On the outskirts of Rutgers’ Livingston Campus is a row of barracks, remnants of the WWII-era Camp Kilmer that look every bit their age. Among these is the asphalt lab of CAIT’s Pavement Resource Program (PRP): a facility that may very well have more to do with the roads we drive on every day than any other place in the region.

The PRP asphalt lab is sometimes dirty, sometimes noisy, hot in the summer, and cold in the winter, but it is always, always busy.

Don’t let the lab’s inauspicious exterior fool you. Serious research concerning the present and future state-of-the-art in asphalt paving is happening inside. From fuel-resistant asphalt for runways to more environmentally friendly pavements and alternative materials, PRP’s asphalt pavement laboratory is where state and federal agencies and the paving industry come with their most puzzling and ambitious projects. Established in the late 1990s as the Rutgers Asphalt Pavement Laboratory (RAPL), the PRP pavement lab has grown into a nationally respected asphalt testing and mix design facility. Program director, teacher, and paving expert Tom Bennert, Ph.D., heads up the operation and is largely responsible for the lab’s exponential growth and advancement over the past 10 years.
New year opportunities cultivate creativity

With a new year comes a fresh start; a spring of initiatives rooted in core values and catalyzed by innovation. As we start 2011, we celebrate our past accomplishments and continue our commitment to future success in research, technology transfer, and education.

We—like everyone—have faced challenges this past year, but have emerged even stronger. The uncertain economy has wrought blows to research institutions, public agencies, and policy makers across the board. Despite this, so far in FY 2010/2011 CAIT has secured nearly $12.7 million in grants and contracts for infrastructure research.

Saying good-bye to our many valued partners and colleagues who have moved on to new opportunities is never easy. Thankfully, with these departures come welcome new faces. To strengthen our programs, since the start of the fiscal year CAIT has hired 12 carefully selected, highly qualified full-time researchers and staff and four post-doctoral associates. These new team members will boost productivity in our engineering, education, communication, and administrative efforts. We fully expect more to join us in the coming year.

Despite the still-struggling economy and other challenges, positive change perseveres in the form of better tools, advanced technologies, new programs, and ever stronger public-private partnerships with agencies, industry, and other universities. CAIT also continues its dedication to educate a new generation of emerging researchers and train professionals already hard at work in the transportation field. This year brought to fruition our first international certificate program in infrastructure asset management to be offered in the Middle East (see CIAM story on page 12).

A somewhat unwitting “media darling” of 2010, infrastructure has been thrust into the spotlight with some tragic stories. It’s true, once again, that with each troubling instance of a failure or disaster comes a beneficial change: wider awareness that amplifies our exponentially growing need to revitalize our country’s infrastructure and increase its longevity. While University Transportation Centers (UTCs), groups like the American Society of Civil Engineers (ASCE), and thousands of dedicated transportation professionals in government agencies and the private sector have always worked toward this goal, joining their ranks are select political leaders who are also dedicated to this cause and a public that increasingly recognizes the critical nature of the task at hand.

We look forward to expanded perspectives, creativity, and knowledge that all lead to improvements born of necessity and the will to make things better. Have a safe and productive 2011!

Ali Maher, Director

PRP is one of only a handful of university labs—and the only one in New Jersey—that is accredited by the American Association of State Highway and Transportation Officials (AASHTO), which recently recertified the lab. The accreditation means PRP meets construction-materials testing requirements for the Federal Highway Administration (FHWA), Federal Aviation Administration (FAA), U.S. Army Corps of Engineers, and the Bureau of Reclamation. The value of AASHTO certification is that it assures agencies and commercial paving companies that the asphalt for their project has been tested with strict specifications on calibrated equipment that is run by knowledgeable and thoroughly trained technicians like those on the PRP team. AASHTO accreditation isn’t a one-time deal—labs must recertify every few years to ensure ongoing quality-control and testing standards are compared and upheld across the nation.

If it’s about asphalt, CAIT’s PRP is involved

PRP has grown into a “full-service” asphalt testing and design lab with capabilities in mechanistic pavement design, structural and performance testing, conventional and polymer-modified asphalt, material modeling, aggregate specification and testing, binder development, and now analysis of environmental advances such as recycled asphalt content performance, pavement noise research (see OBSI story on page 7), and warm mix asphalt (WMA).

WMA is one of the most promising environmental developments in asphalt paving. WMA can be produced and laid at lower temperatures than conventional hot mix asphalt (HMA). The “green” benefits of WMA are lower energy consumption in heating the mate-
Right: WMA is one of the most promising environmental developments in asphalt paving. WMA can be produced and laid at lower temperatures than conventional HMA. The “green” benefits of WMA are lower energy consumption when heating the material and lower emissions that reduce negative impacts on pavement workers and air quality.

Below left: PRP is a full-service pavement testing and mix design facility that includes a specialized binder lab where researchers test asphalt binder characteristics and performance for DOTs and industry partners.

Bennert has published at least three papers on reflective cracking—a persistent problem that’s the bane of many road owners—including a paper that won the K.B. Woods prize in the area of design and construction at the Transportation Research Board (TRB) annual meeting in 2008 and also was a top project presented by the New Jersey Department of Transportation (NJDOT) at the AASHTO meeting that year. His comprehensive knowledge is widely valued. Bennert serves on the FHWA Technical Working Group on warm mix asphalt and TRB committees for General Issues in Asphalt Technology (AFK10), Pavement Rehabilitation (AFD70), and Non-bituminous Components of Asphalt Mixtures (AFK30). He is also on the board of directors of the New Jersey Society of Asphalt Technologists (NJSAT).

