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## Fatigue Retrofit Improves Chesapeake City Canal Bridge



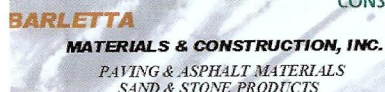
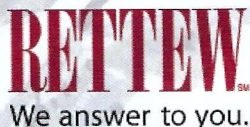
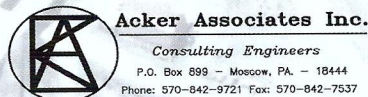
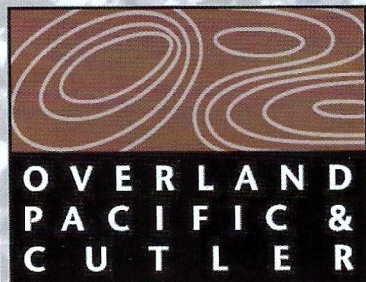
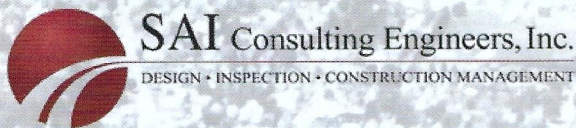
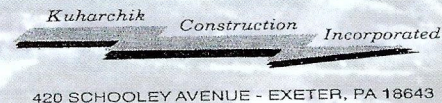
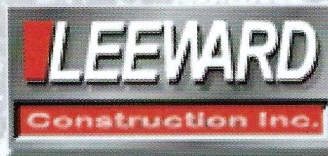
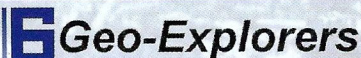




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*The cover photo shows a wide angle view of the Chesapeake City Bridge with Chesapeake City on both sides of the Chesapeake and Delaware Canal. The Canal and the Bridge are owned and operated by the U.S. Army Corps of Engineers. Show Tide Arch Span as it consist of built-up riveted steel tie girders and arch ribs that support the floor system through arch hangers.*

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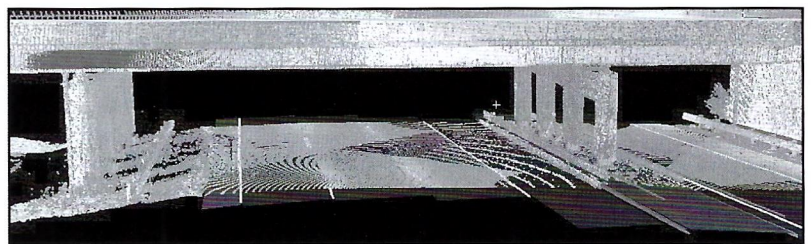
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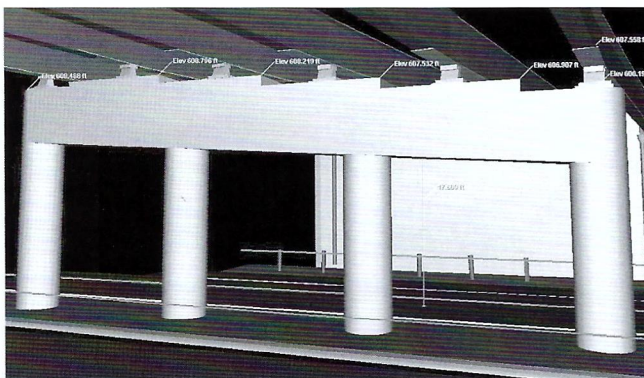


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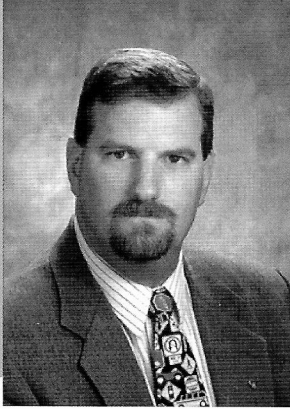
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# President's Message

*Richard D. Clifton, P.E.*



To those of you that attended ASHE's 50th birthday party in Hershey, PA, I hope that you had as much fun as I did. Hats off to Sandy and Sandi and everyone involved in organizing and executing this year's National Conference – you did a fabulous job! For those of you that missed the conference you need to take a look at the article in this edition of the SCANNER and visit the conference website to see all of the pictures of the fun that you missed. Hopefully you can start making plans now to ensure that you do not miss the 2009 National Conference in Hotlanta!

One of the most special things about this year's conference was the ASHE History Book that was given to each ASHE registrant. I hope you have taken a few minutes to read how our organization was formed 50 years ago. To those that did not attend the conference I understand that the document will soon be made available through the ASHE National Website. Clearly, our founding fathers envisioned a national organization to advocate the advancement of the highway industry. The keynote speaker at the opening session, Pennsylvania Senator Rob Wonderling, issued a challenge to us to be the advocates that our founders envisioned. He noted that if we do not promote the highway industry loudly and clearly then we will see the industry continue to degrade. Unfortunately, it is hard for us to make our points loudly and clearly because most of the country does not know who we are. While we are more than 6,000 members strong we represent only 14 states.

In my remarks at the conference banquet I noted that my top priority for ASHE is to develop a plan that will grow the organization across the country. In January, the National Board of Directors adopted a vision for the growth of ASHE into every state. This was the first step in developing a plan to reorganize the regions so that we are prepared for nationwide representation on the National Board. The next

step is to develop a plan that will get us from where we are today to fulfillment of this vision and the vision of our founders.

This year I will be working with the National Board of Directors and many of our Past National Presidents to develop an update to our Strategic Plan. Part of this plan will include a strategy for growing ASHE across the nation. Keys to this growth include increased exposure of the Society throughout the nation and targeted growth in key areas. Unfortunately, none of this happens overnight and none of it happens without hard work. As with any organization, the more widely the work can be spread the less work there is for any individual. While all of our National Committees and National Board Members will be important to the success of our growth plan, two particular Committees will have the key roles – the New Sections Committee and the Public Relations Committee. Both of these Committees have strong leaders and several dedicated members but both need even more help to be completely successful. If you think that you might be able to help out these Committees or any of the other National Committees, please contact me. As I noted in my last column, you will realize your maximum benefit only if you get involved. Let me add that ASHE will provide the maximum benefit only if our members are active and engaged.

In my Conference remarks I noted that I hoped to return to Hershey in 50 years to celebrate a full century of ASHE and I hoped that I will be celebrating with members from every state of the union. I am not sure that I will be fortunate enough to live to be 95 years old and be able to celebrate ASHE's 100th birthday but I do hope to see the day that we complete the vision of our founders and have ASHE Sections in every state. Then we will be able to make our points loudly and clearly and be the advocates our industry so desperately needs. ■



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# Performance-Based Highway Maintenance

Jesús M. de la Garza, Ph.D.

Transportation agencies traditionally specify in their road maintenance contracts how work is going to be performed, the means and methods to be used, and the sequence in which the job is to be performed. Traditional contracts are by necessity project-specific and short-term. In the late 1980's and early 1990's this philosophy started to change when a few transportation agencies around the world began considering privatization as an alternative to improve the efficiency and effectiveness of services provided to the public. As a result of this initiative, new partnerships between the public and private sector for maintaining and preserving public roadways were developed and implemented.

These new contracting relationships are known as Performance-Based Road Maintenance Contracts (PBRMC). Performance-based contracts are by necessity long-term contracts. PBRMC calls for performance-based work, in which a desired outcome is specified rather than a material or method. In other words, this contracting model focuses on the final product and not on how it is achieved. In comparison to the traditional contract arrangement, PBRMC allocates higher risk to the contractor (more responsibility), but at the same time opens up opportunities to reduce the cost of achieving the specified standards as a result of implementing new technologies, materials, processes and innovative management strategies. The theory behind PBRMC is the fact that "industry" might know cheaper and better processes, so the government should specify only the desired result or outcome (what) and let the competing offerors choose the processes (how).

Reliable and comprehensive sets of guidelines to evaluate the effectiveness and efficiency of PBRMC are limited. Transportation agencies currently rely on

criteria developed from traditional methods to evaluate the performance of private contractors in maintaining the public roadways. These procedures vary significantly among agencies and some have not been properly defined to monitor performance-based work.

In July 1995, the Commonwealth of Virginia enacted legislation to authorize public-private partnerships to build, operate, and maintain transportation facilities, under the approval of the Virginia Department of Transportation (VDOT). This legislation is better known as the Public-Private Transportation Act (PPTA). When the PPTA was signed into law, Virginia became the first state to allow private contractors to submit unsolicited proposals for interstate maintenance and construction.

The Center for Highway Asset Management ProgramS (CHAMPS) at Virginia Tech was formed as a research center of expertise which provides independent assessment and technical leadership to support innovations in highway maintenance contracting and asset management practices. Faculty and students in CHAMPS provide ongoing support to VDOT on matters related to: 1) the privatization of highway maintenance activities; 2) innovation and research in maintenance contracting; and 3) asset management practices. CHAMPS has developed a conceptual effectiveness level-of-service framework to monitor performance-based road maintenance contracts. This framework provides transportation agencies with guidelines — based on statistically valid procedures — to assess the overall performance of private corporations in maintaining all the features (assets) located within the right of way of public roadways at the minimum acceptable performance level.

