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ZABALGANA FOOTBRIDGE OVER MADRID – IRÚN RAILROAD IN VITORIA

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Summary

The Zabalzana footbridge allows the connection between the two sectors of this new neighborhood of Vitoria which is cutted by the railway line that runs between Madrid and the french border in the Basque Country. The design here presented was selected from more than 25 proposals submitted in an open design competition. The solution integrates the budget constraints, the different elevation levels associated with pre-existing urban development in both sectors, constructability, social demands and aesthetic. It is, in our opinion, a good example of creating a public space based on a rational use of available resources, integrating aesthetic at a moderate cost into the solution.

Keywords: footbridge; steel; locked coil ropes; extradosed

1. The problem: general constrains and location of the footbridge

Zabalzana is a new neighbourhood in the city of Vitoria. The Madrid - Irún railway line separates sectors 1 and 2, called Borinbizkarra and Zabalzana North. Since the creation of this sector of the city, neighbours demanded a pedestrian connection between the two sectors: "the railway is a wound that had to be sewn". The City Council of Vitoria convened a design competition for a new footbridge that improved connectivity between the two sectors of Borinbizkarra and Zabalzana North. The key driver of the competition was the total budget for the construction: less than 1 million euros.

2. The competition

In order to solve this double access, several possibilities were analyzed during the competition phase. It came to the conclusion that a footbridge with a shape of 'Y' in plan was the more adequate response to the existing requirements. The 'Y' shape with a significant asymmetry taking advantage of that there was more space towards the west. In this area, a long ramp could be better fitted to connect with the existing cycle route that runs parallel to the railway. On the contrary to the east, there was a much smaller space and it was thought to make a stairway there that allows a quicker access to the more agile pedestrians. One of the most complex problems in footbridges with long ramps is to accommodate a structural shape that fits well to the main structure. The necessary length of the ramp was 90 m which greatly increased the cost of the work and made it out of the limit of the budget. Therefore, it was thought to make the embankment ramp which, in addition to being much cheaper, was also an anti-noise barrier for houses near the railway.

3. The design phase: the difficulties of supporting a 'Y' shape structure

The footbridge in a structure with Y plant, with 53.10 m of span in its main north-south section on the railroad and 29.60 m of span in the east-west bay, supported by three abutments. The cross-section of the footbridge is made of steel, U-shaped 4.80 m wide, with slightly folded webs, total width 6.40 m and constant edge equal to 1.85 m in three abutments, south, northeast and northwest.

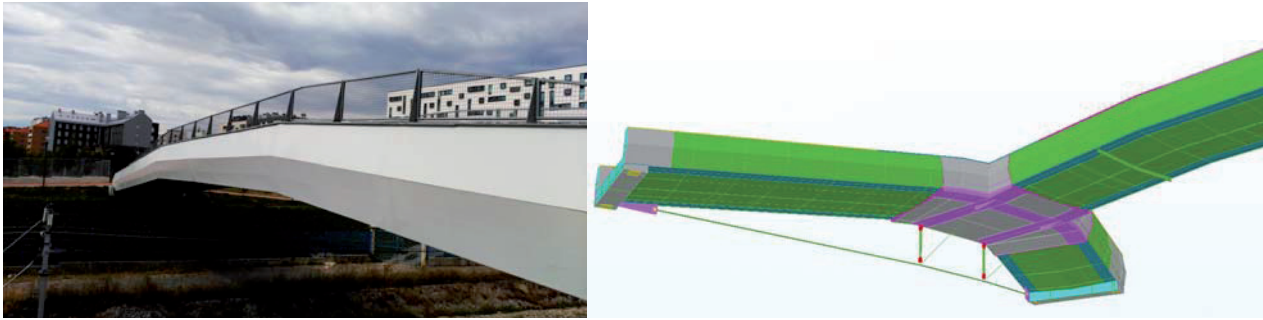


Figure 1. Visual effect of the slightly folded webs and extradosed prestress

Due to the geometry of the 'U' section of the resistant cross-section and to the 'Y' shape in plan, there is no continuity of the main beams, which leads to the need to use a lower external prestress cable to solve the support of the structure. The initial thoughts were to have the external prestress cable located in plan closer to the main span to receive directly the load from the two webs of the main span, and then transferring directly to the abutments. With that layout of extradosed cable significant negative reactions at abutments appeared. That unexpected problem was solved just moving the extradosed prestress to the external edge beam of the ramp. Figure 1 show the geometry of that complex zone where was also necessary to incorporate the deviators and anchor system of the extradosed cable. Fortunately, no more unexpected problems appeared during the design phase and the fabrication of the structure was made.

4. Construction: The excitement of the installation

No significant problems arise during the fabrication of the steel structure nor foundations and the construction of the ramps. During one night the main span of the footbridge had to be installed. Only a short cut of the power supply of the catenary between 0:00 and 5:00 AM was allowed. During the installation the matching between the two parts of the steel structure was no as perfect as required. Some 'in situ' adjustments of the steel structure were necessary to complete the structure. The initial prevision of 1 hour work was prolonged to 4 hours, close to the required opening of the railway line with the logic worries of all the team. All of us had a really exciting night....



Figure 2. Footbridge finished with the safety fence – Old man enjoying the space under the footbridge

5. Opening

The Zabalgana footbridge is a celebrated structure. Neighbours crossing in the opening day were very happy to have that new connection between sectors. When visited the site one year after the opening We could see and old man siting under the footbridge enjoying the space created under the footbridge. The effort made to create that space was plenty rewarded.

6. Credits

Design and Owner's representative on site: FHECOR e INJELAN. Owner: Ensanche 21: Daniel González de Garibay, Iñaki Diez Unzueta, Vitoria Local Council: Francisco Javier López de Aguilera. Constructor: Construcciones Amenábar. Eva Calvo Iglesias. Steel workshop and installation of the steel structure: Metálicas ESTRUMAR. Locked coil ropes supplier : PFEIFER.