

Analysis of Fatigue Behavior of Steel-Concrete Composite Bridge Deck

Kyung, Kab-Soo^{1,a}, Jeon, Eun-Kyoung^{1,b}, Lee, Hee-Hyun^{2,c}, Kwon, Soon-Cheol^{1,d}, Kim, Hyeong-Yeol^{3,e}

¹Korea Maritime University, Dongsam-dong 1, Youngdo-ku, Busan, 606-791, Korea

²Construction Technology Consultant Co., Geumjeong, Gunpo, Gyeonggi, 435-050, Korea

³Korea Institute of Construction Technology, 2311 Daewha-dong, Ilsan-gu, Goyang, Gyeonggi 411-711, Korea

^akyungks@hhu.ac.kr, ^bsh8368@naver.com, ^clhh@ctceng.co.kr, ^dalmight75@naver.com, ^ehykim1@kict.re.kr

ABSTRACT: Bridge deck is directly exposed to external environments and traffic loads. The deck can be more easily deteriorated than other bridge members and is often needed to be repaired or strengthened during the service life. Therefore, development of high strength and durable bridge deck that requires minimum maintenance during the service life is demanded. This study has been conducted to obtain basic data that are essential for the establishment of a fatigue design guideline of a steel-concrete composite bridge deck. The developed deck has high flexural rigidity compared to the conventional reinforced concrete deck. In this paper, the results of a detailed structural analysis and a fatigue test on the developed deck are presented. A guideline for the fatigue design of the developed deck is also proposed.

1. Introduction

The bridge deck is directly exposed to external environments and traffic loads. For these reasons, the deck is vulnerable to deteriorate and its service life is relatively shorter than other bridge members. Therefore, the existing bridge deck is often needed to be repaired or strengthened to maintain or to improve the load carrying capacity and durability during the service life. To minimize the maintenance of the bridge deck, the development of a durable and high-strength bridge deck system is demanded.

As a part of the research efforts to develop a high strength and durable deck system, a steel-concrete composite deck system has recently been developed in Korea (Kim and Jeong, 2006). To validate the performance of the developed deck system for application, the strength, durability, and convenience of maintenance of the developed deck system over the conventional deck system have to be investigated.

In this study, the static and fatigue tests were conducted to validate the structural performance of the developed steel-concrete composite deck. The results of the tests are briefly presented in this paper. In addition, a guideline for the fatigue design of the developed deck system is also proposed on the basis of the results of the fatigue test.

2. Steel-Concrete Composite Deck

2.1 Description of Specimen

The developed deck system consists of the profiled steel sheeting, perfobond rib shear connector, reinforcement, and concrete (Kim and Jeong, 2009). Table 1 lists the dimensions of the deck specimens tested in this test program. The profiled sheeting was manufactured by SS400 grade steel plate (its allowable stress is 140 MPa) and the design concrete

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