

Shaping Forces; the symbiotic relation between structure and architecture

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Abstract

Over the past two decades architects are finding their way into the bridge design practice. Ever since the 90's we have seen an exponential growth of the involvement of architects in bridge design. Many beautiful and well integrated designs have been realized all over the world, but an equal amount of farfetched bridge designs have seen the light of day.

What are the key design considerations to achieve a beautiful and yet structurally sound bridge? Does a structure always need to follow the most efficient form, according to the laws of mechanics and of finance? Or is there such a thing as symbiosis between Form and Force, a way of working that ensures that the final result becomes greater than the sum of its parts?

Best practices in bridge design from the authors architectural office demonstrate the belief that structure and architecture are involved in a symbiotic relationship. One cannot be successful without the other. Just how this successful interaction is achieved is the subject of this paper.

Keywords: Architecture, Bridge design, Structural design, Optimization, Concrete, Navel bridges Nieuwe Venneep.

1 Introduction

This paper is a review of two early bridge designs by the hand of the author, designed and drafted at his architectural office at a time when he was freshly graduated from both the school of Architecture as well as the school of Civil Engineering in Delft. Since this is an autobiographic review it is important to maintain a certain amount of objectivity and critical self-reflection. However, nearly two decades have elapsed since the bridges were first drafted. That is why an unbiased reflection of the employed working methods is possible.

The early designs of the Navel Bridges in Nieuw Venneep, the Netherlands, are a clear demonstration of the author's conviction that

structure and architecture are involved in a symbiotic relationship. One cannot be successful without the other. The manner in which such a successful interaction can be achieved is the subject of this paper.

The title Shaping Forces is based on the adage form follows force; the assumption that an architectural design that follows a the path of structural logic also holds a greater aesthetical value. There are many ways of determining how structural logic can be defined. One way is by economising on the use of material; by following the path of the loads towards the foundations in such a way that the least amount of material is used. A very popular approach among academics and students nowadays is achieved through computational design in which advanced parametric form-finding and optimization