



Bridge over the Orio river

Guipuzcoa, Spain / 2010-2011

Structural type
Characteristics
Client
Scope

hybrid suspension/cable-stayed bridge
Main span 180 m
Diputación Foral de Gipuzkoa
detailed design



The bridge which crosses the Orio River employs a hybrid support system combining suspension with cable-stayed. The aim of such a system is to decrease the height of the piers and to create a structure which is less aggressive with the surrounding scenery and at the same time, lowering the costs of a traditional suspension bridge construction. The bridge has a main 170.0m span with 60.0m compensation spans which more than cover the boat race channel.

The transversal cross-section has a useful width of 24.0m which accommodates two 3.0m pavements, two 7.5m road lanes, two 0.50 spaces to house the guard rails and a 2.0m central reservation where the mast-like pylons from the pier may pass through.

The piers employ high-resistance reinforced concrete. They are conical in shape and taper upwards from the base to the underbelly of the deck where they take on a regular 2.0m diameter to the pylon head. The head is capped off in steel and houses the bracket which anchors the cable stays and the saddle for the main suspension cables. Each pier is founded on eight 2.0m diameter piles which are embedded in the subjacent marls level. The pile-cap is placed below the river bed level so as not to be visible at low tide.

The suspension system consists of four cables situated in the axis of the transversal section which allows the placement of pairs of hangers set 5.0m apart, which hold up the deck in its central area. The system is completed with 6 pairs of cable stays situated on each side of the pylons which stay this part of the structure.

The deck is composite, having a transversal cross-section with a closed core made up of two 4.5m wide cells and a 1.65m axial height. On top of the metal section a light 0.20m deep concrete slab is placed which receives the road finish and pedestrian walkways. Transversally every 2.5m, transversal webs are placed, which receive on the upper chord both the loads derived from the slab and the stay or suspension system.

The abutments act as counterweights against the vertical forces imposed by the main cables which are anchored horizontally on the deck, and for this reason they are therefore solid reinforced elements. The abutment on the right bank has been projected to have a triangular format and that one of its faces runs parallel to the riverside. Adjacent to the abutment, shallow embankment walling has been constructed which allows the integration into the surrounding landscape.



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