

CLOSE COMMUNICATION AIDS CREATIVITY

Lochner's two-part program keeps far-away offices in close touch so designers stay abreast of new techniques and trends to aid transportation-focused projects

by Craig A. Shutt

Designers throughout H.W. Lochner Inc.'s 31 offices stay in touch thanks to a concerted two-prong communication strategy. The format ensures they access new ideas and techniques that help them design a range of bridge projects nationwide and stay abreast of technological advancements such as building information modeling (BIM) and alternative-delivery formats, as well as innovations with materials such as concrete.

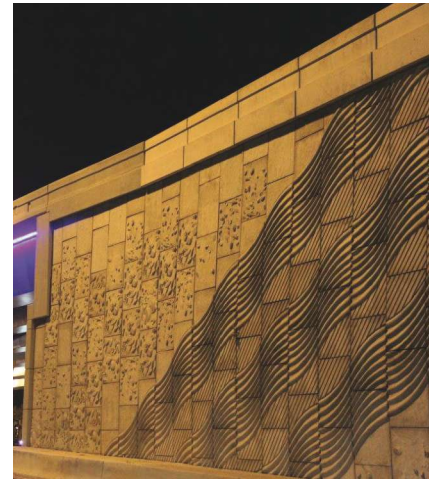
"Our goal is to generate strong relationships that help improve our efficiency and create innovative, cost-effective designs for our clients," says Brian Byrne, senior structural engineer and project manager in the East Hartford, Conn., office. The internal corporate-communication strategy incorporates a culture of work sharing, as well as systems that encourage knowledge sharing company wide.

Work-sharing formats include regular monthly conference calls within divisional groups to discuss new projects, progress on existing ones, and specific challenges, explains Chuck Craycraft, risk manager and vice

president in the Lexington, Ky., office. "We share ideas and experiences with structural issues of all types and take advice or input from others in the same group around the country." Adds Byrne, "It's great to hear what others have been doing, which may give me a spark that I can introduce to my project."

Knowledge sharing allows designers with a particular challenge to seek input at any point, says Byrne. It is coordinated by the Technical Resource Group (TRG) and operates through an intranet system called LochNET. "TRG connects firm leaders within specific disciplines to facilitate sharing of ideas about expertise and materials."

LochNET provides a forum for any employee to participate in knowledge exchange. For example, designers type in questions to which anyone can respond within specific technical communities. Employees also use this forum to post updates on projects and interesting challenges that arise. These then can be followed up with replies to the post, emails, and related documents. "The LochNET platform helps create strong relationships around the



A number of concrete innovations were incorporated into Lochner's work on the Interstate 95/Spanish River Boulevard Interchange project in Palm Beach County, Fla. All Photos: H.W. Lochner Inc.

country," Byrne says. "Of the 50 or so structural engineers we have on staff, I've probably worked with 80% or more to collaborate on designs."

Adapting to Challenges

The system allows the team to adapt to design and constructability issues as well



Lochner used nonproprietary equipment to slide into place the Lardo Bridge, carrying State Highway 55 over the North Fork of the Payette River in McCall, Idaho.



The 158-ft-long, single-span Lardo Bridge features 90-in.-deep precast, prestressed concrete girders and aesthetic details.



By bundling projects in the rapid-replacement program by the Pennsylvania Department of Transportation, Lochner helped reduce costs 558 replacement bridges by 25%. Many of the projects featured cast-in-place and precast concrete designs.



as issues with new owner requirements. That's especially helpful with multi-part bid options created in design-build and other alternative-delivery formats, where cost and schedule are separately weighted elements.

Lochner is no newcomer to the design-build format, Byrne notes. "We've been doing design-build since the late 1990s, and we encourage its use. When design-build can be applied well, it breeds innovation and new perspectives."

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It especially aids in minimizing risk factors, notes Craycraft. "Even with design-bid-build projects, we look to mitigate risk elements posed especially by time elements by working with the owner. But design-build gives us more opportunities to work with our contractor partners to identify alternatives and to assist the contractor in better estimating construction times."

Owners want faster schedules, but they don't want to increase risk factors to achieve them, he says. "In the design-build format, we can work with the general contractor to create alternative concepts that will meet the time needs and find efficient ways to improve construction times, which really helps with A+B-type contracts." These A+B-

type contracts combine factors for cost ('A' component) and scheduling ('B' component) to find the best combination.

