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SCANNER

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Concrete Deck Testing – Correlation Results

Walter N. Hucal, P.E.

Interstate highways are mercilessly subjected to heavy truck and traffic loading demands. Due to these demands, the Delaware River Joint Toll Bridge Commission (DRJTBC) requested a bridge deck and roadway condition study on a 4.75 mile stretch of Interstate 78 under their jurisdiction, from the west abutment of the Delaware River Bridge in Pennsylvania to the Still Valley Interchange in New Jersey. The purpose of this study is to determine which recommendations would be necessary to protect DRJTBC's investment for the next 15 years without the need for additional major roadway and bridge repairs or rehabilitation.

The scope of work is comprehensive and complex, covering numerous engineering disciplines. One of many key components in this study is to evaluate the condition and integrity of the concrete decks for six bridge structures along this corridor, including the seven-span continuous, 1,222-foot long dual-structure Delaware River Bridge. In order to carry out this evaluation, the following six non-destructive tests (NDT) need to be performed: visual inspection; delamination check via hammer and chain drag; chloride content analysis; half-cell potential readings; concrete cover via pachometer; and four-inch diameter coring.

It is important to note that the six structures under investigation are approximately 20 years old, and the top mat of transverse and longitudinal rebar is epoxy coated.

The findings from each test, respectively, show:

- Transverse cracks no greater than 1/30" of moderate density exist across the structures. No significant spalls are observed, and hence rebar is not exposed. Minor SIP corrosion is noted in small isolated areas.
- Delaminations typically occur in small isolated areas (approximately 0.05% of total deck area), except for a one-span structure, where nearly 5% of total deck area is delaminated along a longitudinal construction joint.
- Six of 64 pulverized concrete samples (~30 grams) indicate chloride content greater than two pounds per cubic yard of concrete. This value is the assumed threshold to initiate rebar corrosion.
- Numerous half-cell values were measured and recorded at nodes across a six-foot by six-foot grid referenced across the concrete deck area. Values range from –60mV to –800mV. A half-cell value of –350mV is the assumed threshold likely to indicate rebar corrosion. A value more negative than this increases the likelihood of corrosion.
- Concrete cover for rebar varies from 1½" to 4". The average value hovers between 2" to 2½". Locations of low concrete cover did not disturb the integrity of the concrete.
- Four-inch diameter coring is only performed following half-cell contour mapping across the deck area, and locating areas of steep half-cell gradients (i.e., where rebar corrosion is likely and would need to be verified physically and visually).

The findings from all NDTs are then correlated in order to accurately evaluate the deck condition. Very little correlation is found between the chloride content and the associated half-cell value for a test location.

All half-cell values, even if they are more negative than the -350mV threshold, are deemed to be of no consequence, as the epoxy coating prevents any electrical continuity between the reference rebar and the rebar test location. In the circumstance where either chloride or half-cell, or both values, exceed the assumed threshold giving rise to initiate rebar corrosion, the associated concrete cover is generally 2 ½". Furthermore, any evidence of significant cracks, spalls, concrete deterioration, or delaminations is not visually observed. Finally, if a four-inch diameter core is necessary to extract from the suspected contaminated location (at least based on theoretical threshold values), it is found that the epoxy coating layer is completely bonded to the rebar after it was removed from the core sample.

In other words, despite the concrete deck containing contaminating elements conducive to rebar corrosion, the epoxy coating appears to effectively shield the rebar from such corrosion.

Repair of isolated delaminated concrete deck areas notwithstanding, and the presence of numerous fine transverse cracks which allow for additional intrusion of chlorides into the concrete deck, the low correlation between the high chloride content results with associated half-cell values compounded with visual evidence and the age of the bridges point to the apparent effectiveness of the epoxy-coated rebar. ■


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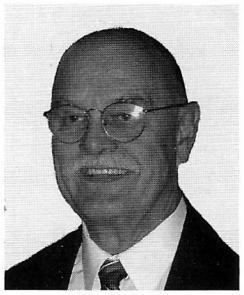
President's Message

Ron Purvis, P.E.



The National Board meets four times each year. The first meeting normally (but not always) occurs at the Annual Conference, the morning after the new officers are installed. The National President selects the location of the other three meetings. The quarterly board meetings typically begin on Friday afternoon with committee meetings. The actual Board meeting begins on Saturday morning. The objective is to adjourn the meeting by noon, but this is often difficult to accomplish because of the amount of business to be conducted.

In addition to the typical secretary's and treasurer's reports, the Board meeting agenda includes reports of the quarterly activities of both the President and President's Assistant. Next on the agenda are reports from the eighteen National Committee Chairs. Most of the committees are active. Many bring issues that require Board approval. Often these issues result in considerable discussion.

Not including routine organizational business, some of the more important issues the Board addressed this year were:

1. Developing a comprehensive update of the National Bylaws.
2. Employing a more focused campaign to improve ASHE visibility nationwide.
3. Updating the Conference Guidelines.
4. Implementing a more detailed status reporting procedure for upcoming National Conferences.
5. Putting into action a new process of assigning individuals to share experience between past and future National Conference planning committees.
6. Progressing toward organizing the nine Regions into functioning units that:
   a. Promote Regional activities and
   b. Provide a link between the Local Sections and the National Board.
7. Promoting a more assertive strategy toward chartering new Sections.
8. Updating the 3-year Strategic Plan.
9. Creating a detailed document containing the history of our organization.
10. Discussing a potential increase in the National dues.

The Board meeting also includes status reports from the upcoming four National Conference Hosts:

- **2006 Region 7,** Williamsburg Marriott (VA)? Most of the planning has been completed as this message is being prepared. The focus is on soliciting financial sponsors and conference registrants.
- **2007 Region 6**, Atlantic City Tropicana (NJ)? Much of the planning has been accomplished. Promotion will begin in June after the Williamsburg Conference.
- **2008 Region 4**, Hershey Lodge (PA)? The hotel is selected, the planning committee is organized and work is in progress.
- **2009 Region 8**, Atlanta, GA? Hotel negotiation has been completed subject to approval by the National Board and planning is beginning.
- **2010 Region 1**, Cincinnati, OH? Hotel selection and planning committee organization are in progress.
- **2011 Region 9**, Orlando, FL? This conference location was approved by the National Board at the spring meeting.

In recent years the Board has required that Committee Chairs and Regional Directors submit reports in advance of each meeting. The reports are organized by the President's Assistant and e-mailed to each Board Member before the meeting. The objective is to familiarize members with the issues to be discussed and eliminate unnecessary report reading during the meeting.

Another objective in planning National Board Meetings is to provide an opportunity for the Board Members to meet with the local ASHE leaders. Hopefully this helps each group share objectives and challenges. The fall meeting was in Region 7, Williamsburg; the winter meeting was in Region 9, Orlando; and the spring meeting was in Region 8, Nashville.

The National Board met with local leaders in all these locations. In Williamsburg, the Board met with the Region 7 Board and 2006 Conference Planning Committee. In Region 9 the local Section arranged for a joint meeting with Section Members for a dinner which included a speaker from the Department of Transportation. The April Board Meeting was scheduled in Region 8 to meet the leaders of our recently chartered Middle Tennessee Section.

It has been an honor to serve you as ASHE National President. Hopefully, I will see you at the National Conference in Williamsburg. ■

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I-295 / S.R. 9A Completion

Mike Goldman, Florida Department of Transportation and Tom Woods, JEAces Construction Engineering Services, Inc.

Twenty years after the opening of the Dames Point Bridge, the State Road 9A beltway should be completed and fully opened to traffic. The Dames Point Bridge (which cost $117 million to construct) opened to traffic on March 11, 1989. That opening date included S.R. 9A segments from the bridge to I-95 on the Northside. The Dames Point Bridge was the first key element of the S.R. 9A system.

Now, the $80 million interchange at S.R. 9A and J. Turner Butler Boulevard is the last segment of S.R. 9A to be finished. After the interchange opens to traffic, all of S.R. 9A will be designated as part of the I-295 beltway system around Jacksonville.

The other section of S.R. 9A currently under construction is the $31.6 million project from Beach Boulevard to the University of North Florida entrance. Construction began in December 2003, and that section will open to traffic this spring, most likely in March or April according to the project schedule.

Traffic movements on the $107 million south interchange project which linked S.R. 9A to I-295 were fully opened last fall. Construction on the south interchange project started in November 2001.

