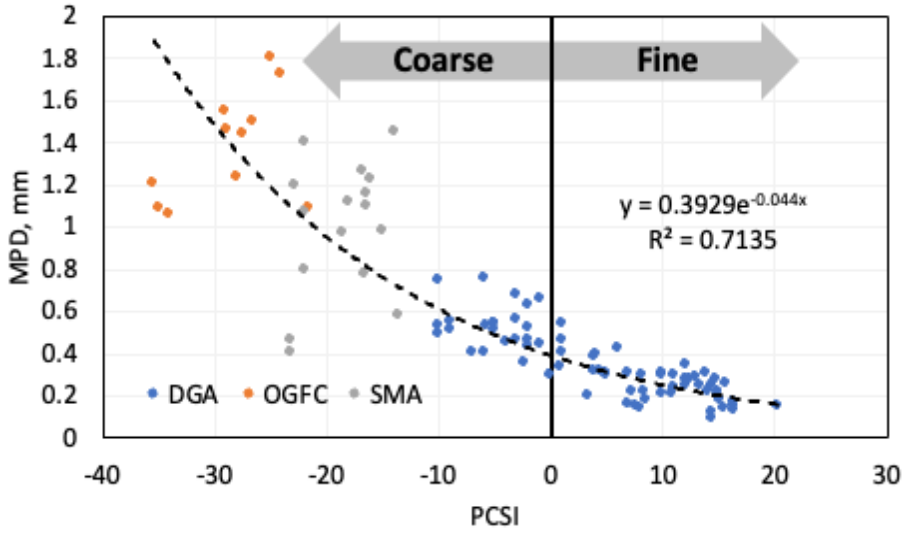


Figure 1: Relationship between PCSI and mean profile depth from NCAT Test Track (NCAT Report 21-01).

Pavement surface texture plays a significant role in maintaining safe roadways.

As expected, OGFC are the coarsest group of mixes, with PCSI values less than -20. This indicates that the percent passing the PCS for these OGFC mixes is at least 20% below the MDL.

Unsurprisingly, OGFC mixtures on the Track yield the highest texture. Every OGFC mix had MPD values after construction greater than 1.0 mm. SMA mixtures are not as coarse as OGFC mixes but are coarser than DGA mixes. The texture of the SMA mixes on the first four cycles of the Test Track varied from as low as 0.4 to as high as 1.4. SMA mixtures should typically have more texture than coarse dense-graded mixes.

Finally, the PCSI zone between -10 and 20 represents the DGA mixes. A clearer trend exists between texture and PCSI for DGA mixes. The probability of increased texture increases as mixes move coarser. Fine-graded 9.5 mm NMAS mixes represent a majority of the cluster of data between approximately 13 and 20 PCSI values. These sections also represent most of the sections with the lowest texture in the entire group.

The PCSI parameter adequately differentiates between mixture types and also correlates with texture very well. The coefficient of determination (R^2) of the best-fit, representing an exponential relationship between PCSI and texture indicates that 71% of the variability in texture in these surfaces is explained by the PCSI alone.

The main source of variability in this relationship is the OGFC and SMA mixes. These mixes are significantly coarser mixes which are more prone to segregate during construction than fine mixes.

Regardless, the relationship between PCSI and texture is clear.

Texture alone does not predict friction performance. Asphalt pavement friction relies on the microtexture of the aggregate particles to provide adequate skid resistance. However, texture plays a vital role in building and maintaining safe roadways and should not be ignored.

For mix designers, safety engineers, or pavement engineers, the PCSI provides a useful index to describe gradation and its effect on surface texture of asphalt pavements.

Contact Nathan Moore at nathan.moore@auburn.edu, for more information about this project.

Members of the Consortium for Asphalt Pavement Research and Implementation (CAPRI) met at Astec Inc. in Chattanooga, Tenn. The group, which includes about 50 organizations, also met in Indianapolis, Auburn, Charleston, and plans meetings this fall in Fairfax, Va., and next spring in Ridgeland, Miss.

CAPRI Gains Momentum

The Consortium for Asphalt Pavement Research and Implementation (CAPRI) is picking up steam to address gaps in research and foster the implementation of best practices and research findings.

Started in 2021, CAPRI welcomes all stakeholder organizations that wish to influence the discussions on resource allocation for national needs.

