High Magnitude Loading of Concrete Bridges

The motivation for full-scale testing of concrete bridges is significant, since it is deemed to solve some of the major challenges related to capacity evaluation of older concrete bridges combined with increasing load demands. A novel test rig was developed as a means to evaluate the full-scale bridge response of concrete bridges spanning up to 12 m (39.4 feet). The test rig was fast to mount, applied the load accurately, and loaded the structures to a very high load magnitude. The bridges were loaded to maximum capacity of the test rig without cracking (approx. 100 tonne (220,000 lbs) axle loads). 3D scanning, LVDTs, distance lasers, and DIC cameras were applied to two of the bridges, as well as land surveying readings, in order to measure the structural behaviour during testing. The loading sequence worked well, and it was possible to measure deflections and strains. Using a wide-angle lens DIC-camera showed to be a promising method to measure strains, in-plane deformations and cracking during testing. Work regarding modelling in conjunction with monitoring is ongoing, to provide a more accurate way to evaluate the ultimate capacity of the bridges as well as stop criteria during full-scale testing.

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