**By Cade Rowley and Jeffrey Perelman**
Contributing Authors

# Movable traffic

## Bridge contractor's tactics keep motorists happy

The new frontier in bridge construction—where innovative, forward-thinking contractors will differentiate themselves—is in minimizing community impacts during construction.

As an industry, we can design and construct grand structures of such size and strength that just half a century ago they would have been mere fantasies. Our engineering technology has since caught up to our dreams, but as our ambitions and technical abilities have grown, so has public impatience with transportation projects that disrupt mobility, businesses and lifestyles.

As a result, municipalities and departments of transportation (DOTs) are more and more often turning to contractors that can construct technically challenging bridges while minimizing impacts to the community. Projects that achieve both goals tend to have the most public support, in turn reflecting well on the public officials who plan and manage them and the teams that build them. Engineering firms and contractors that want to differentiate themselves as bridge-construction specialists (and win the best projects) will have to be strong in both areas. Their challenge is to create iconic structures while turning the DOT customers responsible for them into community heroes.

### Arches prove to be golden

Sundt has been successful on both fronts through several innovative approaches. Prefabricating bridge elements off-site—as it did with the West 7th Street Bridge in Fort Worth, Texas, and with the new pedestrian bridges at San Diego International Airport's Terminal 2—is one example. In both cases,

traffic was allowed to remain in its original configuration throughout most of the project schedule and was only rerouted for a short period of time when those prefabricated elements were finally put in place.

The West 7th Street Bridge, completed last fall, has an innovative design that consists of 12 precast, post-tensioned arches that weigh 640,000 lb apiece, measure 163 ft long and rise more than 20 ft above the roadway surface at their highest point. Casting them in place would have meant closing the bridge to traffic for a year or more, but Sundt's innovative approach trimmed the closure down to just four months and allowed the project to be completed a full month ahead of schedule.

"We made the arches off-site in order to keep the existing bridge open as long as possible," said Sundt Project Manager and Texas Area Manager Chris Cedar. "We cast them lying flat on their sides, then post-tensioned them and installed the stainless steel rods that run from the top of the arch to the tie. Once they cured and reached 6,000-psi concrete strength, we rotated them up into the vertical position and slid them over into a storage area. Each one took about six weeks to complete, but the amount of time spent planning was enormous."

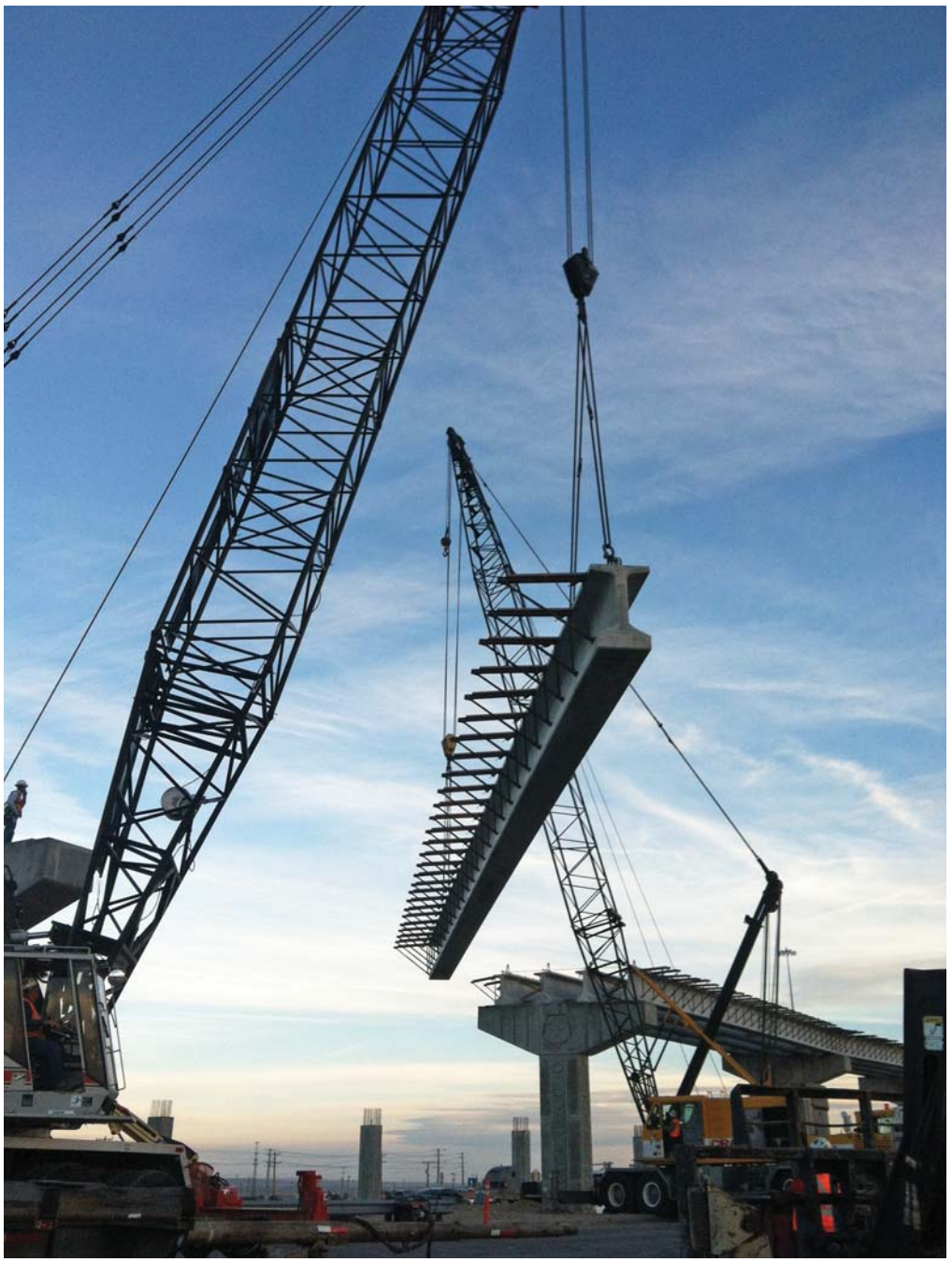
One at a time over the course of a month, the arches were transported down the streets of Fort Worth and across the old bridge to their final locations. They were then set into place on either side of the existing bridge using twin superlift cranes. Once all of the arches were in place, Sundt closed the old bridge and demolished it to allow the new structure to be built in its place—in just 120 calendar days.

