SCANNER

NEWSLETTER OF THE AMERICAN SOCIETY OF HIGHWAY ENGINEERS

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Spring 2005-2

Route 15 Success

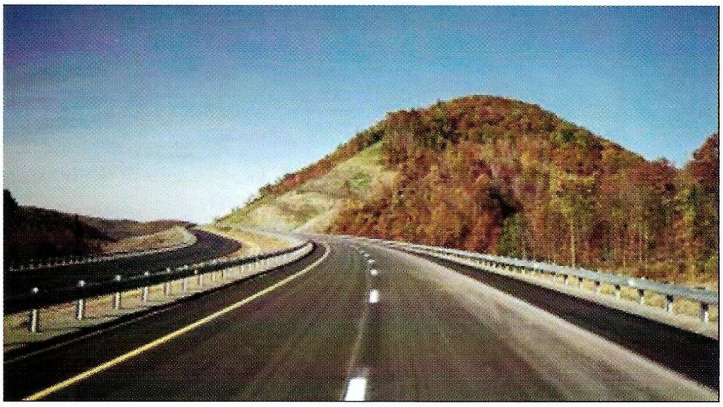
Kerry Drake, Assistant District Executive - Construction, PennDOT Engineering District 3-0

As we travel through our careers, we build a history of past projects. Some are the first to be remembered, great job, good quality, made money, etc., and then there are those that we try to forget. It's paying attention to details - and that means close attention from the first day to the very last day - that makes the difference between a top ten project and one to forget. Let's look at a top ten project...

Located in Tioga County, SR 6015, Section D52 consisted of the construction of approximately 6 miles of new limited-access highway from Blossburg to Mansfield. Earthwork and structure contracts were completed by New Enterprise Stone and Lime, and Glenn O. Hawbaker, Inc. completed the paving contract in 15 months.

As the main part of the $14 million paving contract on SR 6015, Section D52, Glenn O. Hawbaker placed and graded over 300,000 metric tons (tonnes) of 2A subbase (300 mm depth) and placed over 200,000 tonnes of superpave (143,000 of 37 mm base [250 mm depth], 44,000 of 19 mm binder [80 mm depth], and 24,000 of 9.5 mm wearing [40 mm depth]). Work included rehabilitation of an existing 4-span bridge and placement of 26,000 meters of guide rail.

To maximize production, the decision was made to perform the bulk of the 37.5 mm base and 19.0 mm binder lifts during nighttime hours. Up to 25 light plants, and numerous on board balloon and halogen equipment lighting illuminated the work area. Ambient temperatures varied much less during night work than during normal morning through mid-day to evening temperature swings. This allowed more consistent roller patterns and



minimization of high temperature tender zones. Additionally, night paving allowed plant dedication and continuous running of one mix throughout the shift. Uniformity of the mixtures was greatly enhanced, again allowing consistent roller patterns and lay-down speeds.

Glenn O. Hawbaker made monumental strides in grade control methods by utilizing state-of-the-art technology in lieu of conventional grading procedures. In particular, a Local Positioning System (LPS) was used for grade control throughout most of the subbase placement and fine grade operations. The LPS provides highly accurate grade control by utilizing a robotic total station to relay positioning information to a machine on the project. The system provides correct real-time grade information for the machine's exact position.

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President's Message

Rodney P. Pello, P.E.

As I near the end of my term as President, I would like to acknowledge and thank the National Board and all of the ASHE members for their support. It has been an interesting journey but not yet concluded. Membership has grown, new Sections have been chartered and interest in ASHE still continues in other unchartered areas. We must keep working together as ASHE becomes one of the voices to be heard in the transportation industry.

As you know, we are in the process of updating the ASHE Constitution. Each of you may have already received a request for your vote to adopt the revised Constitution. If you have already responded, thank you. If you have not responded, please do so immediately. Your vote is not only important, but is also your responsibility as an ASHE member. The revised Constitution will serve to reinforce our core values as we move forward. The benefits of membership in ASHE remain the same as always.

I have had the pleasure of visiting numerous Sections in several states during my presidency. In every location I have found the same common thread that binds ASHE together as a unique organization. At all the Section meetings I have attended, the attributes of an ASHE meeting are the same. The diversity of the group, the camaraderie that develops between public and private sectors, the technology exchange and shared experiences were evident at every location. The purpose and mission of ASHE was being fulfilled. Just as important, everyone was having a good time as well. I can personally attest that ASHE is alive and well. It remains your individual responsibility to keep the message of ASHE alive as we grow in numbers and stature in the days ahead.

The National Conference in Pittsburgh is close at hand. It will be an exciting program in a great city. I hope all of you will show your support and commitment to ASHE and the incoming National Officers and Directors through your attendance.

See you in Pittsburgh and have a great summer. ■

CORRECTION: "SMART Pavement - A Collaborative Effort" which appeared in the Winter 2005-1 issue of the SCANNER *was in fact authored by* ***Jack McCune, P.E. - Project Manager - Dick Corporation*** *and* ***Julie Vandenbossche, Ph.D. University of Pittsburgh.*** *Vic Spinabelli was incorrectly credited with writing the article. I apologize for the misunderstanding. JS*

The Columbus Metro Freeway Management System

Implementing ITS on a Large-Scale

By: Edward J. Carmichael, Parsons Brinckerhoff, Dublin, Ohio
Robert Tolson, PB Farradyne, Rockville, Maryland

In light of the ever growing need for increased motorist safety and traveler information, the Ohio Department of Transportation has moved to develop an advanced freeway management system. This Intelligent Transportation System (ITS) encompasses incident detection, emergency management and information systems to inform motorists of accidents and delays due to congestion and has lead to the creation of the Columbus Metropolitan Freeway Management System. The three-phase project began in 2001 and is expected to continue through 2006.

Its purpose is to enhance incident management procedures and additional modes of providing traveler information, traffic management and traffic data collections. Through this project, regional systems will be improved by incorporating multiple ITS devices throughout the city. In addition to this, a state-of-the art IP telecommunications system and operating hardware/software were deployed for the monitoring and control of this equipment. This telecommunication network consisted of a wired and wireless network that covers most of the Columbus metropolitan area. A myriad of ITS and communications engineers and consultants were employed to enhance the value of the services provided to the state of Ohio and further engage ITS modernizations.

The governing plan developed by the Oversight Committee consisting of several agency representatives from the Ohio DOT, the Mid-Ohio Regional Planning Commission and the City of Columbus, was thought to be in the best interest of achieving the project's goals through its Strategic Deployment Plan. The plan was to highlight the functionality, coverage, communications, construction costs and the option for expandability by other partners. Several other agencies and companies took a hand in launching the project including PB Farradyne, the transportation technology division of Parsons Brinckerhoff.

