

Abstract

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A Non-Destructive Test for the Evaluation of the Integrity of Piers During Construction

•Concrete piers are vital structural members in most bridge systems. However, several problems accompany piers erection during construction. These problems vary from segregation of concrete to concrete caving and other problems resulting from piers frequent large sizes. This may consequently affect the safety of the whole bridge structure under actual service loads. As a result, clear needs for checking the integrity of piers exist during bridge construction. Despite that, the most dominant method for checking the integrity of structural members in the site is visual inspection though it may not be sufficient. This paper introduces a non-destructive technique for testing the integrity of piers after its construction before loading. Global vibration-based system identification technique is used as a tool in the test. It is shown that by dividing the pier into vertical segment elements, the aforementioned non-destructive test gives stiffness parameter estimates for the corresponding elements. The results obtained indicate that on using the suggested test, good mean estimates of the stiffness coefficients are obtained for noisy signals; excellent estimates are obtained for clear signals. Moreover, the test is found to be capable of detecting a damage of 20% stiffness loss when it is incurred in one of the pier segments. The suggested test can be extended to include other production quality control applications in construction sites.