Currently, CAPRI includes about 50 organizations, including about half of the state DOTs. Members also include contractors, associations, suppliers, and research institutions.

All CAPRI members contribute financially, but the investment is quite low. Highway agencies contribute $10,000 per year, which covers travel reimbursement for the two CAPRI meetings each year. All other organizations pay $6,000 per year and cover their own travel costs.

Meetings are typically in March and October and are hosted by a member organization, giving participants the opportunity to learn more about other consortium members.

To date, meetings have been hosted by Heritage Research Group in Indianapolis, NCAT in Auburn, Ala., Ingevity in Charleston, S.C., and Astec Inc. in Chattanooga, Tenn. This Fall, the Virginia DOT is hosting the meeting in Fairfax, Va., and next Spring, the Mississippi DOT and Ergon are co-hosting the meeting in Ridgeland, Miss.

Jason Blomberg, with the Missouri DOT added, "I've really enjoyed the discussions at CAPRI meetings and connecting with very knowledgeable people from all across the country. A bonus is being able to see first-hand amazing facilities like Astec's plant manufacturing facility and the labs we've visited at Heritage, NCAT, and Ingevity."

At the first few meetings when everyone shared their challenges and ideas, discussions covered a range of asphalt pavement issues affecting performance and sustainability. In some cases, several participants were unaware of recently completed studies or

Formation: Established in 2021, CAPRI aims to fill research voids and encourage the application of research outcomes and best practices.

Identifying Needs: One of CAPRI's early projects focused on crafting a guide for executing field validation experiments concerning Balanced Mix Design (BMD).

CAPRI
CONSORTIUM FOR ASPHALT PAVEMENT RESEARCH AND IMPLEMENTATION

Filling the Gap: This particular research topic had previously been identified as high priority but was not selected for funding from NCHRP for 2022.

NCAT's Role: CAPRI awarded this project to NCAT in March of the same year. The draft guide by NCAT is currently under review.

ongoing research to explore solutions to common problems.

The open conversations were enlightening and helped bring into focus a few prioritized topics.

At the spring 2023 CAPRI meeting, two topics were highlighted: improving in-place density and improving longitudinal joint performance. Resources for improving density have now been curated on the consortium's website: www.capriasphalt.us.

The fall 2023 meeting will have further discussions on improving longitudinal joints, and then the focus will shift to Balanced Mix Design (BMD).

One of the first projects commissioned by CAPRI was the development of a guide for building field validation experiments for BMD.

That was a highly-rated research need statement that was initiated out of a Transportation Research Board (TRB) committee but didn't get funded by National Cooperative Highway Research Program (NCHRP) in 2022.

Seeing a need unfulfilled, CAPRI picked it up and awarded the work to NCAT last March. The draft guide was completed in seven months and is being reviewed before the fall 2023 meeting.

"This project is a great example of how CAPRI can fill in a research gap very quickly to help the asphalt community advance technologies in a more timely fashion," notes Jon Epps of the Texas Transportation Institute.

The consortium is directed by an Executive Committee consisting of representatives from 11 member organizations, including four highway agencies, the Federal Highway Administration (FHWA), one representative from the Asphalt Institute, one representative from the National Asphalt Pavement Association (NAPA), one representative from a State Asphalt Pavement Association, two contractor representatives, and one representative from a university research center or private research organization engaged in asphalt pavement research.

The Executive Committee drafted bylaws in 2021, that were ratified by representatives from all member organizations in the first year of operation.

"We want to continue to grow CAPRI so that we can be sure to be a forum that involves all stakeholders," says Richard Willis of NAPA.

Information about how to join CAPRI can be found at www.capriasphalt.us.

Contact Randy West at westran@auburn.edu for more information about CAPRI or visit www.capriasphalt.us.

NCAT submits Draft Test Method for HT-IDT to ASTM

The high-temperature indirect tension test (HT-IDT) is gaining interest as a BMD test for rutting susceptibility.

The HT-IDT was first suggested as a rutting indicator for mix design by Christensen et al. in National Cooperative Highway Research Program (NCHRP) Report 673 in 2011. Their original work involved specimens compacted to N_{design}.

Other researchers have since demonstrated a good correlation between the HT-IDT and more popular rutting tests, like the Asphalt Pavement Analyzer (Bennert, et al. 2018) and the Hamburg Wheel Tracking Test (HWTT) (Chen, et al. 2023).

