DESIGN OF A NEW FOOTBRIDGE OVER THE ADIGE RIVER

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Summary

A new footbridge over the Adige river is presented: the particular site of construction, lies on the heart of this natural park in the north-est of Italy. The new foot-bridge has to be built with a restricted possibility of space and boundary conditions are limited, being the site protected by the regional park authority. In order to build in this particular situation, a suspension bridge type has been designed and is herein presented.

Keywords: Footbridge; aesthetic; dynamic; structural concepts; planning; new materials.

1. The Context

The bridge has been planned to be installed along the Adige river, in the Natural Regional Park. The park is characterized by a very low demographic presence, and by a widespread amount of flora and fauna protected species. In this context, all the design and structural choices have been made according to the minimization of the environmental impact, and finalized to a harmonic structural design.

2. Structural Design

The design of the structural concept of this footbridge has intentionally taken into deep consideration the existing boundaries of the context, such as required functions, environment, and economic issues. Due to many of these contextual improvements, a preliminary study has been launched, together with a typological comparative analysis. The structural alternatives taken into consideration have been the following: an arch structure with a suspended deck; a suspension deck with an inclined pylon; a symmetric configuration, composed by two pylons and a suspended deck. This structural solution has been chosen for the final construction and is composed by: a principal system made by two steel pylons, a suspension system of steel wires, a stability system, and finally the foundation system. The principle system, is composed by two A-shaped inclined pylons, high enough to carry the whole decking system, with a net span of approximatively 250m. The minimum distance between the river and the deck has been fixed on 6 m. The stabilization system is realized by spiral cords of high tensile steel. Pylons will be realized by S355 steel, with hollow box variable sections defined by different thick plates realized with an automatic welding process. The spiral cables with high strength wires (1600 N / mm ²), are protected against corrosion by galvanizing Class B (300 g / m²). Cable carriers flow into the anchoring point (at the top of the support columns) where it has been studied a particular constructive hinge-pin that allows to connect the ropes, and to obtain the equilibrium position of the various components also in order to facilitate the assembly operations. The tie rods connecting the deck and ropes are made of galvanized spiral cords. The deck is covered with larch wood, suitably treated and having a thickness of 0.08 m, 0.20 m large and with a varying length width. The strips are positioned transversally to the direction of travel, built each other with 80 to 10 mm space to allow the passage of water and the usual expansion of the wood itself. The stays are anchored in the suspension cables on one side and into the cross beams at the other side, with a constant spacing of 2.5m. At the outer perimeter of the deck are placed the stabilizers rope: these cables are equipped with stabilizing components of curvature in the vertical and horizontal planes so as to achieve an effective response against the action of gravity loads and the action of lift and drag caused by the wind. The curvature of the cables in the vertical plane is used to induce a state of initial pre-stress in the presence of permanent loads. The structural system generates prevailing vertical components in the foundation system,