In October 1995, VMS Inc., a maintenance contractor, submitted the

*...agencies around the world began considering privatization as an alternative to improve the efficiency and effectiveness of services provided to the public.*

first unsolicited proposal under PPTA regulations to implement a public-private partnership for the maintenance of a portion of the interstate highway system in the Commonwealth of Virginia. VMS's proposal was approved in December 1996. By establishing this new agreement, VMS became the first private firm to assume full responsibility of the comprehensive maintenance of significant portions of a state's interstate highway system. From 1997 to 2007, VMS managed the maintenance for 250 miles of interstate highway, which constitutes approximately 25% of the total interstate highway system of Virginia. Through the use of the performance-based TAMS (Turnkey Asset Maintenance Services) instrument, VDOT is now on a path to privatize 100% of the maintenance of the interstate highway system. Virginia Tech through CHAMPS is responsible for the assessment of such performance-based TAMS contracts. ■

*Dr. Jesús M. de la Garza is the holder of the Vecellio Professorship in Construction Engineering and Management at Virginia Tech. He leads the Center for Highway Asset Management ProgramS (CHAMPS), which conducts research and supports VDOT on the privatization of highway maintenance.*



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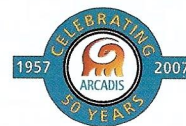
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# Fulton Road Bridge

May 1, 2008 marked the one year anniversary of the demolition of the historic Fulton Road Bridge over the Cleveland Metroparks' Zoo and Big Creek Reservation. Since the demolition of the nearly 75-year-old structure, crews have made significant headway in construction of the new bridge.

Demolition of the bridge was a challenge in its own rite. "The most difficult aspect of the demolition was trying to coordinate the implosion with local police forces, highway patrol, EMS, fire, the Cleveland Metroparks Zoo, railroads, residents, City of Cleveland, Cuyahoga County and local media," said Ray Bencivengo, Ohio Department of Transportation Area Engineer who is charged with overseeing the project. "The coordination effort was tremendous."

Since the implosion, Kokosing Construction Company, prime contractor on the project, has been successful in the removal of over 25,000 tons of debris and has recently begun setting pre-fabricated concrete arches, a method much different than the original cast-in-place method used on the former bridge.

The current method of construction utilizes pre-cast, segmental arches and post-tensioned concrete. Both foundations and piers are cast in place with the pre-cast arch segments erected onto temporary tower supports. The concrete arch segments are then connected using post-tensioning methods. The designer of the structure is Michael Baker Jr., Inc.

"One of the biggest challenges is actually getting these pre-cast arch segments fabricated and delivered to the site. This is a pretty high number of super-loads for one specific project," said Greg Kronstain, Ohio Department of Transportation, District 12 Field Engineer. "It is certainly unique construction."

While the overall look and feel of the new bridge will be very similar to the original structure, several key elements including bike lanes, high level and low level lighting and an overlook near the center of the bridge

have been included in the new design. Also included with the project is the addition of an all purpose trail beneath the bridge to allow for access into the Cleveland Metroparks' Big Creek Reservation.

According to Brendan Finn of the Cuyahoga County Engineer's Office who will maintain the structure post-construction, the pre-cast concrete deck arch structure type was selected to preserve the architectural significance of the community while minimizing construction duration and impacts to the property below. "Piers for the replacement structure's arch spans are located in the same footprint as the original bridge piers," Finn said. "The open spandrel deck arch imitates the appearance of the old bridge but fewer spandrel columns will provide a lighter appearance."

The completed bridge will be 1,583 feet long, 81 feet wide and will stand up to 110 feet above the Cleveland Metroparks' Zoo and Big Creek Reservation. Renderings of the proposed structure have been viewed as highly favourable by the project's stakeholders. One-on-one meetings were held with stakeholders including political, governmental and community organizations. Two public meetings were held to allow for public input into the project development process.

"This is one of the few structures that may be more visible by traffic beneath the bridge than those traveling on it," said Bencivengo. The zoo's attendance exceeds one million visitors a year with primary access points crossing under the bridge. "It was important for all of the project's stakeholders to work together to maintain the look and feel of the old bridge."

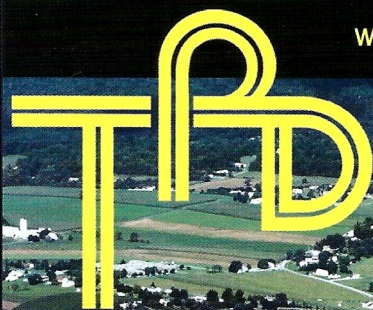
Construction crews are currently working to set the pre-cast arch segments and are expected to continue into the fall. "Right now, our primary focus is getting the arches set and doing the post-tensioning work," said Kronstain.

The entire project is expected to be complete in late 2009/early 2010. ■

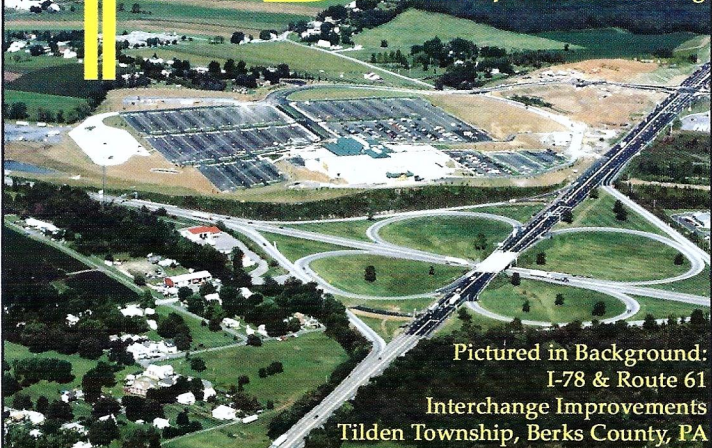


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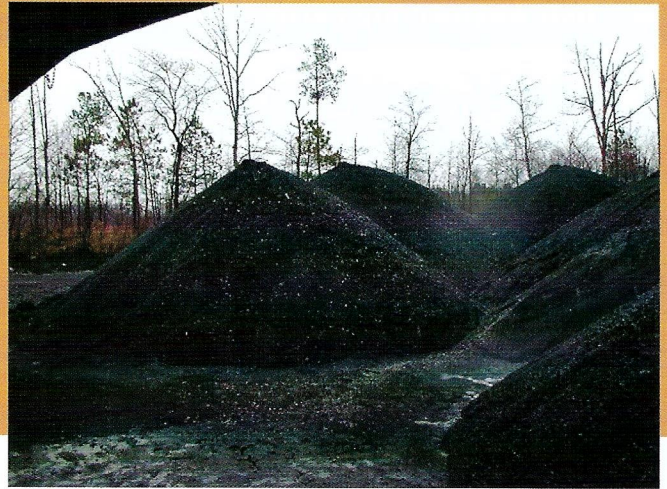
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## Manufactured Waste Shingles in a Hot-Mix Asphalt

*Ann Overton, Virginia Transportation Research Council*



The Virginia Department of Transportation (VDOT), like other state DOTs, strives to hold the line on highway maintenance costs, especially for petroleum-based asphalt and binders, in the face of skyrocketing oil prices. VDOT uses asphalt concrete to pave most of the roads in Virginia.

VDOT's research division, the Virginia Transportation Research Council (VTRC), is investigating several green technologies to help VDOT save money – and reduce waste – on this evermore costly material. One recent VTRC project analyzed a field installation using the asphalt from roofing shingles in the pavement binder, to good results.

A 4.1-mile, two-lane section of Route 671 in southeastern Virginia was paved using a surface mix containing 5 percent shingle waste as well as another surface mix with 10 percent recycled asphalt pavement for comparison. The Research Council conducted density tests on the pavement and various laboratory tests – permeability, fatigue, tensile strength ratio, rut, and binder recoveries – on samples collected during construction.

Both the field and lab test results indicated that the behavior and performance of the two mixes should be similar. In fact, the shingle mix is still performing well on the road after 18 months of service.

In the 1990s, state legislation directed VDOT to form a "Recycled Materials in Highway Construction Advisory Committee" to recommend how VDOT

might use various recycled materials – glass, tires, plastics, aggregate fines, bituminous concrete, among others – in highway construction.

The committee also recommended research into the use of recycled roofing material. As a result, VDOT developed a draft specification for its trial use in asphalt concrete in 1999. The specification allowed either tear-offs – roofing removed from buildings – or manufacturing waste.

Manufactured shingle waste tends to be more consistent in material characteristics than tear-offs and contains no harmful materials, such as asbestos. VDOT wanted to gain experience and verify that the process would produce mixes equal to or better than those without shingles. VDOT also hoped to use the draft specification to place trial sections upon request from contractors before providing blanket approval for a specific source and process.

Although there had been inquiries before 2006, no contractor had asked to place asphalt concrete containing roofing material. In 2006, a North Carolina contractor did request VDOT's approval to use asphalt concrete containing manufactured shingle waste. Although the source of the shingle waste was in North Carolina, there was a potential advantage in decreasing the cost of the asphalt concrete in VDOT's Hampton Roads District in southeast Virginia near the contractor's plant in nearby Gaston, N.C.

With the considerable rise in the cost of asphalt binder and the fact that shingles

contain an appreciable amount of asphalt binder, the future savings in the cost of such a mix binder could be substantial. It is likely that approximately 50,000 tons of hot-mix plant mix containing waste shingles could be supplied to VDOT's Hampton Roads District per year from this contractor. As much as \$2.69 could be saved for every ton of asphalt that uses the waste shingles.

The study recommended that VDOT's Materials Division prepare a permanent special provision to allow the use of manufactured shingle waste in asphalt, which has been completed. Implementation of this special provision has the potential to save \$134,500 per year in the Hampton Roads District alone.

By the time you read this article, written in June 2008 on a day when the price of a barrel of oil hit a one-day peak of \$138.10, it's anyone's guess what the cost will be at the end of the year. When the report for this project was written in January 2008, binder was costing approximately \$340 per liquid ton.

Following the success of this project, VDOT's Asphalt Research Advisory Committee has also recommended that the Research Council study the use of tear-off shingles both in the lab and in the field. The study is expected to begin later this year.