Funding for the multi-million dollar contract fell in accordance with the ITS Integration Strategy for Central Ohio. Because of the regional significance of the project, ODOT, along with the city of Columbus funded the multi-phased endeavor in order to achieve the project's initial goals.

Once a budget was determined, the challenge was to achieve broad, yet effective, ITS coverage throughout Franklin County's freeway network while being mindful of the needs for future expansion. The system would be required to cover over 175 miles of freeway with ITS device deployment depending on location and current traffic trends. The endeavor included field studies of over 150 sites to determine what devices could and should be implemented and where. Cost constraints were a concern as were all the potential engineering challenges at each site. As plans and details developed, 96 sites were chosen for implementation. These devices include Ramp Meters, Dynamic Message Signs, CCTV Cameras, Repeater Sites (for wireless devices), and Vehicle Detection Stations. All devices are linked by wireless, fiber optic cable or a hybrid combination of the two, which are tied directly to the command center currently located in downtown Columbus at the City of Columbus Transportation Division Traffic Management Center. Here, all the devices can be controlled and monitored. For example, if there happens to be a crash on I-270 (like there is everyday), CCTV cameras should spot it before the first passer-by can reach for their cell phone. Early warning plans will be in place to advise motorists by way of Dynamic Message signs to get the word out within seconds of the incident, with constant updates. Depending on where a traveler may be on the highway alternate routes, if available, will be recommended and the potential for lost time from long backups may be reduced. This highlights just one of the many advantages of implementing ITS on our freeways and highways.

Many engineering disciplines were relied upon to plan and design a large-scale project of this nature. The resultant plan set included more than 200 plan sheets, most of which were completed right here in Central Ohio. Detailed plans and quantities were

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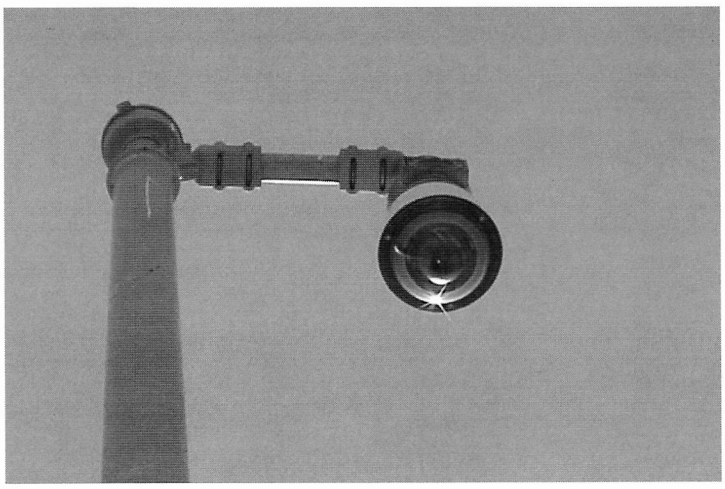
Dynamic message sign



Closed-circuit TV camera

Constructability Reviews Speed Bridge Project

Tom Kerins, Urban Engineers, Inc.
Submitted by the ASHE Franklin Section

Unforeseen conditions discovered during construction typically result in unanticipated cost increases and serious delays to a project's schedule. However, if a project's plans and specifications are subjected to a detailed constructability review during the design phase, a significant amount of unforeseen conditions can actually be avoided. Constructability reviews performed by experienced construction professionals can help ascertain whether or not a given design can be reasonably constructed in the field without unnecessary costs or project delays, and without sacrificing quality.

The concept of performing formalized constructability reviews is not new, but it is not widely practiced among government transportation agencies. When done right, the review process can enhance the design and construction of any transportation project and provide a significant return on investment as well. Additionally, the traveling public benefits substantially when transportation improvement projects are reviewed for constructability and then built without delay and within budget.

The Pennsylvania Department of Transportation had the foresight to see the use of constructability reviews as an integral part of the design and construction process. In 1998, Urban Engineers began an innovative five-year agreement to provide constructability reviews for PennDOT projects throughout the state. The Urban constructability team reviewed small-scale projects, such as the reconstruction of 4 miles of S.R. 30 in Delaware County, to large-scale projects, such as an $80-million restoration of the Fort Pitt Bridge and Tunnel in Pittsburgh.

Project Timing

With the potential of leaving the downtown Pittsburgh area at a standstill, the Fort Pitt Bridge and Tunnel project presented a severe intrusion into the traffic patterns of the region's main traffic transportation artery. With few options for parallel routes, businesses and commuters relied on the 640-foot span and 3,614 - foot tunnel to connect the heart of Pittsburgh with the city's western suburbs and the Pittsburgh International Airport. PennDOT was under considerable pressure to keep traffic closure time to a minimum, while having to complete a multi-year upgrade to the weathered 43-year-old bridge and tunnel system.

During design, Urban's constructability review team worked closely with the design team from HDR Engineering to identify construction activities that could progress under traffic or during offpeak hours. All major construction activities were addressed in detail, allowing PennDOT to get a good idea of how long it would take to complete the work that absolutely required full traffic closures. These reviews resulted in the development of innovative contract specifications that provided contractors with a significant incentive to perform as much work as possible prior to completely closing the roadway, thereby reducing the duration required for the full closure.

Using the constructability review, PennDOT was able to develop thorough and aggressive timetables for construction. Although some contractors were concerned that the schedules could not be met, the lowbid contractor, Trumbull Corporation, came in with an aggressive schedule that reasonably reflected what had been developed during the review process.

"Had the constructability review not been performed, opportunities for early traffic openings could have been missed, incentives and disincentives would not have fit the project as well, and overall costs would probably have been higher," said Joel Bowman, project manager for the PennDOT District 11-0 Design Development Unit on the Fort Pitt Bridge and Tunnel project. "The review process greatly increased PennDOT's confidence in the overall schedule and helped the department to provide realistic expectations for the public." According to Bowman, the constructability review process offers many benefits, including better-cost estimates, specifications, design details, and bids.

How a Constructability Review Works

Constructability reviews work best when begun at the outset, in conjunction with the project design, and continued throughout the life of the project. Very often, key decisions that impact the ability of a contractor to efficiently perform various construction operations take place very early in design and without consideration to the means and methods necessary to construct the project. Too often, constructability reviews have been tasked to design engineers with limited field experience who primarily rely on detailed checklists. Proper constructability reviews need to be performed by a team of individuals with extensive field experience, as well as a clear understanding of the project's design and the constraints of the project site. The constructability review team should serve as an objective, fresh pair of eyes that can scrutinize the entire project from the perspective of both designers and contractors, prior to starting construction. If field problems result in decisions being made at the work site, it is already too late to avoid additional costs.

