In creating the David Kreitzer Lake Hodges Bicycle & Pedestrian Bridge in San Diego, designers produced an elegant structure that allows pedestrians crossing the lake to become a part of the environment and enjoy the experience more. A key reason for its success was the use of reinforced concrete to create a stress-ribbon design, which provided both aesthetic and functional benefits.

The two piers and abutments were constructed of conventionally reinforced cast-in-place concrete, as were the four massive piles at the south abutment. The ends of each span were also cast in place, so the deck could be tied into the piers. The south abutment was founded on alluvium, which made rock anchors impractical, so four 8-foot-diameter cast-in-drilled hole (CIDH) piles were used instead. Extensive amounts of reinforcing bar were needed in the piles and pile caps to satisfy the high load demands. The south abutment’s complicated design required strut-and-tie analysis, which was facilitated by the layout of the reinforcing bar throughout the abutment. Its integrity depended on the reinforcing bar’s ability to equally disperse the high forces throughout the concrete and also to transfer the loads into the pile system. The reinforcing bar placement and spacing in the piles was critical, as they are subjected to high shear and bending along with varying axial forces.

The force demands required two sets of bundled #14 reinforcing steel (rebar), each transversely restrained by four bundled #8 reinforcing steel (rebar). The north abutment also was subjected to high lateral prestressing forces, requiring significant amounts of reinforcing steel to transfer the loads to the rock anchors while minimizing cracking.

The bridge deck consists of 87 precast concrete segments, placed individually on bearing cables and post-tensioned as a group to achieve the needed stiffness.

An added element of complexity came with the four 8-foot-diameter piles, which comprise a flexible abutment system that allows the piles to flex as they are pulled toward the lake by the stress ribbon. The use of steel reinforcing ensured the piles would have the required strength to withstand this tremendous lateral force of about 8 million pounds.

The bridge’s sleek profile allows the bridge to appear to nest above the ground during the dry season, while in wet conditions it appears to float over the water. This approach would not have been possible without the unique reinforcement design used in various portions of the bridge.

This elegant bridge solution provides pedestrians with an enchanted experience as they cross the lake. It’s a beautiful bridge with simple lines that fits into its environment well. The designers used a creative solution to handling the challenges at the south abutment.