Lochner has been involved in a number of public-private partnership (P3) projects, adds Byrne. "We expect to see more of these as owners are strapped for funds. P3s can work well to reduce costs and generate innovation."

Byrne points to Lochner's recent work for the Pennsylvania Department of Transportation's (PennDOT's) rapid-replacement program through a P3 agreement for the design, construction, financing, and maintenance of a large number of bridges. As a subconsultant on the technical team for an owner's side contract, Lochner evaluated approximately 1000 bridges as part of a larger program and assisted with the prioritization methodology. Ultimately, PennDOT designated 558 bridges for replacement.

Estimates indicated that the P3 format saved 25% as compared to a traditional delivery method. "By bundling a large number of similar bridges into one project, there were substantial efficiencies with design, construction, and maintenance."

ABC Techniques Expanding

Close communication also aids in developing new accelerated bridge construction (ABC) techniques. "We've been using ABC ideas for many years due to our many railroad clients," Byrne says. "They need to keep trains running and that means replacing bridges quickly. Now state agencies are taking

a closer look at what they've done and want to adapt those techniques to their own needs."

The capability to reduce user costs and minimize closures has made ABC methods attractive, but owners are wary of such significant changes to familiar construction techniques. "Most agencies have had good experience with ABC, but we have to demystify ABC techniques and make them more standard to convince agencies they will work," Byrne says. "We have to ensure we can minimize costs and make ABC methods the first choice."

ABC techniques were used successfully for the Lardo Bridge, carrying State Highway 55 over the North Fork of the Payette River in McCall, Idaho (see Winter 2016 issue of *ASPIRE*TM). The existing bridge was replaced in 2014 with Idaho's first federal-aid funded, design-build project. The 158-ft-long, single-span bridge features 90-in.-deep precast, prestressed concrete girders with aesthetic detailing, pedestrian viewing platforms, and a wider roadway to accommodate sidewalks and bike lanes.

The state designated a maximum 4-month closure (September to December) for this highly traveled tourist route. Innovative detailing of the abutments allowed them to be built as a rigid frame with the superstructure on temporary supports adjacent to the existing bridge, avoiding construction within the tight confines of the existing back spans. When the bridge closed, it was demolished and the new structure was slid into place.



Creating a Citizens' Advisory Board helped Lochner meet all of the stakeholders' needs when designing the Red Bridge Road bridge replacement in Kansas City, Mo.



Prestressed concrete girders were used for the 1100-ft-long Red Bridge Road bridge replacement that included a variety of amenities to commemorate the area's history.

'The use of a design-build format and the ABC techniques saved a significant amount.'

"The system used nonproprietary equipment that helps reduce costs further," Byrne notes. "It was a small project at \$3.6 million, but the use of a design-build format and the ABC techniques saved a significant amount."

The precast concrete girders were heavier and more challenging to transport to the site through the mountainous terrain, which added cost, he notes. But superstructure costs compared to steel alternatives were

so low that it more than made up the difference.

"The design-build environment allowed us to investigate sliding the bridge to take advantage of precast concrete's benefits. We were able to combine the best cost estimates with fast construction scheduling to win both the low cost 'A' component and the schedule 'B' component of the bid."

More Stakeholder Input

Minimizing user costs has become a critical element, as more communities take an active role in bridges constructed nearby. The way Lochner handles those efforts can be seen in its work on the Red Bridge Road improvements and bridge replacement in Kansas City, Mo. The bridge needed to be expanded to meet traffic needs,

but residents were concerned about potential right-of-way acquisitions and the proximity to three historic wagon trails.

Lochner created a Citizens' Advisory Board to work on balancing traffic and aesthetic needs. "We needed to gain the trust of all the groups involved and show our commitment to addressing their concerns. We wanted to ensure we had buy-in from everyone," says Byrne.

The new 1100-ft-long prestressed concrete girder bridge crosses the Blue River, railroad tracks, and a designated floodplain. The plan included a 10-ft-wide multi-use trail, sidewalk, 30 drainage structures, 3000 linear feet of storm sewer, and best management practices that treat all of the roadway runoff water before it enters the river.