Recognizing the potential for widespread adoption of this test and the need for a national standard test method, NCAT researchers submitted a draft test method for the HT-IDT to the American Society for Testing and Materials (ASTM), which develops and publishes voluntary consensus technical standards.

The current ASTM method for the indirect tension test (ASTM D6931) is typically used for intermediate-temperature testing to assess the potential for cracking or moisture damage.

A few states are evaluating the HT-IDT as a simple rutting test for BMD. However, without a national standard, the test methods being used by the states are slightly different, which could cause confusion about results and proposed criteria.

Before widespread adoption, test parameters like test temperature selection, specimen thickness and air void content, conditioning method and time, etc. must first be standardized.

In 2021, NCAT conducted a study to compare results from rapid rutting tests (including the HT-IDT) with the results of wheel tracking tests. That study, summarized in the Spring 2023 edition of Asphalt Technology News, found the HT-IDT results were strongly correlated with Hamburg Wheel-Tracking Test (HWTT) results for the surface mixtures placed on the 2021 NCAT Test Track.

Based on the relationship between the HT-IDT and HWTT results, NCAT researchers suggested 20 psi as a reasonable threshold value for rutting with the HT-IDT test at the NCAT Test Track. This criterion will be further evaluated when the final field rutting data from the 2021 Track are available.

The High-Temperature indirect tension test (HT-IDT).

The ASTM draft test method includes information from the 2021 NCAT Round Robin for a preliminary precision and bias statement. Sixteen labs participated in the HT-IDT round-robin from which it was determined that the within-lab coefficient of variation (CV) was 8.3% and the between-lab CV was 14.6% for the single mixture used in that study.

The draft test method for a national standard for the HT-IDT was balloted by ASTM in August and September of 2023. It is anticipated that the asphalt testing stakeholders will provide feedback in the form of comments or negative votes until a standardized test is approved.

Establishing a national standard for the HT-IDT will continue to elevate the utility of performance tests being considered for BMD. Stakeholders that are not currently using the HT-IDT would be able to adopt or modify the national standard to suit their needs and decrease the potential for rutting in pavements.

Rutting can lead to ponding of water in wheelpaths and increase the potential for hydroplaning.

References

Advanced Asphalt Technologies, LLC. 2011. NCHRP Report 673: A Manual for Design of Hot Mix Asphalt with Commentary. Transportation Research Board, Washington, DC.

Bennert, T, E. Haas, and E. Wass (2018) Indirect Tensile Test (IDT) to Determine Asphalt Mixture Performance Indicators during Quality Control Testing in New Jersey, Transportation Research Record 2018, Vol. 2672(28). National Academies of Sciences.

Chen et al (2023) Validation of Rapid Rutting Test Procedures Using Plant Mixtures from the 2021 NCAT Test Track, Asphalt Technology News, Spring 2023 Edition.

Contact Nathan Moore at nathan.moore@auburn.edu or Adam Taylor at tayloa3@auburn.edu for more information about this project.

Upcoming Training at NCAT

- Nov. 14-16, 2023: Balanced Mix Design.
- Jan. 30-Feb. 1, 2024: Advanced Mix Design.
- Feb. 5-9, 2024: Asphalt Engineers Workshop.
- Feb. 26-March 1, 2024: Asphalt Technology Course.
- March 12-14, 2024: Balanced Mix Design.
- April 1-5, 2024: Asphalt Mix Design.

Please contact Stacie Hunter (slh0037@auburn.edu) for more information.

Also, subscribe to the "Training In Your Pocket" YouTube channel at https://www.youtube.com/@TrainingInYourPocket.

Test Track hosts Inertial Profiler Certification Program

Since 2009, NCAT has provided a certification program for the Inertial Profilers. Each year, more than 40 operators and their profilers come to NCAT for their certifications, as state DOTs generally require an annual certification for operators to use their systems on state jobs.

A "profiler" is a data collection vehicle, usually a van or truck equipped with a system of lasers, accelerometers, and other sensors to measure pavement surface characteristics as it is driven at regular traffic speeds. These data typically include smoothness, rutting, distress, and texture.

Currently, profiler calibrations only deal with smoothness data since this is a common pay factor for many pavement construction or rehabilitation projects. Rough or uneven pavements adversely affects driver safety, fuel efficiency, ride quality, vehicle and tire condition, and pavement durability.