"We took an already extremely aggressive five-month schedule for the bridge closure and reconstruction and got it done in just four months," Cedar added. "The Texas Department of Transportation collaborated closely with our construction team and provided early approval of a very detailed plan to construct the bridge in just 80% of the allotted time."

The feat earned Sundt major accolades from public officials: "We got lucky and got the right contractor, Sundt Construction," said George Behmanesh, assistant director of transportation and public works for the city of Fort Worth. "They helped us carry the ball across the goal line and have truly exceeded my expectations. Great teamwork all the way made this project a success."

Sundt and joint-venture-partner Kiewit Construction used a similar approach to maintain traffic flow during a $230 million expansion project of San Diego International Airport's Terminal 2. Two structural steel pedestrian bridges were installed over a newly constructed roadway in a single night—a feat that took mere hours to perform after several months of careful planning and coordination with the project team and the San Diego County Regional Airport Authority. The bridges, each weighing slightly less than 100 tons, were built and assembled on grade in an alternate location on the jobsite over a few months—rather than in place—and then installed using a specialized dolly and 350-ton crane. The team's approach meant that the main terminal roadway was only closed over one night, rather than the several weeks that would have been required by a more traditional build-in-place approach.

"Our whole goal was to minimize the road closure and therefore the impact to the



**Self-performing most of the concrete construction helped Sundt manage the schedule and reduce traffic impacts while reconstructing a portion of Loop 375 Transmountain West in El Paso, Texas.**

**In order to keep traffic flowing during the reconstruction of the Cordes Junction Traffic Interchange in Arizona, Sundt and its joint-venture partner constructed one of the bridges over live interstate traffic. The photo shows the falsework that was created to safely perform that portion of the project.**

airport operations," said Brad Kirsch, the Sundt project manager who helped plan and supervise the placement of the two bridges. "After closing the main terminal roadway and putting a detour in place, a subcontractor that specializes in moving historic homes hauled the assembled bridges down the roadway on a heavy-duty dolly system to a location adjacent to their final location. Then our steel erector used the 350-ton crane to lift and set the bridges in place, each with just one pick of the crane. In the weeks prior, we modeled/animated the full operation using building information modeling to ensure success. Multiple picks would have been easier to plan, but it would have taken longer."

The operation began at 10:30 on a Friday night, and the first bridge was in place by 1:30 a.m. The roadway underneath it was reopened by 4 a.m. The second bridge was in place by 5:30 a.m., and the roadway was fully reopened by 7 a.m. that Saturday morning.

## "Shoofly" is no bother

Sometimes, a bridge can be slid onto temporary supports to maintain traffic flow while a new bridge is built in its place. Sundt is using this approach with the $213 million project it is currently constructing with joint-venture-partner Slayden Construction in Portland, Ore. Their task is to completely reconstruct the 87-year-old Sellwood Bridge, which stretches 2,000 ft across the Willamette River. The new structure will be seismically sound and includes more travel lanes and dedicated space for pedestrians and bicycles in order to ease traffic congestion, improve safety and support alternative modes of transit.

Rather than rebuilding the bridge in sections and shifting traffic back and forth between the old structure and newly completed segments, the team created a "shoofly" (detour) bridge to keep traffic flowing throughout the project. The approach involved lifting the old bridge deck and truss with hydraulic jacks and sliding it to one side, placing it on a set of temporary piers and then connecting it to temporary approach spans so that traffic can continue to use it while the new bridge is constructed.

