

Bending Moment Diagram as Shape: Bicontentio Bridge and Bicontentio Sinus Footbridge in San Sebastián (Spain)

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Abstract

Two Bicontentio bridges have been built in the Martutene quarter in San Sebastián (Spain). They have replaced two previous bridges over the Urumea river with insufficient hydraulic clearance. Both bridges are an application of a pre-designed parametric bridge developed by ANTA.

The characteristics of the Bicontentio bridge prototype include forms that mimic bending moment diagrams, hidden abutments, neutral colors, and it integrates the natural terrain with the support structures. To achieve a more slender appearance, the cross-sections along the length of the bridge prototypes are very variable.

Keywords: beam, restraining, double-bolt articulated joint, variable depth, parameterization, bridge, footbridge, aesthetic.

1 Pre-designed bridges

A Project for a bridge can have two different approaches:

- One-off bridge designs, in which the bridge is adapted to a specific site.
- Repeatable bridges, in which simple geometry can be customized to very usual boundary conditions.

Current technology allows a third way for drawing up a project: the parameterization of architectural bridge designs.

In ANTA, we have developed some pre-designed prototypes which are based on bridges previously built: Multicontentio, Bicontentio, Bicontentio Sinus, Monocontentio, Monocontentio Sinus, Von Mises and Honeycomb Von Mises.

The availability of really powerful calculation and drawing tools means a reinvention of the role of bridge designers.



Figure 1. Pre designed Bridge Prototypes

Projects usually start from scratch, and they are related to a contract and a specific site. Thus we can say that every project is a prototype. What we are proposing from ANTA is a paradigm shift, based on the development of projects which produce singular bridges that meet boundary conditions.

The Bicontentio prototype is a bridge elastically restrained on two side spans. The prototype span ranges from 20 to 66 meters, and it is an