In working with PennDOT and its designers and contractors, the Urban team identified a number of critical components that form a useful framework for the constructability review process:

- *Document review.* Examine all contract documents to determine what can be done within the constraints of the construction site and what can be done better.
- *Site investigations.* Visit all work sites involved in the project. Since some issues can only be resolved at the site itself, the review team should visit each one, paying close attention to existing conditions, traffic flows, utility locations, points of access, commercial and residential access requirements, laydown, and storage areas - all performed before the contractor arrives on site.
- *Utility coordination reviews.* Determine the location of existing, new, and relocated utility company facilities that will be impacted in each stage of the project.
- *Preliminary construction schedule reviews.* Review preliminary construction schedules and milestone dates

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Interchange at Interstate 95 & St. Augustine Road

"The Gateway to Jacksonville"

By: Buckley K. Williams, C.C.C.A (England-Thims & Miller, Inc.)

At the southern boundary of Duval County, a new "Gateway to Jacksonville" has been established with the recent opening of a new interchange. Enhanced design features of this interchange include towering columns, ponds with three-tier fountains and comprehensive landscaping accented with decorative lighting, all of which come together to provide a sense of arrival to Jacksonville for commuters and tourists traveling northbound on Interstate I-95. This "Welcoming" accomplishment was made possible by the partnership forged between private and public sector interests to deliver a major regional transportation enhancement in Northeast Florida.

Flagler Development Company (Flagler) realized that a new interchange on I-95 at St. Augustine Road would benefit their Flagler Center project, the Florida Department of Transportation (FDOT) and the City of Jacksonville. For Flagler, the interchange would provide near direct access for the developing job center that includes the new Baptist Hospital. For the FDOT, regional benefits would be realized for the general public by improving hurricane evacuation routes and alleviating traffic congestion on I-95. For the city, improving access between I-95 and the St. Augustine Road community provides development opportunities for future employment centers.

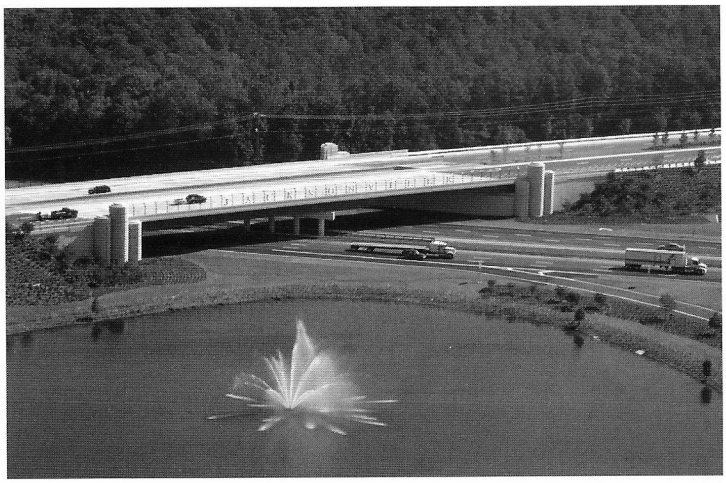
Flagler provided all funding for this $25 million dollar construction project with a tax-increment repayment agreement (for only a portion of the costs) with the City of Jacksonville. Flagler's development responsibility included maintenance of non-standard improvements within limited access right-of-way, and retaining a team of professional firms to: obtain funding agreements with the city (ETM), procure construction agreements with the FDOT (ETM), produce final design plans in accordance with FDOT's standards and specifications (BHR), develop landscape plans (ETM) and retain a prequalified project management/CEI firm (ETM). Along with J.B. Coxwell as Prime Contractor, this "project of mutual benefit" has resulted in the largest public/private interchange endeavor in Northeast Florida.

For the actual construction, a unique Interchange Development Agreement was executed between Flagler and the FDOT that challenged both parties to merge differing project management objectives. Private contract administration methodologies and private sector owner/contractor/engineering relationships were balanced to meet the needs of FDOT roadway and bridge specifications, inspection requirements, material certifications and safety/environmental concerns. The FDOT provided a responsible project manager to oversee the construction process and to serve as liaison between project personnel and various FDOT offices, as well as coordinate Federal Highway Administration (FHWA) acceptance.

Additional challenges were encountered as this project was located between other significant concurrent I-95 corridor improvements such as the I-95/I-295 Interchange project and the I-95 St. Johns County Design/Build widening projects. Only a unique project management team that embraced an open relationship of professionalism, communication and coordination could have successfully ushered this process to completion.

Design enhancements are detailed as providing high quality architectural/hardscape elements such as 40-foot tall pile supported column tower groupings, an identifying "JACKSONVILLE" moniker emblazoned in 4-foot tall letters spanning I-95, dynamic fountain aesthetics and the dramatic up-lighting of column tower groupings, 100 gallon oak trees, Medjool Palms and bridge treatments; all designed to provide a memorable driving experience to commuters and tourists. Another unique feature of this project is the dual structure bridges over I-95 (each 312 feet long) with single span 72" pre-stressed concrete Florida Bulb Tee beams of up to 156 feet on a 48-degree skew. On November 18, 2004, the Florida First Coast Chapter of the American Concrete Institute presented the "Significant Concrete Structure" achievement award to the I-95/St. Augustine Road Interchange project in recognition of having the longest pre-stressed concrete Florida Bulb Tee beams cast in the State of Florida.

The unique partnership born from this project endures as further planned lighting enhancements to tower/lettering/bridge elements are procured and the project enters the maintenance cycle as a joint effort between Flagler, the City of Jacksonville and FDOT. This project serves as an impressive landmark giving the community a sense of ownership by its association with "The Gateway to Jacksonville" that will be a source of civic pride for many generations. ■



Four Bears Bridge

Reprinted with permission from the The North Dakota Department of Transportation and the Mandan, Hidatsa and Arikara Nation

Overview

The history and significance of the Four Bears Bridges are intertwined with the prehistory, history of settlement, and subsequent development of the upper Missouri River basin. The Mandan, Hidatsa, and Arikara tribes occupied the fertile river bottomland in north central North Dakota, beginning around or prior to the late fifteenth century. The Fort Berthold Indian Reservation, established in 1851, gave the Three Affiliated Tribes a residual of those lands on which to live. Almost 25% of the reservation, some 155,000 acres, was inundated as a result of the U.S. Army Corps of Engineers' 1945-1953 Garrison Dam and Reservoir project, and the Indians, as well as white settlers, in the path of the project were relocated.