Bennert’s innovative work also has been featured in national industry publications like FHWA’s Public Roads, NAPA’s Hot Mix Asphalt Technology (HMAT) magazine, and Pavement Preservation Journal, to name a few.

PRP’s reputation, combined with the AASHTO “seal of approval,” brings scores of clients seeking Bennert’s expertise and—as he is quick to point out—the indispensable help of the researchers, technicians, and graduate and undergraduate students on his team. Bennert couldn’t do all the work alone even if he wanted to: the lab does scores of projects each year for NJDOT and other DOTs and agencies in the region. Among PRP’s other clients are the Port Authority of New York and New Jersey (PANYNJ), Garden State Parkway (GSP), and New Jersey Turnpike; industry giants like NuStar, AID, Stantec, and Road Science; and consultant and engineering firms from all over the country. They all turn to PRP because it has a history of helping to solve some of the industry’s most perplexing problems with creative solutions.

The White House, horse urine, and hydroplaning?

In the category of creative solutions, take the issue the Port Authority in New York City was having with roads in Central Park. Hansom cabs are a staple in the city, trotting through more than 6 miles of roadway within the park and the perimeter of its 843 acres. Unfortunately, horse urine is tough on asphalt, especially the binder that holds it together. The solution for binder dissolution turned out to be a fuel-resistant mix PRP developed for runways that was proposed by NuStar Energy, L.P., one of the largest asphalt refiners in the United States with whom PRP works regularly.

PRP’s portfolio also includes involvement in some very high-profile and sometimes unusual projects. In 2009, the FHWA–Eastern Federal Lands Highway Division issued an RFP open to paving manufacturers around the nation to solve a severe cracking problem with the asphalt in front of the White House. NuStar won the contract and came to PRP to test their proposal. Part of their proposed mix design incorporated a unique blend of red, white, and blue aggregate that—once the asphalt was sandblasted—would be unusual and visually iconic. Along with conducting the asphalt mixture designs used to produce the pavement material, PRP determined the fatigue and rutting properties of the asphalt to ensure it would perform up to NuStar’s claims.

The testing for 1600 Pennsylvania Avenue is an example of a significant contribution and a recurring service PRP performs. And, while proving the efficacy of proposed paving alternatives, they occasionally discover a particular asphalt has properties that solve problems beyond the one it was initially designed to combat. Case in point: open-graded friction courses (OGFC).

OGFC asphalt is designed with a greater percentage of air voids that allow stormwater
to drain through the pavement and out to the road shoulder. OGFCs have proven to greatly reduce road surface water and splash and spray, which in turn increases visibility and decreases chance of hydroplaning—both serious safety factors. “Before and after” crash stats on a section of I-95 that PRP worked with NJDOT to pave with an OGFC showed crashes reduced nearly 15.5 percent after the new surface was applied. A somewhat unexpected additional benefit of an OGFC is that water forced through the air voids by vehicle tires gives the pavement a self-cleaning property, clearing out precipitation and debris, which in turn deters degradation and damage from freeze-thaw. OGFC surfaces also tend to be quieter, so it’s safe to say they’re a win-win-win when it comes to safety, lifecycle value, and noise reduction.

The work may start in the lab, but that’s not where it stops

Of all the research PRP does, the work that is implemented in the field is what Bennert and his team are most proud of, whether they are NJDOT contracts or “unofficial” projects like the pavement acoustics testing PRP has recently undertaken. “I feel like our research in things like reflective cracking have the biggest impact. When I know what we study in the lab and in the field is then helping DOTs and people in the paving industry, that’s what we are in business for. We ultimately want to make roads better for people who drive on them every day as well as easier to maintain for the agencies who are responsible for their upkeep.”

Another instance of PRP research that led to real-life application—and subsequent awards—was a bridge deck-wearing course (BDWC), originally developed for PANYNJ to combat severe rutting and other surface performance issues on the George Washington Bridge. The GWB carries approximately 300,000 vehicles per day across the Hudson River making it a critical link in the Northeast corridor. PANYNJ came to PRP with three proposed performance additives to evaluate. Based on rigorous performance testing in the lab, Bennert made the recommendation to use a product from Royston called Rosphalt 50 that made the mix durable, rut resistant, and waterproof—all highly desirable qualities for bridge deck surfaces. At the time it was developed, that specific mix was proprietary to PANYNJ, but recognizing its proven benefits, PRP pushed to have it released more widely and developed a generic performance-based specification that would allow other innovative asphalt mixtures to be used for BDWCs. Now, that mix is specified in NJDOT jobs as well. The generic BDWC that stemmed from the GWB mix was used on an NJDOT job resurfacing the Route 87 bridge in Absecon, New Jersey—a bridge subjected to corrosive salt air and brutal freeze/thaw. The Absecon bridge project went on to win the 2009 National Asphalt Paving Association’s award for innovative asphalt mixture and application.

