

## Effect of CFRP Composites on the Dynamic Behavior of Concrete Bridges

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### Abstract

Bridges are elevated structures subjected to several external actions, which prevent them from being subjected to deterioration and cracking during their lifetime. In Algeria, the heritage of civil engineering structures includes more than 22,000 bridges, 30% of which are more than 60 years old and require immediate maintenance and/or reinforcement. In this paper, we present the results of an in situ experimental investigation of the behavior of an old bridge, before and after its reinforcement, by CFRP carbon fiber composites, at the level of its load-bearing elements. This involves the application of the ambient vibration technique using seismometers at defined locations of the structure. In order to calibrate the experimental results obtained, a dynamic finite element analysis was carried out using appropriate commercial software. The numerical results were compared with those of the experiment and show that the differences do not exceed 8% for the values of the vibration frequencies. Also, this study showed the effectiveness of composites with gains of around 35%, which proves that the technique of reinforcement by CFRP composites can be an alternative solution, in practice, to traditional solutions, such as the addition of mortars or glued sheets.

### Keywords

Bridge, concrete, composite CFRP, experimental, numerical, behavior.

