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Theoretical, Numerical and Experimental Assessment of Elastomeric Bearing Stability

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Abstract : Elastomeric bearings (EB) are used in many applications, such as base isolation of bridges, seismic protection and vibration control of other structures and machinery. Their versatility is due to their particular behavior since they have different stiffness in the vertical and horizontal directions, allowing to sustain vertical loads and at the same time horizontal displacements. Therefore, vertical, horizontal and bending stiffnesses are important parameters to take into account in the design of EB. In order to acquire a proper design methodology of EB all three, theoretical, finite element analysis and experimental, approaches should be taken into account to assess stability due to different loading states, predict their behavior and consequently their effects on the dynamic response of structures, and understand complex behavior and properties of rubber-like materials respectively. In particular, the recent large-displacement theory on the stability of EB formulated by Forcellini and Kelly is validated with both numerical simulations using the finite element method, and experimental results set at the University of Antioquia in Medellin, Colombia. In this regard, this study reproduces the behavior of EB under compression loads and investigates the stability behavior with the three mentioned points of view.

Keywords : elastomeric bearings, experimental tests, numerical simulations, stability, large-displacement theory
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