The Research Council report, *Use of Manufactured Waste Shingles in a Hot-Mix Asphalt Field Project in Virginia*, by G.W. (Bill) Maupin Jr., VTRC 08-R11, is available at [www.vtrc.net](http://www.vtrc.net). ■



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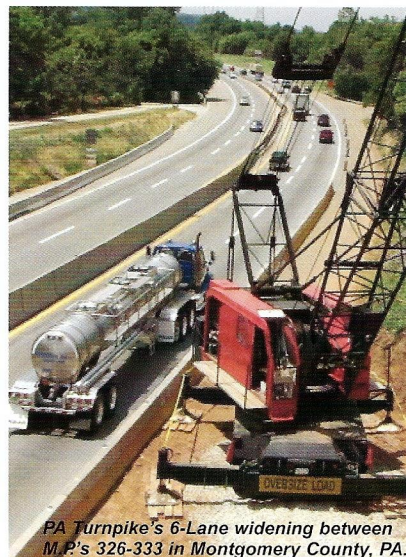
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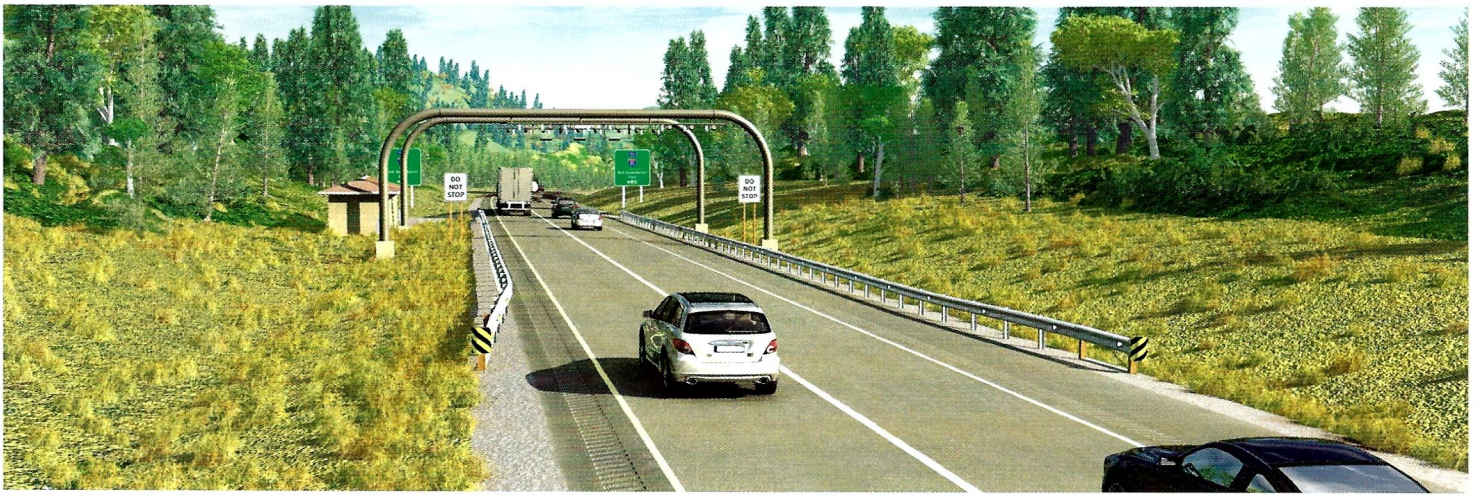
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# An Innovative Public Approach to Funding Transportation in Pennsylvania

Barry J. Schoch, P.E., McCormick Taylor & David W. Seltzer, Mercator Advisors, LLC

*Pennsylvania, like many states, is facing staggering transportation investment needs due to aging infrastructure and rising construction costs. Compounding the issue is the growing reality that vehicle miles traveled (VMT) and gas consumption reductions are directly related to high fuel prices, which reduce the primary revenue source of gas tax receipts.*

In July 2007 the Pennsylvania legislature addressed the challenge by passing Act 44, a historic and innovative strategy that authorized a 50-year “public-public” partnership between the Pennsylvania Turnpike Commission (PTC) and Pennsylvania Department of Transportation (PennDOT).

Under Act 44, the PTC will provide PennDOT with more than \$83 billion over a 50-year period for transportation maintenance and improvements in Pennsylvania by:

- Increasing tolls on the Mainline Turnpike to fund cash transfers and pay debt service on Monetization Bonds backed by future toll revenues on the existing system;
- Applying to the federal government for permission to convert I-80 to a toll facility to fund a complete reconstruction of this vital highway, as part of the federal Interstate System Reconstruction & Rehabilitation Pilot Program (ISRRP Program); and
- Using toll revenues to pay I-80 operating expenses, including rental payments to PennDOT.

Efforts are well underway to implement Act 44; the PTC has already transferred over half a billion dollars in funding to PennDOT, to expedite critical highway and bridge projects while ensuring long-term investment needs are met with dedicated funds. Act 44 also provides much needed funding to all of the state’s rural and urban public transit agencies. This legislation keeps management of a key infrastructure asset—the Pennsylvania Turnpike—in public hands so that transportation officials can continue to monitor needs and adjust funding accordingly.

## Background – The Funding Challenge

Pennsylvania is not alone when it comes to funding challenges. National reports indicate that transportation funding needs have reached a critical point, with the Highway Trust Fund projected to show a \$3.2 billion shortfall in its highway account next year.

*“Funding” continued p. 24*





# As Gas Prices Rise, So Do the Costs of Congestion

Michael G. Bruce, PE, and Paul W. Gruner, PE, PS

*Continuous Flow Intersections (CFIs) continue to provide an efficient and cost effective method to deal with congested arterial intersections, thereby saving on users' time, gasoline and air pollution.*

Conventional solutions are no longer enough – adding lanes has diminishing returns as green time is still at a premium. Interchanges are expensive, consume increasingly expensive land, and destroy the urban character. As a result, solutions such as CFIs are rapidly gaining acceptance and moving into the mainstream of highway engineers' toolboxes.

Since the CFI at Maryland 210 and 228 won the AASHTO Francis B. Francois Award for Innovation in 2002, three additional CFI intersections have been opened to traffic in the U.S., one in Louisiana in 2006, one in Utah in 2007, and one in Missouri in 2007. In Ohio, a project including a CFI will be bid in the fall of 2008 and another in Federal FY 2010.

## A Review of CFI

A CFI is an at-grade intersection that eliminates one or more left-turn phases from a signal while allowing the left turn movements. As a result, the green and clearance times can be redistributed, reducing delays, fuel consumption, and air pollution. These at-grade intersections improve performance like grade-separated interchanges at a fraction of the cost and disruption.

At a CFI, left-turning drivers are routed first to a left-turn bay – several hundred feet before the main intersection – and then across opposing through traffic at a signal-controlled crossing point. Because these vehicles are now left of oncoming traffic, they can turn left simultaneously with through traffic at the main intersection, on the same green light, without stopping. (For a video demonstration of CFIs, visit [www.abmb.com/cfi-testdrive.html](http://www.abmb.com/cfi-testdrive.html).)

CFIs are controlled by coordinated traffic signals at each conflict point, all operated by a standard signal controller, so that left-turning drivers can make the continuous left turn. This means that:

Left-turning drivers can turn without worrying about oncoming traffic; oncoming traffic does not stop at the main intersection to accommodate left-turning vehicles; and conflict points are reduced.

## History of CFIs

The CFI concept, developed about 20 years ago, has been included in research efforts by the Federal Highway Administration, Transportation Research Board, and other organizations. It also has been documented in publications such as the ITE Journal, the FHWA Traffic Control Systems Handbook, Transportation Research Record, and NCHRP Synthesis 225, Left-Turn Treatments at Intersections.

More than 50 CFIs are now operating worldwide: five in the United States and the remainder primarily in Mexico, where they have proven their value by reducing congestion markedly over the last 15 years. The U.S. prototype was built in 1996 at Dowling College on Long Island. Four years later, the high-volume CFI was opened at Maryland 228 and 210, approximately 15 miles south of often-gridlocked Washington, D.C.

ABMB Engineers, Inc. and Gresham, Smith and Partners recognized early the benefits of CFI and have developed a close partnership in the implementation of CFI projects throughout the Midwest and Southeast.



## Advantages of CFIs

CFIs result in a smooth, continuous flow of traffic, and the benefits are considerable:

**CFIs are economical.** CFIs can be implemented for as little as 10 percent of the cost of grade-separated alternatives

**CFIs are safe.** Since CFIs reduce the number of conflict points at the main intersection, they're inherently safer. Ongoing safety studies at completed CFI intersections in the United States will verify early results, but all preliminary indications are that CFI performance in the field supports the theoretical improvements.

**CFIs can be constructed while maintaining traffic.** While constructing a grade-separated interchange can require 18 months to two years and require temporary roads to maintain traffic, constructing a CFI can take as little as 6 months and be phased to maintain traffic. A CFI also requires substantially less right-of-way than a grade-separated interchange.

**CFIs save motorists time.** CFIs can reduce average delay by as much as 90% due to reallocation of green time and reduction of signal cycle length.

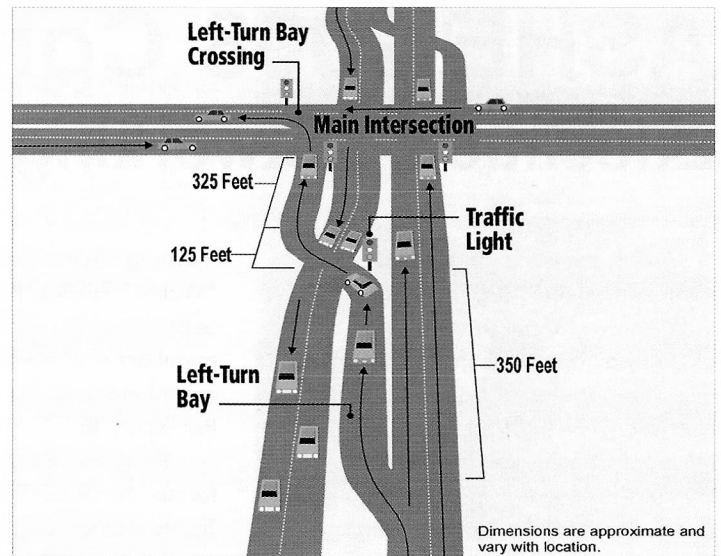
**CFIs are well accepted by motorists.** Public acceptance of the two-leg CFI at Airline Highway and Siegen Dr/Sherwood Forest Drive in Baton Rouge, LA, has been exceptional. The intersection has received high praise in the media.

