

Application of Various Schemes for Damping Estimation of the Suspension Bridge for the Cause Investigation of a Vortex-Induced Vibration

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Abstract

A vortex-induced vibration (VIV) was observed on the Yi Sun-sin Bridge. The primary source of VIV was estimated as the temporal screens applied on the bridge railings for maintaining curing temperature of the replaced wearing surface. The interesting aspect is that the bridge deck was oscillated as 4th vertical mode so that lower damping ratio of 4th vertical mode can be a factor of the development of unexpected VIV. This paper presents the extracted modal damping ratio through various system identification schemes based on the field monitored data. The damping ratio of 4th vertical mode is around 0.4% for each scheme while 1st and 2nd vertical modes indicate about 1~2% of modal damping ratio.

1 Introduction

On Oct. 26, 2014, a huge vortex-induced vibration (VIV) is observed in the Yi Sun-sin Bridge (YSS Bridge) shown in Figure 1.



Figure 1. Investigated bridge

A series of wind tunnel test, discussed at the conference¹, was performed to reproduce the observed VIV and found that the source of the unexpected vibration was the temporal screens used for the curing of the epoxy-coated pavement. Figure 2 shows the result of wind tunnel test.

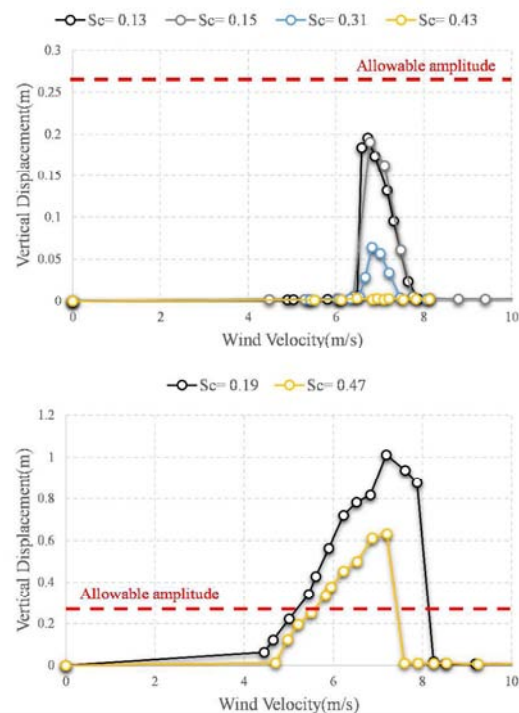


Figure 2. V-A curve: (a) original section, (b) original section with temporal screens