TRANSPORTATION TIMES

Summer 2015

STV TRANSPORTATION AND INFRASTRUCTURE DIVISION'S NEWSLETTER

FOCUS ON BRIDGES:
STV PROVIDES SUPPORT FOR BRIDGE PROJECTS

Photo © Mark Flannery Photography

LONGFELLOW BRIDGE
BOSTON, MA

Read more on pages 2 and 3

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STV 100 Years

MEET THE AUTHOR

Mark Ennis, P.E., PMP
Vice President

As the head of STV's structural design group in the Northeast region, Mark boasts more than 25 years of experience in new and rehabilitated bridge design, inspection and capacity ratings. He has overseen the design of a broad range of bridge types, from historic movable structures, to visually iconic cable-stayed spans.

The Longfellow Bridge traverses the Charles River between Boston and Cambridge. STV was able to avoid delays by addressing historic details early in the design process.

STV TAKES PROACTIVE APPROACH

To Prevent Delays on Longfellow Bridge

By Mark Ennis, P.E., PMP

The historic Longfellow Bridge in Boston is in the midst of a dramatic makeover, as the 109-year-old bridge is being rehabilitated to meet 21st century transportation demands under an aggressive construction schedule, all while honoring the structure's original architectural grandeur.

With its graceful steel arches and its ornate granite piers and towers that give the structure its local moniker as the "Salt and Pepper Bridge," the Longfellow stretches over 1,700 feet, carrying Route 3 and heavy rail along the Massachusetts Bay Transportation Authority's (MBTA) Red Line across the Charles River between Boston and Cambridge. It is considered Massachusetts' most historically significant bridge, making it subject to federal preservation standards and reviews.

The $255 million rehabilitation calls for the complete reconstruction of the bridge's 11 arch spans; the seismic retrofit of 12 masonry substructures; and the dismantling, repair and reconstruction of its signature towers.

When completed, the bridge will comply with modern transportation standards, including improved bicycle access and handicapped accessible pedestrian walkways.

Any restoration of this span was going to take a monumental effort to properly honor the bridge's history while also making it functional. But with such a tight schedule, design reviews would have to be expedited and completed on time.

To counter potential scheduling snags, STV, serving as the lead designer for this initiative which was procured using the design-build delivery method for the Massachusetts Department of Transportation (MassDOT), implemented a consultation process at the outset of the project to expedite issues regarding historical aspects of the bridge rehabilitation with the six federal, state and local stakeholders involved under Section 106 of the National Historic Preservation Act (NHPA).

NHPA gives consulting parties the authority to review all aspects of the design that may affect the bridge's historic character. As designs for the project developed, the design-build team met regularly with preservation officials to outline constraints, describe possible options and provide recommendations.

The utilization of 3-D software provided a clearer understanding of the visual impacts of the project, and the team regularly met with MassDOT's historic resources supervisor to determine if the impacts were significant enough to require review by all of the NHPA consulting parties.

Among the stipulations for the White-Skanska-Consigli joint venture build team was using riveted construction on exterior steelwork visible to the public and salvaging or replicating the original steel buckle plates being used for the deck.

As a result of this proactive approach, every formal recommendation presented to the Section 106 consulting parties was resolved without delay.

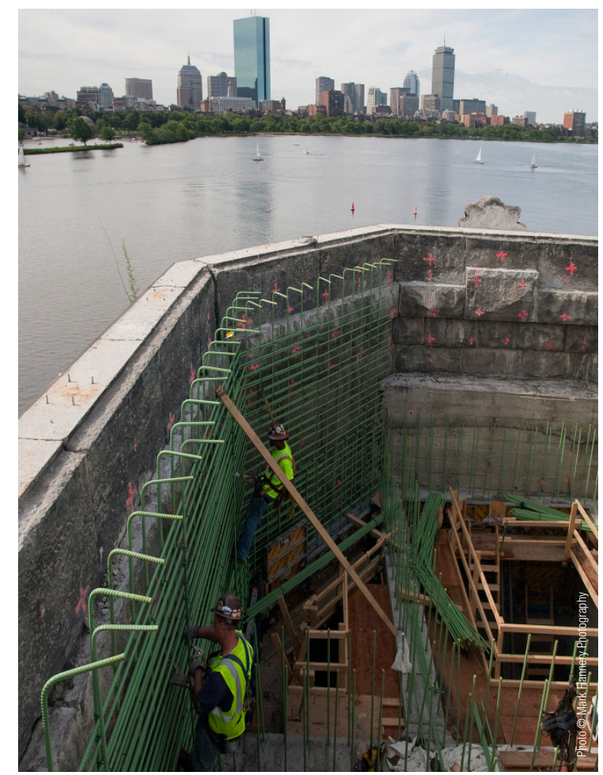


Photo © Mark Hanner Photography

MEET THE AUTHOR

G. Stuart Matthis II, P.E.
Vice President

During his 35 years in the design and construction industry, Stu has managed some of the largest, award-winning transportation projects in the Southeast with an overall value of more than $1 billion. He currently serves as the firm's business development director for the Southeast region.