Planning for S.R. 9A started in the 1970s. The environmental impact statement for the S.R. 9A corridor was finished in 1977, and the Jacksonville Transportation Authority began construction of the Dames Point Bridge on May 23, 1984.

The Florida Department of Transportation later assumed construction and design oversight on other segments of S.R. 9A. The part from Monument Road to St. Johns Bluff opened to traffic in December 1993. S.R. 9A from J. Turner Butler Boulevard to Baymeadows Road opened in April 1998. The section from Baymeadows Road to U.S. 1 opened in October 2000, and the part from Atlantic Boulevard to Beach Boulevard fully opened to traffic in November 2004.

When finished, all of S.R. 9A will be officially designated as part of the I-295 interstate highway system.

The two remaining sections now under construction have presented some unique construction and design challenges. One of the more interesting features on the project adjacent to the University of North Florida campus is the trestle bridge over the Sawmill Slough wetlands area. It is a sensitive environmental area and abuts similar wetlands on the UNF campus.

I-95/I-295/9A South Interchange, Fully opened of Fall 2005

To help preserve the environmental integrity of the area, designers of the project deviated from the standard method of highway construction of building a road on ground level embankment. The elevated trestle bridge over the Sawmill Slough wetlands is approximately 20 feet high and 2,071 linear feet long. The trestle bridge took about 18 months to build.

It was constructed with 272 AASHTO type IV beams and 314, 80 and 90 foot 24-inch prestressed piles. The bridge is constructed of piers and pile bents of 96 feet. The concrete deck is cast at eight-and-a-half inches thick to allow for grinding of the surface to improve rideability and transverse grooving for increased traction and to drain the water.

The bridge is being built from an access road constructed between the northbound and the southbound bridges. The access road is permitted by the U.S. Army Corps of Engineers (USACOE) and the St. Johns River Water Management District as a temporary road. The fill for the road was placed on geo-fabric to facilitate removal and delineate the existing ground. The sides of the road were stabilized with sod and are bounded by silt fence. The only permanent impact to the area, permitted through the USACOE, is the .09 acres of area occupied by the pilings.

The project design-build team of this section of S.R. 9A includes the Superior Construction Co., Carrie Stanbridge of the Florida Department of Transportation, GAI Consultants, Parsons Transportation Group Construction services and JEAces Construction Engineering Services, a part of Jones, Edmunds and Associates.

The interchange at S.R. 9A and J. Turner Butler Boulevard, the final part of the S.R. 9A puzzle, started last July. The project involves building elevated circular ramps to move traffic between S.R. 9A to J. Turner Butler Boulevard.

"This project has a little bit of everything," says Rob Hansgen, the FDOT's project engineer.

The project includes box culvert construction, flat slab bridge widening, AASHTO girder bridge widening, flexible asphalt pavement construction and rigid pavement construction. Mechanically stabilized earthwalls on the interchange will be in excess of 40 feet high while most of the MSE walls on highways in the Jacksonville area are about 25 feet high. The walls will require about 1.4 million cubic yards of embankment.

Superior Construction is the contractor on the project. It was designed by H.W. Lochner, Inc. JEAces Construction Engineering Services and the Parsons Transportation Group are providing construction management services. ■

SmartFIX40: Balancing Acceleration and Community

Luanne Grandinetti, Manager of Communications, Community Relations Division, Tennessee Department of Transportation

Faced with widening one of the oldest sections of Interstate 40 through downtown Knoxville, yet determined to fulfill a promise to motorists to minimize the inconvenience of road work, the Tennessee Department of Transportation has embarked on the largest project in the state's history. Transportation Commissioner Gerald Nicely initiated the project with confidence that it could be completed successfully as an accelerated highway project.

Many motorists traveling through downtown Knoxville on their way to visit the Great Smoky Mountains have experienced traffic tie-ups and delays on I-40. This section has never been widened since it was built in the early 1960s. It is also one of the highest accident locations in the state.

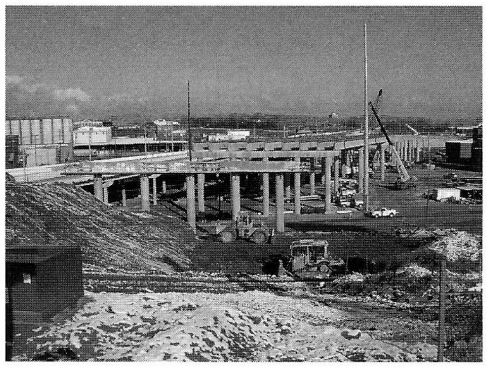
After months of precise planning for the contract, TDOT let a contract for the first phase of the project called SmartFIX40 at a cost of over $80 million dollars. This complex urban interchange project, which includes a second phase and contract, will cost almost $190 million dollars. It includes widening I-40 to three lanes in each direction, reconfiguring several interchanges, and constructing a new city boulevard leading to downtown Knoxville. The second contract was recently awarded at $104.6 million. Both contracts include multi-million dollar bonuses for early completion and liquidated damages of $25,000 per day for late completion.

The overall accelerated construction process TDOT is using to speed up construction is called SmartFIX. It involved short-term total closures of roads or bridges with ample work areas for crews and freedom to go around the clock.

One of the most important tasks throughout the life of the project is a major public information effort. Disruptions to the involved communities and major traffic closures including the 14-month closure of I-40 in 2008 involving a major reroute of traffic means communication through a variety of methods is critical. The construction of the SmartFIX40 on-site office serving as an information center for residents, project staff offices, as well as a location for public meetings has already proved invaluable. Since opening in August of 2005, over 350 visitors have stopped by the center to review plans or request information about the project.

Planning for this project took years of cooperation and patience between many different parties including impacted neighborhoods, historic districts, commercial properties and city and state officials. That partnership resulted in a highly functional design that addresses I-40's serious safety concerns and preserves the integrity of the adjoining historical areas. Community input regarding noise walls, landscaping, lighting, and other functional and aesthetic aspects of the project has been incorporated into the final design through an extensive public involvement process.

Aerial photo



Construction of Hall of Fame Drive

For the first time in TDOT highway contracting history, the contract includes a 'no excuse' deadline for on time completion. Bonuses are awarded for early completion, liquidated damages are assessed for late completion.

A key feature is a CEI contract (Construction Engineering Inspection) with an engineering consultant to help keep the project on schedule. This contract provides for 24/7 inspection services which, under current staffing levels, cannot be provided by TDOT.

The payoff for motorists is two-fold. First, more than two years of traffic delays, lane closures and motorists' frustrations will be shaved off the project by allowing construction crews to work without traffic restrictions while I-40 is closed. Second, this is the first widening of this section of I-40 since it was built over 40 years ago and congestion will be relieved significantly through this area.

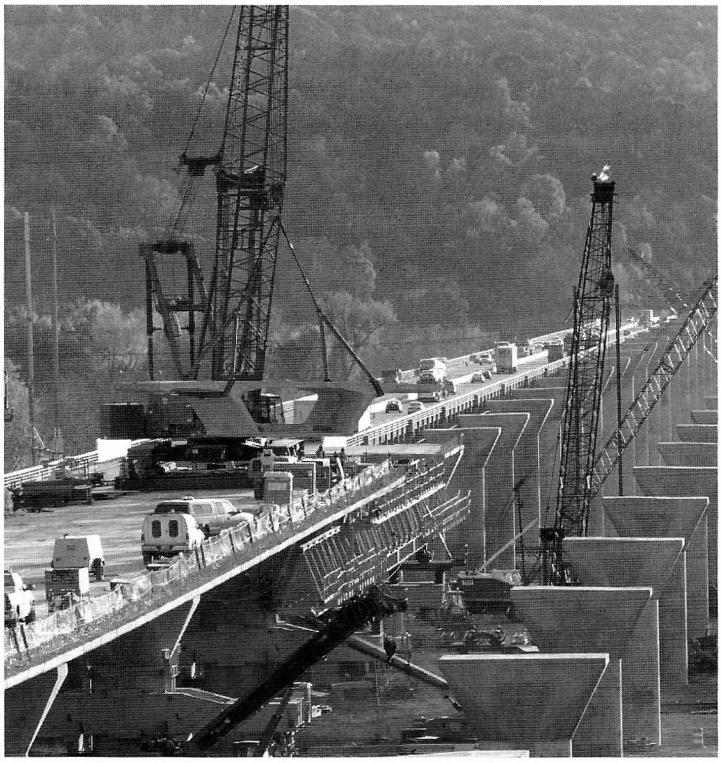
Urban areas present the most complicated challenges for highway construction because of heavy traffic which ironically is the very reason this project took decades to get underway. While minimizing the enormous traffic impacts, SmartFIX40 will result in the reconstruction of a four-lane bottleneck through downtown Knoxville improving both the safety and efficiency on the interstate system.