A piece of old reservation life was brought forward into the Garrison Dam era when the 1,425-foot long continuous through truss main spans of the first Four Bears Bridge (1934) built on the reservation were salvaged and reused as the main channel spans for the second Four Bears Bridge (1955) over the reservoir.

The North Dakota State Highway Commission designed the 1934 bridge, and it was their first use of a continuous truss design. Both the 1934 and 1955 bridges were named Four Bears in honor of Mandan and Hidatsa Chiefs of that name. By the 1990s, it was evident that the second Four Bears Bridge was too narrow to safely serve its purpose. The NDDOT (North Dakota Department of Transportation) undertook a series of studies to evaluate improvement options. Based upon the results of these studies, the NDDOT decided to replace the bridge with a wider bridge. The third Four Bears Bridge was designed with input on aesthetic features from the Three Affiliated Tribes, and is expected to be constructed in 2003-2005.

The First Four Bears Bridge (1934)

The Fort Berthold Reservation Civic Association, circa 1928, had as its mission a bridge at Elbowoods to link the sections of the reservation divided by the Missouri River. They joined with other community civic associations in the region to form the Elbowoods Bridge Association. It would also facilitate tourism to the Badlands and the Verendrye National Monument. Since the bridge was wholly on the Fort Berthold Reservation, the funds for its construction would come from the federal government, which had the responsibility to provide bridges on its territory. It was a 100% federally financed project, providing that the state committed to designing the bridge and authorizing construction. This was used as an important selling point.

The State Highway Commission, under the leadership of State Bridge Engineer Clifford Johnson[1], commenced engineering studies for a bridge at Elbowoods in 1930. The initial surveys and soundings were destroyed when the State Capitol burned on December 28,1930, and they had to be redone in 1931. Actual structure design began in July 1931. The state originally proposed a 5-span bridge with four simply supported through truss spans (one at 423 feet and 3 at 329 feet)[2], but the War Department's disapproval was curious because the plan provided greater clearance than the Williston and Sanish bridges (both of which also spanned the Missouri River) and several bridges in South Dakota. A new design with a 1,425-foot long, 3-span continuous main span and a 190-foot long through truss approach span was then presented to the War Department and approved in March 1932. The Bureau of Public Roads approved the design in April, and plans were completed at the end of August 1932.[3]

The first Four Bears Bridge was completed in June 1934, and it was named for Chief Four Bears. However, there was disagreement as to which Four Bears: the Mandan Chief immortalized in George Catlin's striking painting, or the Hidatsa Chief who signed the Treaty of Fort Laramie in 1851 on behalf of his people. It was decided to honor each of them with half of the bridge. The northern half of the bridge honored the Hidatsa Chief, and the southern end honored the Mandan Chief. The dedication and opening of the bridge held on June 14-17, 1934, was marked by elaborate ceremonies and parades attended by 8,000 visitors.

The through truss bridge[4] was only the fourth all-weather crossing of the Missouri River in the state. The first bridge over the river was constructed at Bismarck in 1922 (Memorial Bridge). It was followed in 1927 by the Verendrye Bridge at Sanish (the original location of the town; not the present Sanish that was established in 1950) and the Lewis & Clark Bridge at Williston. Both the Sanish and Williston bridges were Pennsylvania through truss bridges.

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[1] Clifford Johnson was born in Grand Forks County and was a civil engineering graduate of the University of North Dakota. He joined the State Highway Commission in 1920. Johnson was State Bridge Engineer from 1924 until the late 1940s, when he left the State Highway Commission and North Dakota and established a consulting engineering firm in Denver. His firm worked for the Commission on projects including the design of the Robbins-Drayton Bridge over the Red River in 1952 and the Long X Bridge in Dunn County in 1957-58. Johnson also worked for the Colorado State Highway Commission, including work on Eisenhower interstate bridges.

[2] The two previous Missouri River crossings designed by the State Highway Commission were simply supported, multi-span Pennsylvania through truss bridges with span lengths in the 275-foot span length range.

[3] North Dakota State Highway Commission. 1932 Report of State Highway Commission to the Governor and Legislative Assembly, p. 51.

[4] For a good explanation of truss bridges, including history, construction and nomenclature, refer to the American Association of State and Local History's Technical Leaflet 95 entitled Bridge Truss Types: a Guide to Dating and Identifying published in 1977 and available as a reprint from AASLH at 708 Berry Road, Nashville, TN 37204.

"Four Bears" continued from p. 11

Prior to the construction of the first Four Bears Bridge, river crossings at this location were accomplished by one of a series of private ferries that operated seasonally. In 1930, 1,772 passengers and 571 automobiles crossed at Elbowoods via ferries, and that tally did not include teams and wagons.

The first Four Bears Bridge was the last link on State Highway 8, which cut through the middle of the Fort Berthold Reservation and was the major north-south route on the west side of North Dakota. The bridge proved important in the social and economic well-being of the area, which included many small settlements on the Little Missouri River to the south and along State Highway 23 to the north, and the small reservation communities of Charging Eagle, Nishu, Lucky Mound, and Shell Creek. Additionally, the Verendrye National Monument just south of Sanish was created in 1917, and the first Four Bears Bridge was touted as a gateway to the North Dakota Badlands.

Physical Description of the First Bridge

The 4-span bridge was approximately 1,616.5 feet in length from center to center of the bearings, and the roadway was 20 feet wide. The bridge was traditionally composed and consisted of a simply supported, 190-foot long Warren Truss with verticals and polygonal upper chords approach span and a 1,425-foot long, three-span continuous main span with span lengths of 475 feet each. Continuous spans, as opposed to simply supported spans, have uninterrupted members over one or more piers and distribute loads, both live and dead loads, from bearing to bearing over two or more spans. The trusses are deepest over the bearings where stresses are the greatest. The advantages of the continuous design are economy of material, which increases the length of the span, and a stiffer (stronger) truss. The superstructure can be erected using cantilevered construction, as opposed to being constructed on false work. A Warren web system works best with continuous trusses,[1] and that was used for the first Four Bears Bridge. The panels on the main spans were subdivided. The lower chords, verticals, and diagonals were built up of steel angles, channels, and plate, and the upper chords were built up box sections with rolled I section and upper cover plate. All connections were riveted.