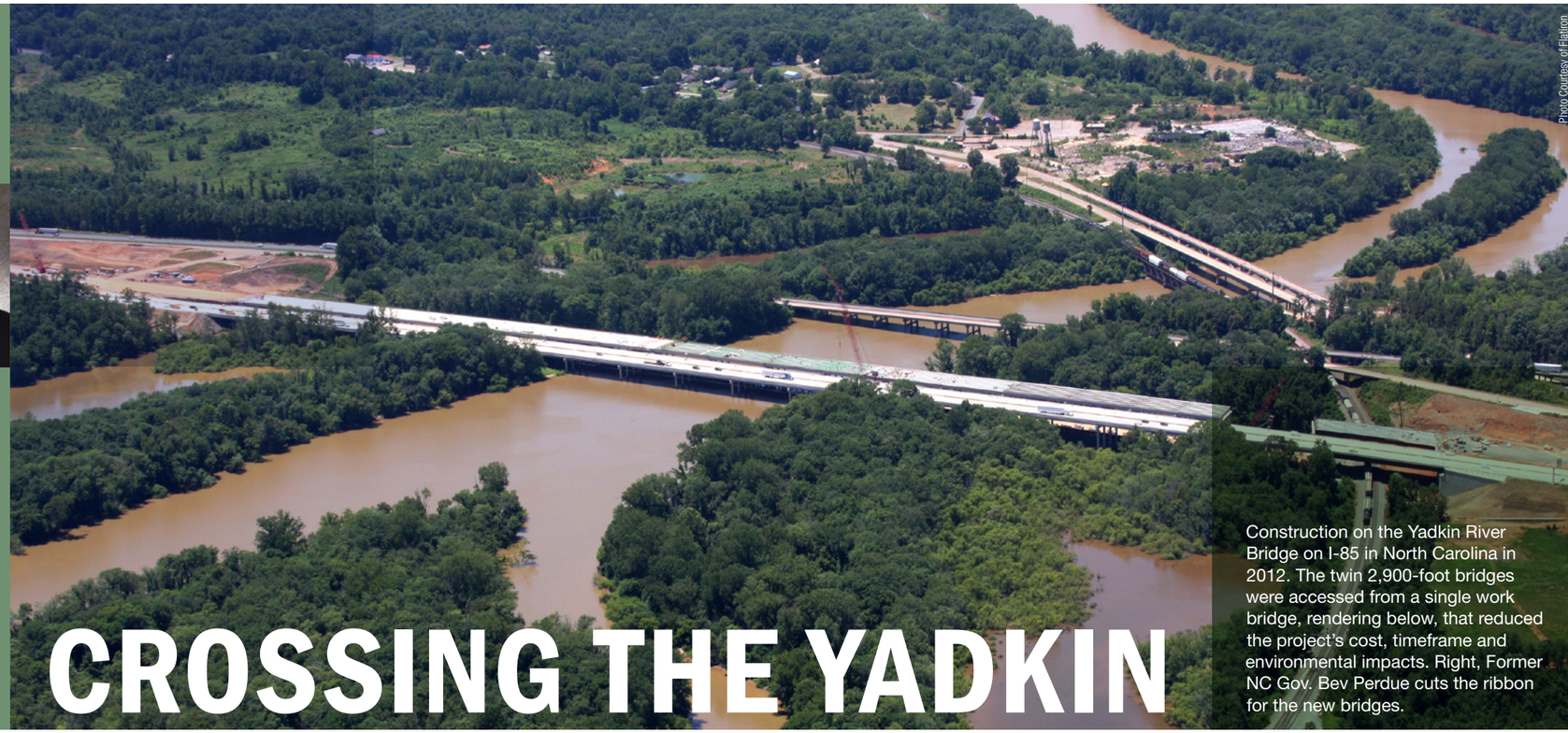


Photo Courtesy of Flatiron

Construction on the Yadkin River Bridge on I-85 in North Carolina in 2012. The twin 2,900-foot bridges were accessed from a single work bridge, rendering below, that reduced the project's cost, timeframe and environmental impacts. Right, Former NC Gov. Bev Perdue cuts the ribbon for the new bridges.

TO MAXIMIZE EFFICIENCY OF THE BRIDGE DESIGN, THE TEAM CHOSE A MODIFIED 77-INCH-DEEP BULB-TEE, PRESTRESSED CONCRETE GIRDER FOR ALL CONCRETE SPANS.

CROSSING THE YADKIN

By G. Stuart Matthis II, P.E.

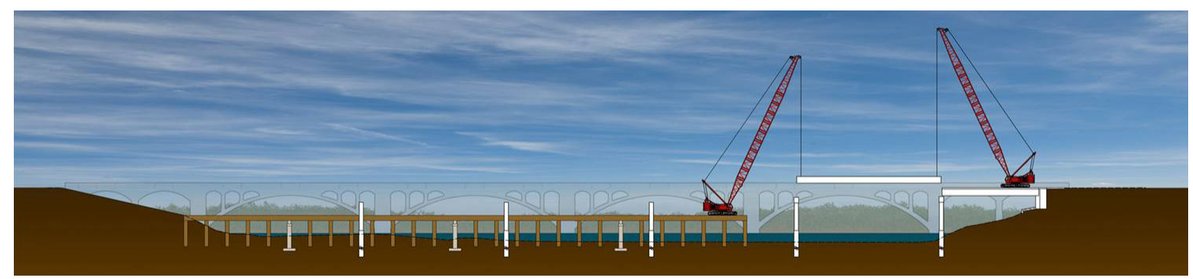
The I-85 corridor between Charlotte and Greensboro, NC, has long been one of the most congested and dangerous highways in the state, necessitating a massive reconstruction initiative including the erection of 2,900-foot-long dual bridges over the Yadkin River.

The original I-85/Yadkin River Bridge was built in the 1950s and had become one of the most outdated bridge crossings in all of North Carolina. In addition to being dangerously narrow, the structure was seriously deteriorated. Initially designed to carry 10,000 vehicles per day, the bridge currently carries 80,000 vehicles per day, including heavy tractor-trailer traffic.

In 2009, the North Carolina Department of Transportation (NCDOT) initiated a design-build procurement for the widening of I-85 and the replacement of the old river bridges. STV was selected as the lead designer for the $136 million initiative as a consultant to the Flatiron Construction Corp./Lane Construction joint venture team. STV was responsible for project management, bridge/structure design and railroad coordination.

A project of this scope and magnitude required outside-the-box thinking from the project team to meet the owner's needs and have all of the various bridge structures and approaches designed and constructed efficiently and safely. For example, the project's planning document envisioned a 46-foot median and separate temporary work bridges for the dual Yadkin River bridges. By slightly widening the median to 70 feet, a single work bridge could be constructed in the center median (instead of two separate bridges), reducing the project's cost, schedule and environmental impacts. The $7 million work bridge provided access to all construction elements and was capable of supporting more than eight million pounds of construction equipment, including large Manitowoc cranes.

To address safety and structural deterioration concerns, the project team focused on getting traffic off the existing Yadkin River Bridge as soon as possible. Flatiron/Lane/STV devised a traffic phasing scheme that involved building the northbound lane bridge first, and then quickly shifting both northbound lane and southbound lane traffic in a four-lane, two-way pattern to this single bridge. An incident management plan



along I-85 to address potential highway accidents and other incidents was also implemented.

To maximize efficiency of the bridge design, a modified 77-inch-deep bulb-tee, prestressed concrete girder was chosen for all concrete spans. Additionally, to eliminate the need for bridge overhang falsework, the team implemented a special "edge girder" that also served as the formwork for the deck slab overhang. This greatly expedited construction by eliminating the need to install and then destroy the overhang brackets, and it also improved safety for construction workers.