Partners make it possible

All the great work that PRP has done and continues to do starts with opportunities and support from its partners and customers: NJDOT, FHWA, PANYNJ, and other agencies and countless paving consultants, contractors, and manufacturers. So, although the driving public has much to thank PRP for, the lab would be spinning its wheels without the rest of the industry—public and private. So, next time you take that drive down the street, think about everyone that worked to put it there.

More on the web: PRP testing capabilities and research at cait.rutgers.edu/prp

In this striking side-by-side comparison on I-95, the lanes on the left are paved with an OGFC, the lanes on the right are paved with a conventional asphalt mix. OGFC asphalt has more air voids that allow stormwater to drain through and out to the road shoulder. OGFCs have proven to greatly reduce surface water and splash and spray, which in turn increases visibility and decreases chance of hydroplaning—both serious safety factors.

The resurfacing of the Absecon Inlet Bridge in Atlantic County, NJ, won a NAPA innovation award. PRP teamed with NJDOT to develop the mix.
Riding to independence
Supporting transportation accessibility for individuals with autism

In New Jersey nearly 82 percent of adults with autism rely heavily or exclusively on their family and friends to get around. But more important than the burden that reliance places on caregivers is the fact it significantly hinders a crucial component to anyone’s independence and freedom: mobility.

Due to diverse skill levels within the autism spectrum, not all individuals with autism can capably operate a vehicle or rely on fixed-route public transportation systems on their own. Even two people with the same diagnosis may not have the same functional skills.

Currently there are assessment tools available to transit providers, such as the Functional Assessment of Cognitive Transit Skills. Though existing tools for transit operators and travel trainers can help determine if an individual has the cognitive skills to use fixed-route transit, they don’t provide a thorough understanding of skills that may be missing—such as functional or social skills—for that individual to ride independently. The transit-provider tools also do not give parents or teachers—or autistic individuals themselves—the knowledge of which transportation services could be used with their current skills, or what skills might be developed so wider transportation options are available to them.

Recognizing the need for widely available, standardized assessment for broader transportation skills, CAIT responded to an RFP from the Organization for Autism Research (OAR). Out of an initial group of 101 pre-proposals, CAIT’s was one of only seven to receive a grant. OAR is a national, nonprofit organization formed and led by relatives of children and adults with autism and Asperger Syndrome. They are dedicated to promoting research that can help families, educators, caregivers, and individuals with autism find much-needed answers to their immediate needs and urgent questions. Since 2001, OAR has awarded more than $2.2 million to fund 112 applied research studies.

CAIT proposes to develop a Transportation Skills Assessment Tool (TSAT) that will identify not only what task-specific skills are necessary to use various transportation options and determine the most appropriate ones. It also will address the level of skills required to do so safely, and illuminate possible skill deficiencies and potential improvement measures that may help an individual with autism gain the ability to use the least restrictive mode, and in turn, open wider possibilities for employment, education, and social interaction.

The CAIT team wants to explore making the TSAT web-based, which would facilitate collection of anonymous data. If this data shows a large percentage of adults with autism are lacking key skills needed to access available public transportation options this could bring to light—and quantify—the need for additional educational programs and adult support services, and even be persuasive in developing optional transportation solutions.

The ultimate goal is to broaden these individuals’ geographical and social possibilities, ensure their safety and, hopefully, reduce anxiety for all concerned. Improved mobility is one step closer to independence and enhanced quality of life for both individuals with autism and those who care for them.

More on the web: researchautism.org
Recipe for success: mix one part psychology, one part traffic safety, and 200 safety professionals

The Transportation Safety Resource Center (TSRC) hosted its 6th Annual Safety Forum at Rutgers Livingston Campus Student Center on October 20, 2010. Attended by over 200 traffic safety professionals, the forum explored the depths of transportation psychology, an emerging science in traffic safety.

The Safety Forum provided an all-encompassing look into the science of driver perception and psychology to a diverse group of public and private professionals in engineering, enforcement, education, and emergency medical services. Topics covered included the effects of law enforcement on driving behavior, self-assessed behavior surveying methodologies, teen personality factors in risky driving, perceptual engineering, the decision-making process behind drunk driving, and EMS and pedestrian safety considerations.

Tom Vanderbilt, keynote speaker and best-selling author of *Traffic: Why We Drive the Way We Do (and What It Says About Us)*, delivered a 90-minute address peppered with humor and supported by pop culture references. Vanderbilt covered the reasons behind common—but nonetheless baffling—traffic behaviors such as “bottlenecks,” roundabout confusion, faulty driver perceptions during various weather conditions, and distracted driving—a topic, he noted, that has been around almost as long as the automobile itself. “In the 1940s, people debated ‘Should radios be built into automobiles?’” Vanderbilt told the group.

The Safety Forum also served as an opportunity to award outstanding accomplishments in traffic safety in engineering, enforcement, and education. Winners from around the state included Kevin Conover of NJDOT for his Intersection Improvement program; Lieutenant Steven Rotolo for his Enforcement Plan to Reduce Truck Roll-over Crashes at the Marine Terminal; and Grace Mancini Introna and Barbara Lazzaro for their involvement in developing and implementing the NJ Transit Driver Safety Education Program.