The bridge was finished with a flooring system composed of a reinforced concrete deck and curbs supported on rolled stringers and rolled floor beams that were framed into the trusses at the lower panel point gusset plates. The vertical clearance at the portals was 15 feet, 7 inches, and 16 feet over the roadway.[2]

The Second Four Bears Bridge

As work on the Garrison Dam proceeded during the early 1950s, an entirely new system of roads on and around what remained of the Fort Berthold Reservation needed to be constructed. To replace the first Four Bears Bridge and the Verendrye Bridge, the Corps planned to construct one new bridge, a 4,483-foot long crossing over the reservoir about a 1/2-mile south of the Verendrye Bridge near Sanish.

The Corps decided to salvage the main span of the first Four Bears Bridge from Elbowoods for reuse. The Elbowoods Bridge was closed to traffic on June 16, 1953. Loss of the bridge resulted in the isolation of people on the south side of the river from the agency facilities. A "farewell to the valley" pow-wow was held in July of 1953, and Elbowoods was completely evacuated in August 1954. The first Four Bears Bridge was dismantled, and the 3-span continuous main spans were reused as the main spans for the second Four Bears Bridge (1955). To this day, the second bridge has great symbolic value to the elders of the Three Affiliated Tribes because it represents their heritage and connection with their ancestral lands and culture. The Corps also considered reusing the Verendrye Bridge as part of the second Four Bears Bridge, but that bridge had to be kept in service during the duration of construction or there would have been no river crossing from Bismarck to Williston.

The design of the second Four Bears Bridge was done for the Corps by Howard Needles Tammen & Bergendoff (HNTB) of Kansas City, Missouri. The general contractor of the superstructure was the Manhattan Construction Company of Muskogee, Oklahoma, which sublet the steel erection and dismantling of the first Four Bears Bridge to John F. Beasley Construction Company. The Maxwell Bridge Company of Columbus, Kansas, performed concrete bridge deck work. Massman Construction Company and the Kansas City Bridge Company, both of Kansas City, Missouri, built the substructure.

Work on the substructure for the second Four Bears Bridge commenced in 1951, and was completed in October 1953. As the substructure neared completion, work on dismantling the first Four Bears Bridge commenced on June 16, 1953, and was complete by November. The Specifications for Superstructure for Highway Crossing Near Sanish, North Dakota, dated December 1951, specified that the shoes, bearing plates, field rivets, bolts and anchor bolts, roadway expansion joints, and both end floor beams were not to be reused in the new structure. Dismantling was done in the traditional manner, by removing field rivets and then marking each member in accordance with the original (1933) erection diagrams. Work started at the south end, and the dismantled sections were transported by truck along State Highway 8 to Parshall and then westward on Highway 23 to the work yard established on the site of the Sanish Rodeo. There, they were prepared for re-erection as the main channel spans of the new structure. Trusses were strengthened, primarily by reinforcing the upper chords and diagonals at the upper panel points. When re-erected, the end floor beams, roadway joints and supporting crossbeams, shoes, and bearing plates would be new.

According to an article in the July 1955 issue of *Contractor and Engineers*, the work of dismantling the huge trusses at Elbowoods

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[1] George A. Hool and W.S. Kinne. *Movable and Long-Span Steel Bridges.* (New York and London: McGraw-Hill Book Company, Inc., 1943), p. 200.

[2] Original plans for the Elbowoods Bridge are on file with the North Dakota Department of Transportation Bridge Division. Copies have also been placed with the Historic Society of North Dakota Archives.

"Four Bears" continued from p. 13
and then re-erecting them at New Town was facilitated by the use of an amphibious derrick with a 170-foot long boom and ingenious telescoping false work bents. The derrick was moved from bank to bank by a series of sub-aqueous cables. Use of the equipment is credited with making it possible to dismantle the first Four Bears Bridge in one construction season. Equipment was then moved to New Town to complete erection of the new, 4,483-foot long bridge. Working first from the valley floor and then the river, the derrick set 2,000 feet of deck girder and deck truss spans and then, using pontoons for floatation, it was used to set the continuous through truss spans salvaged from Elbowoods. The superstructure was in place by October 14, 1954, according to an article in the October 14 issue of the New Town Times, and the last concrete curb on the roadway deck was placed on September 14, 1955. Plaques with names of the Mandan, Hidatsa, and Arikara chiefs from the first Four Bears Bridge were attached to the inclined end posts of the second Four Bears Bridge (they were later removed for safe keeping in 1997 because no one could see them and they were getting damaged from oversized loads.)

The Water Buster clan of the Hidatsa tribe petitioned the State Legislature to name the new bridge Four Bears, and in March 1955, a resolution to that effect was adopted. Four Bears was a member of the clan. The Three Affiliated Tribes lobbied Congress to have the reservoir named Lake Sakakawea. The Corps turned ownership of the bridge over to the North Dakota State Highway Commission. Opening ceremonies were held from October 1-3, 1955 with a three-day long pow-wow by the Three Affiliated Tribes; two days of public ceremony and then one day of tribal rites and ceremonies. Aside from routine maintenance and portal brace repairs due to damage from oversized loads, the bridge was not modified after its completion in 1955.

Physical Description of the Second Bridge

The 14-span, 4,483-foot long bridge was composed of approximately 102-foot long built-up, deck girder-floor beam spans at each end, 11 deck truss spans, each approximately 948 feet in length, and the re-erected, 1,475-foot long, 3-span continuous through trusses from Elbowoods as the main channel spans. The flooring system of both truss types was composed of rolled stringers, with the difference being that there were four stringers supporting the deck on the through truss spans, while the deck trusses had only one stringer at the center line of the roadway deck, which was a reinforced concrete deck with concrete curbs. Standard design, built-up metal railings were placed inside the truss lines.

The new bridge had the same 20-foot roadway width of the 1934 bridge, not the 28-foot wide roadway width that the North Dakota State Highway Department was using for its early 1950s major river crossings.[1] The vertical clearance at the portals remained approximately 15 feet, 7 inches.

The substructure consisted of reinforced concrete abutments with wing walls, reinforced concrete, solid-shaft, hammerhead piers at piers 2 through 12 (numbering was from east to west), and reinforced concrete walls with individual footings connected by web walls at piers 1 and 13. The hammerhead piers were either founded on spread footings or steel H piles.

The Third Four Bears Bridge (2005)

By the 1990s, traffic volume over the second Four Bears Bridge had increased significantly. The bridge, with its 20-foot roadway width, was substandard in both roadway width and safety features, such as its inadequate safety barrier/railing. The NDDOT (North Dakota Department of Transportation) undertook an engineering Feasibility Study in 1993. The study focused on the evaluation of various alternatives to widen the bridge to accommodate current and future traffic demands. The study concluded that the narrow bridge should be replaced, based on load capacity, lifespan of a new bridge, and economics. In 1996, a Value Engineering Study was undertaken by the NDDOT to evaluate bridge types for replacement of the second Four Bears Bridge. Various bridge types were evaluated, including truss, arch, suspension, cable stay, and girder; girder was preferred for this location.

