



Conceptual Design and Aesthetic of Bridges

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Summary

"The walls between art and engineering exist only in our minds." (Theo Jansen). Structural Engineering is a combination of Science and Art. Science is based in universal laws and is valid for everyone and for all times.

Art and Aesthetic are more personal and changeable with culture and time. Elegance from the point of view of engineering could be formulated as the right combination of several factors such as: scale, blending with the context, functionality, efficiency, detailing, influence in the public realm, and a sense of timeless.

The proper addressing to the aforementioned factors is vital in the aesthetical result of the structure. In the paper, a discussion of the conceptual design and the influence of those variables in the outcome are being presented.

Keywords: Aesthetic, Bridge Design, Elegance, Landscape, Context, Visual quality, Conceptual Design.

1. Introduction

Structural Engineering is a combination of Science and Art. Science is based in universal laws and is valid for everyone and for all times. Art and Aesthetic are more personal and changeable with culture and time. Elegance from the point of view of engineering could be formulated as the right combination of several factors such as: scale and context, functionality, efficiency, detailing, influence in the public realm, and a sense of legacy. But what makes a bridge elegant? Is the conceptual design an adequate tool to have a visually attractive structure? Across this paper some ideas about bridge aesthetic and design principles are discussed. Some case studies are also presented as well as some thoughts about the implication of the conceptual design in the elegance of bridges.



Fig. 1: Montoro Bridge

2. Conceptual Design versus Concept Creation

Conceptual Design is commonly referred to the process of selection of the most adequate solution that better fulfills the objectives of a project. The structural design as a creative activity is a combination of science or an art. 'The process to conception of a structure cannot be regulated and is also not driven by any methodology. Concept development is consequently a personal approach that varies depending of the author. It is governed by on his or her professional experience and personal background including not only the technical but also other cultural aspects

3. Case Studies

In bridges, the right proportions, altogether with the interaction of the structure in the landscape, are the determinant values in the visual quality of the project. The context plays therefore a crucial role in the visual quality of a structure. The same bridge located in an urban or in a rural environment will be perceived in a different way. Through the following examples, the role of the context and the design decision made to improve the aesthetic of the structure are discussed. For instance, in the case of the **Zabalgana footbridge** in Vitoria (Spain) the presence of a railway line and the necessity to have two different accesses in one of the sides have resulted in a special configuration in plan. Sizes of the elements and continuity of the structure and ramps give the footbridge a unique character.



Fig. 2: Zabalgana footbridge

4. Conclusions

General rules could be formulated to at least get rid of the less attractive solutions. The general principles of simplicity, uniformity, order, and contextualization lead to more visual pleasant structures. Scale of the structure, type of use play also a crucial role related to the general proportions, member size and therefore in the aesthetic of the bridge. The structural design as a creative activity is a combination of science or an art.. Concept development and its consequences in terms of the aesthetical value of the design have to be cultivated. There is a general lack of discussion about bridge aesthetic, and therefore a Congress like this, related to this topic is crucial to the improvement of our designs, and therefore of the public vision of our work.