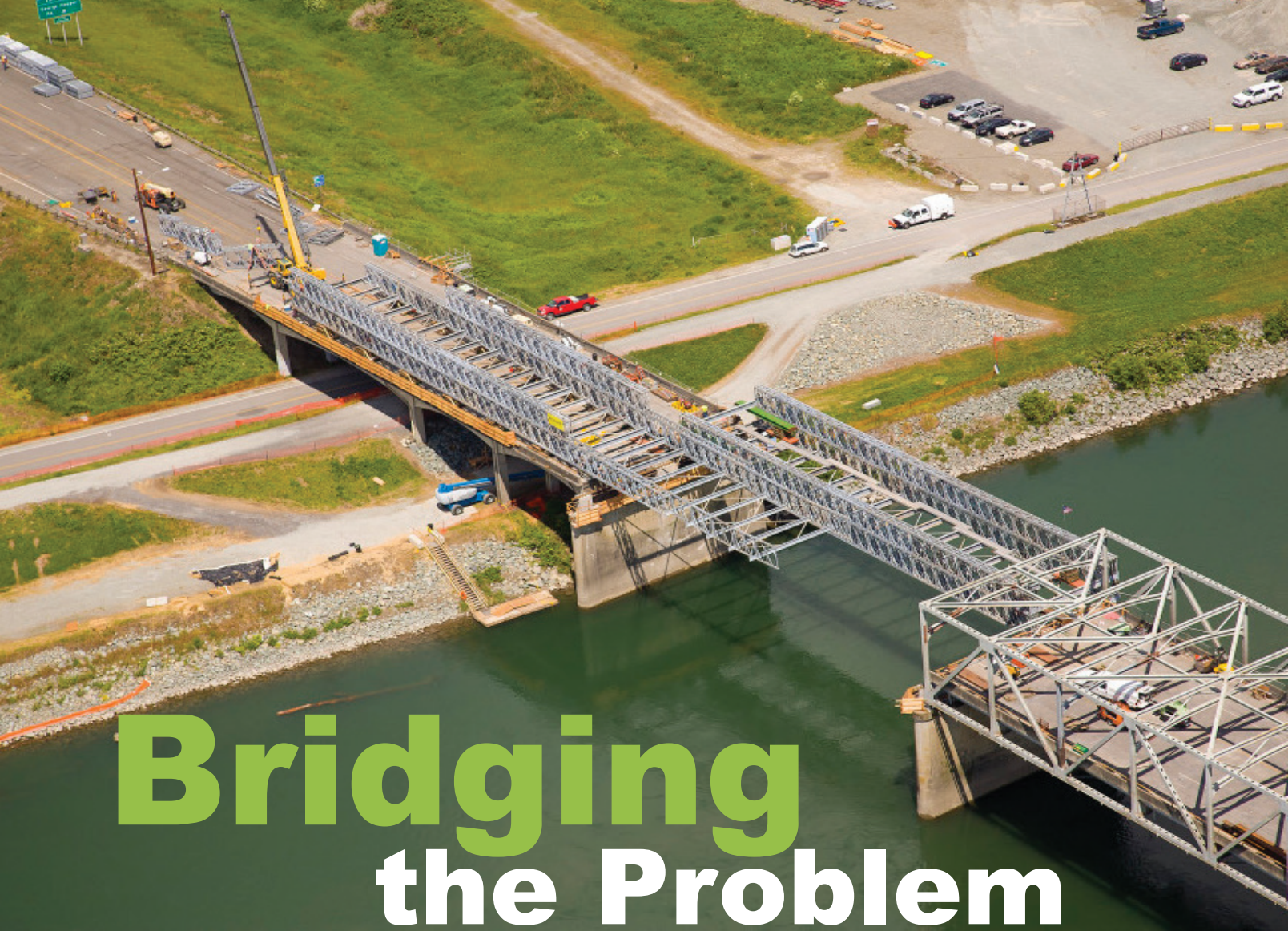

Bridging the Problem

Retrofits offer a cost-effective way to rebuild America's failing infrastructure

BY JACK ARIZCUREN

Bridges that are highly functional rarely get in the news. They do, however, when accidents or failure occur. Fortunately, with only a few exceptions like the 1-5 Skagit River Bridge in Washington State in 2013, bridge failures are not a common occurrence.

Nonetheless, there are tens of thousands of bridges at the state and local level that need to be replaced in the next 10 years because they are either structurally deficient or functionally obsolete. A bridge is considered structurally deficient when it has certain conditions placed on it to ensure its safety, such as speed or weight limits. When a bridge design is not suitable for current use, it is deemed functionally obsolete.

