



Architectural Engineering of FRP Bridges

Joris SMITS

architect, civil engineer,
lecturer
Delft University of Technology
Delft, the Netherlands

J.E.P.smits@tudelft.nl



Joris graduated at the TU Delft where he combined Civil Engineering and Architecture. His understanding of structural design has profoundly defined him as an architect. He has designed a wide range of bridges and has won prizes all over the world. His designs are rational yet expressive. Since 2012 he combines his architect's practice with lecturing at TU Delft.

Summary

This paper deals with the use of Fibre Reinforced Polymers (FRP'S) in architectural and structural bridge design. The challenges and opportunities that come with this relatively new material are discussed. An inventory is made of recent engineers' solutions in FRP, followed by a discussion on architectural application of FRP's derived from the authors architectural practice.

Keywords: architecture; structural design; bridge design; FRP; Juliana Bridge; fly-over Waarderpolder; Wildlife crossing Rijssen-Wierden; Dragonfly Bridge Harderwijk; Delft Design Composite Bridge.

1. Introduction

Albeit the fact that the building industry is very conservative compared to other industries such as the automotive or the aerospace industry, new materials and innovative techniques are finding their way into the bridge industry. One of these innovative materials is Fibre Reinforced Polymers (FRP). In the Netherlands alone we have seen a growing number of FRP bridges being realized over the past few years. Most of these bridges have been engineered as a straightforward loadbearing board with railings mounted on top. Yet FRP has a lot to offer in terms of the aesthetical appearance of a bridge.

Our best practices in FRP demonstrate our belief that innovation and progress is not something we should be shy about. Every new material has its own unique characteristics that call for a unique design approach. Freedom of form, texture and colour are only some of the many aspects that enable us to express uniqueness in FRP bridge designs. We have designed smooth and shiny bridge edge elements that bestow a slender and modern appearance to a bridge. We have also developed slender and daring monocoque structures that span over 25 meters. But always it is the material itself that forms the chief inspiration for all our designs.