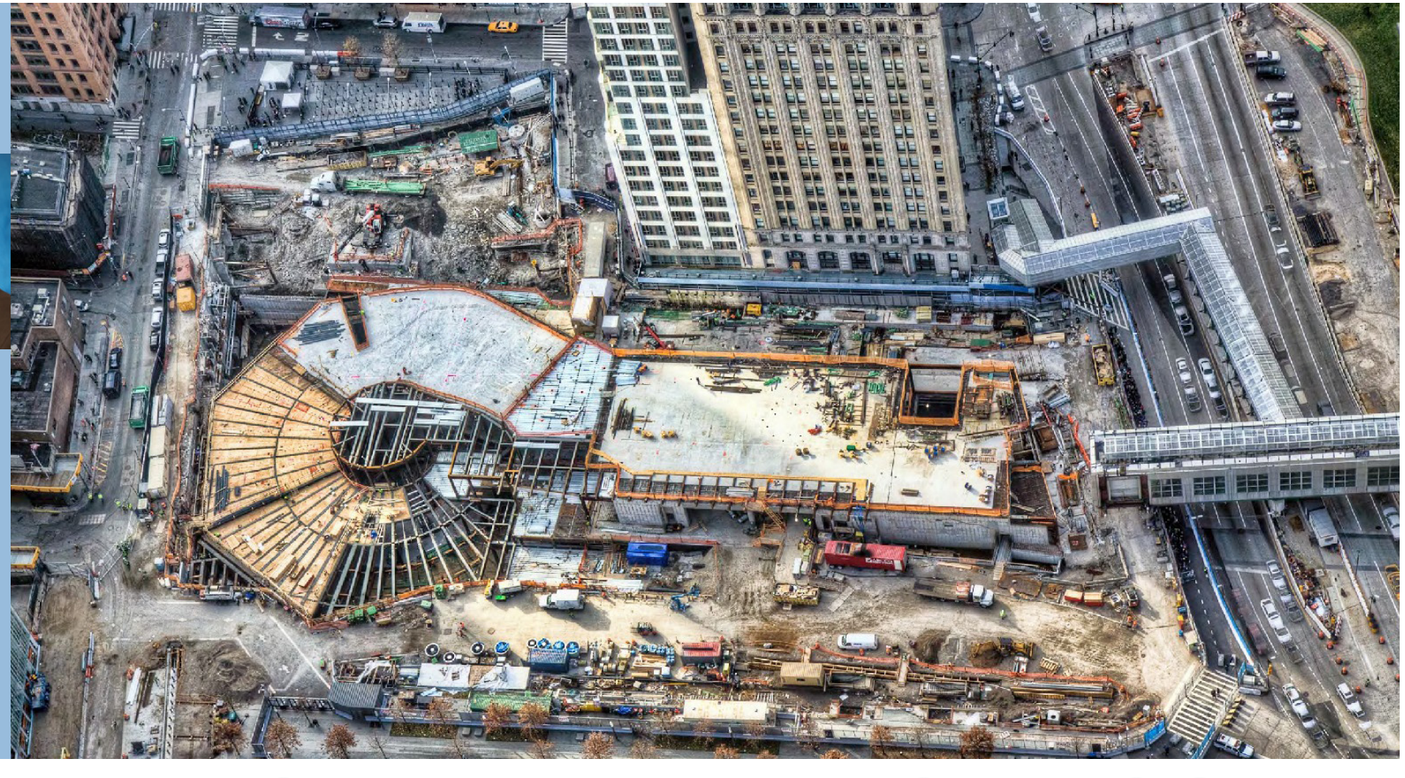
Throughout design and construction, the Flatiron/Lane/STV team coordinated with a number of key stakeholders and public and private agencies to keep the initiative moving forward. Because the I-85/Yadkin River Bridge crosses five railroad tracks, consisting of freight rail, intercity passenger rail and future high-speed rail, its construction schedule was coordinated with many railroad operators.

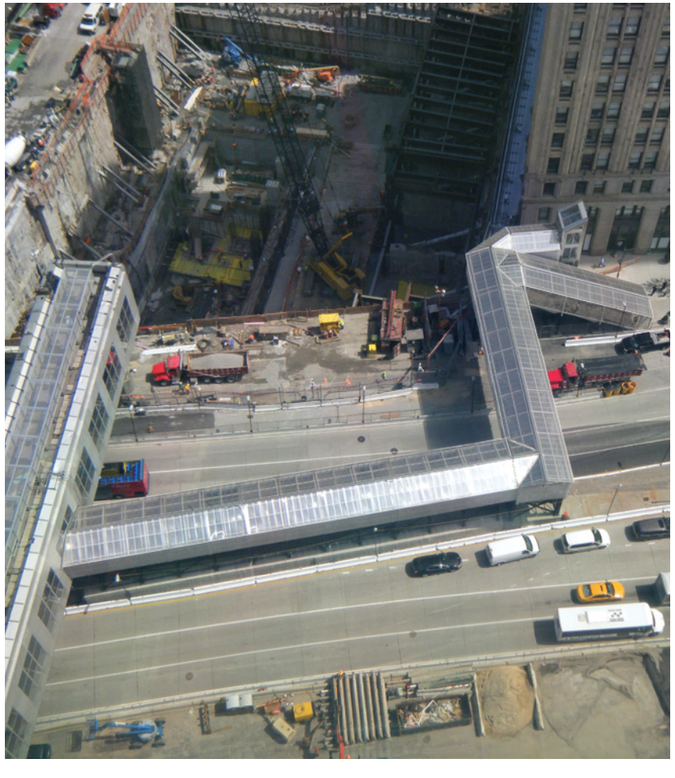
Other construction elements required coordination and communication with utility companies, including one adjacent to Duke Energy's main transmission line across the Yadkin River. With no room for adjacent work bridges, the team devised a top-down construction technique. By conducting partnering sessions with utility owners, the team successfully managed the utility coordination for this and other facilities that were in conflict with the new construction.

MEET THE AUTHOR

Thomas Mellett, P.E.
Vice President

Boasting a resume with more than 40 years of experience, Tom has a record of excellence in providing construction management and resident engineering services on significant civil and infrastructure projects. He manages the resident engineering group in STV's New York office and is currently overseeing reconstruction of Route 9A in lower Manhattan and the $550 million rehabilitation of the Kosciuszko Bridge between Brooklyn and Queens.





