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18. Adhamiyah Bridge, Baghdad (Iraq)

Client:	*State Organisation of Roads and Bridges*
Consulting Engineers:	*Maunsell Consultants Ltd*
Contractor:	*Marubeni Corporation, Japan*
Value:	*$US 36 million*
Design period:	*1977-1979*
Construction period:	*1980-1983*

Adhamiyah Bridge provides the eleventh crossing of the River Tigris in the Baghdad area and has the longest span over the river to date. The four main spans have a total length of 370 m, the principal span being 182.5 m long. The Master Plan for Baghdad requires a skewed crossing at the end of a bend in the river. This means that the river span is longer than would have been the case had there been no constraints on choosing the shortest distance across, or had it been thought desirable to position a foundation in the deep channel on the outside of the curve.

For hydraulic and constructional reasons the main pier is positioned in the shallow water of the dry weather channel and the shape adopted for it was chosen to cause minimum disturbance in both dry weather and flood flow conditions. All piers are founded on cylinders sunk to rock-like material and designed for extreme river bed scour.

After a study of a number of alternatives, a steel cable-stayed structure was found to give the most economic solution. To minimise the pier width a single-plane cable system on the bridge centre line was adopted. An asymmetric span arrangement was required by the alignment of the crossing and this led to the use of a single tower set on the main river pier. The cable system is of harp form, the outer cable being anchored to the pier at the end of the bridge and the inner cable to a tie-down pier constructed within the flood plain.

The bridge deck carries dual 10.5 m-wide carriageways and two 3 m-wide footways. At an early stage in the development of the design it was decided that for the conditions prevailing in Baghdad all site connections should be bolted and a minimum weight "waffle" slab concrete deck was chosen rather than orthotropic steel plate which would have required site welding. The principal support member is a spine box girder 7.5 m wide. The box cross section dimensions were chosen to utilise high tensile steel plate with thicknesses in the range of 12.5 to 45 mm to simplify fabrication. Deep cantilever plate girders attached to the box support an outer longitudinal plate girder which improves the live load distribution. There are infill cross beams between the heavy cantilevers. Cantilevers outside the outer plate girder support the footways. One of several innovative features of the design is the use of a diagonal bracing system between the outer girder and the spine box to increase the overall torsional rigidity of the 30 m-wide deck. The concrete deck acts compositely with the supporting steel structure.

The slender tower, which is within the width of the central median, passes through and is independent of the spine box. It widens locally to support brackets for the pair of inner cable saddles and then tapers in to the tower top upon which the outer cable saddle is mounted. The tower is formed from seven shop-fabricated steel box sections. The cables are formed from groups of locked coil strands: 12 No in the outer cable and 2 x 12 No in the inner cable.

(Maunsell)