



Conceptual Design of Bridges and Sustainability

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Abstract

During the design of a bridge, the conceptual design phase is the most critical in relation to the sustainability of the work. The three pillars of sustainability are the economic, social, and environmental. Therefore a good design has to give the right answer to those three critical aspects of sustainability. It is evident that a rigorously conceptual design has to study the context in detail, including both social and environmental aspects. The project has to look for the optimal use of resources.

This way of making the conceptual design of a bridge is not new at all. If one studies the way of working of the great masters of engineering such as Maillart, Fernandez Casado or Cardoso, one could recognize that these three aspects were always present in their designs.

Nevertheless, the current approach to sustainability refers mainly to the use of materials, energy consumption and to CO₂ emissions. These factors are of great influence in other disciplines such as industry or building construction, however, there are other factors that fundamentally influence the present and future impact that results from the construction of a bridge.

It is therefore considered necessary to move forward in this more holistic vision, similar to that which high-quality structural engineering has employed in the past. An integral approach to the conceptual design already used by the great masters of engineering and in which attention always goes beyond the merely structural. In this paper all these aspects are discussed.

Keywords: Conceptual Design, Bridge, Sustainability, Social, Landscape, Aesthetic, Environment.

1. Introduction

During the design of a bridge, the conceptual design is the most critical phase in relation to the sustainability of the project. At this stage main decisions are taken such as, the exact position of the bridge, the location of foundations and piers, the structural type and the construction process. It is clear that those aspects are essential in relate with the context.

According to the classic approach, sustainability are based on three pillars: the economic, social, and environmental aspects. The sustainability of a bridge design is therefore measure against those three aspects. It is evident that a rigorously

conceptual design has to study the context in detail, including not only the optimization of resources but the social and environmental context of the site. Therefore conceptual design as should entail

It could be consider that there is a general agreement of the former ideas. Nevertheless the problem arises when dealing with the practical application in the design of those principles. It is very common that in structural engineering sustainability is understood mainly in terms of the use of the right materials considering the conditions of the site, low energy consumption, low CO₂ emissions, etc. All of these aspects, which although important, have a much smaller influence on the sustainability of work than other, much