For more information on the SmartFix project, go to the project website at www.tdot.state.tn.us/smartfix. ■

Susquehanna River Bridge – Pennsylvania Turnpike

Brian Ranck, P.E., PTC and W. Jay Rohleder, Jr., P.E., S.E., FIGG

Drivers in the Harrisburg area on "America's first superhighway," the Pennsylvania Turnpike, have front row seats to watch construction of the new Susquehanna River Bridge. To accommodate planned expansion from four lanes to six lanes in the mainline section, the existing 55-year-old bridge over the Susquehanna River is being replaced with a new structure designed by FIGG of Exton, Pennsylvania.



The new Susquehanna River Bridge is being erected adjacent to the existing two lane, 55-year-old bridge which will be removed once traffic is shifted to the new alignment.

During the project ground-breaking ceremony, the Pennsylvania Turnpike Commission's Executive Director, Joe Brimmeier said, "The Commission has chosen an innovative design, called a precast concrete segmental bridge, for this distinctive signature bridge." Twin bridges, each 5,910′ in length, are being constructed on an alignment north of the existing bridge. Construction began in November of 2004 with the low bid of $82.4 million ($120 per square foot of bridge deck) offered by a joint venture between Edward Kraemer & Sons, Inc. of Hanover, Maryland and G.A. & F.C. Wagman, Inc. of York, Pennsylvania.

Each bridge pier is founded on two of the 156 total 6′-6″ diameter-drilled shafts. Approximately 90% of the shafts were complete as of January 2006. Cast-in-place piers, ranging from 27 to 80 feet in height, are oval in shape and carry a vertical band created with a form liner to celebrate the limestone pattern found on the nearby Pennsylvania Turnpike Commission Administration Building. To date, 58 of the total 78 piers have been completed. A temporary causeway that extends into the shallow, non-navigable Susquehanna River has facilitated pier construction.

The trapezoidal box girder superstructure shape is precast in segments for ease of delivery using a match-casting technique. The segments are individually cast in a linear sequence along the longitudinal length of the bridge. Each match-cast segment uses the adjacent, previously precast segment in the span to form the bulkhead shape of the face. After individually precasting a segment, it is separated from the adjacent match-cast segment and temporarily stored in the yard.

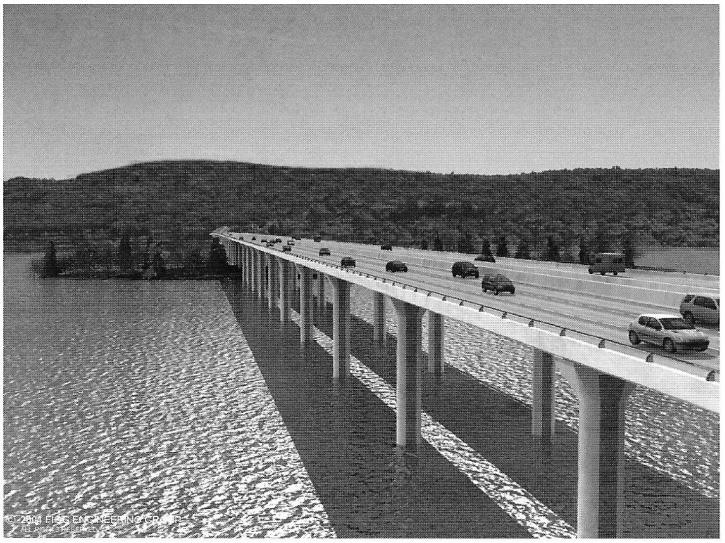
The contractor established a casting yard adjacent to the bridge site, using four beds of forms to efficiently match-cast and store a ready inventory of superstructure segments in preparation for the rapid span erection process. The close proximity of the casting yard to the bridge site simplifies precast segment delivery for erection and allowed the contractor to cast fewer typical segments in longer lengths than assumed during design. This allowed for efficiencies with larger delivery weights and fewer total casting and erection operations. The result is an average of 13 segments in each span. There are 40 spans for each of the twin bridges that result in a total of 1,040 segments being cast, with approximately a third completed as of January 2006. Typical segments weigh approximately 100 tons and are 57′ wide by 8.7′ high. These large segments are easily delivered from storage to erection by truck transport over the incrementally completed spans of the bridge to the new span being erected. Ten of the 80 total spans have been erected as of January 2006.

In addition to crossing over the wide Susquehanna River, the bridge also spans several sets of rail lines, State Route 230, and Calver Island in the middle of the river. High-tension power transmission lines in close proximity to the bridge, where it crosses the rail lines, provided a challenge for span erection. The contractor addressed this challenge by using a special low-profile segment loader to individually place each of the heavy precast segments into position on the erection trusses. This eliminated the need for a crane, which avoided the time and expense that would have been required to reposition the high-tension lines twice instead of moving them just once to their higher final elevation prior to erection of the span. This same special segment loader is being used to place segments for the remainder of the span erection. FAA coordination had also been arranged in association with maintaining required

clearances for a crane on the bridge in relation to the nearby Harrisburg International Airport flight paths. Using this low-profile, segment-delivery equipment rather than a crane on the bridge, also benefits the required flight path clearance.

The cost-efficient bridge design takes long-term maintenance into consideration by limiting the number of expansion joints. Seven continuous units in each of the twin bridges, ranging from 714′ (five spans) to 900′ (six spans), allow for minimizing the use of expansion joints. This reduces both construction and on-going maintenance costs in addition to enhancing the smooth ride for users of the Turnpike. The new bridge deck surface profile will provide a quality ride for the traveler based on standards determined by the International Roughness Index (IRI) method. The final bridge deck surface profile will be evaluated with the ultimate goal of providing an IRI less than or equal to 35 inches/mile/lot. The IRI bridge deck ride quality will be determined by using approved pavement surface measuring equipment and a certified operator. The ride quality will be evaluated following completion of superstructure erection. The segments are being cast with an extra sacrificial ½" of concrete on the top slab to allow for adjustment by milling. An additional 1½" of concrete is being cast into the top slab of the segments to provide a high performance integral wearing surface for the bridge, designed to enhance the service life of the bridge.

Each of the new twin bridges is designed to provide three travel lanes, a 6′ inside shoulder and a 12′ outside shoulder. A mock-up of the lighting system for the bridge is also being performed during construction. The design will gently illuminate the exterior web face of the superstructure. A Pennsylvania HT bridge barrier rail will provide a substantial safety barrier and will also allow those using the bridge to experience views of the Susquehanna River and beautiful surrounding hills through the open upper rail profile. Currently, 30,000 vehicles per day use the bridge, and projections double this number within 20 years. Traffic will continue on the existing bridge until construction is completed in mid-2007, at which time all traffic will be switched to the new bridge and adjoining roadway.



Computer rendering of Pennsylvania Turnpike Commission's Susquehanna River Bridge.

In addition to the new bridge, related construction contracts are being concurrently implemented by the Pennsylvania Turnpike Commission to reconstruct 1.5 miles of highway to align with the new bridge and demolish the existing bridge. These separate but related contracts are also providing a new Eisenhower Boulevard overpass, on-and-off ramps at the Harrisburg East Interchange and a new, nine-lane toll plaza at the Harrisburg East Interchange. ■

Aerial view of the casting yard with the new bridge visible at the upper right. Segments are produced in the four casting beds on the upper left, then stored in the casting yard prior to erection.

