

The Fatigue Performance of High Performance Concrete Composite Girder

C. XU

Associate Professor

Tongji University

Shanghai and China

xuchenprc@tongji.edu.cn

Prof. Xu's research field includes steel and composite structures, intelligent composite materials and structural monitoring

B.Y. ZHANG

Master Student

Tongji University

Shanghai and China

zhang_by@tongji.edu.cn

Z. H. HOU

Master student

Tongji University

Shanghai and China

zhehaohou@163.com

Contact: xuchenprc@tongji.edu.cn

1 Abstract

The application of high performance concrete has been increasingly concerned in the negative flexural region of steel-concrete continuous composite girder because of its favorable tensile performance. However, the unclear cyclic and ultimate performance of a high performance concrete composite girder results to the problems which hinder the further application. In this case, a series of fatigue negative bending tests on HPC composite girders and fatigue push-out tests on stud connectors in HPC were executed. The test results showed that the fatigue slip in the HPC composite girder was smaller than the normal concrete composite girder, and the fatigue life of stud in HPC was longer than the one in normal concrete. Meanwhile, according to the comparison between the stud fatigue live evaluations and test results, the AASHTO-based evaluations were comparatively with larger safety redundancy, and JSCE was close to the test results but had smaller safety redundancy.

Keywords: Steel fiber reinforced concrete; Composite girder; studs; Fatigue test.

2 Introduction

The tensile concrete crack and compression bucking of steel plate are the critical factors to the mechanical performance of steel-concrete continuous composite beam. The high performance concrete which contains steel fiber inside is considered as a way to solve the problem because of its high tensile strength¹. On the other side, shear connectors between steel and concrete is of vital importance to the composite beam. Slip

feature is regarded as an index to reflect the composite action.

At present, the application of HPC composite girder is still limited due to the insufficient research on the mechanical performance of the composite girder such as the cracking feature, interlayer slip, load-carrying capacity and fatigue life evaluation of the shear connectors. In this sense, two composite test girders as well as the push-out tests were designed and executed for the insufficient researches.