Initiation of and challenges associated to full-scale concrete bridge testing and related monitoring

Halding, Philip Skov; Schmidt, Jacob W.

Publication date: 2016

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Initiation of and challenges associated to full-scale concrete bridge testing and related monitoring

Philip S. Halding¹, Jacob W. Schmidt²

¹Department of Civil Engineering, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark.
²Department of Civil Engineering, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark, and COWI Denmark.

e-mail: phsh@byg.dtu.dk, jws@byg.dtu.dk

Abstract

In June 2016 a project regarding full-scale load-testing of concrete bridges was initiated. The project runs for four years, and is a collaboration between DTU, COWI, and the Danish Road Directorate. The overall project scope is to develop test methods and related state-of-the-art monitoring which can be used in a standardized way to test the capacity of existing (one span) full-scale concrete bridges. This method combined with applied theory is hypothesized to provide an efficient tool to evaluate the bridge class and potentially provide a more exact way to evaluate the full scale structural response of the tested bridge. Even though the project was initiated in June 2016, already four bridges have been tested in September 2016: Three were tested to verify the novel test rig and loading procedures, and one bridge was monitored using different types of monitoring.
monitoring equipment. The loading configuration and monitoring equipment is shown in Figure 1. A unique combination loading was applied in two tempi: 1) Initially, steel weights were applied onto the loading frames (force controlled loading), and 2) jacks between the loading beams and the loading frames apply an additional semi deformation controlled load. This two-step approach ensured controlled, high magnitude loading of the bridge as well as a load configuration as it is applied in theoretical evaluations according to given standards. In addition, this test setup enabled the possibility to reveal the initiation of inelastic regime.

The testing scheme of the bridge was conducted within only one day. This was one of the most critical points, since the road above and below will have to be closed during a test which is very expensive and troublesome for the road users.

It was concluded that the test rig worked as desired enabling an axle pressure of approximately 95 tonnes (highest axle load for a class 500 vehicle is 23.7 tonnes). The test rig enabled fast and controlled loading and the measurement equipment provided the desired values. However more data analysis has to be done to get a more detailed overview of the obtained results. Based on this testing, the next step can be taken, where monitoring and sampling of data acquisition will be more optimized and wireless. In addition, the DIC results were at a quality level which opens the opportunity of adding more cameras in combination with more advanced laser measurements.