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Innovative approaches for condition monitoring of shear connections in steel-concrete composite bridges

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Composite bridge represents one of typical types of bridges on Australia highways. This presentation talks about the development motivation, theoretical background, verification and application of a recently developed relative displacement sensor for civil structural health monitoring. The developed sensor is very sensitive to the relative movement between two points on the structure and is also easy to be directly mounted on the structure. It does not require a stable reference point therefore it is easy to setup and is cost-effective to measure the relative displacement. It can be used for real-time and offline structural health monitoring. The recent studies on using relative displacement sensors for structural health monitoring of steel-concrete composite bridges are presented. A slab-on-girder composite bridge model is fabricated in the laboratory. Condition monitoring of shear connection conditions in composite bridges is performed under ambient vibrations and moving load excitations. The relative displacement sensor is also applied for the crack monitoring in the composite bridge. Experimental results demonstrate that the relative displacement sensor shows a superior performance than traditional vibration sensors, i.e., accelerometer and laser displacement sensor in monitoring the shear connection conditions. The application of this relative displacement sensor has been successfully extended to monitoring the joint condition of steel truss bridges. Experimental studies and damage detection results on a laboratory simplified steel truss bridge are presented to demonstrate the capacity and performance of this developed sensor in structural health monitoring of joint conditions of steel truss bridges.

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