The NCAT Test Track, first constructed in 2000 to study the impacts of heavy traffic on asphalt pavement mixtures, also offers advantages for certification of Inertial Profilers. For its core mission, a fleet of trucks applies over a decade of typical interstate-type traffic in only two years in order to assess how the experimental pavements withstand harsh loading conditions.

As part of the weekly operation schedule, the fleet idles on Mondays to perform maintenance on the tractor-trailers and provide safe access to the test sections for the pavement researchers.

The Alabama Department of Transportation recognized the need to ensure profiling equipment met industry standards (AASHTO R-56 and R-57) and identified the Test Track as an ideal location given the facility's controlled access for safe testing, the opportunity to build test sections with targeted levels of roughness in the untrafficked lane, and proximity to in-state contractors.

ALDOT provided the initial funding support for the certification program, which helped NCAT acquire equipment, establish suitable pavement sections for certification, develop the training curriculum, and write the specification requirements.

A profiler is a specially-equipped vehicle loaded with a system of lasers, accelerometers and other sensors often driven over highways at regular traffic speeds to collect data on smoothness.

Highway departments have used segments of open roadways to serve as profiler certification sites, but doing so is less-than-ideal and makes it more challenging for profiles to remain consistent over time. While in use, the lane must be routinely closed for baseline profiles using walking profilers. Other profiler certification programs use low-volume roads or abandoned airports, but these sites are often in remote locations and may lack supporting facilities.

To represent the range of conditions that are present in an agency's network, locations chosen for profiler certification sites also need to offer pavements with varying levels of relatively rough and smooth pavement sections together in close proximity.

At the NCAT Test Track, the vast majority of research test sections are located in the right lane, leaving the left lane available for profiler-specific pavements and operations. The left lane, which is not typically subjected to heavy truck

In 2020, NCAT added this fully-automated PathRunner profiler data collection vehicle with a 3D automated crack and rutting detection system to its fleet to assess pavement conditions on the Test Track, local pavement preservation experiment locations, and other field projects. Such profilers depend on accuracy to provide helpful information out in the field. These vehicles are brought to the NCAT Test Track to compare their measurements to the baseline measurements to ensure accuracy and repeatability.

passes, maintains a constant smoothness or International Roughness Index (IRI) over many years. This allows profiler operators to monitor equipment performance over time and evaluate accuracy against the baseline profile as well as historical measurements taken in previous years.

Four sections are used to evaluate profiler accuracy and repeatability, including three dense-graded asphalt mixtures (smooth, medium-smooth, and medium-rough) and a smooth open-graded friction course. Each profiler certification section is one-tenth of a mile in length and located in the straight parts of the 1.7-mile oval track to avoid complications with the profiler's accelerometers in the steep curves.

Assistant Research Engineer Grant Julian is the certification coordinator and typically accepts profiler certification clients two Mondays out of each month throughout the year.

The certification course consists of a half day of classroom training and a written exam, followed by verification testing of each of the profiler's primary components (accelerometers, distance measuring instrument (DMI), and height sensor), followed by multiple test-runs on the certification sections at highway speeds. Profilers and operators must show a repeatability average of 92% and an accuracy average of 90% compared to the baseline profile.

NCAT's profiler certification program serves as the annual certification site for all profilers used on ALDOT projects and provides an evaluation compliant with AASHTO R-56 that can be used by other highway agencies. Use of the NCAT Test Track offers advantages to operators who rely on the accurate collection of data from Profilers for their management of asphalt pavements. For more on NCAT's profiler certification program, contact Julian at juliagg@auburn.edu.

For more information on NCAT's profiler certification program, contact Grant Julian at juliagg@auburn.edu.

The 2021 Track Conference attracted 218 in-person attendees, including these who inspected the Test Track.

NCAT Test Track Conference scheduled for May 7-9, 2024

Concluding the Current Research Cycle, Preparing for the Future

The end-of-cycle NCAT Test Track Conference will take place May 7-9, 2024 on the Auburn University campus. The agenda will focus on providing practical findings and implementation value in three research areas: mix and materials, structural pavement design, and pavement preservation.

While the conference's central emphasis will focus on the NCAT Test Track, researchers will also delve into mix performance testing and preservation findings stemming from the collaborative partnership with the Minnesota DOT Road Research Facility (MnROAD).

