Permanent glass-fibre-reinforced under water concrete floor

Jeroen Laagland

BAM Infraconsult bv, The Netherlands

Contact: Jeroen.Laagland@BAM.com

Abstract

Glass fibre reinforced polymer (GFRP) has been applied in underwater concrete floors as part of the permanent structure of two underpasses within a road upgrade project in The Netherlands. This application is unique in view of the permanent nature of the use of GFRP in such structures. These underwater concrete floors are subjected to both downwards loads, such as traffic loads and permanent load, as well as by water pressure uplift.

The construction pit consists of permanent sheet piling with a prefab concrete deck on top and a permanent underwater concrete floor between the sheet piling. This permanent underwater concrete floor is reinforced with only GFRP reinforcement. The fibre prevents cracking in the outer zone and increase the tensile strength.

Keywords: Mixture, Glass Fibre; Under water concrete; Permanent.

1 Introduction

The design and construction of a permanent Glass Fibre Reinforced under water concrete floor is an innovation, which has been applied by BAM as part of road upgrade project for the Province of Overijssel, The Netherlands. The project started in 2018 to improve road safety and traffic flow of the N348 between the villages Raalte and Ommen.

Two underpasses have been built as part of this project (at Oude Twentseweg and Dalmsholterdijk) and use permanent sheet piles under the N348 for support of the deck structure.

As opposed to previous applications of Glass Fibre Reinforced concrete in the of tunnels and underpasses, this permanent underwater (UW) concrete floor is reinforced with fibre glass only.

1.1 Project data

The project is the upgrade of a stretch of the N348. The N348 roadway connection is of national and regional importance. The project is divided into 10 so-called building blocks (Figure 1), each with different features and challenges.

The Building Blocks BS5a and BS10 include the underpasses mentioned above. The underpasses form the connection between the infrastructure at the eastern and western side of the N348. The application of a split-level crossing is a strong improvement of road safety.

An overview of a typical underpass and its approaches is presented in Figure 2.

The underpass structures consist of the following components (Figure 3):

- Prefabricated deck supported by a permanent steel sheet piling;
- **Underwater concrete floor with the road structure on top (base course draining leakage water and asphalt top);**

https://doi.org/10.2749/ghent.2021.1339
Distributed by structurae