**CFIs are flexible.** In many cases, CFIs can be adapted to an intersection's unique site conditions. And because CFIs can be installed in one-, two-, three-, and four-bay versions, more than one CFI design may be feasible at an intersection. Often, two-bay CFIs are constructed because they tend to avoid right-of-way and access issues that can exist with a four-bay CFI.

**CFIs are green.** Because CFIs reduce congestion, they also reduce pollution from emissions. And because delays are reduced, drivers save on fuel costs.

**CFIs can be built within tight constraints.** The CFI under design for Five Mile Road and Beechmont Avenue (SR 125) in Hamilton County, OH, has a gas station on one corner, a bank on another, a restaurant and town center on the third, and office buildings on the fourth. Through the use of various access strategies and careful location of the CFI legs, the potential impacts to these businesses have been mitigated.

**CFIs can be pedestrian-friendly.** The CFI at Five Mile and Beechmont is also being designed with pedestrian crossings. All pedestrian movements are protected, and with a CFI pedestrians are always crossing in the same direction as moving traffic.



## Current CFI progress in the United States

CFIs are now in planning, design, construction, or operation in the following states:

Arkansas  
Georgia  
New York  
Louisiana  
Maryland  
Mississippi  
Missouri  
Ohio  
Texas  
Utah  
Virginia

## Initiating a CFI project

A CFI project generally results from an overall study of a congested intersection. In many cases, other alternatives have already been studied and found to be unacceptable or too expensive. The CFI becomes an additional alternative for study. The initial study can usually be done at a cost that is affordable for a state or local government. If a CFI is the recommended solution, then funding for design, right-of-way, and construction is sought. Usual sources for such funding can all be considered, but one of the most attractive options is Federal Congestion Mitigation and Air Quality funds. Several CFI projects have in fact benefited from these funds. ■

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# ASHE 2008 Conference

## Education, Networking, Fun and Food

ASHE members and guests, numbering nearly 700, celebrated the 50th Anniversary of the American Society of Highway Engineers in Hershey, PA, just miles from the organization's beginning in Harrisburg, PA in 1958. The ASHE 2008 National Conference, held June 11-15 at the Hershey Lodge, was hosted by Region 4 (Altoona and Harrisburg Sections.)

180 golfers enjoyed 18 holes of golf on the East and West courses of the Hershey Country Club. Guests toured Doneckers, a family-owned department store offering unique items, the Pennsylvania Capitol, and State Museum.

The traditional ASHE Icebreaker was held Thursday evening, giving attendees time to meet 50 exhibitors and meet and reunite with other ASHE members. Abundant food and an open bar framed the evening.

Sandi Loy-Bell, Sandy Ivory (conference co-chairs) and ASHE National President Perry Schweiss welcomed ASHE guests at the opening session on Friday

morning. Guest speaker James A. "Mickey" Rowley, Pennsylvania Deputy Secretary of Tourism welcomed ASHE members and guests to the State and gave an entertaining 'list of facts' about Pennsylvania.

Pennsylvania Senator Rob Wonderling, former Pennsylvania Department of Transportation Deputy Secretary, told the audience in his keynote address that he has many visits from doctors, lawyers, etc. who request help from him for their professions, but very few visits from highway engineers. He said as a group, highway engineers need to make sure Legislators are aware of the highway industry and aggressively pursue support. His remarks were a topic of conversation throughout the Conference, as well as at the ASHE National Board meeting on Sunday morning.

The Past Presidents' Luncheon honored Russell E. Horn, Sr., a charter member of ASHE and the first Section, Harrisburg, as the Robert E. Pearson

Person of the Year Award winner. Mr. Horn's support of ASHE and the Highway Industry was recognized with a standing ovation from those attending. In addition, 17 National Past Presidents were presented with a new pin studded with semi-precious stones.

Friday events also included a meeting of the National Past Presidents, technical sessions and guest tours. Technical sessions included:

- "Highway Driven/Industry Driven – a discussion on the important relationship between the nation's transportation system and industrial/economical development throughout history to today.
- Railway Influence on Roadways – discussion on the influence of the American Railroad system on the American Highway system.
- Transportation, Legislatively Speaking – a discussion of the past 50 years of Transportation legislation and reforms.



The ASHE National Past Presidents were honored during the 50th Anniversary Conference. Those attending (left to right) included: Seated - James Charles, PE (1998/1999), Pasquale Dougherty, PE (1997/1998), Sandy Ivory (2002/2003), Richard Prentice (2006/2007), Russell Horn PE (1962/1963), Michael Suich (1988/1989), Raymond Petrucci, PE (1994/1995), J. Dixon Earley, PE (1982/1983). Standing - Charles Flowe, PE (1999/2000), Stephen Lester, PE (1990/1991), Gene Smith, PE, RS (1980/1981), Domenic Piccolomini, PLS (2000/2001), David Greenwood, PE (1996/1997), Ronald Springman, PE (1987/1988), John Rutter, PE (1964/1966), Rodney Pello, PE (2004/2005), Perry Schweiss, PE (2007/2008).



Friday tours included the Nissley Vineyards & Bube's Brewery Luncheon, the Strasburg Railroad and Railroad Museum and the Harley Davidson factory.

Friday's evening entertainment was a trip five miles from the Lodge to the Antique Auto Museum for a "Cruise Through Time." Over eight decades of restored and original antique cars, buses and other memorabilia were on display throughout the Museum. Guests danced to the sounds from the Fabulous Greaseband, who played and sang the last five decades of music.

Saturday tours included day-trips to either the Gettysburg National Battlefield or an Amish settlement. The technical tour was a trip to the Enola Railroad Yard, which handles 1,200 rail cars daily, and to the Rockville Bridge, a stone masonry arch railroad viaduct built in 1900-1902 with forty-eight 70-foot spans for a total length of 3,820 feet.

A Red Carpet Revue Reception and Gala Dinner capped Saturday's activities. "Joan Rivers" greeted guests and interviewed ASHE celebrities on their way into the reception. Dinner followed, which featured delectable Filet Mignon and Crab Cake dinner.

National President Perry Schweiss spoke on his term as President and recognized long term National Secretary Terence Conner and long time National Treasurer Robert Yeager for their service to ASHE. Terry and Bob both retired this year. Perry also presented Sandy Ivory with the President's Award and introduced the two original Charter members attending the Conference, Russell E. Horn, Sr. and John V. Rignani.

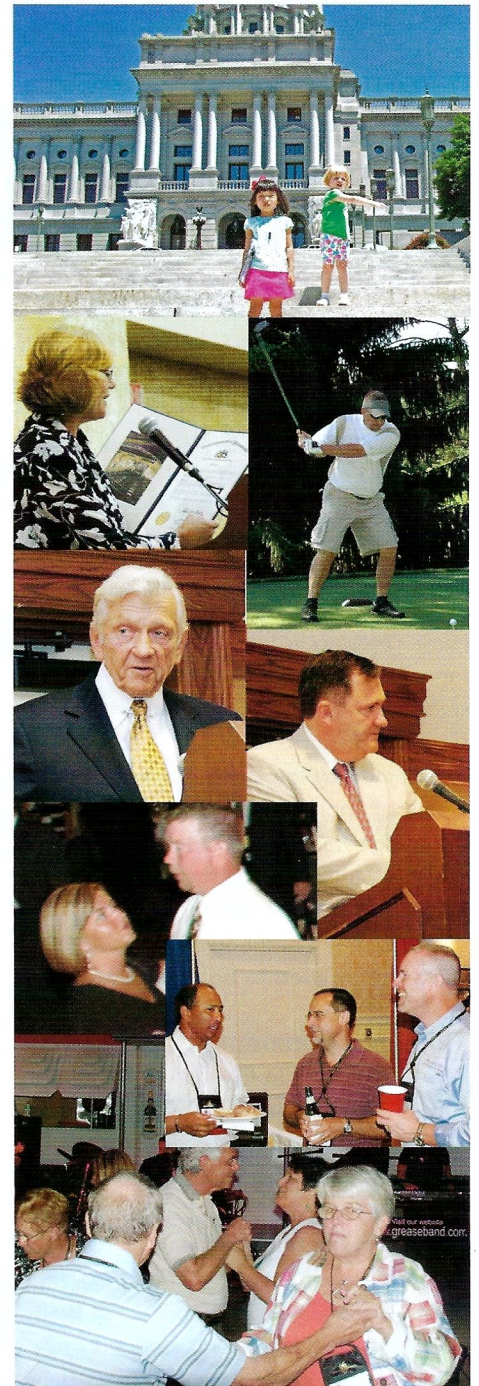
Sandi Loy-Bell, on behalf of the Conference Committee and Region 4, presented a check for \$5,000 to next year's Committee for the ASHE Conference in Atlanta, Georgia. "I hope this will become an ASHE tradition since the Sections in Region 6 (last year's Conference host) gave \$6,300 to us for this Conference – a much appreciated boost to the budget," she said. Tom Ziegler from the Georgia Section invited everyone to attend the Atlanta Conference and presented a video highlighting the area.