Patricia Ott, recently retired NJDOT Director of Traffic Engineering and Safety, received the prestigious Karen A. Yunk Achievement Award for the hands-on approach she has used throughout her career to promote innovations in safety engineering, education, and outreach. At this celebration of her commitment to safety for the past 20-plus years, Ott accepted her award, noting that her work in traffic safety is far from finished; Ott’s next efforts to save lives will be as the owner of her consulting firm, MBO Engineering, LLC.

“I am extremely proud of the work that I and my partners have accomplished over the years, and receiving this award to recognize that is a wonderful honor that I will never forget,” Ott said to the crowd.

The first Safety Forum to delve into the combined “hard and soft science” of transportation psychology was a success judging by attendees’ written feedback and in-person praise.

“The year we wanted to focus on topics that were not merely ‘preaching to the choir,’ but something new and innovative that would help our audience consider a wide array of views on the driver’s disposition physically, mentally, and socially before they plan campaigns and improvement designs,” said Carissa Sestito, TSRC’s outreach coordinator. “That’s partly the reason behind acquiring speakers outside of our region to participate this year, and our attendees seemed to get a lot out of it. As a matter of fact, one gentleman told me that he’s been to national conferences that weren’t as good.”

The Federal Highway Administration (FHWA) and the New Jersey Division of Highway Traffic Safety (DHTS) fund the Safety Forum each year.
What causes highway noise? And why do we spend millions of dollars constructing sound barriers along freeways? Contrary to popular belief, researchers say the main source of noise from cars, SUVs, and light trucks on high-speed roads isn’t from engines or even air displacement (that whoosh you feel and hear when a car flies by): at speeds higher than 35–40 mph, it’s from the interface between vehicle tires and the pavement.

CAIT’s Pavement Resource Program (PRP) has been concerned about pavement noise for some years now, but its research in that area really accelerated when John Hencken joined the PRP team full time in September 2010 and established an organized on-board sound intensity (OBSI) program. OBSI systems capture tire-to-pavement noise using a set of sophisticated microphones mounted on a vehicle near the contact point—literally where the rubber meets the road.

Looking at all the factors that contribute to highway noise (aerodynamics, engine noise, exhaust, etc.) as it is perceived roadside—called wayside testing—has been measured and studied for about 50 years or more. But OBSI, a relatively new test method, looks specifically at tire-pavement interface because many believe that, when moving faster than 30 mph, it’s the main source of vehicle-generated noise.

Noise control, generally everywhere except our highways, is governed by the Department of Environmental Protection (DEP) including regulations for private and commercial noise generators—from bars and clubs to industrial operations like quarries or factories. But controlling roadway noise is the responsibility of departments of transportation (DOTs) and other agencies as put forth in the New Jersey Noise Control Act of 1971 and Federal Noise Control Act of 1972. CAIT focuses its pavement acoustics research on reducing noise on roadways that fall under the jurisdiction of either federal or state DOTs.

OBSI allows us to measure and gather useful information about noise that comes from different pavement types. “Tire companies do extensive noise studies on tires, auto manufacturers do studies on noise generated—inside, outside, from the windows, ventilation, etc.—by and in the vehicles they build, so pavement experts should be testing
the noise pavement makes, right?” says Hencken, lead OBSI researcher. “Researchers have already designed quieter pavements, some of which are implemented in parts of New Jersey. We are trying to do three main things with OBSI research: solidify the argument to use quieter pavements for more projects, point out the added benefits that quiet pavements have (e.g., skid resistance, drainage), and learn more about the pavements themselves. There are many applications from the environmental side as well as the pavement engineering side that can be realized through the study of acoustics,” Hencken says.

PRP Director Tom Bennert agrees, “Our understanding of OBSI could lead to better designs and specifications for pavements that address highway noise at its source. If we can do that, building expensive sound barriers might not be necessary.”

How it works

There are three main forces or elements in the tire-pavement interface: 1) the point at the front of the tire where the tread and pavement first make contact; 2) the energy or sound generated as the tire forces “trapped” air through the pavement; and 3) the point at which the tread leaves the pavement and vibrates as it snaps back from being compressed and dragged as the tire rolls forward (see diagram below).

An OBSI “rig” consists of two intensity probes; one mounted at the lead edge of the tire where it first contacts the pavement, and one at the back of the tire where the tire patch comes off the road surface. Each intensity probe has two microphones that are placed a given distance apart and oriented perpendicularly very close to the tire. This very specific placement of the microphones allows researchers to measure the noise specifically coming from the tire-pavement interface and ignore noise generated from the wind as the car is moving. The OBSI rig is placed on the rear right wheel so many atmospheric problems typically encountered with environmental noise testing can be minimized or eliminated altogether. Ideally, testing is done consistently using the same make and model of vehicle outfitted with Standard Reference Test Tires (SRTT), which all OBSI researchers

September 13–15, 2010, the CAIT pavement acoustics team traveled to Elkin, North Carolina, to participate in the On-Board Sound Intensity (OBSI) Rodeo.

Instead of bucking broncos and silver spurs, this rodeo involved a range of passenger vehicles and OBSI microphone rigs. The event was organized by FHWA as part of a pooled-fund study to ensure that researchers and engineers using OBSI are following the same test protocols in the field—and reaching the same conclusions. Edwin Haas and John Hencken (above, left and right respectively) represented CAIT.