A CRITICAL LINK FOR THE FUTURE OF WTC SITE

Planning, coordination keys to maintaining schedule

By Thomas Mellett, P.E.

As construction continued on nearly every square foot of the World Trade Center site, the New York State Department of Transportation (NYSDOT) turned to STV to help keep two critical projects on schedule while providing safe pedestrian access across the busy Route 9A in lower Manhattan.

STV is providing construction management, coordination and administration services for the reconstruction of the Route 9A (West Street) promenade/multi-lane landscaped urban boulevard. The firm was tasked with devising a plan for a temporary pedestrian bridge extension over the roadway without interfering with ongoing work at the WTC Vehicle Security Center (VSC), which was also designed by the firm.

The pedestrian bridge faced a multitude of challenges, the biggest being a deadline to have both the roadway and the VSC completed by the opening of the September 11 National Memorial & Museum and One World Trade Center. The bridge was further hampered by delays resulting from the 2007 Deutsche Bank building fire and the building's subsequent demolition. The proposed path for a more permanent structure placed its eastern terminus on the site of the VSC and conflicted with construction schedules.

To overcome these challenges, STV coordinated with NYSDOT, the Port Authority of New York & New Jersey (PANYNJ) and other stakeholders to devise a plan using the center median of Route 9A to redirect the pedestrian bridge away from the VSC construction site.

The VSC was built under the management of the PANYNJ and is considered an essential piece of the WTC site by providing secure access to an underground road network for deliveries and tourist buses entering the site. The reconstruction of Route 9A was also critical in providing a corridor for replacement of damaged utilities serving the entire downtown area, as well as new services for the WTC site.

NYSDOT directed STV to manage and coordinate the effort to design, negotiate cost and construct the revised bridge extension. Working closely with the prime contractor for the Route 9A project, STV led the effort to complete the planning, design and construction of the $10 million bridge extension within five months for uninterrupted advancement of VSC construction. The revised design included an enclosed pedestrian bridge extension with an elevator for ADA compliance and automatic doors to isolate the controlled environment of the existing bridge while meeting the aesthetics of the neighborhood.

The 15-foot-wide covered bridge extension includes a 140-foot framed superstructure supported on 12 piers extended above the Route 9A median from the existing bridge, an 80-foot-long truss spanning northbound West Street and a triple-tiered steel staircase with concrete-filled treads. The extension had to be connected through the façade of the existing Liberty Street Bridge without adding any additional load to it. Ninety mph wind load requirements necessitated substantial piers and spread footings. Piles were ruled out due to the complex utility network below Route 9A/West Street. The elevator for outdoor use was a major challenge and, to maintain its functionality, was redesigned to avoid winter freezing of hydraulic fluids and other concerns.

The team also resolved issues, such as the presence of a major sewer chamber beneath the corner bent; development of architectural treatments for entering the side of the existing glazed, stainless-steel-clad bridge, owned by Battery Park City Authority; and maintaining pedestrian traffic across the bridge during construction, peaking at over 1,500 pedestrians per hour. The new bridge extension opened to the public in April 2010, and has survived two major hurricanes in the New York City area without damage. It is expected to be decommissioned as early as this fall upon completion of the VSC, or will remain open until completion of the VSC roof-top access for pedestrians.

MEET THE AUTHOR

Dennis Biegel, P.E.
Associate/Senior Mechanical Engineer

A leading national expert in movable bridge machinery systems, Dennis has played a critical part in the inspection, design and construction of more than 50 movable bridges across the United States and internationally. Over the course of his nearly 20-year career, Dennis has worked on mechanical and electrical systems for bascule, lift and swing bridges and has been instrumental in growing STV's presence in the movable bridge market segment.

KEEPING OLD MOVABLE BRIDGES IN OPERATION

By Dennis Biegel, P.E.

Oyster Harbors Bridge, Barnstable, MA

With its growing staff and diverse project portfolio, STV is increasingly sought after by movable bridge owners to provide a range of design and construction support services for these unique and complex structures. In the past decade, the firm has undertaken more than $400 million in movable bridge construction projects. This has helped STV grow into a major player in this niche market sector.

One instance of the firm's quick-thinking in the moveable bridge arena came at the Borden Avenue Bridge, a rare retractile type movable bridge in Queens, NY. In 2008, the bridge stopped closing properly because the west abutment and southwest wing wall were rotating, causing a crack in the southwest wing wall that quickly increased in size. The movement of the walls accelerated so much over a period of months that by January 2009, the owner, New York City Department of Transportation (NYCDOT), closed the bridge to traffic for safety reasons. STV worked closely with NYCDOT to assess conditions, analyze data from NYCDOT's ongoing survey monitoring program, and determine the mechanism causing the shifting. NYCDOT decided to replace the entire abutment. Because the bridge was more than 100 years old, NYCDOT had STV take advantage of the bridge closure to design additional steel repairs and a replacement of the existing concrete deck. To meet the aggressive schedule, construction began before the final design was completed.

STV performed similar services in support of the aging Radio Island Railroad Bridge in Morehead City, NC. The bascule bridge serves the Carolina Coastal Railroad over the Newport River and features an unusual overhead, articulating counterweight modeled after a 1920s patent. As contracted by the North Carolina Department of Transportation, STV designed a replacement of the bridge's entire floor system and repairs of the span support framework, including bascule girders, and the unique structural linkages which upgraded the load capacity of the bridge. The firm also designed a replacement for a hand-operated diesel engine and manual braking system, incorporating an electric motor and power-activated brakes which are operated by a modern electrical control system with remote capabilities. One of the primary challenges of this project was the introduction of new electrical control and physical locking systems to be compliant with current codes where none had existed before. All work was performed with the need to minimize impacts to marine and rail traffic.

Like the Carolina Coastal Railroad Bridge, the 80-year-old Oyster Harbors Bridge in Barnstable, MA was also in need of rehabilitation after the mechanical systems became misaligned, heavily worn and broke down all too frequently for the small island community's only highway access. The electrical control system had numerous safety issues and was so poorly configured that control of the bridge movement was inconsistent and unacceptable to the owner. STV designed numerous upgrades to the mechanical system, including the re-wiring of the control system. The bridge has since operated flawlessly through subsequent summer boating seasons.