The nation's two largest full-scale pavement testing facilities, NCAT and MnROAD, have conducted accelerated pavement testing for more than two decades and have been engaged in a research partnership since 2015.

Flexible pavement studies are cooperatively funded by state DOTs from all over the country using real construction methods and live trafficking under actual climate conditions. This provides an authentic environment for researchers to study and evaluate the performance of materials used in roadway construction.

The first day of the conference will focus on findings from mix/materials and structural pavement analysis research, and include a tour of the NCAT Test Track.

Presentations will cover topics such as:

- the impact of fibers and recycled materials additives on pavement life
- balanced mix design with and without additives
- designing mixes for minimum and enhanced friction performance
- interlayer bond strengths with different tack products and rates
- high performance open-graded friction course mix design
- innovative high polymer using new and innovative methods
- the impact of in-place density on inlay performance
- environmental product declarations.

Structural pavement analysis presentations will include the impact of:

- lime modification and cement stabilization on mechanistic-empirical design methodologies
- thick layer paving for rapid rebuilds
- cold recycling structural contribution and fix unneeded return, alignment
- reflective cracking mitigation strategies

The second day will be dedicated to pavement preservation, featuring a guided walking tour of Lee Road 159.

Presentations in the technical sessions will include:

- emulsion-based treatments
- thinlays
- cold recycling
- various treatment combinations from both the southern and northern test sections.

Presentations will feature an enhanced online tool to highlight the life-extending and condition-improving benefit curves of each treatment as a function of the pretreatment pavement condition.

The overview will include low- and high-traffic preservation test sections in Alabama and Minnesota. The day will conclude with a reception and working dinner, complemented by an informative and entertaining guest speaker.

On the final day, researchers will delve into the practical implementation of findings and future plans.

The NCAT Test Track will be rebuilt for the ninth research cycle in the summer of 2024 and is expected to include traffic continuation of surviving Additive Group test sections at NCAT and MnROAD. Conventional and high-performance cold recycling is also expected to play a large role in the 2024 research cycle.

Data collection will continue on southern and northern preservation test sections through phase three of the preservation group experiment, which can be explored in detail at https://pooledfund.org/Details/Study/754.

The previous track conference in 2021 exceeded expectations in terms of participation. We had a remarkable turnout, with 218 in-person participants and an additional 149 participating remotely. Notably, almost half of the attendees were from highway agencies and research sponsors, underlining the strong interest and commitment from this sector.

Approximately a quarter of the attendees represented material and equipment suppliers, showcasing the vital role they play in supporting our initiatives.

The remaining quarter encompassed a diverse mix of participants, including contractors, industry associations, and consultants, highlighting the conference's broad appeal across all sectors of the pavement industry.

A wealth of data will be shared during the conference planned May 7-9, 2024.

Contact Buzz Powell (left) at buzz@auburn.edu for more information about this project.

Auburn Civil Engineering Assistant Professor Benjamin Bowers supervises graduate student Elizabeth Turochy.

Graduate School: Is it Right for Me?

Auburn University and NCAT provide Premier Graduate Program in Pavements and Materials

This is an exciting time to be a civil engineer, and your expressway ramp to a rewarding career in pavement engineering may begin with graduate school at Auburn University and a research assistantship through NCAT.

Over the past three decades, more than 100 pavement engineers began their careers with a graduate degree from Auburn. We are proud of all our former graduates who have become leaders in all segments of the industry and are making a difference around the world.

Today, our exceptional students are involved in developing technologies that will lead to net-zero carbon pavements that will continue to serve as the backbone of our transportation infrastructure and support a growing economy.

A Master's or Ph.D. degree at Auburn combines a top-notch classroom education from Auburn's outstanding Civil & Environmental Engineering faculty with practical, hands-on experience with materials testing, pavement construction, pavement design and analysis, and pavement preservation.

We currently have 16 graduate students in the Pavements & Materials area.

With nine Pavement & Materials faculty members and 11 additional highly qualified NCAT research engineers, each grad student interacts daily with a phenomenal team of experts who love sharing their knowledge with students.

Each student earns a Research or Teaching Assistantship that includes a tuition waiver, and most receive an additional financial fellowship to live humbly without a student loan.

The Auburn experience is captured in the Auburn Creed, penned by Dr. George Petrie in 1943.

Petrie held various positions during his long tenure at Auburn including professor of history and Latin, head of the History Department, and dean of the Graduate School. Petrie also organized and coached Auburn's first football team in 1892.

