Energy capacity influence on modal parameters of prestressed concrete box girders

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ABSTRACT

Extensive works have been done recently to describe precisely the structural performance of major civil infrastructures, such as concrete bridges, but the huge amount of bridges in a highway system makes it difficult to apply new or conventional tests to all the bridges. The use of structural health monitoring (SHM) to describe the current performance of a structure will improve efficiency in bridge maintenance. The purpose of finding the link between SHM and structural performance is to have tools for decision making in maintenance or judgement of the bridge condition.

This paper deals with the results of a set of experiments carried out in three concrete box girders inside the facilities of Public Works Research Institute (PWRI), Japan. The girders were subjected to different loading-unloading scenarios and also, with the aim of reproduce tendon breakage, an artificial failure was induced in several tendons by cutting some of them at the ends of the elements. Along the whole process, vibration tests were performed before each static-loading stage was started. Static and dynamic responses of the girders were measured and collected by several instruments consisting of accelerometers, displacement transducers, strain gauges and cameras. Moreover, the cracks were also measured and details of crack growth are presented. With all these information gathered, the modal parameters are obtained from the vibration response and the description of the performance is possible by the calculation of energy dissipation, energy absorbed capacity and change in stiffness. Finally, the change in modal parameters is explained by a correlation with the energy capacity of the concrete box girders.

REFERENCES