In the Windy City, STV is in the early stages of a full structural/mechanical/electrical rehabilitation of the Van Buren Street Bridge over the Chicago River for the Chicago Department of Transportation (CDOT). STV is currently in the process of finalizing an in-depth inspection report and rehabilitation recommendations. The bridge has recently begun showing its age and needs extensive steel and concrete repairs, upgrades and rehabilitation of its mechanical equipment, and a replacement of its obsolete electrical control system. The chief challenges will be staging the construction on the bridge, given its location within a dense urban streetscape and the historic nature of the structure, and CDOT's functional systems and operational protocols, developed to meet the unique challenges of bridge and traffic operations in the Loop.

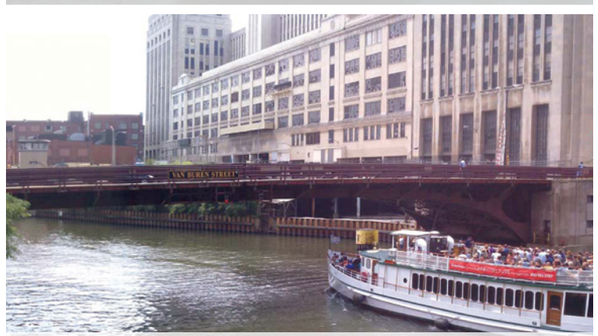
STV's movable bridge staff is also helping a number of other agencies keep their structures in good working condition, including the New York State Department of Transportation, the Massachusetts Department of Transportation, and the City of Boston Department of Public Works. The firm has also helped freight railroads, including BNSF, CSX and Canadian National, with troubleshooting, repair and rehabilitation of a number of their movable bridges. Elite contractors such as Scott Bridge, Balfour-Beatty, FH Paschen and ACROW have retained STV to provide movable bridge construction engineering services. And the firm has been asked to participate in some significant design-build pursuits with several major contractors as well, playing a key role in proposal development with Cianbro, Flatiron Construction Corp., Middlesex Companies, PCL Construction and The Lane Construction Corporation over the past several years.

STV's wide range of projects and clients are a testament to the hard work, dedication and technical excellence of its growing specialized staff. STV has become a leading national expert in movable bridge engineering, providing a level of multidisciplinary coordination, client service and technical excellence that is unparalleled.

Loop Parkway Bridge, Long Beach, NY

Borden Avenue Bridge, Queens, NY

Radio Island Railroad Bridge, Morehead City, NC



Van Buren Street Bridge, Chicago, IL

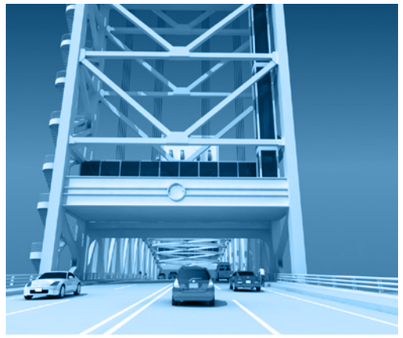
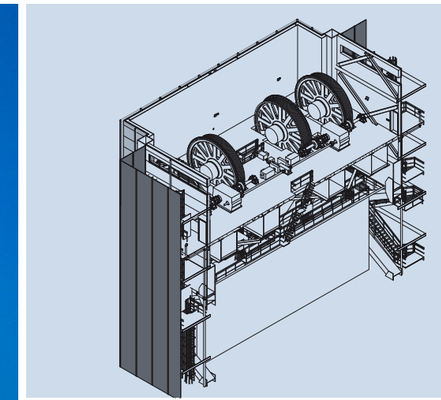


Photo © Rosales + Partners

Computer renderings show the new Fore River Bridge between Quincy and Weymouth, MA.

Top right, a 3-D schematic drawing of the bridge towers' machinery room.



BIM AT WORK

Building Information Modeling Aids Movable Bridge Design in Massachusetts

By Nikole A.K. Bulger, P.E. and Ennio Eleuteri, P.E.

In Massachusetts, STV's expertise in building information modeling (BIM) software has expedited the design and construction of the Fore River Bridge replacement, a signature project in the state's $3 billion Accelerated Bridge Program (ABP) and one of the first bridges in the Bay State to be designed using 3-D modeling. By fostering communication between clients, designers and contractors, this innovative approach has streamlined the large-scale design-build process while positioning STV as a national leader in accelerated bridge construction techniques.

During the design stage, STV prepared the bridging documents for the Massachusetts Department of Transportation (MassDOT), and advocated for the use of BIM because it allows designers and contractors to quickly and easily convey information about the design, and particularly about how the different systems relate to one another. A 3-D model was important for the proposed Fore River Bridge, which includes a 324-foot vertical lift span that will travel 115 vertical feet to allow for the passage of large vessels on the Weymouth Fore River between Quincy and Weymouth, MA. Complete integration of the structural, mechanical, electrical, and architectural project elements was critical to the project's success. As part of the bridging documents, the design-build team was required to develop and maintain a BIM model of the structure to identify systems conflicts and to perform virtual walkthroughs with the MassDOT operations staff who will operate and maintain the structure.

While not a replacement for quality 2-D sketches and sections, 3-D model views of the bridge tower's structural elements, mechanical systems, operator's house, and mechanical/electrical room envelopes, access stairways and platforms, electrical motors and other components have enabled the team to identify possible conflicts that they couldn't easily identify with standard drawings. It has been particularly useful for locating architectural components, extensive conduits and piping around the lift tower's massive frame. Further, it has been invaluable in demonstrating the impacts of proposed design modifications to the owner, who can then virtually tour the facility prior to making final decisions.

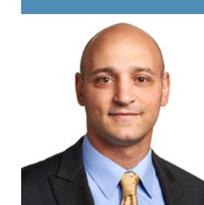
Introduced by former Massachusetts Gov. Deval Patrick in 2008, the ABP encourages the use of innovative design to complete projects on-time and on-budget and with minimal disruption to motorists, pedestrians, bicyclists and commerce. Recipient of the American Association of State Highway and Transportation Officials' 2011 Francis B. Francois Award for Innovation for its "innovative program management, project development and construction technologies and methods," the groundbreaking initiative has reduced the state's deficient bridge inventory by 16 percent. Where applicable, MassDOT continues to apply lessons learned from both ABP and BIM to current and future projects.

Given the success on the Fore River Bridge, STV will continue to advocate for the use of BIM on complex and movable bridges in the state to expedite design and construction while reducing project costs.

