MODAL IDENTIFICATION, MODEL UPDATING AND NONLINEAR ANALYSIS OF A REINFORCED CONCRETE BRIDGE

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Abstract: This paper proposes a rational methodology for the structural assessment of a reinforced concrete bridge in Tunisia. This methodology is based on ambient vibration measurement of the bridge, identification of its modal signature, finite element model updating and nonlinear analysis. The selected case study is an eight-span bridge with a continuous slab. Each span is simply supported at rubber bearings and has a length of 25m. Because of the repetitive geometry of the bridge, ambient vibration tests were conducted on one span using a data acquisition system with nine force-balance accelerometers placed at selected locations. The Enhanced Frequency Domain Decomposition (EFDD) technique was applied to extract the dynamic characteristics of the bridge. A 3-D finite element model was developed and updated to obtain reasonable correlation between experimental and numerical modal properties. The parameter selected for the updating consists of the concrete modulus of elasticity in each concrete element of the finite element model. A decrease of its value indicates the possibility of damage or stiffness reduction. We demonstrate that using the EFDD technique along with model updating and nonlinear analysis provides valuable information for the evaluation of the bridge structural condition.

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