



Experimental study on the natural vibration characteristics of a steel composite girder bridge before and after reconstruction of the RC slab

Masato KOMURO

Associate Professor
Muroran Inst. of Tech.
Muroran, Japan
komuro@news3.ce.muroran-it.ac.jp

Masato Komuro, born 1969, received his Ph.D. in civil engineering from Muroran Institute of Technology in 2001.

Norimitsu KISHI

Rector
Kushiro Natl. Col. of Tech.
Kushiro, Japan
kishi@kushiro-ct.ac.jp

Norimitsu Kishi, born 1949, received his Ph.D. in civil engineering from Hokkaido University in 1977.

Ryoji KAWASE

Executive Director
Koken Engineering Co. Ltd.
Sapporo, Japan
r.kawase@koken-e.co.jp

Ryoji Kawase, born 1956, received his Ph.D. in civil engineering from Muroran Institute of Technology in 2003.

Summary

In order to investigate the natural vibration characteristics of a steel composite girder bridge before and after replacement of the RC slab, micro-tremor measurement tests after traffic passing were conducted. Here, 51 high-sensitive servo-type vibration meters and a wireless LAN system were used to measure the vibration acceleration of the bridge. The results obtained from this study were as follows: 1) natural vibration frequencies and modes can be appropriately evaluated by conducting the proposed micro-tremor measuring test; and 2) since natural vibration frequencies were increased and all vibration modes were improved to be more symmetrical and/or anti-symmetrical, it is seen that the bridge stiffness is upgraded by replacing the RC slab.

Keywords: natural vibration; slab replacement; steel girder bridge; micro-tremor measurement test.

1. Introduction

In recent years, deterioration of the reinforced concrete (RC) slab of a bridge tends to be a more severe problem in the case of repeated traffic loads and chloride attack due to de-icing salt in the cold regions of Japan. Photo 1 shows an example of the damage to the concrete of the bridge slab. Occurrences of this kind may rapidly increase in the near future. Usually the deteriorated concrete slabs of bridges were partially repaired and/or whole the slab was completely replaced.



Photo 1: An example of damage to the RC Slabs of bridges

The replacement of the whole of the slab must be carried out under one-way alternating traffic because of not closing the highway using the national highway bridge. In this case, since one half (i.e. lane) of the slab was removed and for the other half the traffic loads were applied temporarily,