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MECHANICAL BEHAVIOR OF ORTHOTROPIC MICROPOLAR CONTINUA SUBJECTED TO LOCALIZED LOADS

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ABSTRACT

The aim of the present work is to show the mechanical behavior of orthotropic micropolar continua subjected to localized loads. Micropolar material models have been proven to be effective in modelling the actual behavior of micro-structured solids subjected to localized loads or in presence of geometrical discontinuities. This is due to the introduction of an addition degree of freedom (the micro-rotation) in the kinematic model if compared to the classical elastic continuum. Therefore, micropolar materials are described by the classical Cartesian displacement field, which gives also the so-called macro-rotation, and additionally by the micro-rotation. Masonry is considered a classical example of micropolar continuum, due to the presence of bricks, which interact among them through contact surfaces made by mortar. The elastic response due to in-plane loading is analyzed in terms of different brick size. Numerical applications will be provided by comparing strong and weak finite element assemblies in terms of stress and strain fields. In conclusion, the advantages and disadvantages of both methodologies will be discussed.