

Evaluation of Beam Structure Using Non-Destructive Vibration-Based Damage Detection Method

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Abstract : Material aging is one of the vital issues among all the civil, mechanical, and aerospace engineering societies. Sustenance and reliability of concrete, which is the widely used material in the world, is the focal point in civil engineering societies. For few decades, researchers have been able to present some form algorithms that could lead to evaluate a structure globally rather than locally without harming its serviceability and traffic interference. The algorithms could help presenting different methods for evaluating structures non-destructively. In this paper, a non-destructive vibration-based damage detection method is adopted to evaluate two concrete beams, one being in a healthy state while the second one contains a crack on its bottom vicinity. The study discusses that damage in a structure affects modal parameters (natural frequency, mode shape, and damping ratio), which are the function of physical properties (mass, stiffness, and damping). The assessment is carried out to acquire the natural frequency of the sound beam. Next, the vibration response is recorded from the cracked beam. Eventually, both results are compared to know the variation in the natural frequencies of both beams. The study concludes that damage can be detected using vibration characteristics of a structural member considering the decline occurred in the natural frequency of the cracked beam.

Keywords : concrete beam, natural frequency, non-destructive testing, vibration characteristics

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