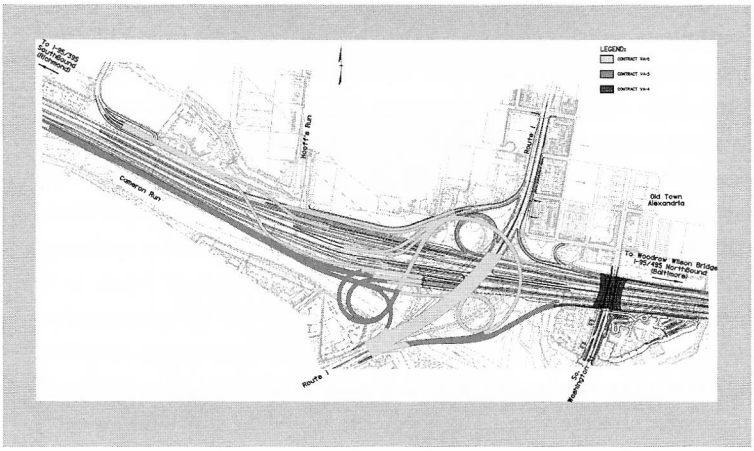
A typical segment is lowered into position adjacent to a pier segment. In the diaphragm of the pier segment, the post-tensioning anchorages are visible.

I-95/US Route 1 Interchange Improvements

Mega Project Takes Shape

Peter F. Bonaccorsi, P.E. (HNTB)

"The Woodrow Wilson Bridge Project is the largest active public works project in the country, and the US Route 1 interchange is the second largest component with a budget of over $620 million. The project is currently ahead of schedule and under budget, which says a lot for a mega project these days." - VDOT Project Manager, Ronaldo T. Nicholson, P.E.



At an expected total cost of $2.5 billion and spanning three jurisdictions, Maryland, Virginia and the District of Columbia, the Woodrow Wilson Bridge Project is one of the largest ongoing infrastructure projects in the United States. The current focal point of the Virginia portion of the work is the $620 million replacement of the US Route 1 interchange. Located in the City of Alexandria and at the southern tip of Washington, D.C., the interchange is a three-level semi-directional interchange with flyover ramps serving 12 lanes of express and local roadways on the I-95/I-495 Capital Beltway. The interchange reconstruction includes over 30 bridges, 14 ramps and a 1.3-acre landscaped urban deck carrying Washington Street over the Capital Beltway at the gateway to historic Old Town Alexandria.

Getting Started

Design of the interchange began in late 1998 and was put on hold for one year while environmental and funding issues were resolved. Construction of the first significant contract, Contract VA-2, started in 2001 and included extensive geotechnical and ground improvement construction. The purpose was to consolidate soft underlying alluvial clays with an extensive system of surcharging and wick drains. Where the time required to adequately consolidate the fills by placement of surcharge fills and wick drains was excessive, soil-cement columns were installed to adequately transfer the proposed embankment loads to the bearing strata. This was VDOT's first experience using soil-cement column technology. Contract VA-3 involved the demolition of a nine-story apartment building to create space for the new 12-lane Beltway and approach to the new Outer Loop Span of the bridge.

Phasing

Three contracts are currently under construction. Contract VA-4, which includes the Urban Deck, will transition and tie the existing six-lane Beltway into the new Outer Loop Woodrow Wilson Bridge Span which is scheduled to be completed in June 2006. Contract VA-5, which is substantially complete, is an advanced bridge contract constructing mainline and ramp structures along and over Cameron Run. Contract VA-6/7 comprises the majority of the interchange including reconstruction and widening of the mainline to 12 lanes, flyover ramps and all of the improvements along Route 1 including a new eight-lane Route 1 bridge over the Beltway. To date, the interchange construction is about fifty percent complete.

Challenges

In addition to solving the geotechnical and construction sequencing issues, some of the more challenging aspects of the design included determining economical and constructible structural and foundation systems for each of the 33 bridges, working within constrained right-of-way adjacent to historical and archaeological resources, and the development of complex staging and maintenance of traffic plans to facilitate construction while moving over 200,000 vehicles per day through the existing interchange.

Constrained Right-of-Way

The project required 9.7 acres of additional right-of-way. Most of the right-of-way acquisition occurred along the Beltway which is being widened from six to twelve lanes. More critical was the reconstruction and widening along South Washington Street which connects historic Old Town Alexandria with the George Washington Memorial Parkway. The frontage along this section of the project included two historic cemeteries, an elementary school and high-rise and garden apartment complexes. There was virtually no room for temporary widening and traffic shifts. To solve this problem, the existing four-lane section was converted to a three-lane section with a reversible center lane carrying traffic in two lanes northbound during the A.M. peak and two lanes southbound in the P.M. peak. The reversible lane configuration is

controlled by a lane signal control system using a series of green and red lane control signals spaced at 400 feet. The system has operated remarkably smoothly with little or no complaints from the traveling public and more importantly with no reported increase in accident rates or congestion.

Bridges

Of the thirty-three bridge structures in the project, structural configurations consisting of multi-span prestressed Bulb-Tee beams supported on multi-pile bents were selected for roughly one-half of the bridges due to the inherent economy provided by this configuration. Integral abutments were utilized on these structures to further enhance the durability of the structures and reduce life-cycle maintenance costs for the client. The remaining bridges on the project were constructed of high-strength, curved, structural steel superstructures configured in 3 to 5 span-continuous units. Due to the unique geology of the area, including subsurface conditions exhibiting a relatively thick soft clay stratum, all piers/bents were founded on plumb 24" square prestressed concrete piles. The inherent stiffness of this foundation configuration allowed for the elimination of battered piles which enhanced the constructability of the bridge foundations.

As noted previously, also included in the project was a deck-over of interstate I-95. The deck-over posed some unique constraints due to the need to accommodate raised planting areas with trees, extensive architectural enhancements including granite veneers and cap stones, decorative pedestrian and vehicular lighting, and roadway and planter drainage requirements. Ultimately, the selected structural configuration employed for this unique structure consisted of 69" deep prestressed Bulb-Tee beams. The span lengths of the beams ranged from 75 to 100 feet. The framing scheme for the structure utilized a splayed configuration of the beams to accommodate the variable width of the deck and planting areas. Precast concrete fascia panels were also used on this structure resulting in a more aesthetically pleasing structure as compared to typical prestressed beam bridges.

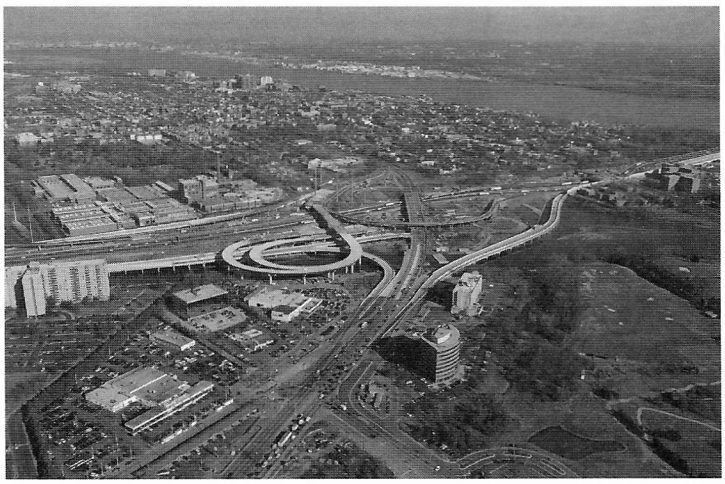
Maintenance-of-Traffic

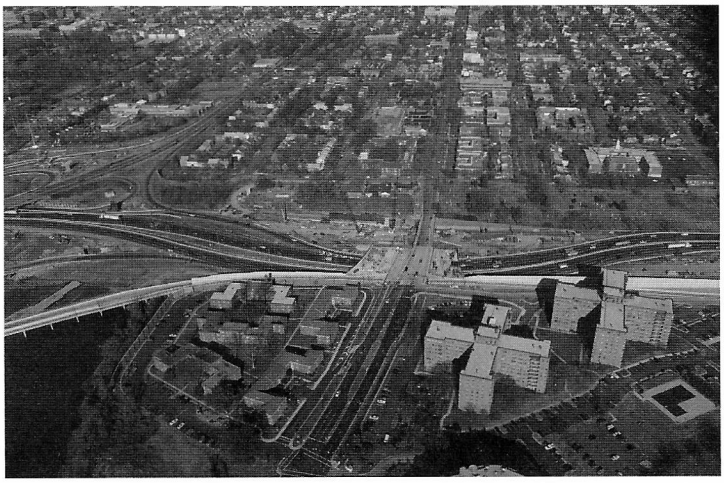
The challenge of building the new interchange virtually on top of the existing interchange required approximately 15 major stages and maintenance-of-traffic sequences. All major lane and traffic shifts are publicized well in advance through electronic message boards, newsletters, the project website, and radio and television coverage. The most notable traffic switch occurred in August of 2005 when the Capital Beltway was reduced from four lanes to one lane for two weekends during the summer to allow for the construction of a reverse curve realignment of the eight-lane Beltway to allow for the construction of the South Washington Street urban deck and overpass. The lane closure was publicized from North Carolina to New Jersey to allow motorists and truckers to plan accordingly and choose alternate routes. The traffic shift occurred on schedule, with back-ups and delays significantly less than anticipated. The original plan called for only a shift to the new Outer Loop span. The plan was adjusted and redesigned as a result of discussions with the owner and contractor. This one change in sequence alone saved the project at lease six months in construction time and allowed construction of the north half of the urban deck to proceed without having to wait for completion of the Outer Loop span.