Consultation with the North Dakota SHPO (State Historic Preservation Office) was initiated to evaluate the significance of the bridge, and, if needed, to begin to resolve any adverse effects. On August 17, 2001, NDDOT requested concurrence with their evaluation of eligibility for the bridge. On October 18, 2001, the SHPO concurred with NDDOT and deemed the Four Bears Bridge eligible for listing on the National Register of Historic Places under Criterion A, due to its association with the early development of the statewide highway system in North Dakota; and under Criterion C, as an example of a cantilevered Warren through truss, which had limited use in the state.

After completion of an Environmental Assessment in February 2002, NDDOT and the Federal Highway Administration determined that the preferred alternative would include the removal of the second Four Bears Bridge and replacement with a new, wider bridge, 100 feet to the north. A Memorandum of Agreement was executed on February 12, 2002 by FHWA, SHPO, and NDDOT. Its subsequent filing with the Advisory Council, and implementation of its terms, accounted for the adverse effects of the proposed project on the historic Four Bears Bridge.

A third Four Bears Bridge was designed during 2002-2003. The bridge was designed to be a unique structure, bearing aesthetic features selected by and representing the Mandan, Hidatsa, and Arikara Tribes. The second Four Bears Bridge will remain in place to carry traffic while the third bridge is being constructed in 2003-2005. It will be removed in or about 2005 when the third Four Bears Bridge will open to traffic. Portions of second Four Bears Bridge will be salvaged for use as the support structure for an interpretive plaque. ■

[1] The North Dakota Highway Department built a 1,058-foot long through truss bridge over the Red River between Robbins, MN and Drayton, ND in 1954. It has a 28-foot wide roadway and was designed in 1952 by Clifford Johnson & Associates of Denver, CO.

As the Wheel Turns

HDR Promotes Reese

HDR has promoted **Edward E. Reese** to senior vice president. Reese is the marketing manager for HDR's in Pittsburgh, PA; Philadelphia, PA: Cincinnati, OH, and Weirton, WV. He is responsible for business development throughout the offices' geographic area.

Reese has more than 17 years of management, business development and project experience focusing on public and private projects nationwide. A graduate of the Pennsylvania State University in University Park, Reese earned his Bachelor of Science degree in Mechanical Engineering in 1987. He has been with HDR since 1996.

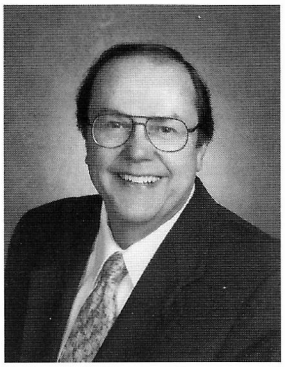
Reese serves on the Board of Directors and as Government Affairs Committee Chairman for the American Council of Engineering Companies of Pennsylvania. He also serves on the Board of Directors of Young Executive Leadership Council of the American Road and Transportation Builders Association. He is a member of the American Society of Highway Engineers; Water Pollution Control Association of Pennsylvania; Water Environment Federal; American Water Works Association; Pennsylvania Municipal Authorities Association; and the Society for Marketing Professional Services.

Zeevaart Named Young Engineer of the Year

Scott W. Zeevaart, P.E., has been named Young Engineer of the Year by the Central Pennsylvania Engineers' Week Council. Comprised of representatives from various engineering and technical societies in central Pennsylvania, the Council promotes the work of engineers by honoring outstanding technical achievements and members of the engineering profession. Zeevaart was presented with this award in recognition of his academic and occupational achievements, professional and educational excellence, engineering and technical accomplishment, and citizenship.

Zeevaart is a project manager in program management and a utility relocation unit manager with Gannett Fleming, an international planning, design, and construction management firm. With more than 12 years of experience, he is responsible for rewriting manuals and operating procedures, facilitating client meetings, conducting re-engineering implementation sessions, and developing comprehensive training programs. Zeevaart directs personnel in program management activities with the Pennsylvania Department of Transportation, and in utility projects involving public utility companies, municipal governments, and highway designers.

Zeevaart holds a bachelor, and a master of science in civil engineering from Purdue University, as well as a master of science in systems engineering from the University of Pennsylvania. He is a registered professional engineer in Pennsylvania and a member of the American Society of Highway Engineers, the Project Management Institute, and the High-Speed Ground Transportation Association. Zeevaart also mentors Purdue University engineering students and participates in races and half-marathons benefiting various Harrisburg charities.



Bradshaw Named Central Pennsylvania Engineers Week Council National Engineers Week 2005 Engineer of the Year

Central Pennsylvania Engineers Week Council named **John F. Bradshaw, P.E., P.L.S.**, as its 2005 Engineer of the Year. Mr. Bradshaw is employed by Michael Baker Jr., Inc., where he currently manages the Construction Services department in Baker's Harrisburg office. He has 39 years experience in engineering of which 37 years have been with Baker. His experience involves the design of major highway and bridge projects, and more recently, involves construction management and inspection for construction projects. He has organized a quality staff of construction engineers and technicians to provide engineering support in the construction and reconstruction of highways and structures. With the growth of this work, a separate department for construction management and inspection services was established in Baker's Harrisburg office.

Mr. Bradshaw was born and raised in Rotterdam Junction just west of Schenectady, NY. He received his Bachelor of Science Degree in Construction Technology from LeTourneau University, Longview, TX. He is registered as a Professional Engineer in PA, NJ and VA, and registered as a Professional Land Surveyor in PA. He is a member of PSPE, where he's currently Vice President of the Central Region in PA. He is also a member of NSPE, ASHE and CMAA. He has held several offices including the presidency of the Harrisburg Chapter of PSPE and the Mid-Atlantic Chapter of CMAA. He is involved with ACEC/PA and PAPA. He was the driving

"Bradshaw" continued p. 23

Future City "L'Etoile Directice" Depicts Life in the Future off the Louisiana Coast

A city of the future - "L'Etoile Directice" - engineered by students from **St. Thomas More School** in Baton Rouge, Louisiana, won the 2005 National Engineers Week Future City Competition™. The students - Lauren Arikol, Lisa Lynch, and Kathleen O'Hara - teamed up with their teacher Shirley Newman, and volunteer engineer mentor Jacque "Jack" Lasseigne, an engineer with Young Wardlow Lasseigne Structural Engineers in Baton Rouge.