Balancing the Issues

Replacing any bridge can have significant issues affecting local commerce and transportation needs, as well as serious environmental concerns. As a result, creative methodology has become critical to rebuilding America's infrastructure. By using some ingenious engineering, we have found a way to use prefabricated commercially off-the-shelf material that offers a cost-effective solution.

When the historically significant George E. Tryon Bridge in Northern California required rehabilitation in 2015, Acrow Bridge provided a temporary hanging truss system in order to maintain traffic flow. The steel span arch bridge, known as the South Fork Road Bridge, was originally erected in 1948. Located near the town of Hiouchi in Del

Norte County, 80 percent of the land is publicly owned national and state parkland. This forest area is notable for containing some of the finest old-growth redwood groves in existence, as well as scores of unique plants and flowers, dozens of species of coastal birds and fish, rocky primitive beaches and sea stacks, pristine rivers, and historic lighthouses. The Smith River itself is one of the largest undammed rivers left in the United States and a part of the National Wild and Scenic River program.

The Smith River region is also a top tourism destination, making it an important part of the regional economy. Maintaining the area's transportation infrastructure is crucial, and the Tryon Bridge project is the fifth South Fork Road bridge replacement in six years.

Adding Safety and Efficiency

Looking at the bridge's structure offers a lesson in bridge architecture and changes that have made bridging more efficient and safer in recent decades. A prime example of a small-scale bridge built in the economic expansion after World War II, the Tryon Bridge is one of only a few solid-ribbed arch bridges in California built using welding, an innovative construction method of the 1940s and not widely used in bridge construction until the mid- to late 1950s. The welds created cleaner lines and a smoother appearance to the components. The bridge is also notable as an example of mid-twentieth century Modernism as applied to transportation infrastructure. Both the arch design and the welding resulted in the use of less steel than might have been used in a truss structure.

In 2011, however, the bridge was declared by Del Norte Community Development engineers to have the lowest sufficiency rating of any county-maintained bridge. Subsequently, it was found to be functionally obsolete at inspection. With a deteriorating lead-based paint matrix, a replacement was deemed necessary.

It was determined that the steel span of 206-ft long and 24-ft wide would be replaced with an aesthetically similar new concrete structure 231-ft long by 32-ft, 4 inches wide, with the additional width accommodating bicycles and pedestrians on a stretch of road with heavy tourist vehicular traffic. The springing arch main span is 141 ft and crosses the south fork of the Smith River at approximately 65 ft above the river.

The $11 million project was developed for the U.S. Department of Transportation, Central Federal Land Highway Division. It includes the bridge, a 500-ft long northern approach, a 200-ft long southern approach, and the reconstruction of an adjacent road. During all phases of construction, it was required that a minimum of one lane of traffic be maintained, which is where Acrow's temporary truss system was a critical element in the project.

When initial bids came in over budget, Acrow Bridge collaborated with Flatiron, a contractor who was able to value engineer a hanging formwork truss bridge outside the existing steel structure. The Acrow structures utilized were two 155-ft clear spans, 9-ft out-to-out. The dual superstructures were erected and set above roadway elevation on the outside of the right of way. The temporary bridge made it possible for the formwork, concrete and rebar to be set prior to transferring the bridge load to the new concrete arch. Thus, the Acrow superstructures acted as a high strength, low footprint trellis that allowed construction activity to progress all the while allowing alternating flows of traffic to use the route. It is anticipated that the project will be completed in 2017.

Mitigating the Challenges

While the rehabilitation of the Tryon Bridge did not present right of way issues, it did pose numerous difficulties. For example, there was a need to work during the construction timeline with restricted staging areas at the site, requiring staged removal and construction. As one of the wettest places in California, the local environment could be harsh at times with an annual rainfall of 67 inches. Additionally, the bridge is located on the very steep, rocky banks of a 60-foot deep environmentally sensitive gorge, and the area is home to threatened and endangered wildlife species. Access of heavy haul trucks and oversized permit loads is severely limited, which also made the Acrow Truss system advantageous since the truss panels are shipped in 10-foot increments.

In addition to regulatory oversight by the U.S. Department of Transportation, the adjacent land is owned by the California Department of Parks and Recreation and the U.S. Forest Service, as well as private individuals, so multiple-agency coordination was a necessary element in the planning and execution of the bridge replacement project.

In summary, a community long served by an engineering gem of its era is duly receiving an innovative retrofit for the future. An environment so pristine and harsh deserved a unique approach and is being well served. ✪

Jack Arizcuren is Regional Manager for Pacific States at Acrow Bridge where he oversees business development in the West coast market. He has over 10 years experience in the civil construction industry and can be reached at jariz@acrow.com.