

PAVING THE WAY

RUSS COLLEGE PAVEMENT RESEARCH SEES THE FUTURE

What's a dream come true for people who use our country's highways every day to get to work, or for day trips or vacations? If you took a survey, one sure wish would be to eliminate road construction and maintenance delays or detours.

This dream could actually be a reality today, says Gayle Mitchell, chair of the Department of Civil Engineering and director of the Russ College's Ohio Research Institute for Transportation and the Environment (ORITE).

"A new design approach has already been developed that will enable asphalt pavement to last 50 years with minimum maintenance," Mitchell said.

That's the challenge of today's highway pavement design and research: constructing the 50-year road. ORITE has seen the future and is building a National Asphalt Laboratory in Lancaster, Ohio, to provide the research base and infrastructure required to meet that challenge.



Preparing for later measurement of strain due to traffic load, ORITE Research Engineer Issam Khoury and civil engineering graduate student Michael Romanello install asphalt strain gauges on US30 in Wayne County.

Asphalt: The Wonder Material

In 2001, 3.9 million miles of highway crisscrossed the United States and carried motorists more than 2.7 trillion miles. If you drive on highways, you know that roads built 10, 15, and 20 years ago seem like they are in need of constant repair. As highway pavements are exposed to daily traffic, changes in temperature, and seasonal variations in moisture, they eventually start to crack or form dreaded potholes. The better the materials and the more rational the design, the longer the pavement will perform.

Ohio has the fourth largest road network in the nation. But currently, the state has no major facility that can respond to the challenges of new pavement design concepts, or materials and products such as Perpetual Pavement and SuperPave, according to Shad Sargand, Russ Professor of Civil Engineering and ORITE's assistant director.

"With government's increased budgetary constraints, it's essential to build highways that will last longer than in the past," he said. "The Asphalt Lab is needed to evaluate the technologies that will enable us to build longer-lasting highways. It will provide industry and government transportation agencies with vital information needed to meet future challenges in constructing flexible pavements and enable researchers to gain new insights into advanced paving concepts," Sargand explained.

So what makes asphalt the wonder ingredient to a road's longevity and durability? ORITE researcher Sang-Soo Kim, associate professor of civil engineering, says it's asphalt's flexibility. He noted that cooking up the right asphalt "recipe" is a rigorous process.

"We use design inputs like moisture, temperature fluctuations, and traffic load to get the best combination of materials and layer thicknesses. The mixture undergoes many laboratory tests to see how it will behave under traffic loads and certain environments," Kim said. "ORITE can study an entire pavement system under various load and environmental conditions," he added.

Building on Success

Research performed at the Asphalt Lab will complement work being done at ORITE's Accelerated Pavement Load Facility (APLF), located on Ohio University's Lancaster campus. The APLF, a one-of-a-kind, enclosed facility, enables testing of highway pavement under controlled, simulated environmental and traffic

conditions. A pavement system can be constructed to actual highway pavement specifications, and sensors can be installed to monitor the response of the pavement.

“Combined with the APLF and our test road in Delaware County, the Asphalt Lab will give Ohio University a unique capability of fully analyzing and testing asphalt mixes and road structures,” Sargand said.

A major charitable gift from the Kokosing Construction Company, based in Fredericktown, Ohio, will help construct the Asphalt Lab. Kokosing has nearly 30 years of experience in constructing bridges, highways, and concrete and asphalt paving. Brian Burgett, Kokosing president and CEO, believes building this kind of research lab is a critical move toward designing and constructing better highways.

“Ohio University has proven itself to be a leader in asphalt research, and the construction of this new facility will continue to broaden the University’s capabilities. All of us who use the highway system will benefit greatly from this work,” Burgett said.

An additional gift was made by Cem-Base Corporation of Twinsburg, Ohio. It will be used to support research of soil stabilization in pavement design at the lab. Soil stabilization involves adding properties to the soil to enhance its stiffness for supporting pavement structures such as a road.

“Cem-Base, Inc., is proud to be a part of pavement research at Ohio University,” said Trip Morris, Russ College civil engineering alumnus and Cem-Base CEO. “The pavement load facility in Lancaster is world-class, and I’m sure soil stabilization will become a preferred soil improvement method with the research results to be determined by such a recognized source,” he added.