MEET THE AUTHORS

Nikole A.K. Bulger, P.E.
Senior Civil Engineer and Project Manager

A civil engineer with more than 15 years of experience, Nikole is currently serving as project manager for STV services related to the construction of the Fore River Bridge. She's a leader in performing site and permit coordination for bridge and infrastructure projects; project coordination on behalf of the owner during design-build delivery; and preparation of design-build procurement documents.



Ennio Eleuteri, P.E.
Associate and Senior Structural Engineer

In his more than 20-year career, Ennio has demonstrated a proficiency in providing design services for new and rehabilitation bridge projects, buildings and transit facilities. He most recently led the design of the Fore River Bridge, and has also led a number of bridge inspection and evaluation teams for the firm. He has expertise in performing various types of structural analyses and is adept at leading teams toward successful project delivery.

Rehabilitation work on a CSXT rail bridge crossing the Mohawk River in Hoffmans, NY.

Photo © Willis (Bill) White

BRIDGE RECONSTRUCTION ON ACTIVE RAIL LINES

Span Replacement on CSXT's Hoffmans Bridge

By Willis (Bill) White III, P.E.

When CSX Transportation (CSXT) asked STV to provide structural engineering design services for the replacement of deck plate girders and deck trusses on a doubletrack railway bridge, the firm had no idea it would face such a major engineering challenge. But the project team ultimately met the challenge squarely with an economical solution.

The CSXT freight railway bridge over the Mohawk River in Hoffmans, NY, was constructed in 1926 as part of the New York Central Railroad. The original channel of the Erie Canal is located on a parallel alignment only several hundred yards away. The railroads competed with the Erie Canal for shipping in the area beginning in the 1830s.

A previous CSXT feasibility study had found that the original structure was designed in accordance with New York Central's 1917 Steel Railroad Bridge Specifications. The existing spans of the original bridge were deemed inadequate for current load standards at 60 mph. The center two truss Spans (3 and 4) were replaced with new deck truss spans in the 1970s, leaving Spans 2 and 5 (deck trusses), and Spans 1 and 6 (approach spans) to be replaced under STV's contract.

In contrast to a single span supporting both tracks, STV's design for the replacement river spans specified side-by-side independent spans for each track to avoid the significant differential deflection issue that exists when one track is loaded and the other is unloaded. However, during design development, the team determined that the height/spacing ratio of the new deck girders exceeded the railway engineering criteria for lateral overturning restraint. The two independent spans would therefore have to be joined by cross frames placed between them.

Addressing the differential deflection became one of the most interesting challenges of the structural design. Since the differential deflection during live load on Spans 2 and 5 could be as much as 2.82 inches, a cross frame connecting the girder sets supporting each track provides lateral resistance while allowing for independent vertical movement. The cross frame prevents introduction of stresses from a loaded girder set to an unloaded one by using oversized vertical slots in the connection. When one track is loaded, the bolts can slide in the slots and allow the deflection, while still providing lateral restraint. This configuration proved to be a simple and economical design.

During construction of Span 5, CSXT inspected Span 2 and discovered that about half the bolts had sheared off. The sheared bolts were not concentrated toward the centers of the spans, where the deflection differential was greatest, but instead were randomly distributed. Further inspection revealed that the culprit was the difficulty in holding fabrication and erection tolerances to align the slots in the cross frame with the holes in the connection plates. STV's team subsequently decided to release and reconnect the cross frames with a combination of realigned slotted holes near midspan and rigid connections near ends of spans. The integrity of these connections is being monitored and to date there have been no more bolt issues.

STV provided services to CSXT during construction as well, including coordinating the date for changing out the spans during an optimum weather window. The 149-mile-long Mohawk River is the largest Hudson River tributary, and vertical and horizontal navigation clearances were maintained for commercial navigation throughout construction. After the contract was awarded, the contractor built new river spans on falsework supports parallel with the existing bridge and used a roll-in/roll-out procedure for installation to minimize the time the track was out of service. Approach spans were erected using cranes on barges to lift out the old spans and install the new ones.

The project presented a number of challenges, both anticipated and unforeseen. During preliminary engineering, the design team worked closely with CSXT to provide plans that would minimize difficulties during construction along with the track outage time required for the work. After construction was completed, STV learned lessons that will improve future designs. The firm's work with CSXT to address concerns before, during and after construction cemented their longstanding relationship.

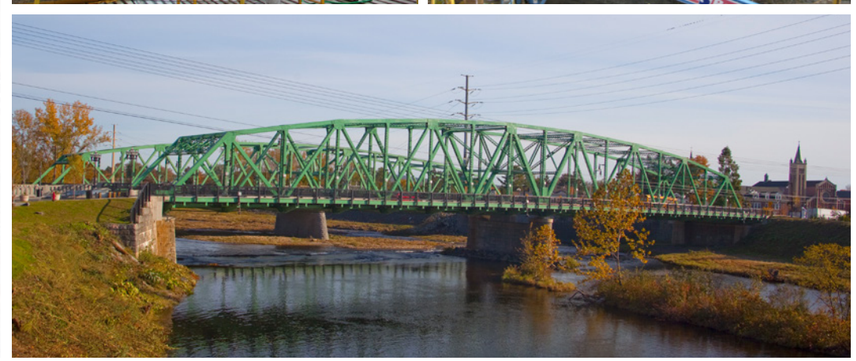
MEET THE AUTHOR

Willis (Bill) White III, P.E.
Associate, Project Manager/ Senior Engineer

For more than 35 years, Bill has performed a range of engineering design and project management services for highway and railway bridge structures around the United States. With particular expertise in hydrology and hydraulics, he has developed designs to meet Federal Emergency Management Agency requirements, while also supplying bridge permitting services for more than 25 CSXT bridges.

As part of a $80 million project in Westfield, MA, STV engineers rehabilitated a 1939 bridge and designed a new "sister" bridge immediately to the east.

Photo © Mark Flannery Photography



Mark Pelletier, P.E.
Vice president and Principal-in-Charge

As the Boston office manager, Mark has more than 30 years of experience overseeing the design and construction of complex transit and transportation projects ranging from airports to viaducts throughout New England. He is an expert in bridges, underground structures and tunneling projects and is currently leading the team to rehabilitate Boston's iconic Longfellow Bridge.

GREAT RIVER BRIDGE GUSSET PLATE REPLACEMENT

By Mark Pelletier, P.E.

Built in 1939 and believed to be the earliest bridge of its kind in Massachusetts, the Great River Bridge is a two-span continuous Warren through-truss superstructure, totaling 368 feet, with truss chords made of riveted, built-up, steel sections. STV was first contracted to evaluate the bridge structure in 1994, but over time the project grew to become a rehabilitation of the Great River Bridge as well as a larger urban renewal project for the City of Westfield and the Massachusetts Department of Transportation.