National officers for the 2008-2009 term were installed by Past President Richard Prentice and President Rich Clifton spoke of his future plans for the growth of ASHE.

Following the program, entertainment was provided by Keith Matheny, a mentalist, and music for dancing was presented by Mr. G, a local DJ.

Fellowship with ASHE members and their guests was provided in the Welcome Center every day in the afternoon and early and late evening. Beverages, snacks, impromptu entertainment, great conversation and card games kept this area well attended throughout the Conference.

The candles are all out on ASHE's 50th Birthday cake, but it was a party with plenty of memories. ■



**Looking Back...Moving Forward**

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# Fatigue Retrofit Improves Chesapeake City Canal Bridge

By Ahmad Faqiri, P.E.

The Chesapeake City Canal Bridge is a two-lane steel structure carrying U.S. Route 213 (also known as Augustine Herman Highway) over the Chesapeake and Delaware Canal which connects the Upper Chesapeake Bay with the Delaware River. The Bridge is the only canal crossing in Maryland. Nearly a mile long, the Chesapeake City Bridge, along with the Chesapeake and Delaware Canal and four other bridge crossings, is maintained by the United States Army Corps of Engineers (Army Corps). Though the bridge has been through several major rehabilitations, cracking of the floor beam connection angles in the main span became unmanageable in recent years and needed to be addressed.

## **Tied Arch Components**

Constructed in the late 1940s, the current Chesapeake City Bridge consists of a series of girder-floorbeam system approach structures flanking a 540-foot tied arch soaring 135 feet above the Canal and the town below.

The tied arch span of the Chesapeake City Bridge consists of built-up riveted steel box tie-girders and arch ribs that support the floor system by built-up steel box hangers. At each hanger location and at the two ends of the tied arch, floorbeams span between the tie-girders completing the tied arch as a rigidly connected exoskeleton for the floor system. The tied arch is fixed against horizontal movements at the north end and expands at the south end by means of fully functional rocker bearings.

Nested within the tied arch is the floor system which consists of fifteen 35-foot long simple span concrete deck/stringer bridges supported on top of the tied arch floorbeams. The simple span bridges, with the exception of the middle

span, are fixed on one end and free to expand on the other. The stringer deck spans are separated from each other by an expansion joint. This system is flexible and does not hinder the tied arch behavior.

In the late 1970s and early 1980s, the floor system underwent major repair. The concrete deck was replaced. The sidewalk was modified to be utilized as part of vehicular lane during stage construction and later converted back to a sidewalk. The expansion joints were replaced with a neoprene compression joint seal system armored with steel angles with tack-welded backer bars. The bridge railings along the sidewalk were welded to the expansion joint armored angles preventing joint movements. In addition, it was later discovered that the concrete placement during the deck replacement was not controlled, such that concrete and stay-in-place forms had been pushed inside the expansion joints and around bridge railing posts.

## **Fatigue Cracks**

During biennial bridge inspections in the late 1990s, hairline cracks were found in the top fillet region of several of the angles connecting the floor beams and the tie-girders in the tied-arch span. The cracks were originally thought to have been fatigue-induced, so modifications such as drilling holes at the end of the crack tips and other preemptive measures were taken to arrest the cracks. Further measures and investigations included load testing, global model analysis of the tied arch, replacement of certain stringer floorbeam bearings that were believed to have ceased to function and replacement of the top portion of the affected floorbeam tie-girder connection angles.

*When neglected expansion-joints led to fatigue cracks in the connection angles of main fracture critical members, it was time for upgrades to the mid-twentieth century bridge.*

By 2005, new cracks were appearing beyond the crack arresting holes as well as at new locations on both existing and recently replaced connection angles. At this time Pennoni Associates Inc. (Pennoni) was retained by the Army Corps to conduct a three phase comprehensive analysis of the cracks on the floorbeam tie-girder connection angles of the Chesapeake City Bridge tied-arch span.

Pennoni, in a collaborative effort with Structure Testing Institute Inc. (STI) and Specialty Engineering Inc. (SEI), conducted structural testing, created a global model for the tied-arch span and floor system, developed a finite element local model of the floorbeam tie-girder connection angles, and performed fatigue analysis to determine the remaining life for the existing angles. These models were also used to develop a design for retrofitting the connection to alleviate the fatigue stress conditions.

The analysis, along with field investigation, indicated that the floor system did not behave as a discrete set of simply supported bridges. Instead, the deck behaved as a rigid continuous surface on top of the floorbeams



inhibiting the ability of the floor beams to move freely with the hangers and tie-girders when the tied arch is subject to live loads. This unique behavior can be described as thus: As the live load travels along the tied arch, the arch tends to deflect downward under the live load and upward in other parts of the arch. This sine-wave-shaped deformation of the tied arch causes the tie-girders to induce rotation to the end of the floorbeams. The inability of the floor beam to rotate freely with the tie-girder due to its connection to the deck causes out-of-plane stress at the floorbeam tie-girder connection angle. This behavior was supported by the global model, which closely approximated the load test data when the deck was modeled as a rigid surface. The challenge then was to investigate why the deck was behaving as a rigid surface. Could it be the joints?

## Solutions and Recommendations

Once the problem was identified, the Pennoni/STI/SEI team proceeded with two objectives. The first objective was to identify the reason why the deck system was behaving in such a manner and to provide repair recommendations to restore the bridge deck to a free functioning state as was intended by original design. The second objective would be to retrofit the floor beam tie-girder connection based on fatigue requirements.

Investigation into the first objective focused on the joints. Since the joints were suspected to be the cause of the

deck's rigid behavior, Pennoni hired a contractor to remove several joint seals in order to inspect the joints in the tied-arch span. During these field investigations, it was discovered that water and salt leakage from the failed expansion joint seals caused excessive corrosion in the 1 1/4" wide joint and stringer bearings below. The joint openings were packed with rust from the steel backer bars. Original steel and bronze sliding stringer bearings were frozen. Some of the newer steel reinforced elastomeric bearings had limited rotational capability. As the packed rust grew across the bridge deck expansion joints, the bridge deck sections were pushed longitudinally along the centerline of the bridge relative to the tied arch. Indications of deck movement were evident in the various elements of the bridge. However, it should be noted that the cracks were located near each end of the tied-arch span, not near the center. This is explained by the lack of movement effect at the center of the tied arch while the movement was more pronounced towards the ends of the tied arch, because of the accumulative expansion of each joint.

In addition to the joint failure, the bridge railings that were connected to both tied arch hangers and the bridge decks were forced out of plane causing their connection angles to rupture. The 1" wide bridge joint between the tied arch and the girder-floorbeam system approach span at the north end was closed completely, causing the neoprene joint seal to protrude from the joint.

Stringer expansion and fixed bearings were also pushed towards the ends of the tied arch causing extreme deformation of the elastomeric bearings and shearing of bearing anchor bolts. The longitudinal movement of the deck was so great that it caused the top flange of the north end floor beam to rupture at the base of a stringer fixed bearing.

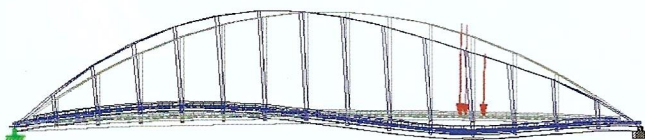
Investigation into the second objective included modeling both softening and  
*"Retrofit" continued p. 27*



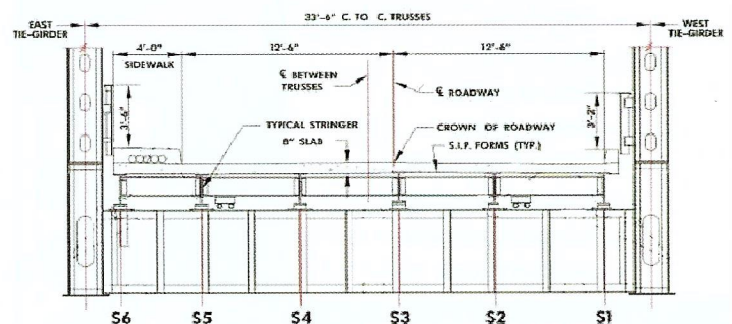
Hairline cracks, on the top end fillet region of the connection angles, discovered in the late 1990s during biannual bridge inspection.



Cracks propagating beyond fatigue arresting drilled holes near the fillet of the connection angle.



STADD model of the Tide Arch deflecting in a sign-wave-shape under Live Load.



Concrete deck-stringer floor system supported on top of the Tide Arch floorbeams.

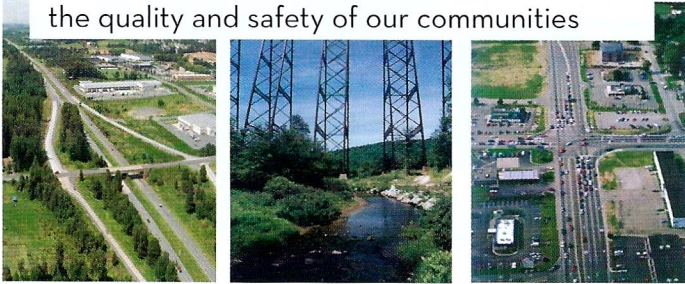


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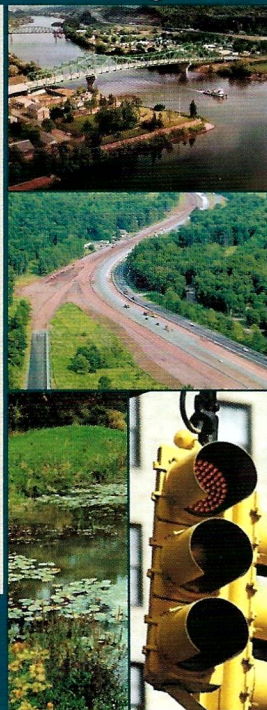
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# Delaware Valley Section Projects of the Year

Robert M. Wright, PE

Vice President, Urban Engineers, Inc.; Member, Board of Directors, Delaware Valley Section

The Delaware Valley Section cited its Projects of the Year for 2007. This is the fourth year that the Section's program has recognized efforts in two separate categories, defined by construction costs (a "small" grouping for projects under \$5 million and a "large" one for those \$5 million and above.) This division opens the competition to a larger number and greater variety of projects. It has also allowed the consideration of notable and significant, but smaller-magnitude, efforts and has avoided these being overshadowed by larger, more complex ones.

