



Viaduct over the Ulla River

Pontevedra-Santiago High-Speed Railway, Spain / 2014

Structural type
Characteristics
Client
Scope

composite truss
main span 240 m, total length 1621 m
Dragados - Tecsá
detailed design and construction support



The viaduct over the River Ulla belongs to the new Atlantic stretch of the high speed railway line, in particular, to the stretch between Villagarcía de Arosa and Padrón. The structure of this viaduct consists of a composite deck with a tubular section within which the trains will circulate. This tube is supported by vertical piers and by triangular cells in the area of the river crossing so that the main span length may be increased without increasing the lintel span.

Due to the shape of the cell that supports the main span, the deck is placed on spans of 100 + 150 + 180 + 240 + 240 + 240 + 180 + 150 + 100m, which converts it into a continual tube of 10 spans with a maximum span length of 240.00 m. The transversal section is 14.00m in diameter. The tube behaves as a continuous beam over supports where shear stresses are maximal. It is permeable in the central areas of the spans where shear stresses are less.

The train runs at the height of a chord placed at 4.00 m from the inferior rim of the tube. At this level, a reinforced 0.30m thick concrete slab is cast and supported between transversal diaphragms placed each 4.00m. The width of the platform is 11.53m at the level of the concrete slab which allows the placement of a transversal section with sufficient space for the two tracks, the ballast bed, the ballast retaining walls and a sidewalk on both sides of the railway.

At the upper part of the tube, 2.00m below the top of the tube, other transversal diaphragms are placed each 3.00m which coincide with the inferior one. The lining of the tube consists of stiffened steel plates for the upper and lower part of the tube. In the interior area of the spans, the upper and lower plates are connected through a discreet latticework of elements whose curvature guarantees the continuity of the tube.

In the adjacent areas of the supports, the upper and lower plate increase their dimensions until the tube remains completely closed.

The upper and steel plates constitute the compressed or tensioned chord of the tube depending on the section of the viaduct. To optimize the structural behavior in the areas where the upper and lower chords are under compression, it has been foreseen the placing of 0.50m thick concrete and an extension depending on the area of the viaduct.

The piers have a constant height and a slightly tapered width from the foundation point to their connection with the tube. The sloped footings pertaining to the cells in the main span are steel and are tapered in both directions, increasing as they close to the tube of the deck.



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