It’s important to minimize the number of variables with test vehicles, equipment, and methods because out on the road, pavements and environmental conditions are so diverse. Each road surface has varying materials and differences in micro/macro surface texture, roughness, stiffness, and density. Finishing and maintenance treatments also play a role. Aggregate type, binder type (for asphalt pavement), resurfacing techniques such as tining/grinding (for concrete pavements), age, and traffic loading all affect sound properties of a given pavement.

OBSI research teams from around the country gathered with their equipment and compared and contrasted different systems, mounting hardware, vehicles, age/hardness of tires, and microphone placement. The other participants in the Elkin Rodeo included North Carolina DOT, University of East Carolina, American Concrete Pavement Association, Illingworth & Rodkin acoustical engineering, and FHWA’s Volpe Transportation Systems Center.

Over a two-day period, each group did five to 10 data-gathering runs on predetermined courses of various pavement types, condition, and age. Teams then swapped tires, remounted their rigs, and did it all over again. The purpose was to collect and compare data sets leading up to a standardization run on the second day. Paul Donovan, former GM acoustics engineer who is now a principal at Illingworth & Rodkin, is the man who virtually invented the OBSI method. Overseeing the activities, Donovan rode with each team for at least one run of the standardization round in order to ensure that each group was testing in exactly the same locations, starting the measurements at exactly the same time, and measuring in the right part of the wheel path.

At the end of it all the groups are still communicating, comparing their data and test results. The rodeo was a great opportunity for OBSI folks from around the country to meet, network, and share best practices, tricks-of-the-trade, and tips on the easiest and most accurate tools and equipment. The ultimate purpose of this event and others like it is to move toward standardization of OBSI methods around the country that will allow more meaningful data entry and data sharing with FHWA and better traffic noise modeling (TNM).
have agreed to use. This mitigates data variables like vehicle weight, model-specific characteristics, and tire tread.

**Quieter roads = music to your ears**

Quantitative noise measurement is important to help combat the negative effects of noise pollution on people where they work, live, and play. Understanding gained from OBSI research could lead to better designs and specifications for pavements that address highway noise at its source. If we can do that, we might be able to reduce the number of expensive, and some would argue unsightly, sound containment structures.

Standards, consistency, minimizing variables in acoustics testing, and knowledge sharing among dedicated experts will give us the best quality data about pavement noise around the United States and how to reduce noise pollution from our highways. ■

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**Romance of riding the rails has been a long-time musical metaphor**

High-speed rail made the top 10 of many infrastructure story-of-the-year lists, but long before 2010, trains have had a history of starring in top-10 music hit lists too.

So, for our first *Infraculture* column of 2011, we decided to list 11 great railroad songs. The concept of writing a column about infrastructure in the arts was partially inspired by how much infrastructure appears in popular music as a subject, imagery, or metaphor. When it comes to train songs, the choices are endless. We could easily have listed 111 instead of only 11. In fact, Johnny Cash’s song catalog alone (e.g., *Let The Train Blow The Whistle, Orange Blossom Special, Blue Train*, et al) may well have comprised the entire list.

Trains have inspired artists from Elvis Presley and Johnny Burnett (who both recorded *Lonesome Train*) to Kraftwerk (*Trans Europe Express*) and The Smiths (*Draize Train*). Some train songs are so iconic that they have been recorded over and over by multiple artists (e.g., *Mystery Train*).

We could have stopped at the obvious choices: *Take the Train* (Duke Ellington), *Midnight Train to Georgia* (Glady’s Knight & The Pips), *Chattanooga Choo Choo* (Cab Calloway, Glenn Miller, et al), *Love Train* (The O’Jays), or *Last Train to Clarksville* (The Monkees). But, we finally settled on this criteria: trains had to be either the main subject, setting, or character and the song had to be onomatopoeic, that is, reminiscent of how trains sound. So, without further ado, here’s our list (in no particular order):

- *Mystery Train* – The Band with Paul Butterfield
- *Get Me Back on Time, Engine Number 9* – Wilson Pickett
- *Lonesome Train* – Robert Gordon and Link Wray
- *Night Train* – James Brown
- *Baby Got Going* – Liz Phair
- *Folsom Prison Blues* – Johnny Cash
- *Downbound Train* – Bruce Springsteen
- *Everybody Loves a Train* – Los Lobos
- *Kundalini Express* – Love and Rockets
- *Blue and Lonesome* – Alison Krauss and Union Station
- *Driver 8* – R.E.M.

Check our Facebook page and we’ll post a note with links where you can listen to these songs and tell us about your favorite train song. All aboard! ■
CAIT, PACO, and a South American university promote CM

Transportation infrastructure construction projects—highways, bridges, rails, pipelines—are increasingly complex. With pricetags often in the billions of dollars, cost overruns of even a few percentage points can total many millions of dollars.

Partially because of the economy, and partially because of their complexity, there is increasing pressure to deliver these mega-projects within budget and, because time is money, on schedule as well. All construction projects experience changes throughout their lifecycle that must be addressed through the change order process. With change orders comes the danger of “scope creep,” when the scope—and the bottom line—of a large, complex project incrementally pulls away from its original vision, timeline, and budget with add-ons like unforeseen requirements, more or different materials, additional engineering services or construction labor, and/or longer timeframes.