Teams from 32 middle schools nationwide, winners of regional competitions in January, participated in the Future City National Finals, February 21-23 at the Hyatt Regency Crystal City in Arlington, Virginia. Second place went to **Epiphany Catholic School** in Miami, from the Florida competition, for their Future City "Ektara." **Our Lady Help of Christians School** in Abington, Pennsylvania, from the Philadelphia competition, took third place honors for their Future City, "Abington."

Bentley Systems, Incorporated, a leading engineering software company, and chair of the competition's Leadership Council host the Future City National Finals. Bentley also provided the first prize for the St. Thomas More team - a trip to US Space Camp in Huntsville, Alabama. All regional winning teams received an all-expense-paid trip to Washington for the National Finals.

Future City invites 7th- and 8th-grade students to create a city of the future using *SimCity 3000* software - donated to each participating school by Electronic Arts of Redwood City, California. Working with a teacher and volunteer engineer mentor, teams build a large, tabletop scale model of a portion of their city, and present and defend their designs before a panel of judges at the competition. The cities contend with pollution, unemployment, security, crime rates, and other real-life problems - with no deficit spending. Students write an essay on creating future transportation systems using basic aggregates - stone, sand, and gravel. The National Stone, Sand and Gravel Association sponsored this year's essay challenge.

Future City National Finals teams this year represented 17 public schools, seven parochial, five private, and three home-schooled groups, and were comprised of 53 boys and 43 girls. As varied as the regional winners may be, they all have one thing in common: a program that challenges them to explore science, math, engineering, arts, and writing and, at the same time, discover abilities they never knew they had.

Teaching students to hone the skills that solve real-world problems is at the core of Future City. Now in its 13th year, Future City encourages interest in engineering by providing hands-on applications for math and science, and lays the foundation for developing workplace skills such as vision and imagination, troubleshooting, teamwork and cooperation. Volunteer mentors offer what is often a student's first glimpse into the world of engineering, a step in encouraging a career in the field.

Future City is sponsored in part by Engineers Week, February 20-26, a consortium of more than 100 engineering societies and major corporations, founded in 1951 to increase public awareness and appreciation of the engineering profession and technology. Co-chairs for 2005 are ASME (The American Society of Mechanical Engineers) and BP, p.l.c. For more information, visit www.futurecity.org and www.eweek.org.

In addition to the Top Five teams announced at the Future City National Finals on Wednesday morning, 32 Special Awards were handed out at the Special Awards Luncheon on Wednesday afternoon, sponsored in part by Shell Oil Company. The complete list of awards follows:

First Place: St. Thomas More School, Baton Rouge, Louisiana. The St. Thomas More team receives a trip to US Space Camp in Huntsville, Alabama, provided by Bentley Systems, Incorporated.

Second Place: Epiphany Catholic School in Miami, Florida. Epiphany receives a $2,000 scholarship for the school's technology program, provided by the Society of Manufacturing Engineers (SME).

Third Place: Our Lady Help of Christians School in Abington, Pennsylvania. Our Lady Help of Christians receives a $1,000 scholarship for the school's technology program, provided by The National Society of Professional Engineers (NSPE).

Fourth Place: St. Philip Neri School in Midwest City, Oklahoma.

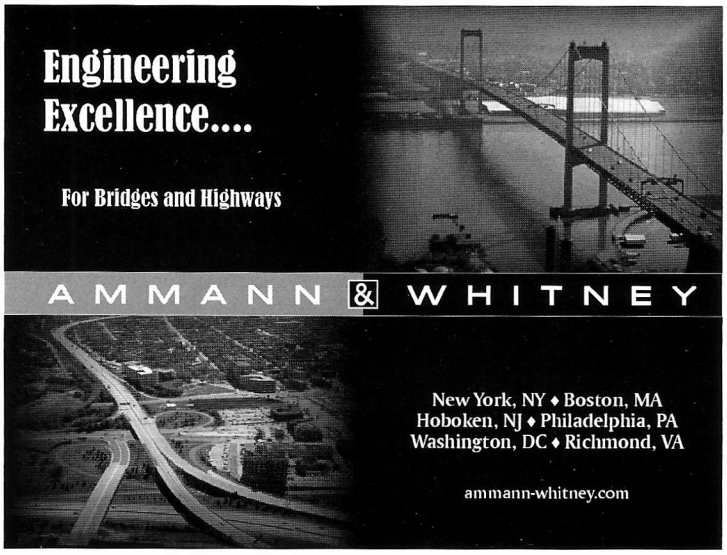
Fifth Place: Valley Middle School in Oakland, New Jersey.

Best Essay, sponsored by the National Stone, Sand and Gravel Association: **St. John Lutheran School in Rochester, Michigan.**

Best Model, sponsored by BP, p.l.c.: **Epiphany Catholic School in Miami, Florida**.

People's Choice Award, selected by the students: **St. Bede School in Pittsburgh, Pennsylvania**. ■

2005 Future City Competition - National Champions, St. Thomas More School, Baton Rouge, Louisiana. Shirley Newman, teacher, students (L-R) Lauren Arikol, Kathleen O'Hara, Lisa Lynch, Jacques "Jack" Lasseigne, engineer mentor.



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URS Corporation is a leading international architectural, environmental and engineering firm. URS offers excellent salary and benefits package. All candidates must be authorized to work in the United States. EOE M/F/D/V You can learn more about our organization by visiting our website at www.urscorp.com.

Below are the open positions available at our Downtown Orlando, Florida office.

For immediate consideration, please apply online at www.urscorp.com and refer to the requisition number listed below.

REQUISTION # URS2112 Water Resources Engineer (FULL TIME)

Position Description:

- Assist project engineers in highway drainage design.
- Perform hydraulic and hydrology calculations.
- Assist in preparing permit applications.

Minimum Requirements:

- Education: BSCE
- Year Experience: 4 - 8 years
- License/Requirements: Florida PE
- Highway drainage design experience required.
- Working knowledge of design criteria and regulations for Florida Department of Transportation and local regulatory agencies required.
- Permitting, storm water management analysis, and storm sewer modeling experience required.

For immediate consideration, please submit your resume online at www.urscorp.com and refer to the requisition number URS2112.

REQUISTION # 04-0013305 Senior Transportation Engineer (FULL TIME)

Position Description:

- Manage traffic operations group.

Minimum Requirements:

- Education: BSCE
- Year Experience: 15 years
- License/Requirements: Florida PE
- Experience in traffic operations required; including all phases of traffic operations, design and planning.
- Working knowledge of design criteria and regulations for Florida Department of Transportation and local regulatory agencies required.
- Working knowledge of supervising personnel required.
- Development of traffic operations/ITS business line.

For immediate consideration, please submit your resume online at www.urscorp.com and refer to the requisition number 04-0013305.