Also included were overlook points with historical information boards, portraits of 10 prominent local residents, decorative railing, colored LED lighting, and aesthetically treated retaining walls to decrease grading operations. "It has become one of Kansas City's signature projects for sustainable design and public involvement."

Concrete Options

Lochner's designers also stay abreast of new materials and techniques, including those related to concrete. "We often implement concrete concepts as a solution to durability issues, depending on the budget," Byrne says. "For ABC designs, creating a precast concrete substructure offers a fantastic technique."

Concrete girders also come to the forefront in many design-build projects. "It's a real bonus when we need to expedite schedules," Byrne says. "Precast and cast-in-place concrete are always options given the key issues we typically deal with."

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Improvements in fabrication methods and improved material techniques have made concrete more versatile. "Concrete is denser and more durable than in past decades," he says. "We've looked at some of the new options, including self-consolidating concrete and lightweight concrete in our design-build projects, and we remain open to using them when the situation calls for it."

Several concrete innovations were included in Lochner's work on the Interstate 95/Spanish River Boulevard Interchange project in Palm Beach County, Fla. Lochner served as a roadway and structural engineering subconsultant on the design-build team and designed twin prestressed concrete Florida I-beam structures on the existing alignment. The 750-ft-long, five-span eastbound bridge featured two spans constructed of 10-ksi high-strength concrete, which eliminated the need

Lochner's Advances

H.W. Lochner Inc. was founded in Chicago, Ill., in 1944 by Harry W. Lochner Sr. and focuses its engineering design work in the surface civil-transportation industry, especially planning, environmental, design, construction management, and right-of-way acquisition. Over its seven decades of operation, it has expanded into rail, transit, and aviation infrastructure.

The employee-owned firm is home to more than 500 professionals, 15% of whom provide a suite of structural analysis, design, and inspection services. Lochner operates 31 offices in 16 states, with annual revenues of more than \$100 million.

In the 1990s, Lochner entered the alternative-delivery field as a lead designer on Salt Lake City's Interstate 15 reconstruction. The firm's portfolio includes more than 40 design-build projects, public-private partnerships, and construction manager/general contractor projects.

for two girder lines. "That created substantial construction cost savings," says Craycraft.

The firm modified standard 36-in.-deep Florida I-beams for a bridge widening over the El Rio canal as part of the project. The modified 24-in.-deep cross sections allowed the bridge to maintain its clearance without changing the profile.

Lochner also designed 940 linear feet of precast concrete sound barriers by creating customized designs that incorporated the area's 150-mph wind load requirements. The design leveraged the limited space for pilings by maximizing the panels' base width. "The design-build approach again helps us to optimize the custom designs," Craycraft says.

Technologies Aid Advances

Design advances are being aided by BIM, notes Andy Lohan, a structural engineer in the Chicago, Ill., office. "BIM is really taking over the industry. It offers huge potential for efficiencies when we can build parametric three-

dimensional models and adjust them as needed. Point-cloud survey data can provide millions of points of reference, which can provide a more comprehensive dataset than one would get from a traditional survey."

The ability for all design changes to be quickly evaluated and incorporated into drawings adds great efficiency. "It allows us to merge geometric and analytic models into a single source of truth for the project, which will increase our effectiveness and make us more competitive."

In all of their processes, Lochner looks beyond the status quo to what may be coming, he notes. "The United Kingdom is very advanced in the use of information modeling, so we're looking at what they're doing as a great starting base. We're also looking beyond our industry to what others are doing with technology that will help us in the future. One example would be gaming engines that link data to objects efficiently. There are some really promising ideas out there."

One idea with potential involves using drones for inspection work, he says. "It offers a lot more efficiency to get a comprehensive view of a bridge, especially areas difficult to reach. They can take high-resolution images and video in a much safer way, when we might not have had any access at all before."

Lochner is getting into drone technology now and looking at the potential for how to maximize its usefulness. "We're evaluating how best to use it and on which structures it offers the most opportunity. The technology is moving very quickly, and we want to position ourselves to adapt to any changes as they develop."

As they learn more, team members will share their ideas and information on LochNET and through other collaborative platforms. "These sharing environments create a culture set up by leadership to help break down geographic barriers and encourage creativity," Byrne says. "It makes it feel like we're a small company while offering the wide experiences available from having the resources of a larger company." 