But there are tools to guard against what some think is inevitable ballooning of construction projects. Configuration Management (CM) is a management process that can identify project scope, define participant roles, manage changes during construction, control documents, and provide an audit trail for problems that occurred during the project.

CM can be defined in different ways depending on the industry and the type of application. The American National Standards Institute defines CM as “A management process for establishing and maintaining consistency of a product’s performance; functional and physical attributes with its requirements; design; and operational information throughout its life.” In a construction context the “product” is the constructed facility or asset, such as a bridge, that is the outcome of a construction project.

Trefor Williams, Ph.D., professor of civil engineering at Rutgers School of Engineering, is CAIT’s resident expert on CM. Williams has been working with PACO Technologies, a national provider of program management and construction management services, and the School of Engineering to quantify and promote the benefits of CM in the construction industry and academia. Working together, the team seeks to develop an industrywide accepted definition for CM and promote its adoption as a standard project management discipline applied during the design, construction, operation, and maintenance phases of a given infrastructure project.

The foundation to achieve this is to teach the concepts and benefits of CM to engineering students who, after entering the workforce, will in turn promote these concepts to the construction industry as a whole. Williams and PACO CEO Frank Otero first jointly presented a seminar on CM back in 2008 and have been developing configuration management course material for graduate and undergraduate lectures and labs. They also have been seeking to partner with other universities in the United States and abroad to pool resources and knowledge and ensure a global perspective. The first such partnership is currently being forged with the School of Engineering at Pontificia Universidad de Javeriana in Columbia.

Alphabet Soup? DHS, NTSCOE, PARTSWG, CBRNEs, and LPS

Acronyms abound in the world of transportation. To a lay person, they might hold as much meaning as a bowl of alphabet soup. But behind the long strings of letters are the organizations and projects they stand for, working to keep us safe.

Researchers, academics, and medical professionals are looking for ways to integrate technologies, systems, and programs that will help save lives in the worst of times—during a natural or man-made disaster. These acronyms are shorthand for people who are so busy improving national security that they don’t have time to spell it all out.

Philadelphia Area Regional Transit Security Working Group (PARTSWG) Training and Exercising

Laboratory for Port Security (LPS) Program Director Tayfur Altiok, Ph.D., will serve as principal investigator on a $416,000 project that aims to enhance threat detection, prevention, and emergency response capabilities of the Delaware River Port Authority (DRPA) of Pennsylvania and New Jersey. The project is part of infrastructure protection guidance efforts that stem from the National Transportation Security Center of Excellence (NTSCOE) program. Rutgers is one of 12 NTSCOE’s in the United States.
The PARTSWG Training and Exercising will focus two essential elements:

• Targeted incident training for key frontline staff that will address detection of suspicious behavior using the Behavioral Assessment Screening System (BASS) and provide basic security awareness and evacuation procedures that will reduce exposure and risk

• Operational training for chemical, biological, radiological, nuclear, and explosives (CBRNE) preparedness and response, including practical scenarios to enhance detection capabilities for CBRNE-related incidents.

DRPA is a regional transportation organization serving southeastern Pennsylvania and southern New Jersey. DRPA owns and operates the Benjamin Franklin, Walt Whitman, Commodore Barry, and Betsy Ross bridges. All four bridges are part of the EZPass electronic toll collection network. Through a subsidiary, the Port Authority Transit Corp., DRPA runs PATCO, which links to NJ Transit and the SEPTA network. It also owns the RiverLink Ferry System and the Philadelphia Cruise Terminal.

DRPA’s broad responsibilities for the transportation system in the Philadelphia/South Jersey region make risk mitigation, assessment, and disaster preparedness and response one of their primary concerns.

Rail Corridor Resiliency Project Funded by DHS

As a part of Rutgers’ NTSCOE, LPS also is collaborating on a project that focuses on vulnerability and resiliency of rail corridors. The purpose of the project is to build a risk-based model of a rail network, estimate the consequences of specific disrupting events to the rail corridor, and develop a set of engineered and human resiliency measures that reduce the likelihood of an event or speed recovery from one. The goal is to help decision makers in the Northeast rail corridor improve response to accidents and attacks and create a valuable tool for education and training that can be applied to other rail corridors.

Earlier in 2010, two major car companies announced they were producing electric vehicles (EVs) for the mass market. Professor Mazurek thinks, What better time to talk to students about EVs?

Two alternative fuel vehicles released this year—the Nissan Leaf and Chevrolet Volt—and others could help reduce urban air pollution and cut our reliance on imported oil, says Monica Mazurek, Ph.D., associate professor of civil and environmental engineering and a resident faculty member at CAIT. For the second year, Mazurek is teaching a Byrne Seminar, “Atmospheric Brown Clouds: The ABC’s of Global Air Pollution.” The Byrne Family First-Year Seminar Program connects first-year students to prominent professors right from the beginning of their adventure at Rutgers through intimate one-credit courses that meet for 10 weeks each semester. Mazurek spoke with Carl Blesch, reporter for Rutgers Today, on the potential benefits and remaining challenges to jump-starting electric cars as a widespread viable transportation option.

Rutgers Today: What are the immediate benefits of electric cars?

