

Yi Sun-sin Bridge: Influence of the Lateral Rigidity of the Main Cable on the Cable Bands and Wrapping Wire

Minjae LEE

Manager
Daelim Industrial Co.
Seoul, Korea
leemj@daelim.co.kr

Minjae Lee, born in 1976, received his B.S. and M.S. in civil engineering from Seoul National University, Seoul, Korea.

Jonghoon MOON

Manager
Daelim Industrial Co.
Seoul, Korea
triton@daelim.co.kr

Jonghoon Moon, born in 1974, received his B.S., M.S. and Ph.D. in civil engineering from Seoul National University, Seoul, Korea.

Jahgeol YOON

General Manager
Daelim Industrial Co.
Seoul, Korea
yoonjg@daelim.co.kr

Jahgeol Yoon, born in 1966, received his B.S., M.S. and Ph.D. in civil engineering from Seoul National University, Seoul, Korea.

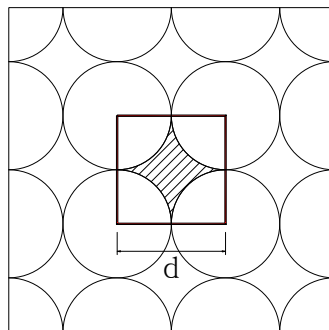
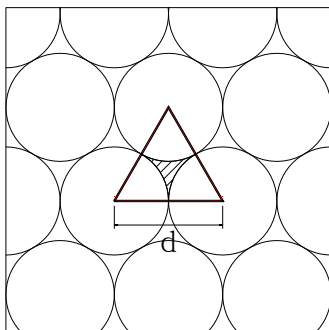
Summary

The lateral rigidity of main cable formed by a bundle of zinc-coated wires in suspension bridge is relatively small due to the void in the cross-section. Accordingly, the outer pressure on cable loaded by the cable bands and the wrapping wire induce deformation easily. The lateral rigidity of the main cable in the Yi Sun-sin Bridge is measured here and the influence of the lateral rigidity on the cable band and wrapping wire is investigated arithmetically.

Keywords: lateral rigidity; cable band bolt; wrapping wire; tension loss.

1. Introduction

The main cable of the Yi Sun-sin Bridge is composed of 12800 wires each 5.35mm in diameter in the main span and 13600 wires in the side span squeezed such that there is 18 to 20% of void space.



If the array of wires is associated with an equilateral triangle, the porous ratio is about 9.3% (see Fig. 1). The porous ratio is about 21.5% when a square array of wires is considered in the extreme. The actual porous ratio is similar to the ratio associated with the square array despite the fact that the triangular arrangement was initially planned due to the misalignment of the wires. This implies that the lateral rigidity of the main cable can be very small compared to an actual steel bar.

Fig. 1: Porous ratio according to the wire's array

The main cable, consisting of a bundle of wires, is wrapped by its cable band and wrapping wire with a specific outer pressure. The hoop tension of the cable band and the wrapping wire is affected by changes of tension, temperature and relaxation of the main cable. The lateral rigidity of the main cable is related to the tension reduction of the cable band bolt and the wrapping wire. This paper will focus on the measurement of the lateral rigidity of the Yi Sun-sin Bridge's main cable and on the influence of the lateral rigidity on the cable band and the wrapping wire.

2. Measurement of the lateral rigidity of the main cable

2.1 Test location

On the main cable between supplementary pylon 2 (SP2) and anchorage 2 (AN2), four fixation bands of short length are installed only to maintain the circular shape of the cable and to support the hand ropes. In this test, these bands are used to put pressure on the cable. The installation and dismantling of the fixation bands are shown in Fig. 2.