



Partially Strengthened Main Cable System for the Rehabilitation of an Old Suspension Bridge

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Abstract

Bridge rehabilitation projects for enhancing the safety and serviceability of old bridges are carried out widely around the world. Especially, suspension bridges are intensively maintained with high construction budgets. The damaged hanger rope, stiffening girder and main tower in suspension bridges can be repaired, strengthened or replaced. However, in the case of a main cable, the remedy until now only removes rust and applies surface repainting. Basically, the main cable consists of thousands of small wires, which is not replaceable. A damaged or disconnected wire also cannot be repaired or replaced. This paper suggests a new method for strengthening a main cable that is deteriorated by the aging effect. By small cables connecting a couple of cable bands on both sides from a pylon, the strength of the main cable can be increased and the possibility of slip of the cable bands are decreased. This suggestion is introduced by an example of an old suspension bridge that has been opened to traffic for forty years. The reinforcing level of the main cable should be decided by the extent of damage. Hence, the level of strengthening of the main cable can be easily controlled by only the amount of ancillary cables.

Keywords: Bridge rehabilitation projects, suspension bridge, partially reinforcement, strength of main cable, additional cable

1 Introduction

Since the Brooklyn Bridge was completed in 1883, a number of suspension bridges have been constructed worldwide. Due to the large number of suspension bridges, maintaining safety and serviceability are required during the service life.

Most cases of maintenance in suspension bridges are the periodic replacement of the cable hanger and restoration of the stiffening girder and pylons, which excludes the main cable. Since the whole loads on the girder are transmitted to the pylon through the main cable, maintenance of the main cable is very important.

The strength of the main cable is reduced mainly by corrosion. However there is no method to fundamentally prevent the failure of the main cable. At worst, demolition and rebuilding bridges can lead to a huge budget spending. Therefore, practical methods are needed for strengthening the main cable.

In this study, the main focus is to determine the most effective methods for strengthening the deteriorated main cable. By installing additional cables onto the existing cable with a couple of cable bands, the tension of the main cable is reduced and the slip behavior of the cable bands is decreased.