This year, six projects were submitted, with four in the small category and two in the large group. Stephanie Butler, Chair of the Section's Project of the Year Committee and Member of the Section's Board of Directors, expressed pleasure with both the caliber and number of submissions this year, as well as the results. "The quality and diversity of the projects that were submitted this year was terrific and the Section is appreciative of those who participated. Additionally, recognizing projects in the two categories allows the Section to better address the smaller efforts that allow opportunities for unique solutions that may be implemented in a more efficient manner, as well as the larger projects that have greater impacts, profiles, and costs," she observed. Section President (2007-08) Bob Milliken noted, "The winning projects highlight ways that engineers and contractors work together to overcome constraints and employ effective methods to deliver needed projects."

The Delaware Valley Section extends its thanks to all the award applicants for their participation. As always, the Section continues to look forward to the recognition of projects within our area next year and encourages project designers, constructors and inspectors to submit efforts for consideration when the 2008 competition opens next January.

## **Pottstown Pedestrian Underpass** **Traffic Planning and Design Inc.**

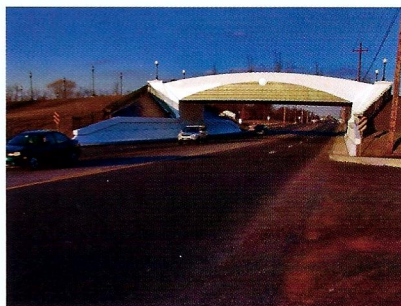
(construction inspection consultant)

Under \$5 million

The project is located in and owned by Pottstown Borough. The designer was Bursich Associates and the construction contractor was McMinn's Asphalt Co., Inc.

The Pottstown Pedestrian Underpass Project was developed through the conversion of the existing Norfolk Southern Railroad archway to a pedestrian walkway, providing a safe passageway for the public and students of Montgomery County Community College. As noted in the letter of support from Pottstown Borough, this project provided an important link between the Borough's Memorial Park to Riverfront Park along the Schuylkill River Trail. The pedestrian underpass is one portion of a larger walkway system that will provide improved pedestrian accommodations throughout Pottstown Borough.

The construction cost for the project was \$1.08 million. Funding sources for the design and construction were the Pennsylvania Department of Conservation and Natural Resources (DCNR), Pottstown Borough, PennDOT, and Montgomery County Community College. Federal Transportation Enhancement funding was utilized for a portion of the work.



## **Forty Foot Road and Pedestrian Bridge Project** **McMahon Associates, Inc.**

(design consultant)

Over \$5 million

The project is located in Towamencin Township, Montgomery County and is owned by both PennDOT District 6-0 and Towamencin Township. The construction contractor was Road Con., Inc. and

construction management/inspection was provided by PennDOT District 6-0.

The project was developed to improve the safety of Sumneytown Pike and Forty Foot Road and reduce congestion in the area. In order to accomplish that goal, there would be a severe impact on pedestrian movements in the area. The addition of the pedestrian bridge to the project allowed for a primary connection between the proposed mixed-use district in the Township, the township-wide master plan trail system, and the Montgomery County Trail System. The existing Forty Foot Road (SR 0063) was widened to a five-lane section with bike lanes. Related intersection and roadway improvements were effected along adjacent Sumneytown Pike. A major component of this project was the pedestrian bridge over Forty Foot Road. Special recognition is also given to Simone Collins Landscape Architecture for its context-sensitive architectural design of the pedestrian bridge.

The construction cost for the project was \$12.98 million. Funding for the design and construction came through the Towamencin Township Infrastructure Authority and PennDOT.





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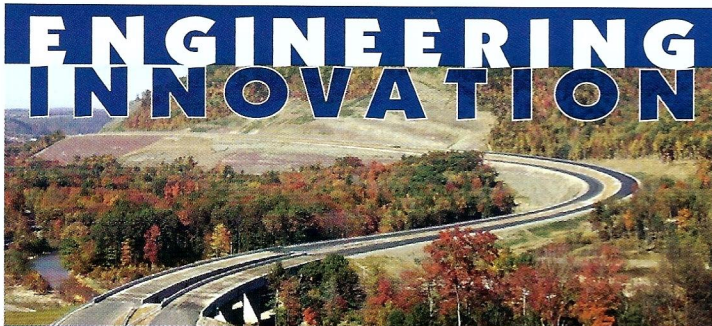
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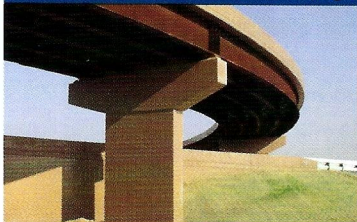
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# Greater Hampton Roads Scholarship Endowment

Old Dominion University in Norfolk, VA recently began a Transportation Engineering Program in the Civil and Environmental Engineering Department. The Greater Hampton Roads Section of ASHE has partnered with ODU to endow a permanent scholarship.

The ASHE GHR Scholarship in Engineering is an endowment of \$25,000 that will be paid over the next 5 years. The scholarship will be awarded annually to a student interested in transportation engineering and plans on pursuing a career in this field after graduation. While making the endowment, ASHE GHR is providing a \$1,000 Annual Scholarship Award over the next 5 years until the endowment is fully funded. After the endowment is funded, the interest from the investment will provide for a minimum \$1,000 Annual Scholarship Award. The endowment provides the flexibility to grow the original \$25,000 investment so that it will fund a larger scholarship award in future years. Also, at their discretion, ASHE GHR can supplement the annual award with other funds to increase the award to a worthy student. The GHR Section's next goal is to organize a Student Section of ASHE at ODU.



From left: Asad J. Khattak, Ph.D. (Batten Endowed Chair Professor – Transportation; Old Dominion University, CEE Dept.); Gary C. Schafran, Ph.D. (Professor and Chair; Old Dominion University, CEE Dept.); Adam J. Jack, P.E. (President; ASHE-GHR); John M. Stronach, P.E. (Treasurer; ASHE-GHR); and Heather M. Ham, P.E. (Past President; ASHE-GHR)

## ASHE Operating Manual Updates

*Shirley Stuttler, Operating Manual Chair*

The following areas of the ASHE Operating Manual have been revised since June 2008:

- National Officers, Regional Directors and Master Section Officers lists for 2008-2009 have been posted.
- The National Organization Section was updated, as a result of two new awards (Terence D. Conner and Robert E. Yeager) which were instated at the 2008 National Conference.
- The New Section Startup Procedures, Section Organization and Section Secretary Duties were updated to include information regarding Section membership personal update capability via the National Website under the MEMBER link. Members may update their personal information and the information in turn is directed to their Section Secretary and National Secretary.
- The Section Program Summaries for 2007-2008 were posted so Sections can refer to this area to obtain suggestions/recommendations for possible programs at their local meetings.
- As a result of the dissolving of Western Reserve and North Florida Sections, the following documents were revised: Introduction, Regional Organization Guidelines and SCANNER Guidelines.





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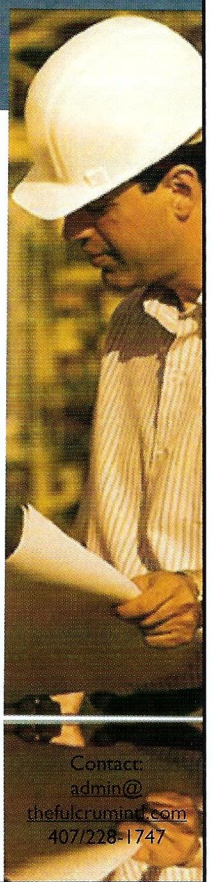
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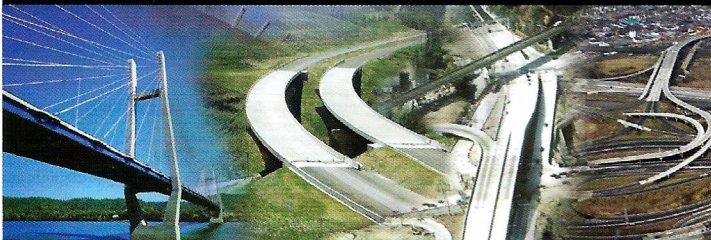
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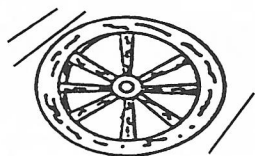
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# As the Wheel Turns

## Employees Win National Awards

*Journal Tribune Staff*

Union County Engineer employees Jeff Stauch and Sue Irwin were recently named Project Managers of the Year for 2007 by the National Association of County Engineers (NACE).

The announcement was made at the association's national convention in Portland, Ore., and was the first time that NACE has made such an award to employees of a county engineer's office.

The award was in recognition of their leadership and project management efforts on the two new covered bridges, the rehabilitated Pottersburg covered bridge and the Big Darby Plains Scenic Byway. Those projects were publicly dedicated in 2007.

Stauch, Assistant Union County Engineer, handled the bridge projects, and Irwin, Union County Engineer's Office Business Manager, coordinated the scenic byway designation.

"It is exciting because it's an award given by your peers," he said. "To get to be part of a project like this is an honor, and then to have the National Association of County Engineers recognize your efforts and your work is kind of special."

Stauch called the projects, "once in a lifetime, signature projects."

