

Monitoring of the Chillon Viaducts after Rehabilitation with Ultra High Performance Fiber Reinforced Cement-Based Composite

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Abstract : Located on the shore of Geneva Lake, in Switzerland, the Chillon Viaducts are two parallel structures consisted of post-tensioned concrete box girders, with a total length of 2 kilometers and 100m spans. Built in 1969, the bridges currently accommodate a traffic load of 50.000 vehicles per day, thereby holding a key role both in terms of historic value as well as socio-economic significance. Although several improvements have been carried out in the past two decades, recent inspections demonstrate an Alkali-Aggregate reaction in the concrete deck and piers reducing the concrete strength. In order to prevent further expansion of this issue, a layer of 40 mm of Ultra High Performance Fiber Reinforced cement-based Composite (UHPFRC) (incorporating rebars) was casted over the slabs, acting as a waterproof membrane and providing significant increase in resistance of the bridge structure by composite UHPFRC - RC composite action in particular of the deck slab. After completing the rehabilitation works, a Structural Monitoring campaign was installed on the deck slab in one representative span, based on accelerometers, strain gauges, thermal and humidity sensors. This campaign seeks to reveal information on the behavior of UHPFRC-concrete composite systems, such as increase in stiffness, fatigue strength, durability and long-term performance. Consequently, the structural monitoring is expected to last for at least three years. A first insight of the analyzed results from the initial months of measurements is presented herein, along with future improvements or necessary changes on the deployment.

Keywords : composite materials, rehabilitation, structural health monitoring, UHPFRC

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