The first line of the Auburn Creed is:

I believe in a practical world and that I can count only on what I earn.

Therefore, I believe in work, hard work.

The creed goes on to read:

I believe in education, which gives me the knowledge to work wisely

and trains my mind and my hands to work skillfully...

I believe in the human touch, which cultivates sympathy with my fellow men

and mutual helpfulness and brings happiness for all.

The faculty and staff work hard to teach our students practical lessons, connecting theory to practice. We value hard work and recognize it will take hard work to meet the challenges of building and maintaining our infrastructure in a circular economy.

We conduct courses in person and online, hosting students in our state-of-the-art lab for a hands-on-experience (this goes for our online students too). We focus on helping our students achieve their educational goals, we want to see them happy and successful.

In addition to the traditional on-campus graduate student experience, the Pavements & Materials program offers other excellent educational opportunities for working professionals through distance learning.

Auburn's online graduate programs are among the nation's best, according to U.S. News & World Report's 2023 Best Online Program rankings released earlier this year.

In fact, Auburn's Civil & Environmental Programs ranked 3rd nationally. Even if a master's degree or Ph.D. is not for you, there may be specific pavements-related courses that interest you, and fortunately, all of the courses taught by Auburn's pavements faculty are available online.

For more information about courses, programs, and degree options at Auburn University, please visit our website at https://aub.ie/PAVOnline.

The median starting salary for a student with a bachelor's degree in civil engineering is $74,749. The median starting salary for a master's degree in civil engineering is $83,092, according to indeed.com.

NCAT Associate Research Professor/Lead Researcher Carolina Rodezno, right, speaks with Liz Pereira Valenca Silva, left, a Brazilian graduate student attending Auburn. NCAT hosts 16 graduate students in the Pavements & Materials area this fall.

Generally, engineers with graduate degrees have higher earning potential throughout their careers, and the advanced coursework and knowledge open advancement and leadership opportunities and certain career paths that may not be open to engineers with bachelor degrees only.

If you're interested in learning more about the program(s) visit https://aub.ie/PAVOnline or contact Dr. Benjamin Bowers, Graduate Coordinator of the Pavement and Materials Group at bfbowers@auburn.edu or any of the other NCAT faculty.

Contact Randy West (left) at westran@auburn.edu or Benjamin Bowers (right) at bfbowers@auburn.edu for more information about graduate studies at Auburn.

New Faces at NCAT

Tom Harman, Senior Research Engineer

At NCAT, Tom supports the delivery of training programs on asphalt-related topics while conducting cutting-edge research on asphalt materials, quality assurance systems, mixture design, and other emerging technologies.

Before joining NCAT in March 2023, Tom served as National Highway Institute (NHI) Director for the Federal Highway Administration, where he served in a wide range of expanding roles over 33 years. His accomplishments at FHWA include overseeing the development of an accredited training portfolio including over 400 courses across 18 transportation disciplines. He pioneered the deployment of the SHRP Superpave system and oversaw the mobile asphalt laboratory program. He also established strategic partnerships with industry stakeholders to enhance training offerings and expand the institute's reach.

As director of the FHWA Center for Accelerating Innovation, he oversaw the Every-Day Counts Program, a national initiative aimed at promoting innovation in transportation projects. He also spearheaded research and implementation efforts related to asphalt mixture design and played a key role in shaping national policies and standards related to asphalt pavement design and construction.

Tom earned his Bachelor's degree in Civil Engineering from the University of Maryland in 1985, his Master's from the University of Illinois in 1987, and has conducted post graduate studies in civil engineering. Tom is a NHI certified instructor and has 11 published articles and workshops, 48 published papers and has written 67 FHWA reports to numerous published articles, papers, reports and workshops.

Tom holds a U.S. patent on a gyratory compactor angle measurement device.

He and his wife, Sharon, were married in 1996 and have three children: Ashley, Corey and Connor. He engages in Special Olympics golf with his son Corey, practices martial arts and showcases his musical talent in guitar and percussion at his local church.

Steven Stiefel, Communications Specialist

Steven Stiefel started at NCAT in August 2023. He handles copy writing and editing, graphic design, photography, social media and putting together newsletters.

He was previously publisher of the Fort Payne Times-Journal newspaper and is a freelance photographer who sees his work regularly published in various magazines and on websites.