Partnering Pays Off

The Virginia Department of Transportation (VDOT), supported by staff of the general engineering consultant Potomac Crossing Consultants (PCC), has been responsible for overall project management and construction inspection. The VDOT core management and PCC staffs are co-located in a project office near the site. The proximity and full-time dedication of VDOT staff to the project has been instrumental in enabling timely decision making and problem solving.

In addition, formal partnering and value engineering among the owner, contractor and engineer have been used from the outset and have yielded tangible savings in both cost and time. As a result, the US Route 1 Interchange reconstruction is currently within budget and on schedule to be opened to traffic in 2008 to coincide with the completion of both the Inner and Outer Loop spans of the new Woodrow Wilson Bridge. ■





Road Safety Audits

Joseph M. Fiocco, P.E., PTOE, Sr. Project Manager of McMahon Associates, Inc.

According to the Federal Highway Administration, a Road Safety Audit (RSA) is a formal safety performance examination of a road or intersection, existing or future, by an independent audit team. RSAs are a low cost method of identifying features of a roadway that can contribute to higher crash rates and/or a greater potential for resulting injuries. Costs for a typical audit will range from $5,000 to $25,000, not much compared to the multi-million dollar price tag on most road construction projects.

The RSA is a process that examines a roadway segment or roadway construction project and formally reports on safety issues using an independent, qualified, and experienced team. To appreciate the RSA's value and uniqueness, one must understand its elements. The process ensures that safety is an integral part of a project by conducting a detailed safety analysis at any or all of the following five stages: feasibility, preliminary design, final design, pre-opening (construction), and in-service (existing roads).

Audits are conducted by a team of experts from all disciplines of highway engineering, with assistance from experts in fields of human factors, law enforcement, and risk management. Audit teams are independent from those involved with the design to ensure that it remains resistant to constraints, like time and money. Field reviews are conducted to identify safety concerns which routine plan reviews cannot. Comprehensive checklists are used to prompt thought and raise multi-modal safety concerns for all road users including pedestrians, bicyclists, trucks, buses, emergency vehicles, and railroads.

"Iowa DOT has implemented road safety audits on proposed resurfacing projects. Previously, very few safety improvements were incorporated into our resurfacing projects. We now see that our staff consistently look for and implement numerous low-cost safety improvements on Iowa's roads." Thomas M. Welch, P.E.; State Transportation Safety Engineer, Iowa DOT

Teams do not evaluate the project manager as the term "audit" may imply. They evaluate the roadway's crash potential and proactively attempt to prevent crashes from occurring. Audits also attempt to anticipate potential problems based on human factors. They are not intended to reactively resolve existing crash problems. A formal audit report is generated by the team for follow-up by the project manager or responsible agency.

The RSA is still relatively new to the United States. It has its origins in the United Kingdom and has been further developed and is being used in other countries, including Australia, New Zealand, and Canada. I've had the pleasure of being involved in two successful pilot safety audit projects in the Delaware Valley. In 1997, the Pennsylvania Department of Transportation began conducting safety audits in District 6-0 and District 10-0 as part of their pilot program. These districts were chosen because they represented both rural and urban locations. The success of the pilot led to a statewide implementation in 2000. The South Jersey Transportation Planning Organization (SJTPO) conducted two audits as part of a pilot safety audit program in 2004, which led to ten subsequent audits in southern New Jersey.

RSAs are a relatively inexpensive way for road agencies to take proactive measures at reducing the amount death and injury. According to the National Highway Traffic Safety Administration (NHTSA), 42,636 people were killed in the United States as a result of motor vehicle crashes in 2004. The World Health Organization (WHO) estimates the worldwide death total from motor vehicle crashes is 1.26 million per year. The RSA will identify safety concerns on the road and in some cases recommend specific action, but will not, in and of itself, reduce crashes; follow-up action will be required. The audit process is an important first step in the long, but worthwhile, journey towards safer highways.

More information about RSAs can be found at www.roadwaysafetyaudits.org. ■

"The road safety audit process looks at the roadway from a purely technical safety viewpoint without outside influences. It is a valuable process that gives an unbiased view of safety issues with support from safety experts. These recommendations are helpful when working with others, such as political leaders." Ricky May, District Engineer, Mississippi DOT

Innovative Pavement Research Foundation Improved Overlay Design Parameters for Concrete Airfield Pavements

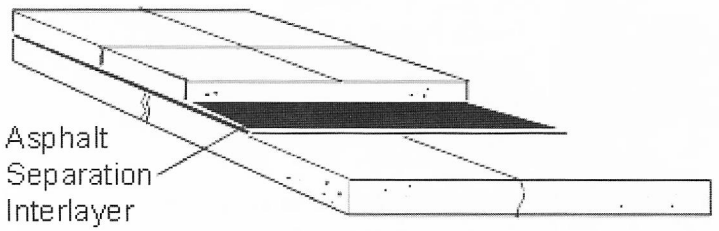
James Mack, P.E., Quality Engineering Solutions, Inc. and Dennis Morian, P.E., Quality Engineering Solutions, Inc.

An unbonded concrete overlay is a concrete overlay on an old concrete pavement separated by an asphalt interlayer (figure 1). Though unbonded overlays have been in use since 1918 when the first was constructed, the design procedures are considerably outdated, especially for airfield applications.

The current rigid pavement overlay design techniques were developed from full scale loading tests accomplished in the 1950's. The material characterizations and data from those full scale tests do not necessarily provide information that is compatible with today's analytical tools and procedures.

For this reason, the Innovative Pavement Research Foundation (IPRF) initiated a research program to improve the understanding of the overlay design parameters and how they affect performance. In September 2005, the IPRF awarded Quality Engineering Solutions, Inc. (QES) of Conneaut Lake, PA a 25 month contract to design, construct and do research on full scale test pavements at the FAA National Airport Pavement Test Facility (NAPTF) near Atlantic City, NJ.

The research test pavement is a 300-foot test pavement consisting of three experimental sections, 75 feet long and 60 feet wide each. The underlying slabs will not be distressed (no shattered or cracked slabs), but will have different joint matching conditions to determine how underlying discontinuities (including cracks) affect the overlay's performance. Each of the three sections has one of three different thickness permutations – overlay thicker than the underlying pavement, overlay and underlying slab having equal thicknesses, and overlay thinner than the underlying pavement. It is anticipated that these combinations will result in the overlay deteriorating first in some sections, and the underlying pavement deteriorating first in others. The "primary" loading for the test will consist of two loading configurations – a tridem gear on one side, and a dual tandem gear on the other, each with the load being 60,000 lbs / wheel.



Schematic of Unbonded Overlay

Construction is currently underway, and is scheduled for completion by the end of April 2006. Loading will subsequently commence, and is expected to last for approximately 9 months. The project is scheduled for competition in November 2007.

QES is a civil engineering firm headquartered in Conneaut Lake, PA. The company specializes in pavement engineering, materials, bridge design, construction inspection, training, research, QA/QC programs, and expert witness testimony. QES is a registered Disadvantaged Business Enterprise. Mr. Mack or Mr. Morian may be reached at 814-382-0373. ■

Creating a New Project Destination: Using Web Portals to Connect Stakeholders

Lisa Olszak and Matthew Sidorick, Olszak Management Consulting, Inc.

The Pennsylvania Turnpike Commission's (PTC) Mon/Fayette Expressway, PA Route 51 to Interstate 376, is changing how a project website can be used as communication and information tool. Websites already securely connect project team members to technical documentation, schedules, and a variety of other information, and are an increasingly productive element of transportation projects. Likewise, the web is an efficient way to communicate with the public. Usually, public and project team websites are separate efforts that require different information and means to access it, but a unique public involvement effort in this project required a solution to combine the two.

