

STRUCTURAL HEALTH MONITORING OF A BRIDGE DECK REINFORCED WITH CARBON FIBER REINFORCED POLYMERIC GRIDS IN ROLLINSFORD, NEW HAMPSHIRE

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Abstract

In December, 2000, the Rollinsford Bridge in Rollinsford, New Hampshire was opened to traffic. The Rollinsford Bridge was constructed with funding from the Innovative Bridge Research and Construction (IBRC) program administered by the Federal Highway Administration (FHWA). A requirement of the IBRC program is the use of high performance and innovative materials. The deck of the Rollinsford Bridge is high-performance concrete (HPC) reinforced with carbon fiber reinforced polymers (CFRP). These materials were selected to create a durable concrete superstructure that is free of metallic reinforcement. Also as part the IBRC program, Rollinsford Bridge was instrumented with a series of strain and temperature sensors to monitor and study the structural behavior of the bridge deck. This paper describes a program of structural health monitoring for the Rollinsford Bridge, the first bridge in the United States to contain high performance concrete (HPC) and state-of-the-art carbon fiber reinforced polymeric (CFRP) grids

In regards to the field test on the actual bridge, over 80 fiber optic sensors, measuring strain and temperature, were installed in the actual bridge deck, the CFRP material, and the concrete girders before construction. Strain distributions found from these fiber optic sensors shows that the maximum strains in the actual bridge were less than 100 micro strains, while deflections of the girders and deck were less than 0.1 in (2.5 mm) under a sustained truck load within two year of service in 2002. This paper focuses on use of the collected data, from both strain and temperature sensors to conduct in-service performance monitoring. The recent data will be compared with the baseline data collected in 2002 and used for model updating using the initial base line model created prior to the Rollinsford Bridge being opened to traffic. The sensor data will be evaluated based on its value in a long-term structural health monitoring program.

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