Mazurek: I could start with air pollution and global warming, but let’s talk about economics. In 2007, there were 80 billion vehicle miles traveled in New Jersey! Think of all the gasoline required to fuel those miles. Then think about how 70 percent of that gasoline was imported. That’s a lot of money going out of our state and country just to buy transportation fuel. If we can move some of our vehicle-miles from gasoline to electric, we could keep more of that money in the United States and even in New Jersey. Electric cars can also run on energy generated by renewable resources—solar, wind, and hydroelectric power, which do not add particulates or greenhouse gases to the atmosphere. Expanding domestic alternative fuels and transportation infrastructure also creates new jobs, strengthens fuel security, and supports small and large businesses’ bottom lines. Economics cannot grow without a secure and affordable energy supply.

Rutgers Today: But renewable resources account for a small amount of the electricity we generate. Wouldn’t driving more electric cars merely shift the pollution source from car engines to power plants?

Mazurek: Historically, renewable energy resources have not been a top priority in this country. China, envisioning an economy based on renewable energy, is investing in renewables. We should invest more in research and promote public policies that make

Above: Doug Stansfield of TransAtlantic Electric Conversions LLC, an EV expert Mazurek invited to speak to her students, also brought his converted Hyundai to last year’s Rutgers Day alternative fuel vehicle fair, which was organized by CAIT.
Many nations with developing economies find themselves faced with increasing and complex challenges of building and maintaining critical infrastructure assets. New, modern systems—and constantly shifting global economies—call for new approaches.

Such complexity can only be addressed systematically, taking into consideration a multitude of diverse, multifaceted issues such as rapid aging, long-term sustainability, environmental impacts, social equity, security, growing demand, and making sure capacity keeps pace with economic growth. These concerns are shared the world over.

Among these many challenges is having enough educated and skilled professionals who are able to make budget-savvy decisions that maximize the longevity and sustainability of their country’s roads, bridges, shipping lanes, water supplies, energy systems, and more. Without the proper technical knowledge and an understanding of business principles, systems can fall prey to less-than-optimal engineering plans and economic calculations that sometimes lead to nonsustainability.

And that’s where Rutgers’ CAIT can help. With its extensive knowledge and experience in infrastructure asset management, CAIT is reaching out to professionals and graduate students in the Middle East to ease the asset management learning curve by sharing its expertise. The Certificate in Infrastructure Asset Management (CIAM) and Masters of Business and Science (MBS) program offers post-graduate courses to working professionals and graduate students looking to advance their careers in operation and administration of infrastructure systems. The program is a joint venture of CAIT, the Rutgers Advanced Technology Extension (RATE), which is the continuing education unit for the Rutgers’ School of Engineering, and the Center for Management Development (CMD) at Rutgers Business School.

What we are providing students is a forward-thinking advanced skill set they can apply instead of having to rely on outdated approaches that merely put band-aids on issues rather than proactively addressing and fiscally planning for them,” says Nazy Sobhi, Ph.D., manager of the CIAM program.

Rutgers aims to help international professional engineers and graduate students cultivate that
Michael Paritee (far right), a representative of ClipperCreek, Inc., demonstrates his company’s public charging station for electric cars to Professor Monica Mazurek’s (far left) Byrne Seminar students Mathew Schimmenti and Anuj Patel.

renewables more abundant and competitive. There are even benefits to using electricity from nonrenewable resources for transportation. Coal is a domestic product. Nuclear power is carbon neutral. And it’s easier to manage particulate emissions from hundreds of fossil-fueled power plants than from millions of tailpipes.

Rutgers Today: It will take more than just marketing electric cars to convince people to drive them. What will it take to make them attractive?

Mazurek: EVs have a shorter range than gasoline vehicles, so there have to be places to charge them where you live, work, shop, or go to school. The Society of Automotive Engineers has developed a standardized plug that lets you connect your vehicle to home and public chargers. While these chargers work on standard 120-volt circuits, they work faster on 240-volt circuits, so homeowners will likely want to wire their garages with the equivalent of an electric stove or dryer outlet. Public chargers will need a convenient way to bill for the electricity you consume. New smart phone apps could tell you where to find a quick charge if you are out running errands. These are things we hope to work on at CAIT.

Rutgers Today: Do electric vehicles make sense for everyone?

Mazurek: Electric cars still make more sense for urban and suburban driving, where trips are shorter, opportunities to charge are more frequent, and air quality issues are critical. To make electric cars attractive for long-distance travel, batteries will need longer ranges and faster recharging. Proposed Level 3 480-volt chargers can recharge most electric vehicle battery systems in much less than an hour. The Chevrolet Volt offers a new hybrid solution to the current scarcity of public chargers and limited battery range by incorporating a gasoline generator. When the battery system runs low, the gasoline generator converts chemical energy to electrical energy that powers the battery system. The battery system and gasoline-powered generator can propel the Volt about 340 miles on a full charge and an eight-gallon tank of gas—the equivalent of 42.5 miles per gallon. This increased mileage means less carbon dioxide, nitrogen oxides, sulfur oxides, organic vapors, and fine particle emissions per mile. Using carbon-based fuels more efficiently decreases air pollutants and greenhouse gases. This is a big step in the right direction.

More on the web: Watch video from Mazurek’s EV class at http://goo.gl/bUS1E

Many thanks to Carl Blesch of Rutgers University Relations, Media Relations, for permission to reprint his interview Mazurek, first featured in Rutgers Today.
**Weeks Marine supports CAIT sediments research**

Weeks Marine, Inc., is one of the leading marine construction and dredging organizations in the country and a valued partner and supporter of CAIT.