As part of Final Design of this $2 billion facility, engineers and project managers have been joined by local leaders, public officials, and community residents to create five Design Advisory Teams (DATs). The DAT areas were chosen due to their uniquely sensitive design features, and the teams were established to ensure that designs are compatible with the community. The DATs combined have over 100 members, represent eight communities, and cover seven of the project's thirteen design sections. They are true decision-making bodies that work systematically to resolve both design issues enumerated in the Environmental Impact Statement (EIS), as well as those that arise during Final Design. Thus, all members of the DATs require access to technical information usually reserved for the design team and project managers. For this new layer of communication between the public and project team, Olszak Management Consulting, Inc. of Pittsburgh, PA, designed a project web portal that not only accommodates this DAT process, but also incorporates all administrative and publicly-available resources within a single destination.

The DAT process generates large amounts of information. There are scheduled rounds of document distribution that include not only the agendas, minutes, and technical materials associated with an array of meetings that occur across all five DATs on a monthly basis, but also the details of new DAT decisions that resolve any of the more than 150 design issues that will be addressed. DAT members and project managers alike would be overwhelmed by information irrelevant to them if they received everything that was created and distributed. Thus, the DAT portal is divided into a number of sections that effectively operate as separate websites. Each of these websites within the portal has its own membership system that organizes project information for users so the path to the information they need is clear, logical and distinct.

Eric Veydt, P.E. is with Gannett Fleming, Inc. – one of seven design firms working on this section of the project. He uses the DAT portal as both a DAT member and a design team member, and says:

"The DAT websites are a secure portal that is of great value to the design team for sharing information regarding planning meetings and other technical information. In addition, all members of the DAT benefit from quick access to meeting minutes, schedules, and upcoming events. Use of this site is simple and intuitive."

Because the DATs make design decisions rather than recommendations, a complete and meaningful record of the process is vitally important to the ultimate success of the project in the represented communities. Thus, behind this partitioned membership system, a single relational database and file system is used to feed information to each of the individual websites as it becomes available. Additionally, the public website draws its content from this same database and file system, as do extra tools for project managers to track information that links the DAT process with the larger transportation project.

With 150 user accounts, nearly 500 downloadable documents, and over 22,000 visits logged between the membership and public websites, the DAT web portal system seamlessly connects project stakeholders. And with its unique partitioned membership system, it does more than make information available – it makes it useful.

"The DAT web portal provides 'state of the art' tools for managing the large amounts of information associated with the 51 to I-376 Mon/Fayette project." – Eric Veydt

For more information, please visit the project online at www.paturnpike.com/monfaydat. You can contact Lisa Olszak by email at lolszak@olszak.com or by phone at 412-224-4310. Matthew Sidorick can be reached by email at msidorick@olszak.com or by phone at 412-224-4317. ■

Funnel Cakes and Film Thickness

Sweet Stuff about Asphalt Pavement

Greg Brouse, Quality Control Manager from Eastern Industries Incorporated

A *durable pavement* will be one with heavy asphalt film thickness accompanied by an appropriate aggregate skeleton. The film thickness is kind of like the mortar, which holds the stone skeleton together and the skeleton itself is the basic Hot Mix Asphalt building foundation. The awesome result of these combined materials is an incredibly durable self-healing product we call *flexible pavement.*

The purpose of a heavy film thickness is to keep the pavement alive through the tortures of temperature extremes and sometimes an inconsistent or unstable substructure; in most cases this means resistance to raveling, cracking and surface deterioration. The purpose of a strong aggregate skeleton is to withstand the incredible point pressures caused by an increasingly intense traffic load, which usually means resistance to rutting.

Careful evaluation of the volumetric properties is critical when designing Hot Mix Asphalt (HMA) so that the aggregate skeleton allows for this heavy film thickness without losing the necessary air void space, also needed to resist premature rutting. Voids in the Mineral Aggregate (VMA) is the measurement of space available in the aggregate skeleton. Minimum VMA criteria can help in assuring a desired level of film thickness.

Likewise, funnel cake is a delicious carnival snack but as the purchaser, we cannot be shy about saying "hey buddy, put an unbelievable amount of that powdered sugar on my cake, then flip it over and do it again." My wife used to walk away and shake her head, but I always said, "If they don't make it right, I'm not buying it." Most times they just hand the sugar can out and say "do it yourself." Gotta love that!

The adoption of *superpave,* a design methodology birthed from the Strategic Highway Research Program (SHRP), was an awesome and necessary step in making major improvements to our road system. This is a scientific approach to better simulate the properties of actual roadway conditions in the laboratory. Understandably, the mixture design portion has gone through many changes and will continue to be improved upon. It has drastically improved overall mixture designs to resist rutting and enhance performance, through the adoption of not only the lab blending and mixture evaluation procedures but a complete overhaul of the liquid asphalt grading system to allow for climatic and other stress conditions.

One concern in the adoption process is the required minimum VMA criteria may not have been effectively addressed, which inadvertently allowed for reduced film thickness in some mixtures. This is understandable because the research was highly focused on Heavy Traffic Roads and even though the system was built with design compensation for things like varying traffic levels, the research into current guideline minimums on criteria like VMA could not take into account already established minimums in all areas of the US, mostly because of the crossover in aggregate sizes under the new system. Consequently, there was the potential for some mixes to have a reduced film thickness.

In addition, it is important to know that the VMA itself may not be a numeric reflection of Asphalt Film Thickness with all types of aggregate. Because of this, some organizations have adopted minimum asphalt contents in addition to minimum VMA criteria.

Kind of like when I tell the guy, "flip over that funnel cake and do it again." It's much easier to get what you want if you can be very specific when you buy it.

Stone Matrix Asphalt (SMA), a European developed open graded mix which maintains a very high film thickness, is one such example of the enhanced performance which can be expected by maintaining heavy film thickness.

If the mixture is not high enough in film thickness, you will probably see the need for an interim surface treatment between regularly scheduled overlays in the life cycle of a pavement. My personal best definition of such a seal - or micro treatment - used on a major roadway is "I had an unexpected problem." In other words, there is a reason why the surface does not stay serviceable until the next scheduled overlay. If you compare the cost of a substantial increase in asphalt content in the initial Mix Design to the cost of an interim treatment, it is few pennies to the dollar.

As a team, our DOT's and industry can drastically improve film thickness and thereby durability while proposing insignificant additional costs to the Department by improving our criteria through a continuing partner effort. Adding asphalt film thickness in the HMA for all road levels will drastically minimize the need for many seal treatments and even crack sealing, an additional cost to the customer that will save them a fortune. Now that's what I call sweet! ■

ASHE Carolina Triangle Section History

North Carolina was the 12th state to organize an ASHE Section. North Carolina was introduced to the National Organization in April 1991. On August 29, 1991, the Carolina Triangle Section, serving the metropolitan region consisting of Chapel Hill, Durham, and Raleigh, was formed by a steering committee of individuals from the Federal Highway Administration, North Carolina Department of Transportation, local municipalities, private engineering firms, and the highway construction industry. On January 23, 1992, the Carolina Triangle Section marked a historic milestone when it was chartered with a record 186 members. The Carolina Triangle Section currently has over 260 members from the public and private sector of the transportation industry. Dinner meetings are usually held at the NCSU University Club in Raleigh, North Carolina.

In May 1993, the Carolina Triangle Section began an ASHE Scholarship Program to support students interested in studying highway-related topics. Over the years, the Carolina Triangle Section has provided (40) students with ASHE Scholarships. The top scholarship, the Bob Pearson Scholarship, is named after the late Bob Pearson, the founding Section President and the first member recognized as the Carolina Triangle Section Man of The Year. Since 1994, funding for the scholarship has been largely sponsored by profits from the Section's annual golf tournament.

During Section meetings, golf tournaments, and social events, members and their guests enjoy the opportunity to network with other professionals in the highway industry and share information, experiences, and friendships. The general Section meeting features keynote speakers discussing current highway-related issues and projects. The Section also sponsors technical training sessions to keep members current on the latest highway subjects. Our section's Century Club is comprised of companies who have donated $100 or more during the current year to subsidize cost associated with general meetings and social events.

In conjunction with the Carolina Piedmont and Georgia Regional Section, the Carolina Triangle Section sponsored the 1999 National ASHE Conference in Asheville, North Carolina. The Conference was called ASHEville '99. The National Conference was held in the scenic Blue Ridge Mountain during the Memorial Day weekend.

