

A Study on Shear Resistance of Perfobond Strip by Using Simple Push-out Specimen

Akinori NAKAJIMA

Professor

Utsunomiya University

Utsunomiya, Japan

akinorin@cc.utsunomiya-u.ac.jp

Masatoshi HASHIMOTO

Master course student

Utsunomiya University

Utsunomiya, Japan

Soichiro KOSEKI

Civil Engineer

Japan Railway Consultant

Co.Ltd, Tokyo, Japan

Yasuo SUZUKI

Research Associate

Utsunomiya University

Utsunomiya, Japan

yasuo-s@cc.utsunomiya-u.ac.jp

Minh Hai NGUYEN

Master course student

Utsunomiya University

Utsunomiya, Japan

Summary

A Perfobond strip is generally used as the shear connector in the various steel-concrete hybrid structures and a few design formulas for evaluating the shear resistance of the perfobond strip are proposed. However, these design formulas are not always applicable to the one employed in the steel-concrete rigid frame bridge, since the formulas are established based on the standard push-out specimen for the stud shear connector in which some cracks may occur in the concrete block of the specimen during the test. In this paper, the shear resistance of the perfobond strip are investigated experimentally by employing the simple push-out specimen different from the standard one for the stud shear connector. As a result, the design formula is proposed for evaluating the shear resistance of the perfobond strip taking into account the dimension of the concrete block as well as the perforation size and the concrete compressive strength.

Keywords: steel-concrete hybrid structure, perfobond strip, shear resistance, design formula

1. Introduction

In the steel-concrete hybrid members and structures, it is important to ensure the required stress transmission between the steel member and the concrete one, generally the adequate shear connectors are arranged between the steel member and the concrete one. A perfobond strip is widely used as the validated shear connector in the various steel-concrete hybrid structures, since the fatigue strength of the perfobond strip is larger and its constructability is better than those of the other type of shear connectors such as the headed stud shear connectors. A perfobond strip as the shear connector for composite girders is proposed first by Leonhardt et al.[1] in 1987 and many related researches have been widely conducted throughout the world. The design formulas for evaluating the shear resistance of the perfobond strip have been also proposed by many researchers[2]-[4] as well as Leonhardt et al.[1]. However, these design formulas are usually constructed based on the push-out test similar to the one for the stud shear connector, and the design formulas are mainly applicable to the perfobond strip employed for the steel-concrete composite girder. Then, the proposed design formulas are not always applicable to the perfobond strip employed for other structural type, such as the connection in the steel-concrete rigid frame bridge, because the restrained condition of the perfobond strip used in other structural type is different from the one in the composite girder.

In this research, three series of simple push-out tests are conducted paying attention to the dimension of the concrete block, the compression strength of concrete and the diameter of perforation. In the test specimen employed here, the steel plate with the perforation is embedded in the concrete block and the specimen is different from the one for the headed stud shear connectors which is usually employed in the past researches. Finally the design formula for evaluating the shear resistance of perfobond strip considering the perforation size, the concrete compressive strength and the dimension of concrete block based on the test results.