Steven graduated from Auburn University in 1989 with a degree in communications. He earned his Master's in strategic communications from Troy University in 2013. Outside of work, he enjoys listening to live music, and spending time with family and friends going to Auburn football and other events.

Mike Ellenberger, Lab Technician

Mike started with NCAT in August and works in our Auburn laboratory. He originally moved to Auburn in 1985 to study wildlife management at the university.

"I've never wanted to leave East Alabama," he said.

He has spent the last 30 years as a project manager running a wildlife management and endangered species consulting company.

A passionate hobby of his is fishing. He claims to cast his rod in "everything from the tiniest rivulet to the greatest rivers, and small puddles to vast seas. Have flyrod, will travel!"

Robert Scroggins, Lab Technician

Robert works regularly from the NCAT Test Track in Opelika. He joined us in June 2022.

Prior to working for NCAT, Robert was employed by an environmental engineering consultant company. He specialized in industrial emissions testing and served as a member of the emergency response team that aided in natural disaster efforts.

He graduated from Auburn University in 2012 with a Bachelor's degree in geography.

His hobbies include kayaking, disc golf, camping, hiking and other outdoor activities.

Chris Sullivan, Building Maintenance

Chris started at NCAT in August and maintains NCAT facilities. Before coming to NCAT, he worked with Landscape Services.

He was born and raised in Birmingham. He graduated from Auburn University with a degree in poultry science. He worked in a poultry processing plant in Decatur, AL., for 12 years, then moved to Montgomery to start a sign business. While there, he worked for Montgomery Academy and St. James School for 16 years in facility management.

A couple of years ago, Chris and his wife, Lane, returned to Auburn, where they initially met. The couple has three children. Their daughter Gracie is an Auburn senior and a member of the defending Southeastern Conference and national runner-up equestrian team. Their son Tom is a wildlife biologist in Mobile and their other son, John, works for a sporting goods company in Atlanta.

When he isn't working, Chris enjoys hunting, fishing and playing golf.

Specification Corner

WEST VIRGINIA DOT
We plan a complete rewrite of our design RAP requirements. Currently, we require the use of a blending chart per the old AASHTO standard. We look forward to discussing potential changes with other DOTs at the Indy Pavement Recycling Summit in October.

UTAH DOT
We are implementing HiMod High Density HMA pavements on our interstate and high volume pavements and bridge decks. This came out of our demonstration project back in 2021 at the I-80 Wendover POE where we placed a 6 inch lift with PG 76-34 binder and achieved full depth compaction at 97 percent. We are using is a 50 gyration 1 to 1.5 percent void mix with a minimum 6.0 percent binder (6.2 percent for bridge decks), VFA required is 90 to 95 percent. This typically comes out at nearly zero voids with 75 gyrations. We have completed multiple project this year with full bonus on density, with the higher requirement target of 96 percent. This mix is also very rut resistant, typically at 4 mm rut with 20,000 passes in the Hamburg with a water temperature of 54 C. IDEAL-CT numbers are around 800 to 1000. The cost for this mix has come in under that of SMA. Our 13 mile project this summer on SR 196 had an installed price of $103 per ton. Bridge decks and smaller projects have been higher. We are consistently achieving 96 percent compaction on bridge decks (3 to 4 inch lifts) with only static rolling.

IOWA DOT
Updated PWL payment schedules based on a 10 year review and analysis.

MICHIGAN DOT
We created an optional PWL spec for SMA mixtures that pay based on Air Voids, Vbe and Density, our normal pay factors are AV, VMA, AC content and Density. The goal was to create a spec that was fair to the contractor and DOT and encourage good quality mix that was being penalized under the old spec but was performing well in service. We recently changed our PWL spec to raise the upper AC content limit to 0.50 from 0.35. We had been seeing projects where 1 or 2 sublots were in the +0.35 to +0.50 range that were performing well in the field and not exhibiting any concerns with too much AC in the mix.

OHIO DOT
At the beginning of 2023, Ohio DOT started requiring a minimum dosage of antistrip for mixes that contain coarse gravel, more than 25% natural sand, or more than 20% RAP that contained coarse gravel. At the beginning of 2023, we also started pilot projects with PWL for density and will gradually increase over a three-year implementation period. We used average of 10 cores previously.

