

# Innovation Drives Expansion

Beam, Longest and Neff expands from its Indiana base with new concrete techniques that create distinctive designs and lower costs

by Craig A. Shutt

An impressive reputation in its home state of Indiana has gained Beam, Longest and Neff (BLN) a long list of repeat customers at the state and local level. Now, the company has begun to grow aggressively, leveraging its value-engineering expertise and ability to find creative solutions to demanding challenges.

“We receive 90 to 95% of our business from repeat customers because of the high quality of service we provide,” says James Longest, president of the Indianapolis-based firm. “Because of the quality of the staff we have retained, and our focus on internal quality control, we produce a product that exceeds our customers’ expectations.”

Adds Thomas Longest, executive vice president, “We pride ourselves on

creating a product with a more efficient and cost-effective solution than any other company could produce.”

Now, they are using their reputation and diverse expertise to gain customers in other geographic regions. “We are absolutely in growth mode,” says Thomas Longest. “We are looking to expand our geographic footprint with great success, while continuing to explore strategic hubs for operational efficiencies.”

The firm currently operates from four offices and could add more, Thomas Longest says. “We will open new offices when they are needed, but we lean extensively on our home office.” That staff, he notes, has working experience with 38 departments of transportation (DOTs).

## Efficient Designs Dominate

Its base of repeat customers is notable because many designs are not the large, signature bridges that other firms use as launching points. “Showcase bridges are not the majority of what we do,” says Michael L. McCool Jr., bridge department manager. “We create designs that are efficient, low cost, and durable, and that gains us notice.”

An example is the Rockport Road Bridge over Clear Creek in Monroe County, Ind. The bridge was designed as a single-span, prestressed concrete I-beam structure with integral end bents and a concrete deck. The design eliminated any piers in the channel and minimized channel work.

The project was a state finalist in the Engineering Excellence Competition of



The replacement Rockport Road Bridge over Clear Creek in Monroe County, Ind., is a single-span, prestressed concrete I-beam bridge with integral end bents and a concrete deck. All Photos: Beam, Longest and Neff.

the American Council of Engineering Companies (ACEC) in Indiana. "It had a conventional design and wasn't a showcase, but it was exactly what the client needed," McCool says. "It was a neat, clean project."

Alternatively, there are more complex projects, such as the State Route 66 Bridge over Green River Road in Evansville, Ind. For this project, the designers replaced an existing steel-girder bridge with 317-ft-long twin structures consisting of curved, three-span, post-tensioned concrete bulb tees with integral end bents. The interior supports consist of integral post-tensioned concrete straddle bents. This unique design was necessary due to the single-point interchange that the bridge spanned.

Construction of the State Route 66 Bridge over Green River Road was phased to maintain two lanes of traffic at all times. The project won an honor award in the Engineering Excellence Competition from the ACEC of Indiana and a 2005 PCI Design Award.

"This was a challenging project, because it had MSE [mechanically stabilized earth] walls used on the approaches and in an urban setting with a lot of right-of-way restrictions," McCool explains. "We were able to build the bridge at a tight interchange with a high volume of traffic without rebuilding the MSE walls. We minimized the construction depth with the post-tensioned bulb tees and were able to follow the curves of the roadway and walls. It added complexity, but it best served the setting."

### Large-Scale I-69 Project

At the other end of the scale, the firm was selected to help develop a new I-69 corridor from Indianapolis to Evansville, with portions still under construction. BLN's involvement includes 49 bridges, with 15 under a design-build delivery format and eight that were value-engineered, which in Indiana is called a cost reduction incentive (CRI) design. The construction packages included multiple bridges, interchanges, and new roadways.

The firm started its work on the project by designing two twin bridges on a tight deadline, one of which they were able to reduce from the planned



Designed to reduce traffic congestion, the State Route 66 Bridge over Green River Road in Evansville, Ind., replaced a single-span steel bridge with a curved, three-span, post-tensioned concrete bulb-tee design.



The construction of the State Route 66 Bridge over Green River Road was phased to maintain two lanes of traffic in each direction.

13-span design to a 10-span structure without changing the roadway profile. "That impressed DOT officials, and we worked our way up the interstate corridor from there," says McCool.

Value-engineering or CRI projects are becoming more commonplace in Indiana, McCool notes. "The CRI concept leads us to analyze superstructures and use more efficient designs, which often allows us to eliminate a beam line or more," he says. "We internally review everything closely to be sure that what we put out to bid is what the contractor will build."

The CRI concept was used on a section of the I-69 project, which originally was designed to carry the highway over State Routes 61/56 in Pike County. BLN's

value-engineering proposal flipped the design so the state routes went over I-69. This design necessitated revising drainage calculations, road profiles, ramps, and other factors.

But the redesign eliminated one bridge and simplified the interchange, resulting in only a single bridge design. The bridge consisted of a two-span continuous, composite, prestressed concrete hybrid bulb-tee beam superstructure constructed with a 16.5-degree skew. MSE retaining walls shortened the span lengths to 96 ft and contributed to the \$5.5-million reduction in cost at the interchange. Overall, the CRI produced savings of nearly \$10 million on the initial \$60-million bid. "The redesigns reduced the size of the project overall



By flipping the original design, Beam, Longest and Neff used Indiana's cost reduction incentive option to eliminate a bridge from the interchange, saving considerable time and money.

by a significant amount, resulting in considerable savings," says James Longest.

### Design-Build Grows

Indiana has been bundling more projects, as happened on I-69, to create better design options, notes James Longest. "I believe in the not-too-distant future, we'll see most projects focused on a P3 [public-private partnership] or design-build basis. That is definitely the direction that states are heading."

