



Design and Construction of UHPFRC Deck for Replacement of Deteriorated Concrete Slab

Yojiro Murakami, Takashi Kosaka, Akinori Sato

Hanshin Expressway Company Limited, Osaka, Japan

Seisuke Muragishi, Kimio Saito

Kajima Corporation, Tokyo, Japan

Yasuo Kawabata

Tobishima Corporation Tokyo, Japan

Contact: yojiro-murakami@hanshin-exp.co.jp

Abstract

Recent study discovered progressing internal cracks in retrofitted reinforced concrete (RC) decks and the difficulties to secure long-term durability of the structure, creating the need to replace the entire deck with more lightweight and durable materials. Thus, Hanshin Expressway has been developing the Ultra High Performance Fiber Reinforced Concrete (UHPFRC) decks and plans to conduct experimental replacement of old decks with new decks. In the meantime, to minimize a period of road closure necessary for replacement of decks, the company has been developing a hydrodemolition technique, a technique to remove concrete with high-pressure water. Experimental introduction is planned to remove the concrete that joins steel girders and decks, while the road is still in service. This paper reports the advantages of the UHPFRC decks and hydrodemolition technique in retrofitting old concrete decks of elevated roads.

Keywords: Ultra High Performance Fiber Reinforced Concrete; UHPFRC; Deck fatigue durability; Hydrodemolition technique to separate steel girders and decks; Beam Protector

1 Introduction

Expressway reinforced concrete slabs designed according to the old design standards are fatigue critical members due to insufficient slab depth and reinforcements. Since the 1980's, Hanshin Expressway, an urban expressway company in Osaka, Japan, has been retrofitting such reinforced concrete slabs using the steel plate adhesion method to improve fatigue life. According to the most recent studies, internal horizontal cracks are still developing in some of the retrofitted reinforced concrete slabs. Therefore, there is an urgent need to develop

reconstruction techniques using thin concrete slabs with sufficient fatigue strength and using unobtrusive approach considering the urban environment.

Hanshin Expressway has currently developed precast UHPFRC deck slabs for the replacement of old concrete deck slabs. The UHPFRC deck slabs are thinner than the old concrete deck slabs. Therefore, the old concrete deck slabs can be replaced with the UHPFRC deck slabs without revising the alignment of the road. The fatigue resistance of the UHPFRC deck slabs was verified through the wheel running fatigue test.