



# Bridge over the river Guadalquivir

Montoro, Spain / 2009

## Structural type

## Owner

## Client

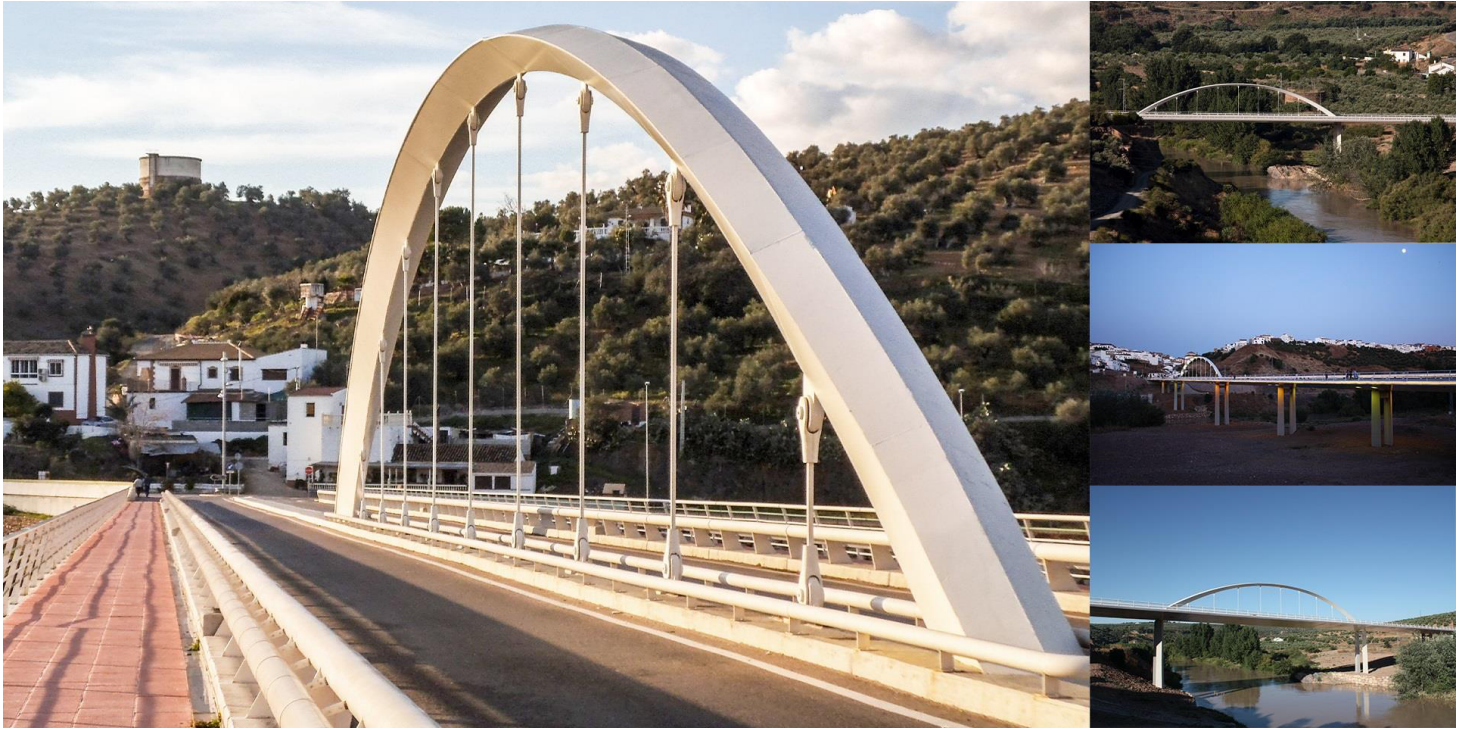
## Scope

composite bridge with steel box and central steel arch over the Guadalquivir river

Gestión de Infraestructuras de Andalucía S.A. Dirección General de Carreteras

Gestión de Infraestructuras de Andalucía

detailed design and construction monitoring



The structural design of the project consists of a composite deck, a steel arch, nine galvanized steel cables and reinforced concrete abutments. The deck has a sequence of 5 spans of 20.00 + 27.00 + 40.00 + 60.00 + 33.50 + 19.50m. The road section consists of two 3.50m lanes, two 0.50m interior verges, two 0.50m hard shoulders and two 3.0m wide pavements (including the necessary space to separate the pedestrian traffic from the road traffic). The remaining width, to reach the total width of 16.30m is completed with a concrete 1.30m wide median strip.

The adopted transversal section is composed of an almost triangular box (minimum depth 100mm at extremes), divided into eight cells by vertical webs and completed with a 0.18m thick concrete slab.

The slab is specifically adequate as it minimizes the dead loads in the deck, in particular at the areas far from the central support (hanger plan) where its efficiency to resist combined axial, bending, shear and torsion forces, is especially high.

Ribs or diaphragms of equal length as the total box width of 16.30m have also been designed. The distance between these elements is variable, depending on which span they are to be placed.

The steel arch has a variable cross section. At the springs the values of the diagonals are 672 x 2700 mm, whilst at crown their value is 1600 x 650 mm. The dimensional variation of these diagonals is done in a circular way which maintains the total sectional area practically invariable. This geometry fulfills the necessary resistance requirements for the bridge. The designed values of steel thickness for this structural element are 40mm at the springs and 30mm for the central section.

A single central plan of nine 62mm nominal diameter hangers has been employed. These elements are closed triple Z cables set at 6.0m intervals.

The piers are composed of two variable cross section shafts, though always maintaining the equilateral triangular shape, with a height with the same lineal variable following a 1:40 ratio. The heights of the piers vary between 7.91m on pier P-5 and 17.33m on pier P-4.



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