New AAPT student chapter welcomes guest speakers

The Association of Asphalt Paving Technologists (AAPT) Student Chapter at Auburn University welcomed guest speakers Matthew Hoyle and Dr. Ben Cox to their inaugural event at the Brown Kopel Engineering Student Achievement Center on Sept. 6. The students, led by Elizabeth Turochy, enjoyed their presentation on “Paving asphalt anywhere in the world: A day in the life of DOD Airfield Construction.”

Asphalt Forum

NCAT invites comments and questions submitted to Steven Stiefel at sds0082@auburn.edu.

The following responses were received to questions shared in the previous issue.

> *What type of mix design program do you use or allow (web-based, spreadsheet, or other, and why)?*
>
> *-Tony Collins, North Carolina DOT*

SHAWN D. JACK, WEST VIRGINIA DOT
WVDOH uses an Excel-based workbook for mix designs. The workbook format allows us to incorporate all design requirements while allowing the sheets to communicate and automatically populate in-house forms.

NATHAN MAACK, MICHIGAN DOT
Michigan DOT has a spreadsheet that was developed in-house for reviewing contractor submitted mix designs. Contractors are free to use whatever tools they wish to develop their mix design but our spreadsheet is the contract document used for production. Very rarely is there a major difference between our numbers but when there is we work with the contractor to resolve it.

ASHLEY BUSS, IOWA DOT
Iowa DOT uses a spreadsheet called SHADES. There are macros to automate updates from our aggregate database. The spreadsheet allows import from Hamburg test results. The mixture design spreadsheet will import Iowa DOT's plant report (also a spreadsheet) which is used during production. The spreadsheets are used to populate databases. We use FME software to perform this.

> *Which state DOTs pay for binder as a separate binder vs. which consider it incidental to the pant mix payment? Wyoming pays for it separately but I've heard that the majority of states don't.*
>
> *- Greg Milburn, Wyoming DOT*

H. ANDERSON, UTAH DOT
We pay for the binder as part of the mix.

ROBERT REA, NEBRASKA DOT
Nebraska pays for binder separately. Virgin binder quantity savings in the mix that is reduced by the use of RAP, is shared with the contractor. Contractor receives 15% of the savings and the NDOT gets 85% of the binder savings.

NATHAN MAACK, MICHIGAN DOT
Michigan DOT pays for as incidental to the mix cost.

ASHLEY BUSS, IOWA DOT
Iowa DOT pays for it separately and I believe we avoid many issues in doing so.

GREGORY SCHOLAR, FLORIDA DOT
At FDOT, asphalt binder is included in the unit cost of the mix. It is not a separate pay item.

VINCENT BATTISTA, COLORADO DOT
CDOT does both. One region pays separately, and the other four do not. I'm not sure the historic reason behind the discrepancy, but we do not see significantly different mix designs between the two (other than those due to geographical differences).

ERIC BIEHL, OHIO DOT
Ohio DOT considers binder incidental.

> *Are there any states who are using bag house fines as "mineral filler" in SMA mixes? Are you experiencing any issues with using them?*
>
> *- Susan Dukes, South Carolina DOT*

ROBERT REA, NEBRASKA DOT
We really like SMA's but we don't have the abundance of materials necessary to make these mixes. When we used to produce SMA mixes, we had to import quite a bit of quartzite from South Dakota. We did not use bag house fines as filler.

> *Has anyone experience significant issues achieving compaction in the field with some of the "extreme" MSCR grades, i.e., 58V-34? or 58E-34? Any other issues when moving to MSCR from the field? Our switch from -28 to -34 has everyone nervous.*
>
> *- Oak Metcalfe, Montana DOT*

ERIC BIEHL, OHIO DOT
No issues we are aware of in Ohio. We don't use MSCR, but we have PG-88-22 and haven't had issues. Most issues we saw early with that grade was the binder thickening while waiting to be used, which would lead to compaction issues.

ROBERT REA, NEBRASKA DOT
No significant issues for Nebraska. The minus 34 starts with a softer base binder. The V and E grades have required the same or similar compaction efforts due to the high polymer loading required to meet this grade.

AUBURN UNIVERSITY
Samuel Ginn College of Engineering

1161 W. Samford Ave., Building 8
Auburn, AL 36849

National Center for Asphalt Technology
277 Technology Parkway
Auburn, AL 36830-5354
eng.auburn.edu/NCAT

Randy West Director
Steven Stiefel Editor

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