Irwin agreed.

"It is quite an honor," she said. "You go to work day in and day out and you do your job each day and it is really nice to get nominated for a national award for some real great projects for Union County, but that were challenging from a project standpoint."

She said the scenic byway designation involved coordination between multiple local, state and federal entities.

"It was really neat to be recognized as someone who is able to manage a project like this," Irwin said.

Union County Engineer Steve Stolte nominated the pair for the award.

"Jeff and Sue both did a great job managing the varied funding sources, local government representatives, public input and state and federal red tape," Stolte said. "Everyone involved in these projects worked hard toward our common vision."

The Project/Program Manager of the Year Award is to recognize significant meritorious work by an individual on a project or program for a county who has demonstrated a commitment to the profession and shows potential for future growth. This award is presented annually to recognize a NACE member county project or program manager working below the county engineer or agency head management level for outstanding service and meritorious achievement in or for a county in managing a construction project or pavement, safety, operations, bridge, or other program.

Irwin and Stauch credited many people in the engineers office for making the projects come to fruition.

"There were many, many hands involved to make it finally come together," Stauch said. "That makes it pretty rewarding."

Stauch specifically thanked Josh Holtschulte, a design engineer for the county engineer's office.

The Union County Commissioners also passed a resolution honoring Stauch and Irwin for their outstanding efforts on the projects.

Ohio swept all awards at the NACE convention. Auglaize County Engineer Doug Rinehart was named the Rural County Engineer of the year and Columbiana County Engineer Bert Dawson was named Urban County Engineer of the Year. This was the first time in NACE history, a state swept the awards.

"It was really nice to be part of a clean sweep for the state of Ohio," Irwin said.

In a statement, the County Engineers Association of Ohio congratulated the award winners.

"The combined bridge and byway project involved extensive effort to pull together various planning processes, funding sources, and local government representatives," read the statement. "The County Engineers Association of Ohio is extremely proud of the accomplishments by this outstanding group of professionals and extends congratulations for their well deserved recognition by NACE."

Receiving a national award from NACE represents the highest level of recognition for a county engineer. To be eligible for an award, recipients must be a voting NACE member in an urban or rural area who has made an outstanding contribution to the county engineering profession and to NACE activities.

*First appeared in the Marysville Journal Tribune, May 6, 2008.*



*"Funding" continued from p. 11*

To further add to the challenge, Congress recently ordered a 40 percent increase in automobile fuel economy (CAFE Standards) which will lead to a corresponding decrease in gas tax revenue. This law, while admired for its energy conservation benefits and reduction in reliance on foreign oil, will adversely affect transportation revenue. Pennsylvania lawmakers, faced with our own state's documented finance needs and the recognition of uncertain federal investment levels, rising construction costs, and declining gas tax receipts, arrived at Act 44 after considering several options. This structured plan reduces reliance on gas taxes and is consistent with energy policies and political realities while capitalizing on the benefits of a unique "Public/Public" Partnership.

### **Public/Public Partnership: Monetization Plan**

An important aspect of the public-public partnership is that it includes a gradual escalation of tolls over the 50-year lease, to ensure that cash contributions to PennDOT and capital investments into the Turnpike and I-80 will steadily increase. But unlike the private concession approach, this plan does not require incurring enormous amounts of toll-backed debt all at once. Instead, the funding is provided as needed each year, over time, with much less reliance on borrowing. The benefit of Act 44 lies in using the Turnpike, a public agency, to raise the funds. Just as other states debating toll road privatization have concluded (e.g., New Jersey, Illinois, Texas), public entities are more cost-effective: They can borrow money at tax exempt rates with municipal bonds, rather than much more costly taxable debt and equity used by private entities. Lower borrowing costs and no need to maximize profits ensures that more money will be available for transportation purposes.

Act 44 provides a stable funding source, starting at \$750 million in 2007 and escalating to \$2.9 billion in 2057. It will generate an average of \$1.67 billion per year, without increasing taxes or privatizing Commonwealth assets.

### **I-80 Toll Conversion Project**

The PTC & PennDOT have applied to the Federal Highway Administration (FHWA) for authority to toll I-80 as part of the ISRRP Program. The program allows up to three Interstate facilities in separate states to be tolled to generate funding for reconstruction or rehabilitation on Interstate highway corridors that could not otherwise be adequately maintained or functionally improved without the collection of tolls. There is one unassigned program slot to which Pennsylvania has applied. The PTC and PennDOT are currently working with FHWA to obtain provisional acceptance of the project into the ISRRP Program.

A multi-disciplined consultant team led by Pennsylvania-based McCormick Taylor, along with Wilbur Smith Associates, Mercator Advisors, and Cozen O'Connor, is currently conducting the studies necessary to meet the requirements of the ISRRP Program and Turnpike policies, including:

- Capital Improvement Analysis
- Toll & Implementation Plan
- Traffic & Revenue Study
- Environmental Analysis
- Economic Impact Studies
- Financial Plan

The Capital Improvement Plan is the cornerstone of the application. Engineers have completed in-depth condition evaluations to determine I-80 pavement and bridge rehabilitation/reconstruction needs. Like most of our nation's interstate system, I-80 was built in the 1960's. As such, it will require significant investment for rehabilitation and reconstruction. Current estimates that \$200-\$250

million/year (over four (4) times current investment levels) is needed and will be provided by the tolling plan.

The Toll & Implementation Plan will include recommendations for the location of toll collection facilities at up to 10 locations along the corridor. The PTC is considering three different toll collection scenarios using the E-ZPass system. The preferred toll collection scenario is Open Road Tolling (ORT), which allows vehicles to move through tolling points at the posted speed limit without having to stop and pay a toll. The goal is to have these facilities in place in the Fall 2010.

The PTC is committed to developing the toll conversion plans in the best interest of the residents and business owners along the I-80 corridor. Innovative mitigation measures will be identified and coordinated in advance with local and regional planning organizations and the public. The PTC will continue to work to establish itself as a good neighbor in the corridor as studies continue.

In summary, Pennsylvania's Act 44 may be a glimpse of the future in transportation funding. Energy goals and policies, coupled with rising oil costs will likely generate continued pressure to develop affordable alternative fuels for automotive travel. As these fuels are developed and installed into the fleet, an energy neutral transportation revenue stream will be needed to charge motorist user fees, ultimately supplementing or replacing the gas tax. Vehicle Miles Traveled (VMT) charges are being touted as a likely solution. In today's technology that means tolls - which are direct user fees based on mileage, not fuel consumption. Act 44 keeps control of those rates in public hands and creates a steadily increasing stream of transportation revenue that is not reliant on gasoline consumption to help meet Pennsylvania's current and future transportation needs. ■



# The Impact of a Changing Workforce

Jackie VanderPol, President of The Fulcrum International

*The way we do business is changing faster than ever before, and our workforce and the way we all work together and compete successfully is changing just as rapidly. Below are a few sound-bites to ponder...see if you agree.*

## Jackie's AEC Labor Trend Predictions

**Creative hiring structures will become commonplace.** As our business becomes more specialized we will see many more contract employees, contingency agreements with top talent, and outsourcing to specialty firms. Take for instance the bascule bridge engineer. This is a specialty that is highly prized, but not required on a day-to-day basis for all but the biggest engineering offices. Premiums must be paid to these professionals though, to compensate for other benefits (health insurance, 401k's, etc.) that they may not have access to as a contract employee.

Outsourcing will happen more frequently, especially for overhead services such as graphics design, computer programming, drafting, IT services, and ongoing production work for big projects. Outsourcing will help meet the M/W/DBE requirements and/or save operating capital.

### **Decisions have to be made FASTER.**

When courting a potential new hire, it's important to move forward without excessive delay. Once you know the person is right for the job, go ahead and close the deal. Today's top talent will be frustrated with a long hiring process, and your competition will win out. Companies will need to elevate the HR process to one of greater importance and authority.

This need to move faster goes for your interactions with clients too. With new competing companies starting up every day, and with them their new techniques and services, successful companies will react more decisively. With too much deliberation it won't take long

for your clients AND your top talent to get frustrated and move on to another company that is perceived to be easier to work with.

**Innovation will be sought after by employers, and rewarded.** An ever-increasing demand for new products, technologies and services means that those companies with the best ideas — who can bring it to market first — will be successful.

Management will rely more on the company's forward-thinking talent to spot opportunities. The employer/employee relationship is switching to a more team approach with all parties saying "We're in this together, so let's make this work the best way we can."

Additionally, employers will be less rigid in the way they treat the outside-the-box thinkers. Often those performers will shine if given flexible hours and remote work options, along with clear goals and accountability. Employers should support an employee's interest in new technology, skills development and interest in global trends. Today's savvy employer will provide staff with adequate time for rest, reflection, research and travel.

### **Quality will be of greater importance.**

Quality is currently often suffering in the wake of the need for products/technologies/services faster and cheaper. I believe this trend will morph as consumers and clients have bad experiences with poor performing products/technology/services and are pressured to be more responsible environmentally. I predict that things will balance out and that clients will want the following in this order of priority. Quality / Innovation / Price / Time / Green.

**There will be more global competition for the best talent.** Be ready. Expect it. Some of our best and brightest will be lured away to the far ends of the earth. They will seek the adventure, the challenge, and the big paycheck. Sorry, but take heart, they will come back in the end.

For those who stay, there will be an increased emphasis on retaining the best talent over the years...keeping a knowledge pool. There will be less emphasis on retaining easier to replace employees, and as a result, there will be even less employee loyalty in the lower ranks if they feel as if they are just a number rather than a valuable team member.