North Carolina ASHE continues to be a viable educational and networking tool for highway-related professionals in the state. The membership continues to grow annually.

The Carolina Triangle Section maintains a web-site at www.carolinatriangle.org. ■

Delaware Valley American Society of Highway Engineers (ASHE) – Infrastructure Award

The Delaware Valley Engineers Week Council held their 2006 Future City Competition at Villanova's Jake Nevin Field House on January 28, 2006. Approximately 170 students from surrounding schools participated. There were many unique models created by ingenious students.

The prestigious Delaware Valley Section of ASHE Infrastructure Award was presented to the team from Barkalow Middle School located in Freehold, New Jersey. Their creative talent was particularly evident in the construction of their model future city and the explanation of the city's infrastructure. They will be invited to display their model and perform a presentation at a future ASHE meeting to be held on April 19, 2006.

The award winners are listed from left to right: Jim Creech, Pete Conforti, Phil Hu and Dan DeLuca. Their teacher is Kim Walsh.

Interchange Concept Development for the I-75 Mill Creek Expressway Project

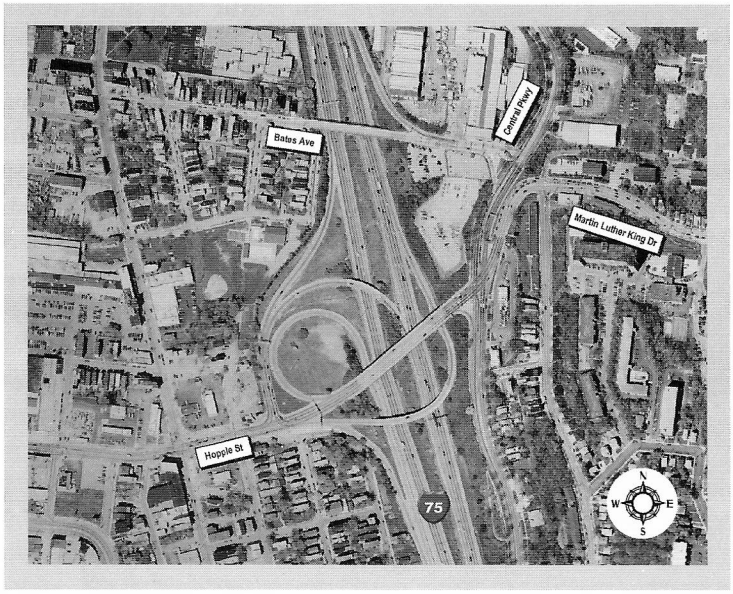
Susan Swartz, P.E., AICP and Greg Parsons, P.E., TranSystems Corporation

Old, congested and accident prone are three characteristics typical of many urban interstates in Ohio, originally built to 1950's and 1960's design standards which did not anticipate the traffic volumes we experience today. These characteristics are particularly true of Interstate 75 in Cincinnati. The roadway, dubbed the Mill Creek Expressway, is heavily congested and burdened with accident rates two to three times the statewide average for freeways. By 2030, the entire corridor is projected to operate at Level of Service F based upon traffic volumes alone, not considering the increases in traffic tie-ups resulting from accidents.

Despite capacity needs, the Ohio DOT and the City of Cincinnati have decided, due to public input, physical and fiscal constraints, to add only one through lane in each direction when the roadway is upgraded in 2011. Travel demand modeling indicates that adding one additional lane draws more traffic to I-75, primarily from adjacent arterials. However, if two or more additional lanes are added in each direction, the draw of traffic occurs at a greater volume and from a wider area, even attracting substantial traffic from I-71 across already congested east-west state routes. The Ohio DOT concluded that additional capacity is clearly desired within the system, but that this capacity may better serve the area if provided on adjacent arterials or I-71.

Because of the limited capacity improvement, other features of the project take on an even greater importance, such as eliminating left-hand exit ramps and poor service ramp locations. As a part of the I-75 Mill Creek Expressway Project, six interchanges are being reconfigured. One such interchange is I-75 at Hopple Street.

The Hopple Street interchange contains a left-hand exit in the I-75 northbound direction. It also has a substandard I-75 eastbound-to-northbound entrance terminal and the westbound-to-northbound entrance ramp originates from Bates Avenue, not Hopple Street, fragmenting the interchange. Northbound traffic from Bates is restricted by channelizing line to only access I-74 and is not permitted to access I-75 north; however, drivers do not obey the markings. The Hopple Street interchange is an important access point to I-75 for the University of Cincinnati and the Uptown area.



Ten different build alternatives, plus the No Build option, were considered for this location. Interchange intersections were analyzed using Synchro v6 (for signals) and RODEL v1 (for modern roundabouts) using 2030 design year turning movement volumes. Conceptual designs were created using line diagrams (sometimes referred to as "crayon drawings") to illustrate each alternative. Ohio DOT officials and stakeholders were able to review and evaluate a large array of options at Hopple Street (along with the other five existing interchanges under study) to determine which concepts merited further consideration.

Based upon this early review, eight options were dismissed due to poor operations, geometric constraints, and excessive costs (compared to other functional options), or other concerns. Three options were accepted for additional design development. These included the No-Build alternative plus the following two options:

Tight Urban Diamond

This alternative would involve reconstructing the Hopple Street interchange as a tight urban diamond (TUDI). The completed interchange would provide for full movements at Hopple Street (Bates Avenue ramp would be closed) and replacing loop ramps with straight ramps. The ramp intersections would be closely spaced and signals coordinated. Due to the short distance between the Central Parkway /MLK Drive intersection and the east ramp intersection, the Central Parkway /MLK Drive intersection is proposed to be grade-separated. A connecting roadway from Central Parkway to MLK Drive would be constructed to maintain access between the roadways, forming a single loop arterial interchange.

Advantages of the TUDI alternative are the elimination of low speed ramp curves and left-hand exit, better operation of the Hopple Street/MLK Drive intersection, and creating a single, full movement interchange. Disadvantages of this option are the high cost due to structures, property impacts, and

indirect connection between MLK Drive and Central Parkway.

Offset Diamond Interchange

This interchange alternative provides for a single ramp intersection located on the west side of I-75. As with the TUDI, all movements are supported by this arrangement; however, the I-75 NB direction ramps would fly over the mainline with overhead bridges such that all ramp roadways meet at the single intersection. By doing so, the intersection of Central Parkway/MLK Drive would remain at-grade.

This concept originally considered the use of a modern roundabout for the ramp intersection. After further analysis was performed for the Central Parkway/MLK Drive intersection future condition, an additional through lane each way on Hopple Street was determined necessary to achieve an acceptable level of service. The added lane would then result in the roundabout containing at least three lanes. Presently, the Ohio DOT will not consider a three-lane modern roundabout at opening day due to driver unfamiliarity; therefore use of the modern roundabout was eliminated from this concept and replaced with a signalized intersection.

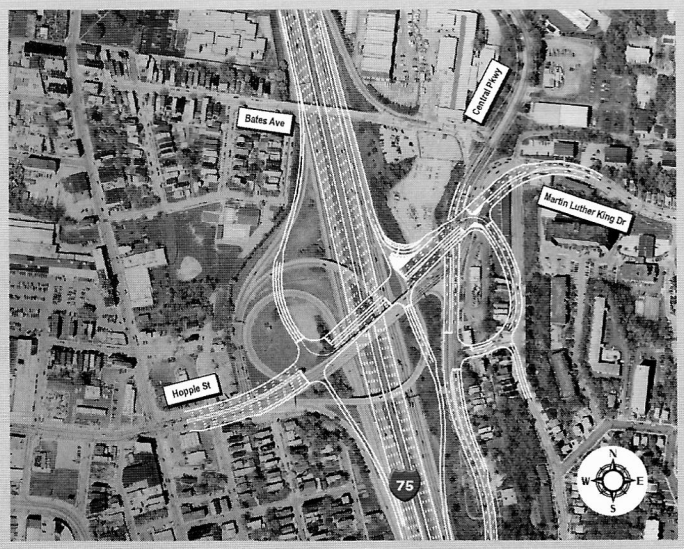
Advantages of the Offset Diamond are elimination of the left hand exit, additional distance between the ramp intersections and the MLK/Central Parkway intersection, and provision of full movements at the interchange. This option has fewer impacts to properties on the east side of I-75.

