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Corner crescent shaped braces for the structural retrofitting of frame structures with isostatic columns

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In the last decades an increasing need of structural retrofitting of existing constructions has been raised, especially in order to reduce the vulnerability of such buildings against seismic induced effects. The existing heritage encompasses both prefabricated reinforced concrete buildings and steel framed structures characterized by the presence of isostatic columns. Many solutions may be introduced in order to reduce the inter-storey drift demand and the actions exerted on the structural members under seismic conditions. In the present paper, a solution of structural retrofitting of frame structures with isostatic columns by adopting steel hysteretic devices referred to as Crescent Shaped Based (CSB) disposed at the intersection between beams and columns is presented. The application of so called corner CSB allows to partially or totally restoring the compatibility between beams and columns and thus increases the overall lateral stiffness of the structures against lateral inter-storey drifts and reducing the bending moment acting at the base sections of the columns. First, an analytical formulation for the assessment of the flexural rigidity of corner CSB devices is proposed. Then, a simplified methodology for the numerical analysis of frame structures equipped with corner CSBs is presented. Finally, a parametric analysis by means of finite element models is carried out in order to assess the possible advantages related to the implementation of corner CSB devices on different frame structures with isostatic columns.

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