

CERRADURA STRESS-RIBBON FOOTBRIDGE. IZNAJAR (SPAIN)

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Summary

A 25.00 m span stress ribbon footbridge is projected in ‘La Cerradura’ recreational area, located on the end riverbed of the Iznajar reservoir, in the province of Granada, Spain. Footbridge allows the access to both river banks, and additionally provides beautiful views of the cliff and the valley. On the other hand, structure allows access to the area all over the year, since present existing path is free of the reservoir action only in summer season, increasing in this manner, the value of this natural area for visitors. Among the studied solutions, the winner was a 25.00 m span stress-ribbon footbridge with two Vierendeel truss ramps for access anchored each 3.00 m against the cliff. The deck of the stress-ribbon is formed by a concrete slab 0.20 m deep and 3.50 m wide. The deck was suspended on two bearing tendons 19C15, and post-tensioning was applied with seven tendons of 7C15. The deck has been assembled from precast segments that are hung on temporary erection cables and removed after post-tensioning of the deck with the internal tendons. The maximum slope of the stress-ribbon is very limited by aesthetic reasons, so the deck is stressed by a large horizontal force that has to be transferred to the soil. The abutments need to transfer into the soil, by rock ground anchors, very large horizontal forces. The Vierendeel truss of 1.50 m deep fits perfectly to the topography of the rock, configured as a genuine way in the air. The whole work gets a perfect adaptation to the environment where it’s located.

Keywords: stress ribbon footbridge, ground anchor, form finding, aesthetics, landscape, environmental adaptation.

1. Introduction

The stress ribbon footbridge, “La Cerradura”, has a total length of 135.00 m, divided in two access ramps of 67.50 m and 42.50 m, and a principal span of 25.00 m. The width of the footbridge, along its length, has been 3.50 m, conditioned by the cycling potential use of the structure. The s-shaped plant of the bridge fits the sinusoidal character of the path that connects. The lace of the structure is strongly influenced by the geography where it’s located. The origin of the structure is marked by two main objectives; first, continuing to a footpath and cycle that is currently inundated during flooding of the reservoir and, secondly, provide a viewpoint to the valley in which is located the reservoir, enhancing the scenic value of the same. The access ramps have steep slopes close to 20.00 % that allow overcome a vertical clearance of 6.00 m with a small horizontal space. The deck is solved using two different type sections. The ramps have been formed by a truss type Vierendeel of 1.50 m of depth, and 3.00 m of longitudinal separation between studs. These ramps have a number of intermediate supports in the rock, executed through a set of active anchors in the same. The main span is resolved by a stress ribbon deck of 0.20 m of constant depth along its entire length. In the area near the abutments are placed two posters 3.00 m long and 0.45 m deep to control the negative flexion in that place. In that deck, it’s defined two families of prestressed cables, a bearing one, formed by two 19C15 tendons, and a second, consisting of five 7C15 tendons. The abutments are connected to ground through a battery of vertical anchors. The deck construction process has, equally, two parts. First, the access ramps will be constructed through the earlier implementation of the rock anchors, the setting of the anchor plates to it, and the subsequent placement of the metal