Weeks generously donated $150,000 toward the purchase of an Ex-Situ Erosion Testing Machine (ESETM) for CAIT’s Soil and Sediment Management Lab (SSML). Developed by FHWA and the engineering office of Hans Prechtl in Austria, the ESETM housed at CAIT will be one of two such devices in existence. It is specifically designed to simulate the flow conditions found in fluvial environments such as riverbeds. In doing so, it allows researchers to model erosion and the dispersion potential of various cohesive and non-cohesive soils and sediments in aqueous environments.

Originally founded in 1919, family-owned Weeks Marine offers a broad range of services related to keeping our waterways healthy, navigable, and viable. They operate more than 500 cranes, tugs, dredges, and other pieces of waterborne equipment and have expertise in dredging, salvage operations, beach restoration, stevedoring, and marine facilities construction.

Based in New Jersey, the company was ranked 89th by *Engineering News-Record* on its Top 400 Contractors of 2010 list. We are honored and grateful to call them a partner and benefactor.

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**Best wishes to safety champion Patricia Ott**

On October 1, 2010, Patricia Ott said farewell as the NJDOT director of traffic engineering and safety, capping off a successful decades-long career in public engineering and safety at a retirement celebration attended by over 100 safety colleagues, friends, and family. While at NJDOT, Ott was an advocate for new ideas in safety and outreach programs.

She also was responsible for oversight of the development of the New Jersey Comprehensive Strategic Highway Safety Plan (CSHSP) and chaired the Safety Management Task Force. In retirement, Ott continues to work with many safety partners in a consultancy role as the owner and operator of MBO Engineering, LLC.
Public works group recognizes public service

Larry Cullari, New Jersey Local Technical Assistance Program (NJ LTAP) field coordinator, received an award November 18, 2010, at the League of Municipalities Conference from the New Jersey Chapter of the American Public Works Association for his contributions to education of the chapter during the past year. He is pictured above with New Jersey Chapter President Paul Wnek receiving his award.

RITA administrator in town for showcase

Administrator for the Research and Innovative Technology Administration (RITA) Peter H. Appel honored CAIT with a visit on October 20, 2010, to learn about ongoing research and programs. Appel traveled to New Jersey for the 12th Annual NJDOT Research Showcase (see page 16), for which he was keynote speaker. RITA is the USDOT department that oversees the University Transportation Center (UTC) program. CAIT has been a Tier I UTC since 1998.

During his visit, Appel heard from key program managers and staff and got an overview of CAIT’s work in the areas of nondestructive evaluation (NDE), pipeline communications and safety, port operations, port risk modeling, roadway safety, bridge management, and pavement materials, design, and engineering. Appel also had plenty of time to interact with students doing research with CAIT during an afternoon poster session where he heard about ongoing projects tackling issues from managing patient flow in hospitals during emergency situations to infrastructure development for alternative fuels to analysis of partial interchanges in New Jersey.

CAIT gratefully acknowledges these valued partners and sponsors who generously supported our first TRB networking reception this year.

THANK YOU!
Showcasing research

For the eighth time in 12 years, New Jersey Local Technical Assistance Program (NJ LTAP) hosted the 12th Annual New Jersey Department of Transportation Research Showcase October 21, 2010. Two hundred attendees from NJDOT, NJ Transit, Federal Highway Administration, universities, consultant firms, and local public agencies joined distinguished speakers and research exhibitors for an overview of important NJDOT Bureau of Research–supported transportation research projects.

The daylong event began with keynote speaker Peter H. Appel, administrator from the USDOT Research and Innovative Technology Administration, who discussed national areas of concern such as transportation congestion, connectivity challenges, and the importance of curbing distracted driving. Appel cited innovative practices that improve safety and mobility, including communication technologies and real-time information. Distinguished guest Mark R. Norman, director of the Technical Activities Division of the Transportation Research Board (TRB), also addressed the crowd.

A new session this year focused on technological innovations to transportation systems in the United States and abroad. Advancements such as using pavement to collect solar energy and technologies for noise reduction, transit enhancements, and traffic management systems were some of the examples presented.

NJDOT Research Bureau Manager Camille Crichton-Sumners presented the 2010 Outstanding Student in Transportation Awards.

Five students from Rutgers University, Rowan University, and New Jersey Institute of Transportation were selected by university faculty members based on merit of their contributions to NJDOT research projects.

To promote NJDOT’s research program and highlight academic work that leads to real-world solutions, one project is selected each year that displays exemplary implementation of research results. This year, Rutgers professor Joseph Seneca received the Annual NJDOT Research Implementation Award. The project, “Economic Impacts of Transportation Infrastructure Investments,” yielded two new powerful software applications that assess economic impacts of transportation infrastructure investments in New Jersey and are now being used to support NJDOT applications for federal TIGER grants.

Four concurrent afternoon breakout sessions featured academic and consultant research partners presenting 12 different NJDOT research projects in the areas of safety, environment, infrastructure, and ITS/multi-modal. In addition to the knowledge imparted, professional development hours (PDH) are granted to licensed engineers who participate in these technical sessions.

More on the web: Search “12th showcase” at cait.rutgers.edu to read the presentation abstracts.