The rehabilitation required a new deck slab, sidewalks, stringers, floor beams and bearings. Two trusses, the abutments and the center pier were to remain, with strengthening as needed. A critical design step involved assuring that the original truss structure could meet the current design code requirements.

In 2004, the original design included a finite element analysis for each of the main gusset plate types with an assumed nominal amount of deterioration. Then in August 2007, the I-35W highway bridge over the Mississippi River in Minneapolis collapsed, killing 13 people and injuring 145. As a result of this tragedy, STV revised its calculations for the Great River Bridge in accordance with the new technical publications providing guidance on gusset plate analysis and design. Using these new criteria, the STV team identified several locations where the rivets warranted replacement with bolts and made the necessary revisions to the contract drawings.

Detailed inspection of the blast-cleaned gusset plates and bottom chord members revealed that the portions of the truss above the roadway elevation were in good condition. However, the bottom chord members and associated gusset plates had significant corrosion, including 100 percent section loss. Deterioration was particularly bad in areas previously hidden behind the curb line. Given the magnitude of the losses, STV's inspectors found additional repairs were necessary, including the replacement of all bottom chord gusset plates. Construction sequencing determined that the plates should be replaced first at the pier and then in succession back toward the two abutments, with work proceeding bay-by-bay. The concrete deck demolition would follow the same sequence. The gusset plates were to be replaced with at least a portion of the deck in place, with construction live load on the structure during this work. Consequently, typical gusset replacement methods were not feasible for the bridge – there could be no movement or change in geometry while replacing the gusset plates, because even slight movements could alter stresses on the truss members.

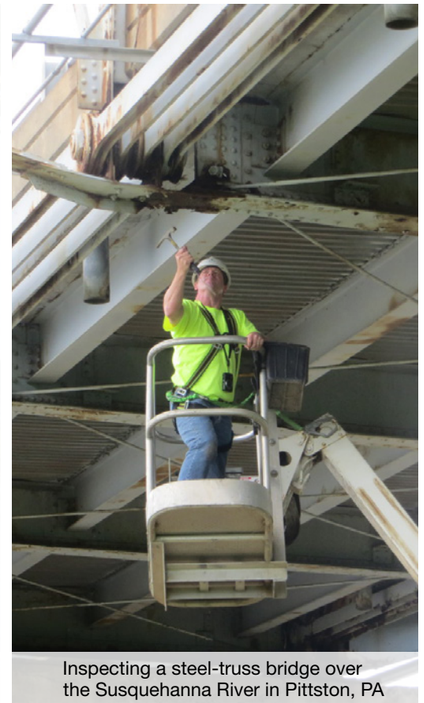
STV designed a gusset plate frame to use in replacing the Great River Bridge gusset plates. A single truss was sandwiched between two gusset plate frames. A gusset frame jacking assembly was included to offset potential frame distortion during transfer of the load from the truss to the frame. STV worked with the contractor to develop the U-shape with a bolted bottom piece to provide more flexibility for frame installation before or after floor beam demolition. Each pair of frames was designed to resist more than 1,000 kip feet of moment and several thousand pounds of axial and shear force.

The new gusset plates came from the fabricator with the same geometry as the existing gusset plates, but without any holes. When a gusset plate was removed from the bridge, it was placed on top of the new gusset plate and match-drilled to ensure an exact fit. The installation of the new gusset plates went smoothly and the holes aligned, allowing the new high-strength bolts to be put in place. The new gusset plates were 1/8-inch to 3/16-inch thicker than the existing plates.

STV employed a plan to monitor bridge movement during these sensitive operations. A survey crew checked the elevations each day that significant procedures occurred. The shots varied by only one or two hundredths of a foot, and movement was usually attributable to the specific construction activities.

The replacement of the 24 major and 32 minor bottom gusset plates took about six months. The replacement of the six bearings involved installation of 12 additional major gusset plates. The innovative process was extremely successful, and the bridge is once again serving the traveling public.

Water Street Bridge over the Susquehanna River in Pittston, PA



Inspecting a steel-truss bridge over the Susquehanna River in Pittston, PA

Rothrock State Forest, Jackson Township, PA

Delaware Canal State Park, Bucks County, PA

Masonry Arch, Wayne County, PA

Loyalsock State Forest, Fox, PA

Statewide Inspection of
LOCALLY OWNED BRIDGES

By Peter Moran, P.E.

Working to enhance the safety of local, municipal and agency-owned bridges throughout Pennsylvania, STV bridge inspectors recently begun a second major inspection project aiming to help bridge owners identify and address structural deficiencies.

Pennsylvania ranks third in the nation in the number of bridges in the state. With most of its 25,000 state and 6,400 local bridges over 50 years old, the state leads the nation in the number of bridges characterized as "structurally deficient."

STV has been supporting the Pennsylvania Department of Transportation (PennDOT) under various inspection contracts for more than 30 years. In 2012, STV was contracted by PennDOT to assess locally owned bridges ranging from 20 feet to more than a quarter-mile long using National Bridge Inspection Standards (NBIS).

The STV team not only inspects and identifies issues at these bridges, but when serious issues are discovered, guides the owner into taking appropriate action, whether it is a restriction or a priority repair that cannot be delayed. When less urgent issues are found, the inspectors recommend appropriate repairs and emphasize the benefits of preventative maintenance. The success of a local bridge inspection program boils down to the ability to ensure public safety and maximize the life of a structure through proper evaluation and maintenance.

Since public safety is paramount, STV maintains a team of inspectors on call to mobilize quickly and perform necessary inspections throughout the state, sometimes within hours of notification. Quick deployment of qualified inspectors enables STV to help PennDOT and local governments assess potentially critical situations and comply with NBIS inspection deadlines.

Beyond field work involving everything from squeezing into tight spaces to working high above the Susquehanna River, the STV team also capitalized on its experience with local bridge inspection projects and its effective ability to navigate a labyrinth of state, municipal and county governments to communicate with local officials, guiding them with recommended repairs and helping to develop long-term maintenance plans.