CIVIL ENGINEERING - HIGHWAY

Robson Forensic is a multi-discipline forensic engineering firm practicing throughout northeastern and central US. We seek mature professionals, experienced in design, construction or maintenance phases of roadways. You would be part of a comprehensive team that investigates roadway collisions. The team includes vehicle engineers and operators, crash reconstructionists, human factors engineers, biomechanical engineers and highway engineers. Your role would be to determine if there are dangerous roadway conditions that were a cause of a particular incident. You must be degreed and registered, with excellent analytical and communication skills. Full time for Lancaster, PA, and Cedar Knolls, NJ. More information and reply via www.RobsonForensic.com.

"Success" continued from p. 1

In addition to increased production, the LPS provided several quality advantages compared to conventional grade control methods. Most impressively, the LPS allowed us to concurrently trim and fine grade the subbase to better than specified tolerances of the proposed grade. The technology also allowed us to better control the grade "between the stakes" rather than depending on conventional stringlining for grade control. This accuracy provided a substantially smoother and more accurate platform for the bituminous paving.

Also, by innovatively utilizing the LPS on a milling machine for fine grading, there was minimal handling of the subbase during the finish grade process and significantly reduced subbase segregation.

In monitoring smoothness efforts, IRI readings were taken before the final wearing course and as a result, high joint areas were ground along with some spot scratching. This, along with the aforementioned efforts at plant mix uniformity, constant motion paving, minimized joints, and consistent roller patterns combined to allow for low IRI numbers which can often be difficult to achieve on new construction projects-without a leveling course.

The road opened on schedule on October 29, 2004 with a ceremonial ribbon cutting. Allen D. Biehler, P.E., PA Secretary of Transportation, was the keynote speaker. The contractor planned their work so that the northbound lanes could be opened on that

date and the southbound lanes were opened to traffic the following week.

Success does depend on paying attention to details, not as a result of luck. A top 10 project has literally hundreds of hands, from design through ribbon cutting, and every hand contributes to the success or failure of that project. Remember that both successes and failures last a career and it's much harder to make successes. ■

"Review" continued from p. 7

for reasonableness and conformity with the contract documents, including traffic control plans and specified staging and phasing requirements.

- *Biddability and estimate reviews.* Make certain that plans and specifications represent an accurate and detailed portrayal of the project for reasonable bidding. Review the engineer's estimate to determine that the unit prices properly reflect any site constraints or special scheduling efforts, such as multiple shifts, extended work hours, and so on.
- *Constructability review meetings and reports.* Provide constant feedback between owner representatives, designers, and the constructability review team to ensure a continuation of workflow.

Foreseeing Expenses

It is no secret that preventing cost overruns, project delays, and commuter frustration offers considerable benefits. Urban has reviewed over $1 billion in construction in the past five years, and estimates that these reviews can produce a return on investment of up to $25 for every $1 spent on reviews. Another five-year agreement between Urban and PennDOT began last year.

"It is beneficial to have an independent review of the project from a construction perspective to support completing projects on time and within budget," said Dave Azzato, an engineer in PennDOT's Bureau of Design and a chief architect in initiating the first constructability agreement with Urban. "Optimistically, the constructability reviews would lead to reduced construction delays and traffic delays, as well as fewer work orders and construction claims." ■

"Columbus Metro" continued from p. 5

developed for each site per ODOT standards. Hardware and Software Specifications are also a very important component on a project of this nature. The use of so many varied pieces of equipment that involve high-technology and require exacting standards for installation and maintenance make it so. These requirements were addressed in a 259-page Supplemental Specification Document. The document covers everything from installation, to testing, to going online system wide.

Soon, if not already, people will begin to notice the dynamic message signs going in overhead and perhaps some of the camera poles now in place. However, to get an idea of the scope and size of this project, it should be noted that hidden in miles of concrete median barrier and also underground are over 215,000 feet (41 miles) of fiber optic cable installed just as part of this project. Furthermore, over 59,000 feet (11 miles) of power cable was installed to energize the equipment. The project also includes implementation of some solar powered equipment where feasible and where electricity was not practical. This is just a sample of the volume and types of equipment and materials needed to construct a project of this scale.

The general traveling public will never know the behind the scene efforts that went into the design and implementation of this expandable city and county wide ITS System, but the system will pay dividends well into the future for serving the same traveling public of Franklin County and its many visitors. Whether it be through incident management and advance crash warnings or through the Amber Alert System, ITS is soon to make its way onto people's radar in Franklin County. ■

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Profile

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

- 17% are State D.O.T. Employees
- 64% are Engineering Consultants
- 9% are Contractors
- 10% are Related Professions
- 50% of the membership have a professional status

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"Bradshaw" continued from p. 19

force behind the creation of CPEWC, and held the position of the first Chairperson in 2000. Mr. Bradshaw has remained active with the council since its formation.

After graduating in 1965, Mr. Bradshaw began his engineering career. In 1967, he continued his career with Baker in Harrisburg, where he advanced to positions of Junior Engineer, Engineer, Senior Engineer, Project Engineer, Project Manager and Senior Project Manager. His project experiences include: the New River Gorge Bridge in West Virginia (longest steel arch bridge in the world); Escautawpa River Bridge in Mississippi; Ravenswood Bridge and Sixth Street Bridge across the Ohio River in West Virginia; and Ouachita River Bridge in Arkansas. He was also involved with the Alyeska Oil Pipeline project in Alaska; the rehabilitation of the PATCO Line and the bridge deck replacement (an orthotropic deck system) for the Benjamin Franklin Bridge in Philadelphia; the expansion of the present Beaver Stadium at Penn State University; and the SEPTA RAILWORKS project in Philadelphia.

Mr. Bradshaw and his wife, Karen, recently celebrated their 40th anniversary in Hawaii, and reside in Mechanicsburg, PA. They have two married daughters and five grandchildren. He is a member of Bible Baptist Church in Shiremanstown, where he has been active as a Sunday School teacher, Chairman of the Building and Grounds Committee, a Deacon and in other areas of Christian service. He took the lead in the construction of a Fellowship Hall for his church, and was instrumental in the establishment of a Christian School with traditional classes. The school has grown from 80 to over 500 students in grades K through 12.

Mr. Bradshaw feels the engineering profession not only provides personal satisfaction, but permits one to use his or her abilities for the betterment of mankind. Mr. Bradshaw has had the opportunity to work on many interesting high profile projects for this purpose, and has found them challenging and enriching. ■

THE ASHE SCANNER
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North Florida	36
Gold Coast	66

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DOT	17%
CONSULTANT	64%
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