



Report of an Unexpected Vortex-Induced Vibration in an Actual Suspension Bridge

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Abstract

An unexpected vibration was observed on the Yi Sun-sin Bridge on October 26th, 2014. Since the bridge was subjected to a single mode vibration in limited amplitude for one and half hours, it was regarded as a vortex-induced vibration (VIV). Since the bridge was aerodynamically well designed for the VIV as well as flutter instability, the cause of the vibration was investigated via a series of two-dimensional wind tunnel tests. The one-side lanes were closed to traffics and the epoxy-coated wearing surface was being replaced at the time of the VIV. Since the primary source was estimated as the temporal screens applied on the bridge railings for maintaining curing temperature of the replaced wearing surface, wind tunnel tests were carried out for the section model of the deck section with and without the screens. This paper presents the screen effects on VIV of the investigated bridge and the illustration of the observed vibration based on in-depth investigation with a series of two-dimensional wind tunnel.

Keywords: Suspension bridge, Vortex-induced vibration, Screens, Wind tunnel test.

1 Introduction

On Oct. 26, 2014, an unexpected huge vortex-induced vibration (VIV) was observed in Yi Sun-sin Bridge (YSS Bridge) for a duration of one and half hours [1]. Since the bridge was aerodynamically well designed for the VIV as well as flutter instability, it is needed to reveal the cause of the vibration and dispel public disquiet. At that time of vibration, for maintaining curing temperature of the replaced wearing surface, the temporal screens were applied on the bridge railings as Figure 1. Therefore, wind tunnel tests were carried out for the section model of the deck section with and without the screens. The purpose of the present study is to understand the source of the unexpected VIV based on wind tunnel experiments result at various Scruton number.



Figure 1. Comparison of section (Left: Original section, Right: Original section with temporal screens)