Development of Composite Non-Destructive Testing Equipment for External Tendon of PSC Bridge

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Abstract

A non-destructive testing equipment and diagnostic technique for external tendons of pre-stressed concrete (PSC) bridge were developed in this study. In this equipment, acoustic emission (AE) and magnetic flux leakage (MFL) type testing equipment were introduced. The use of AE equipment is to detect cavities in external tendons, and the use of MFL equipment is to detect damage to strands. In order to verify the performance of this non-destructive testing equipment, specimens of tendons with artificially damaged strand were fabricated and tested in a laboratory. As a result, it was confirmed that the location of each damage could be detected precisely. It is expected that more precise evaluation will be possible through further analysis and enhancement.

Keywords: non-destructive testing; external tendon; acoustic emission; magnetic flux leakage;

1 Introduction

External tendons play an important role in the load carrying capacity of PSC bridges. If the grout filling of the external tendon is insufficient, corrosion may occur due to exposure of the stranded wire to the air, and loss of cross-section due to corrosion may lead to the breaking of the stranded wire, which may cause the total collapse of the bridge. In this study, a non-destructive testing equipment for external tendons was developed. AE and MFL type inspection equipment was introduced into this non-destructive testing equipment. With the AE type equipment, the presence of a hall in the grout is determined by post-processing Fast Fourier Transformed (FFT) data of the external tendon hitting sound. With the MFL type equipment, the presence of defects in the steel wires in the external tendon is determined.

2 Equipment components

The non-destructive testing equipment is composed of AE equipment, MFL equipment, and platform. The AE equipment consists of a striking part that strikes the external tendon and a microphone sensor that measures the acoustic signal, and the MFL device consists of a magnetizing part that magnetizes the steel wire and a Hall sensor part that measures the leakage flux. The platform was equipped with a driving device, a control device, and each measuring device, and in consideration of portability, it was made possible to detach each part.

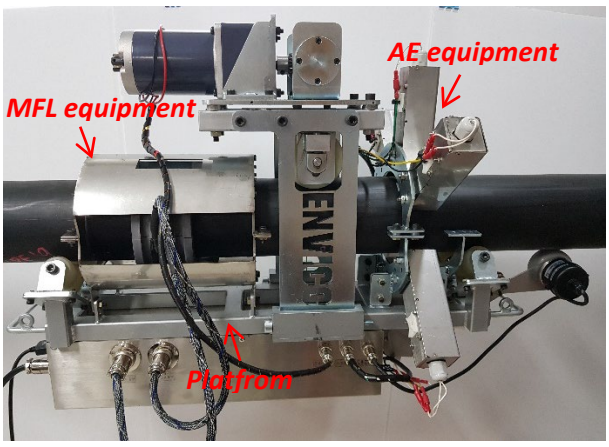

Figure 1. Profile of the equipment

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