

Design and Construction of Innovative UHPC Pedestrian Cable Stayed Bridge in Korea

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Summary

This paper presents the design and construction of the first pedestrian cable-stayed bridge using ultra-high performance concrete (UHPC) developed by the Korea Institute of Construction Technology (KICT). UHPC exhibits compressive strength larger than 150MPa, which enables it to resist to large compressive forces. In addition, its high resistance to tension and shear makes it possible to minimize the thickness of the cross section. Accordingly, a pedestrian cable-stayed bridge exploiting at the most the characteristics of the developed UHPC has been planned, designed, cured, placed and erected in the site of KICT. This full-scale test bed demonstrated the applicability of UHPC for cable-stayed bridge structures and allowed to derive future research topics.

Keywords: UHPC; pedestrian bridge; cable-stayed bridge.

1. Introduction

Ultra-high performance concrete (UHPC) is an innovative and ultra-high strength material that has been developed to secure the ductility and strength of the structural members. UHPC exhibits significantly improved tensile strength, flexural strength, resistance to cracking, shear strength and resistance to impact through the addition of steel fibers and admixtures. The material characteristics of UHPC can be summarized as follows: development of ultra-high strength through the exclusion of coarse aggregates, uniform material properties and satisfactory particle distribution; formation of remarkable micro-structure by high temperature steam curing; increase of toughness through the addition of steel fibers. The following advantages can be expected from the application of UHPC to bridge structures: diminution of weight (dead load) through reduction of the cross-section; extended lifespan of the bridge through outstanding durability.

France is currently the leader in UHPC technology and KICT has recently developed UHPC with strength of 200MPa. Up to date, a very few bridges have erected using UHPC. As an example, Seonyu pedestrian bridge was built in Korea in 2002 but was relying completely on French technology. The very first application of UHPC for bridge is Sherbrooke pedestrian bridge constructed in 1997 in Canada. This bridge was followed by Shepherds Bridge in Australia, the viaduct of Papatoetoe railway station in New Zealand, Chabotte Bridge in France and Sakata Mirai pedestrian bridge in Japan.[1][2][3][4]