



Mix design and properties of Ultra-High Performance Fibre Reinforced Concrete for the construction of a composite UHPFRC - concrete bridge

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Summary

The mix design and properties of the two different types of UHPFRC materials that will be used for the construction of an innovative 46m long, 2-span overpass road bridge are presented. The originality of this bridge construction project is to combine conventional reinforced concrete with UHPFRC to strengthen those zones of the bridge structure which are exposed to aggressive media like deicing salts.

Two principally different types of UHPFRC will be used for the bridge construction: a mix for casting on the construction site with a high cement and steel fibre content for the load bearing and water proofing top layer of the bridge deck slab and for an innovative UHPFRC hinge. The kerb and sidewalk overlay elements are prefabricated using a practically proven UHPFRC with comparatively low cement content and low steel fibre content due to the fact that these elements are prestressed. These kerb elements will be directly glued to the bridge deck which is a further step towards an advanced construction system for concrete structures.

Keywords: Ultra-High Performance Fibre Reinforced Concrete; mix design; mechanical properties of UHPFRC; durability; prefabrication and on-site application of UHPFRC.

1. Introduction

The outstanding properties of Ultra-High Performance Fibre Reinforced Concretes (UHPFRC) offer high potential and new possibilities for the future design and construction of concrete structures. Due to its highly improved structural density caused by the absence of capillary pores significantly improved performance in terms of resistance and durability may be obtained especially in zones where the bridge structure is exposed to aggressive media like deicing salts and where high mechanical loads have to be taken up. Various mixes of UHPFRC are nowadays available to cover the specific needs of individual applications.

An innovative 46m long, 2-span overpass road bridge has been designed to be built in 2008. The originality of this bridge is to combine conventional reinforced and prestressed concrete with UHPFRC. The reasoning leading to the conceptual design and the originality of the bridge design as well as aspects of quality assurance and control during the construction of the bridge is described in a companion paper [1].

This paper describes the mix design and the properties of the two different types of UHPFRC materials that will be used for the bridge construction.