Disadvantages of Offset Diamond are its high cost (although expected to be lower than the TUDI) and lower speed ramps for I-75 northbound. This option also requires more space for ramps, thus shortening distance between Hopple Street ramp terminals and adjacent interchanges at I-74 and Western Hills Viaduct.

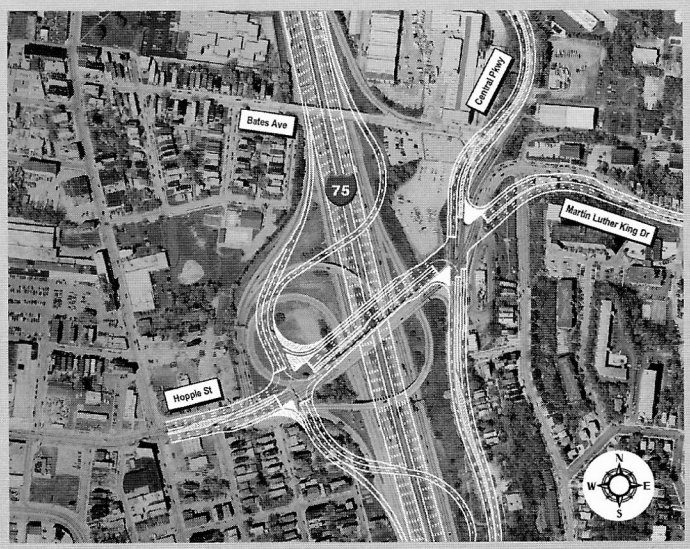
Going forward in the Project Development Process, TranSystems and ODOT will continue to evaluate the Offset Diamond Interchange and the Tight Urban Diamond Interchange utilizing refined traffic volumes, simulation models, additional design detail, and environmental studies to compare the two options. Drawings for the I-75 Mainline improvements as well as each of the interchanges under study are available along with project reports at ww.i75millcreekexpressway.com. ■

Susan Swartz is TranSystems' National Practice Leader for NEPA/Environmental Planning. Susan is a registered professional engineer in Ohio and a certified planner specializing in project management for major corridor studies.

Greg Parsons is a Senior Transportation Engineer and Lead Geometrics Engineer for TranSystems in Ohio. Greg is a registered professional engineer in Ohio.



Tight Urban Diamond Interchange Alternative



Offset Diamond Interchange Alternative

ASHE *SCANNER* & Web Advertising Insertion Order

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- ❑ Check enclosed (payable to ASHE)
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Place our ad as marked:

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- ❑ One year

Ad size:

	One run fee	Four run fee
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❑ Full page	$425	$1,600 ($400/issue)
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❑ Business card	$150	$ 500 ($125/issue)
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Specifications:

Full page	10" x 7 5/8" (w)
Half page	5" x 7 5/8" (w)
Quarter page	5" x 3 13/16" (w)
Business card	1 1/2" x 2 1/2" (w)

- Ads are printed black and white; spot color (determined by issue press run color) can be added for an additional 15% fee.
- Send electronic files in .pdf, .jpg, .tif, or .eps format to jennifer@wannerassoc.com. Camera ready art can be accepted as well.
- Link your company to the ASHE website. E-mail your company name, logo, and url address to jennifer@wannerassoc.com. Your company will appear for one year on the Consultants, Contractors and Suppliers page.

Profile

The *SCANNER* is published quarterly by the American Society of Highway Engineers and delivered to over 5,700 readers nationwide.

- 18% are State D.O.T. Employees
- 62% are Engineering Consultants
- 10% are Contractors
- 10% are Related Professions
- 45% of the membership have a professional status

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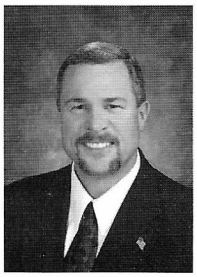
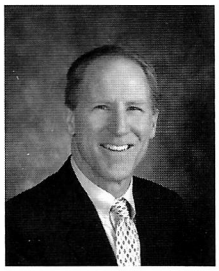
As the Wheel Turns

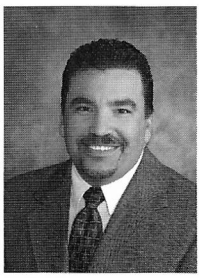


DAWOOD Engineering is proud to announce **Mark E. Gaines, P.E.** as Chief Highway Engineer. The addition of a dedicated DAWOOD highway group quickly realized success when the firm's first PennDOT contract as a prime consultant was announced in February. He has directed context-sensitive, environmentally challenging and high-profile design projects across the state. Chief Engineer Gaines, who has managed many notable PennDOT and Pennsylvania Turnpike Commission projects, will continue to strengthen DAWOOD's position, and reputation, in highway engineering.

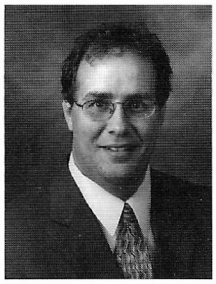
With 20 years of progressive responsibility in design management services and as a design engineer on projects in Pennsylvania, for municipal governments or authorities, as well as projects in Delaware, Maryland, Virginia and West Virginia, Gaines will direct the firm's growing highway design services group, the overall management of all highway transportation and other like public works projects, proposal preparation, highway design, value engineering and quality assurance/quality control functions on those projects. His two decades of experience in highway design has included particularly challenging projects—such as the U.S. Route 219 Meyersdale Bypass in Somerset County, the Pennsylvania Quality Initiative project design winner and National Quality Initiative Achievement Award finalist—and context-sensitive design solutions for other high-profile projects. He has designed and managed bridge reconstruction projects, roadway widening and rehabilitation contracts, intersection improvements, safety, mobility and congestion management initiatives. On these and other projects, Gaines has been responsible for preliminary and final design processes including design field view plans, erosion and sedimentation control plans, right-of-way plans, traffic control plans, utility coordination, specifications and cost estimates along with assuring public involvement throughout design. He frequently provides consultation services during project construction.



DAWOOD Engineering is proud to announce **C. Theodore (Ted) Fridirici, CEP** as Director of Environmental Services. With 20 years of experience in NEPA documentation, natural resource investigations, agency coordination and public involvement, Ted brings a service-oriented approach intended to win repeat business—make the client's life easier. He brings expertise in diverse environmental services, and a background in both public works and private-sector projects. He will oversee DAWOOD's growing Environmental Services offering enhanced capabilities.



DAWOOD Engineering is proud to announce **Vincent J. Paparella, P.L.S.** as Director of Surveying Services. Recently promoted to director, Vince joined the firm in 1998 and directs operations in one of DAWOOD's most requested service areas. Surveying Services has long set the industry standard—whether working on highway, rail, aviation, facilities, recreation or land development projects. The firms boasts 10 licensed surveyors and eight field crews—all of them, employing state-of-the-art equipment and the latest technology to assure accuracy and project quality.



The Partners of Rummel, Klepper & Kahl, LLP, are pleased to announce that **Todd E. Rousenberger, P.E.** has been promoted to Associate effective April 1, 2006. Todd joined RK&K in 2003 as Branch Manager of the Norristown, Pennsylvania office. He has been responsible for office operations and provides technical and marketing leadership in transportation planning and design, infrastructure design, and environmental service.

Todd's 14-year career as a transportation engineer encompasses a wide range of projects for private and public sector clients. He has extensive experience in all phases of highway planning and design and has completed many projects including highway and bridge construction on both new and existing alignments. Todd has been a key team member and/or manager for the SR 33 Extension and SR 222 Bypass projects in District 5-0, SR 322 Widening in District 6-0, the SR 30 Widening Projects in District 8-0, and the I-95 ITS contract for the Pennsylvania Turnpike Commission. Todd is currently managing concurrent projects for PennDOT Districts 5-0, 6-0, and 8-0; the City of Allentown; and the Columbia Borough. In the past five years, Todd has been responsible for transportation improvement projects valued at more than $110 million.

A native of Allentown, Todd earned his Bachelor of Science degree in Civil Engineering from Widener University in 1991 and his Masters of Business Administration from Lehigh University in 2005. He is a registered Professional Engineer in Pennsylvania and an active member of the American Society of Highway Engineers. Todd resides in the Lehigh Valley area with his wife and two children. ■

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Middle Tennessee	96
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Consultant	66%
Contractor	9%
Other	9%