Creating a detour bridge is safer for construction crews and the public because it frees up the existing alignment for workers and keeps traffic out of the construction zone. By eliminating the need for complicated traffic phasing, it also shortens the project duration and therefore the overall cost. In the case of the Sellwood Bridge project, the approach will shorten the schedule by approximately one year and reduce the cost to the owner, Multnomah County, by $5-10 million.

After several months of detailed planning and modeling, the bridge slide was completed in just 12 hours (minimizing the impact to traffic to just six days). The 1,100-ft-long steel bridge truss is approximately 25 ft high, weighs about 3,400 tons and had to be moved 33 ft on one end and 66 ft on the other. It was considered a highly complex operation, even by the high standards of most bridge-construction specialists, but the benefits to the client and traveling public have been deemed invaluable.

"This was one of the longest bridge sections ever to be moved," said Sundt Area Manager Ted Aadland. "That, plus its age, made it very difficult. The site itself also presents a number of challenges. The project is tightly confined, being sandwiched between the Willamette River, a cemetery and difficult topography. The Slayden/Sundt Joint Venture Team has worked hard to come up with solutions that minimize traffic impacts, and so far I think we've been very successful."

It is hard to argue with an idea that is faster, safer and less expensive than the traditional build-in-place approach. While detour bridges are not right for every project, they should be considered more often to bring greater efficiency and reduce traffic impacts.

## Out on their own

Impacts to communities also can be minimized through creative approaches to scheduling and self-performing critical-path activities, like concrete construction. This turned out to be the winning formula on the reconstruction of Loop 375 Transmountain West in El Paso, Texas, where Sundt improved a heavily utilized, 3.5-mile stretch of the roadway near I-10. The project includes building four concrete bridges in addition to many other features. Sundt's crews managed the tight schedule by performing the structural concrete work on the bridges, columns and footers and installing all of the underground utilities.

"This project had a very tight schedule so we performed a lot of the work ourselves to complete the work in a timely manner," said Sundt Project Manager Javier Aviles. "We definitely had a lot better handle on the quality that way. We also helped our concrete flatwork subcontractor (performing the curbs, gutters and sidewalks) by supplementing their forces with a few key people to provide a higher level of quality and production."

One of the most difficult aspects of the project was constructing the bridges during live traffic.

"We spent a lot of time on scheduling and sequencing our work to make sure our cranes were properly positioned, our concrete formwork was in place and the concrete placements were completed so that we didn't impact morning rush-hour traffic," Aviles said. "We also performed a lot of the work at night so we could at least shut down one

lane to perform our work. Placement of the concrete columns and pier caps took place behind concrete barrier rails or in between the roadway medians—another way to keep traffic moving while we worked."

## Get technical

Some methods of minimizing community impacts boil down to exemplary technical abilities. On the $52 million reconstruction of the Cordes Junction Traffic Interchange in Arizona, Sundt and joint-venture-partner Vastco Inc., constructed a cast-in-place bridge over live traffic in order to keep cars moving.

The project replaced a 50-year-old interchange located at I-17 and S.R. 69, about 65 miles north of downtown Phoenix. It is used by approximately 40,000 vehicles per day, most of which are just passing through on their way to smaller towns in northern Arizona. In order to reduce congestion and improve safety, the Arizona Department of Transportation (ADOT) tasked Vastco/Sundt with constructing two new interchanges (one for through traffic and one for local) as well as seven new bridges.

Because of the length of the spans, one of the bridges had to be the cast-in-place, post-tensioned concrete structure mentioned above. Constructing it over I-17 without closing the roadway was accurately predicted to be one of the project's more challenging elements and a primary reason ADOT selected Vastco/Sundt for the job.

"With this kind of bridge construction, you have to put up falsework that you can build on top of and then remove after the bridge is post-tensioned," explained Sundt Project Manager Dominic Mascia. "Our team worked hard to minimize traffic impacts and get the falsework up. This is an important section of I-17 that needed to remain open to the fullest extent possible throughout construction."

Because there was no easy way to detour traffic around the site during construction, a temporary interchange, or "systems detour," was created through it. The systems detour was situated between the old and new interchanges, using pieces of each to facilitate traffic. The approach essentially streamlined and reduced the number of phases originally required by construction.

"The contract required that we maintain two lanes in each direction on I-17 during peak travel hours, and we also had to maintain connectivity to Cordes Lakes and S.R. 69 at all times," Mascia added. "That sounds simple enough, but when you're basically building a job right where those things already are, it becomes very challenging."

Challenging it may be, but for contractors aiming to be among the elite of bridge-construction specialists, finding new ways to reduce traffic impacts is necessary. It is not enough anymore to build great bridges cost-effectively. The most sought-after contractors also will find ways, like those mentioned above, to minimize disruptions so that motorists can carry on with their lives while the hum of construction buzzes alongside them, below them or overhead . . . anywhere but in the way. **R&B**

Rowley is a business development manager for heavy civil construction for Sundt. Perelman is a growth and strategy officer for Sundt.

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