

POSSIBLE APPLICATION OF FRP BRIDGES IN RENOVATION AND REPLACEMENT TASK OF RIJKSWATERSTAAT

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SUMMARY

An increasing number of existing bridges no longer comply to current standards or have become functionally obsolete. Complete renovation is costly, time-consuming, results in disruption of traffic and is not sustainable. Current repair alternatives are often time-consuming and heavy in weight. In addition to existing methods, fiber-reinforced plastics (FRP) could provide a repair alternative whereby applying a FRP deck will relieve the main girders and can mean that the greater part of the existing bridge can remain. The lifespan of existing structures can be longer extended. This offers new technical and strategic possibilities for the major renovation and replacement task of bridge structures of Rijkswaterstaat, explained in this paper. An updated version of the Dutch CUR-96 recommendation on the design of FRP structures was published in 2018 and an English translation in 2019. This document offers an improved framework and guidelines and is comparable to the Eurocodes regarding concrete and steel structures at material level. The recommendation may therefore be regarded as a desirable basis for the development of a Eurocode for FRP composite structures. Like other road authorities, Rijkswaterstaat is looking into the possibility of replacing current bridge deck structures of highway structures with FRP decks, mainly due to the favorable weight and durability performance. Various already applied FRP structures in Europe demonstrate the possibilities and value of its application.

Keywords: *Bridges, FRP, Renovation, CUR96, Eurocode, Innovation*

1. INTRODUCTION

Rijkswaterstaat (The Dutch national road and waterways authority) is facing a substantial proportion of the infrastructural structures among its assets in need of refurbishment, renovation or replacement in the coming decades, either because it is becoming of age to the extent it becomes structurally deficient or because it becomes functionally obsolete as a consequence of the ever changing society. Due to the age of the objects managed by Rijkswaterstaat and the intensive use over the years, Rijkswaterstaat has to deal with a growing task in the coming decades to maintain the network, the so called “R&R wave” (renovation and replacement task). Can FRP structures help Rijkswaterstaat to be prepared for the R&R wave and provide a more evenly spread task? After the R&R wave is explained in chapter 2, chapter 3 will give a description of the current strategy and solutions for a more evenly spread R&R wave. Chapter 4 shows the reason for choosing FRP (when the material can be used best). The CUR recommendation and points of attention are given in chapter 5. Where chapter 6 shows applied structures of FRP. In chapter 7 a pilot project is presented.

2. RENOVATION AND REPLACEMENT TASK RIJKSWATERSTAAT

The purpose of Rijkswaterstaat is to ensure a constructively safe, reliable and available network. This network must also be as sustainable and maintainable as possible and meet the usage requirements for the future. The reason that many objects reach the end of their technical life at the same time is because many bridges and viaducts were built in a short period of time. This is mainly due to post WW-II reconstruction. Figure 1 shows a clear peak in number of bridges and viaducts built during this period. With an average lifespan of 80 years suggest a new clear peak in renovation or replacement task for Rijkswaterstaat. (see figure 1). The yellow bar