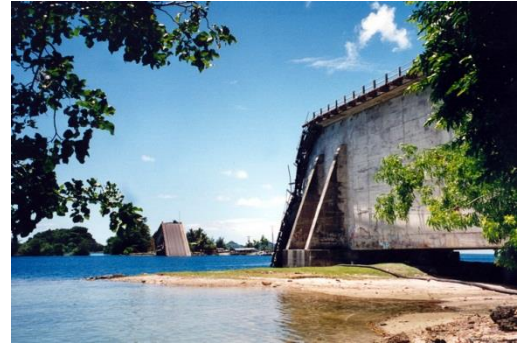




PROJECT PROFILE

Koror-Babeldaob Bridge

Collapse Investigation | Koror, Palau



CLIENT

Republic of Palau

BACKGROUND

Sixteen years after completion of the bridge, the main-span cantilevers deflected over four feet, resulting in a noticeable drop and angle change at the mid-span hinge. Deflection was distinctly perceptible to users of the bridge who naturally questioned the structural capacity. In July 1996, a year-long construction project to correct the sag was completed. The retrofit included closure of the center hinge and the addition of continuous external post tensioning tendons. On September 27, 1996, the bridge collapsed, cutting off transportation between the islands as well as vital services including water and electricity. Through its attorney, the Republic of Palau retained WJE and T. Y. Lin to determine the cause of the collapse.

The Koror-Babeldaob Bridge is a prestressed concrete box-girder bridge built in 1977. The 790-foot main-span was a record span length for segmental concrete box-girder construction at the time it was built. The structure connects the islands of Koror and Babeldaob in the Republic of Palau, a group of islands 500 miles east of the Philippines.



SOLUTION

WJE professionals performed field instrumentation, strain-relief testing, and underwater investigations as part of the collapse investigation. The team concluded that the collapse of the bridge was triggered by delamination of the top flange. The closure of the center hinge during the retrofit resulted in a substantial increase in compressive stress as well as temperature-induced daily variations in this stress. While the estimated stresses due to the retrofit were within normally accepted limits, the top flange was particularly vulnerable to delamination due to the closely spaced tendons, lack of vertical reinforcement, and relatively low tensile strength of the concrete. Carbonation-induced corrosion may have contributed to the delaminations and ultimately the collapse.



WJE's investigation and guidance were instrumental in helping the Republic prevail in their lawsuit against the retrofit construction team and obtain funds to replace the bridge. Construction of the new bridge began in 1997 and was completed in December 2001. The bridge was named the "Japan-Palau Friendship Bridge" at its opening ceremony on January 11, 2002.