The design-build approach encourages innovations, and BLN takes advantage of these opportunities. "Design build and CRI have led us to new strand technologies and to using lightweight concrete to create longer beams to eliminate spans," says McCool. The firm often uses a specialized girder shape developed by Indiana, and similar to the

Nebraska bulb tee. "It offers the same concept and can compete against steel options from a depth standpoint."

The designers also are looking closer at the use of lightweight concrete and internally cured concrete. BLN has had success with a research project conducted by Purdue University, which is evaluating options for internally cured concrete. "It is getting more interest in the state and is becoming a new tool in the designer's toolbox," says McCool. The new concrete provides a unique mix design with aggregates that retain water, which may reduce the overall amount of shrinkage cracking.

The research program is conducting a test in rural Monroe County, where side-by-side, single-span, adjacent box-beam structures are being monitored for surface shrinking and cracks. "I

like the results we're seeing so far. It offers promise for better long-term serviceability, and it's performing well to date."

Reducing life-cycle costs has become a key focus, as owners realize the full extent of benefits from more durable structures, adds James Longest. "Clients especially like that we can save money upfront, as well as over the life of the project. Concrete becomes even more competitive when life-cycle costs are taken into account. As we apply new techniques and innovations, that will become even more true."

**'Concrete becomes even more competitive when life-cycle costs are taken into account.'**

BLN stays current with design techniques in many ways, including technical staff participation on several technical committees. "I bring back a lot of new ideas that are on the cutting edge of design from the meeting discussions, and we use as many as possible in our design plans. We like to stay out in front on AASHTO updates and local code revisions," says McCool.

An example can be seen in the design-build project its Colorado office completed that replaced five bridges along I-25 south of Fountain, Colo. The bridge design features two 71-ft-long spans comprising adjacent, prestressed concrete box beams. Due to the high volume of traffic, Colorado officials required a short construction schedule that minimized traffic impact. The design-build team looked for ways to accelerate construction to disturb traffic for only 15 days while replacing the five bridges.

The designers used as much precast concrete as possible and allowed concrete closure placements on the

A design-build delivery method was used to replace five bridges along I-25 south of Fountain, Colo. The design allowed the high-volume bridges to be constructed with impact to traffic lanes for only 15 days.





Fountain County Bridge No. 7 in Indiana used Beam, Longest and Neff's bridge design, survey, environmental, and right-of-way services.

bridge deck while under traffic. This resulted in only single-lane closures of the northbound lanes. Some of the acceleration techniques, such as precast concrete approach slabs and joint connections, had not been used before in the state, but the concepts were derived from recent PCI publications.

Providing high constructability and lower costs often are accomplished due to the designers' familiarity with what works best in each location, notes James Longest. "Our designs result from having intimate knowledge of the local design manuals, as well as a particular state's requirements along with contractor's construction methods."

### Three Generations of Leadership

Beam, Longest and Neff (BLN) was founded in 1945 as the partnership Pierce, Gruber and Beam, which was incorporated in 1953. In 1957, the firm formed Highway Surveys Inc., which was merged with the parent company 10 years later, forming BLN.

Over the years, ownership transitioned within the founding family from Hubert Longest Sr. to Hubert Longest Jr. and most recently to James and Thomas Longest. In that time, it has expanded into a full-service engineering firm with 100 employees and four offices, comprising the corporate headquarters in Indianapolis; Charleston, W.Va. (1984); Louisville, Ky. (1999); and Denver, Colo. (2010).

### Creating Value in New Ways

Creating value can mean more than simply saving initial costs, notes Thomas Longest. For instance, a 24-ft-wide bridge may meet traffic requirements, but if the structure is used by 30-ft-wide farm equipment, it may make more sense to widen it. "Making it that much wider will save money long-term from a maintenance standpoint and better serve the community."

Value also comes from reducing construction time, which improves safety. That often leads to repair and rehabilitation projects, which can speed turnaround and reduce costs. "Clients are looking to build more projects with fewer dollars, so they very much are in preservation mode," says Thomas Longest. "We are doing more rehabilitation projects, as well as more deck, joint, and rail replacements today."

Rehabilitation projects tend to be smaller in scope than replacement projects, McCool notes, but they can become complex if drawings are incomplete or work is being done in phased construction under traffic. "If we have to speculate on what has been built or work around maintaining traffic, it can become a more challenging type of project."

### Cost-Effective Aesthetics

Aesthetics also are becoming more significant in bridge designs, notes Thomas Longest. "Owners are interested in improved aesthetics, especially in urban areas, although less so in rural areas. We usually discuss options for creating cost-effective aesthetic designs."

The biggest obstacle is the mindset that adding design elements or decorations will be costly, he says. "Owners don't realize there are many effective solutions for making bridges more interesting without making them cost more. Our first choice is always to use formliners and stains; in one instance, we replicated the look of Indiana limestone, which was very popular near the bridge. We also use decorative railings a lot. Once clients see what's possible, they embrace it."

In some cases, the firm creates samples or renderings to help visualize the end

result. They also create partnerships with local planning authorities (LPAs) where the bridge is located. "The LPA often will partner with the client to fund part or all of the aesthetic improvements being considered."

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Types of bridges also are evolving, with more interest in pedestrian bridges than ever before, says McCool. "We are adapting as new bridge options become available by staying abreast of new design technology and practices. Our goal is to tighten everything down in advance and create close communication with our partners, including the precasters. We want to have all the details understood so the bridge we're designing provides the most constructable option possible." 

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Beam, Longest and Neff provided bridge design and other services for the Hamilton County Bridge No. 230 in Indiana.