On this recent statewide project, the STV inspection team dealt with numerous PennDOT engineering districts and agencies rather than a single-source client. Unlike most other inspection contracts which are handled through the contracting district, PennDOT's Central Office administered this agreement and individual assignments came in the form of on-demand work orders from various districts and other state and local agencies. Each district and agency had its own preferred procedures, formats and communications, and maintaining consistency presented challenges from a management standpoint. Having benefitted from exposure to various formats, STV combined many of the best practices from each client into the deliverables for this contract. While some customization was necessary, the team was able to provide a high level of quality and consistency for local bridge reports throughout the state.

Following high demand from municipal and county governments for assistance with their inspection programs, nearly all of the funding allocated for this initial five-year contract was exhausted within the first two years of the agreement. PennDOT subsequently advertised a second 5-year agreement and the STV team was awarded this contract over 13 other bids, a strong indicator of STV's outstanding performance and client satisfaction.

Peter Moran, P.E.
Structural Engineer/Project Manager

Peter's 20 years of engineering experience includes a special focus on in-depth inspection, condition evaluation and load rating analyses for highway and rail bridges. He is currently managing inspection projects for state and locally owned bridges throughout Pennsylvania and has also performed design services for public agencies in New Jersey.

Photo © SV/Lumagraphica /Shutterstock

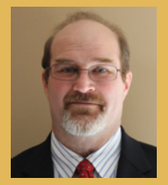
PEOPLE ON THE MOVE

John Daza, P.E., has joined STV as a project manager and senior structural engineer for the New York metropolitan area working in the Transportation & Infrastructure Division's Northeast region. In his 20 years of experience, he has overseen the design and construction of numerous road, bridge and other infrastructure projects. He has provided construction support services for the iconic World Trade Center Transportation Hub, the Long Island Rail Road East Side Access project and New York City Transit's Second Avenue Subway. He has also provided structural engineering services for the reconstruction of the roadway network around the World Trade Center site and oversaw the critical repairs to the Holland and Lincoln Tunnels in lower Manhattan.

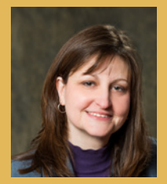
Philip Cremin, **P.E.**, has joined STV as a vice president and chief civil engineer for the New York metropolitan area working in the Transportation & Infrastructure Division's Northeast region. Prior to joining STV, he was the engineer of design for the LaGuardia Airport Redevelopment Program, a $4 billion project that included infrastructure work, a parking garage and coordinating the public-private-partnership program with the various teams involved. Over his 30-year career, Philip has worked on nearly every major transportation hub and system in the New York City metropolitan area including Newark Liberty International Airport, LaGuardia Airport, JFK International Airport, Holland Tunnel, Lincoln Tunnel, George Washington Bridge, various ports and the Port Authority Trans-Hudson (PATH) rail system.

Michael Shapiro, **P.E.**, has joined STV as a vice president and design-build manager from his base in Glendale, AZ. In this role, he is responsible for identifying business opportunities, managing relationships within the project team, overseeing technical proposal development, managing pursuit schedules and budgets, monitoring legislation and funding allocations impacting alternate delivery capital programs, overseeing the implementation of design-build projects and promoting and establishing innovation in proposals and project execution. Michael has 37 years of experience with more than $20 billion worth of work in design-build and public-private-partnerships (P3). Prior to joining STV, he was a vice president, design director, capture manager and manager specializing in alternative delivery projects, including P3s and design-build transportation, at a support services firm in the transportation sector.

Eric Pitts, **P.E.**, has joined STV's Atlanta office as a senior special projects manager, where he will play a key role in STV's design, construction management and asset management operations in the Southeast. Prior to joining the firm, Eric was a civil engineer with the Georgia Department of Transportation (GDOT) for more than 20 years and has extensive experience in administering and directing statewide maintenance programs for highways, roadways and bridges. A Georgia native, he is a proud graduate of Georgia Tech University.



Barbara Hoehne, **P.E.**, has joined the Harrisburg, PA, office as an associate and senior project manager. A civil engineer with more than 20 years of highway design and management experience, she has worked extensively with Pennsylvania Department of Transportation districts throughout the commonwealth, as well as with the Pennsylvania Turnpike Commission and Lancaster County Transportation Authority. Barbara currently serves as deputy project manager on the final design of the 5.3-mile northern section of the Central Susquehanna Valley Transportation Project on a new alignment in Northumberland, Snyder and Union counties.



Rob Dubnicka, **P.E.**, **PTOE**, has joined STV as a senior engineer and manages the firm's newest Southeast office in Columbia, SC, the state capital and largest city. Rob brings more than 26 years of experience in all aspects of traffic planning and engineering, including proficiency in implementing QA/QC processes to improve the quality of plan production. He has led numerous technical efforts to evaluate traffic operational benefits of alternative technical concepts for design-build pursuits. Currently, he is providing QA/QC review on NCDOT US 21 and Gilead Road Intersection Improvements (U-5114) and SCDOT I-526 Extension EIS, and traffic analysis on the York County US 21 North Phase I and SC 51 Corridor.

Robert Baughman, **P.E.**, has relocated to STV's suburban Raleigh office in Morrisville, NC. A 35-year veteran of the firm – all in Charlotte – Bob plays a senior role on major transportation projects, with emphasis on rail and mass transit. He currently manages STV's efforts as a major subconsultant on GoTriangle's Durham-Orange light rail transit alignment between Chapel Hill and Durham. Prior to his relocation, he served as project manager for the $1 billion LYNX Blue Line Extension in Charlotte, now under construction.

Mario Valenti, **P.E.**, **LEED® AP BD+C**, a structural engineer in STV's New York office, became part of an elite group of design and construction professionals when he was named one of *Engineering News-Record's* "Top 20 Under 40" in the New York Region. Since joining the firm in 2009, Mario has provided innovative design solutions for some of the most significant projects currently under construction, including the Metropolitan Transportation Authority/Long Island Rail Road (LIRR)'s East Side Access project, which will bring LIRR service directly from Long Island to Manhattan's East Side via a new tunnel system. Mario's design focused specifically on a new station under Grand Central Terminal.

Ryan Barth, **P.E.**, a project engineer in the Baltimore office, has been recognized as a rising star in the design and construction industry by being named one of *Engineering News-Record's* "Top 20 Under 40" in the Mid-Atlantic Region. Ryan has been involved with some of STV's highest-profile projects in the Baltimore/Mid-Atlantic region, including the east segment of the Maryland Transit Administration's proposed Purple Line light rail line that will connect New Carrolton in Prince George's County and Bethesda in Montgomery County.

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