**More reliance on technology requires more ongoing training and technology investment to stay current.** Employers will need to continue providing ongoing training on new technology, and invest in upgraded equipment to keep up or stay ahead of the industry. This is, of course, a potentially enormous overhead expense. It will be vital for companies to find ways to maximize their training and technology dollars. Thoughts to accomplish this might be to assign certain employees to specific training and then set aside time for them to train other employees. Sporadically used computer programs can be shared where practical, and equipment can also be shared and checked out, similar to a library book. In order to keep peace in the company, it will be vital to create an atmosphere of planning ahead and coordinating schedules. A few minutes of scheduling and planning could potentially allow a company to be cutting-edge AND financially solvent at the same time. Perfect. ■



# Massive Challenges, Massive Successes

## The Lewistown Narrows

The complexity of The Lewistown Narrows project lies in the successful fusion of a variety of engineering goals – from structural, to geotechnical, to environmental – all while satisfying the expectations of the Pennsylvania Department of Transportation (PennDOT) and building a working relationship with the community. It was a multi-faceted project with massive challenges and ultimately massive successes.

Aptly named The Narrows, the roadway snakes its way between the winding Juniata River and steep slopes of Shade Mountain. With over 20,000 motorists traveling through the passage daily and upwards of 55,000 travelers during peak times, such as holidays and Penn State football weekends, the roadway is a vital artery. But, because it was a two-lane stretch of road flanked on either end by 4-lane ‘interstate look-alikes’, The Narrows stretch was generally bottlenecked and had been deemed one of the nation’s most dangerous highways.

To modernize the highway, the design team – led by The EADS Group – was challenged to squeeze two additional lanes into the already tight space while being sensitive to the historic Pennsylvania Canal System and significant environmental concerns. Additionally, official detours would have

been 30 to 60 miles long; so, the roadway would have to remain open to traffic throughout the massive year-round construction.

The first step in overcoming the challenges was choosing a bifurcated alignment for the narrowest portion of the roadway. The alignment pushed westbound lanes 20 feet above eastbound lanes for about 2.3 miles. Supporting the alignment is the longest mechanically stabilized earth (MSE) wall in the United States and the second longest in the world, according to the designer and supplier of the wall, Reinforced Earth, Inc.

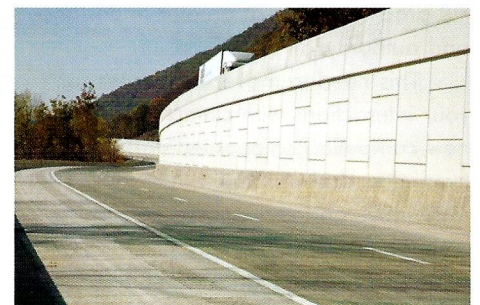
While the wall is the most obvious and visually impressive support of the alignment, many travelers may be interested in knowing an equally impressive support is buried beneath the slopes. 8,800 micropiles made of 7” pipe and averaging about 26 feet in length were driven into the steep, talus covered slopes to stabilize the mountainside. That means there is roughly 43.5 miles of pipe drilled into the side of the mountain to provide a solid foundation for the construction of a safe highway facility. Prior to the project, very little design criteria or reference material was available that could be applied to this unique challenge. As a result, sub-

consultants Erdman Anthony and GTS Technologies, Inc. developed the analysis, design methodology, and ultimately the design criteria for the project’s slope stability system.

As mentioned before, The Lewistown Narrows was a multi-faceted project and vehicles were not the only consideration in the design of the roadway: several environmental and historic mitigation activities were included as well. Because the project encroached into the Juniata River bank area, the design included an offsite replacement of the lost habitat with a larger open-water and marshy area. A 2.5 acre pond and 2.8 acre wetland area were seeded with grass and designed to sprout indigenous wetland vegetation and to provide a habitat for a variety of native plants, birds, ducks, bats, frogs, turtles and other wildlife.

Though the Juniata River is an important environmental concern, the

*“Narrows” continued p. 27*





*"Retrofit" continued from p.16*

stiffening of the connection angles. The softening scheme investigated involved coping the top flange of the floor beam, but the outside stringer bearings were too close to the tie-girder, making it impractical. In addition, this scheme resulted in unacceptable stress concentrations on the floor beam web. The stiffening scheme investigated was simple and did not require modification or alteration of the tie-girder and floorbeam. This scheme included providing a thicker connection angle to replace the top portion of the existing cracked or under-designed connection angles.

### Repair and Retrofit

Based on the three-phase analysis and retrofit recommendations, the bridge rehabilitation and fatigue retrofit consisted of the removal and replacement of the bridge deck expansion joints, replacement of bearings, and replacement of the top portion of the floorbeam tie-girder connection angles. Pennoni completed the final design, while construction was handled by Cianbro Inc. The repair sequence consisted of joint repair, followed by bearing replacement. Connection angle replacement was then critical. It was important to bring the bridge deck and its elements to their original condition, releasing the accumulated stress in the deck floor system before the installation of the new connection angles. Once the expansion joints were cleaned and prepared to receive the new joints, indications of the bridge deck moving back to its original condition was observed in several locations along the bridge, even before the expansion joints were completely restored. For example, the closed bridge joint between the tied arch and the girder-floor beam system approach span was opened up to approximately  $\frac{3}{4}$ ", which was 75% of its 1" design width. In addition, the stringer expansion and fixed elastomeric bearings that were deformed were observed to normalize.

Once the deck floor system was repaired to function freely, the top of connection angles were replaced at floorbeam locations that already had experienced fatigue cracking and also at floorbeam locations that were likely to experience fatigue cracking during the life of the bridge. The fatigue life determination of the existing connection angles was conducted in accordance with the requirements of AASHTO Standard Specifications and the design of the proposed connection angles was performed in accordance with the requirements of the AASHTO LRFD.

### Lessons Learned

When a bridge is being repaired, even slight modifications could change the behavior of the bridge and result in significant consequences. As learned from the Chesapeake City Bridge fatigue retrofit, neglect of serviceability elements such as joints which are not typically considered high priority repairs, could result in bearing malfunction and complicated fatigue and fracture failure. With this bridge's expansion joints and stringer bearings repaired, and floor beam connection angles retrofitted, Chesapeake City Bridge will be protected for many years to come. ■

*Ahmad Faqiri is a senior engineer with Pennoni Associates and the president of the Delaware Association of Professional Engineers.*



*1 inch wide joint at the end of the tied arch span closed up as a result of the bridge deck system moving outward.*



*Stringer bearing and its anchor bolt being pushed towards the end of the tied arch causing extreme deformation of the elastomeric bearings and shearing of the bearing anchor bolts.*

*"Narrows" continued from p. 26*

greater challenge for the design team was to preserve the unique historic areas of the Pennsylvania Canal system. The bifurcated alignment relieved much of the concern for the Canal; however, a Canal Park was designed to mitigate any impacts the reconstruction may have on the area. Included in the park were plans for a new visitor area – complete with recreation/ picnic area, a restored section of the PA Canal lift lock system, a restored towpath spillway, interpretive signs and trail markers to guide visitors along the towpath for a 1.5 mile journey along the Juniata River. The project also includes a fish and boat access area located at the end of towpath trail.

The project was scheduled to be completed by the end of 2008 but was opened to traffic on December 14, 2007 – one full year ahead of schedule. The new modern, 4-lane, limited access highway has eliminated conditions that have been a bane to drivers for decades and has given the community new access to wildlife and historic areas. The Lewistown Narrows has shed its 'most dangerous' title and is now a local attraction and engineering marvel. ■





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### AD SPECIFICATIONS

- Electronic file formats: PDF or Windows Platform, PageMaker, Photoshop, Illustrator, eps, tif or jpg.
- File must contain layout, all image files and fonts used.
- Ads are printed in color.

Ad size:	Width Depth
Full page	7.5" x 10"
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1/4 page	3.667" x 4.75"
Business card	3.667" x 2.25"
Screen:	Scanned photos at no less than 300 dpi

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#### Advertiser Information

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City, State, Zip:	
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E-mail:	
Invoice will be mailed to advertiser listed above unless otherwise noted. Checks payable to ASHE SCANNER. Contract must be received before ad placement. Terms 30 days.	
Signature:	Date:

#### ASHE Profile

The *SCANNER* is published quarterly by the American Society of Highway Engineers and delivered to over 6,000 readers nationwide.

- 16% are State D.O.T. Employees
- 67% are Engineering Consultants
- 7% are Contractors
- 12% are Related Professions
- 49% of the membership has a professional status

#### SCANNER Correspondence

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# American Society of Highway Engineers 2009 National Conference



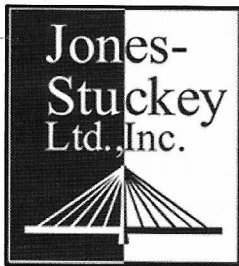
Atlanta, Georgia  
June 3 - 7, 2009



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Triko Valley .....	160

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Franklin .....	213
Mid Allegheny .....	84

### Region 3

Pittsburgh .....	613
N. Central West Virginia .....	61
Potomac Highlands .....	46
South West Penn .....	248

### Region 4

Harrisburg .....	393
Altoona .....	190

### Region 5

North East Penn .....	135
East Penn .....	105
Williamsport .....	157
Central New York .....	65

### Region 6

Delaware Valley .....	402
First State .....	143
New York Metro .....	179
North Central New Jersey .....	135
Southern New Jersey .....	236

### Region 7

Blue Ridge .....	69
Potomac .....	128
Chesapeake .....	151
Old Dominion .....	55
Greater Hampton Roads .....	85

### Region 8

Carolina Piedmont .....	73
Carolina Triangle .....	219
Georgia .....	497
Middle Tennessee .....	146

### Region 9

Tampa Bay .....	120
Central Florida .....	174
Northeast Florida .....	299
Gold Coast .....	59

Total ..... 6426

Professional Status .....	50%
Government .....	14%
Consultant .....	67%
Contractor .....	7%
Other .....	12%