CHANGE IN MODAL PARAMETERS OF CRACKED SINGLE-EDGE NOTCHED PLAIN CONCRETE BEAMS *

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Abstract

The aim of this work is looking into the possibility of capturing the change in the modal properties (natural frequencies, modal shapes and modal damping ratio) of plain concrete elements due to the presence of cracked areas by using a simple continuum damage zone numerical model. To do so, and as a first step, single-edge plain concrete beams were identified by experimental modal analysis with and without cracks in order to find out how cracking affects the first three flexural modes of the element. Then, numerical modal analysis was performed by finite elements in order to identify the material properties of the intact specimens by model updating and also check the experimental results. Finally, a boundary element – finite element coupled code was used to find a continuum model for the cracked single-edge notched beam able to reproduce the experimental results in terms of natural frequency shifts and modal damping ratios. It was found that, in order to reproduce the experimental frequency response functions, an overdamped damage zone is needed together with an equivalent crack length.

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