Students will benefit from the Asphalt Lab as well, via hands-on training that complements the Department of Civil Engineering’s recent introduction of classes on asphalt mixing and pavement design.

ORITE is poised to tackle these challenges based on its national prominence as a premier transportation research institute. It has built test sections of roads with built-in monitoring systems that measure everything from surface temperature and moisture to road strain and pressure. Test sections include US 23 in Delaware County, US 33 in Logan County, and the new WAY30 project in Wayne County. (“WAY30” comes from the Ohio Department of Transportation’s format for naming projects—using a three-letter county abbreviation, followed by the route number.)

ORITE has also conducted many research projects for state and federal government agencies. The institute’s Center for Pipe and Underground Structures was selected as one of only three U.S. centers for testing thermoplastic pipe and resin products. It has several other ongoing research projects that provide valuable information on pipe design and how pipes perform under heavy loads.

Quieter, safer, easier-to-maintain roadways that last up to half a century? That’s a solution with wheels. 🚗



Shad Sargand, Russ Professor of Civil Engineering and assistant director of ORITE, carries concrete to fill strain-gauge boxes prior to placement of concrete on US50 East in Athens.

REBUILDING LAND—AND LIVES

More than 20 years of Soviet occupation, civil war, and the post-9/11 U.S. invasion have left Afghanistan’s roads, schools, buildings, and water systems decrepit or non-existent. But the country is slowly beginning to rebuild.

Russ Professor Shad Sargand was born in 1954 in Kabul, Afghanistan, and grew up in a village near the Pakistani border during tense times in the history of Afghani-Pakistani relations. Today, he’s a nationally recognized expert on pavements, culverts and pipes, bridges, and other highway structures.

In February 2003, Sargand and the Russ College hosted Afghanistan’s first deputy minister of the Ministry of Rural Rehabilitation and Development, Kamaluddin Nizami. It so happens that the two are old high school buddies. Sargand met with his fellow engineer to see how he could help his native countrymen build a new life. Having gone back to Afghanistan since 9/11, Sargand has experienced his home’s needs firsthand.

“Various companies involved are using different guidelines and specifications, and there is no way to verify that any standards are being met. Lack of quality control in the field can also lead to mistakes that jeopardize the safety of citizens,” Sargand said.

Since Nizami’s visit, the Russ College’s support for an organized effort in rebuilding civil infrastructures in Afghanistan has grown. U.S. Representative Bob Ney, who represents Ohio’s 18th District and is co-chair of the U.S.-Afghanistan Caucus, successfully lobbied support for a bill in the House to provide funding.

Hinging on Senate approval, the project has three main objectives. First, it aims to ensure that those working on Afghanistan’s infrastructure use good methods and materials. Thus, the Russ College and the Ohio Research Institute for Transportation and the Environment have offered to train degreed Afghan engineers at Ohio University for one year in best practices.

The second objective is to train Afghan engineers to maintain the infrastructure. This means building a national test lab in Kabul while Afghan engineers are being taught statewide. The lab would establish one, high-quality standard, which would help the nation become independent in building and maintaining roads.

Civil engineering faculty will coach the engineers for a time after they return to Kabul. Assistant Professor of Civil Engineering L. Sebastian Bryson will consult on geotechnical and foundation engineering efforts, and the

design and construction of foundation systems for bridge and building structures.

“What interests me is that my contributions will possibly have far reaching effects on the people of Afghanistan,” Bryson said.

The third objective is to give Afghanistan a sense of ownership and pride in the reconstruction of its national infrastructure. Its engineers will be trained to implement a fee collection and maintenance system, possibly based on U.S. toll-based highways.

Ohio University first proposes to host a workshop to discuss the issues surrounding the effort. Attendees would include Russ College faculty, Afghan representatives, Representative Ney (who is fluent in the Persian language) and other U.S. legislators, Ohio University officials, and various technical experts. The group will discuss the strategy already laid out and how to best achieve its goals.

The overarching theme for this entire humanitarian effort is perhaps best expressed by Ben Stuart, an associate professor of civil engineering in the Russ College.

“As the saying goes, give someone a fish and they eat for a day. Teach someone to fish, and they eat for a lifetime.” 🐟