Numerical Study on Ultimate Capacity of Bi-Modulus Beam-Column

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Abstract : Development of the technology demands a higher-level research on the mechanical behavior of materials. Structural members made of bi-modulus materials have different elastic modulus when they are under tension and compression. The stress and strain states of the point effect on the elastic modulus and Poisson ratio of every point in the bi-modulus material body. Accompanied by the uncertainty and nonlinearity of the elastic constitutive relation is the complicated nonlinear problem of the bi-modulus members. In this paper, the small displacement and large displacement finite element method for the bi-modulus members have been proposed. Displacement nonlinearity is considered in the elastic constitutive equation. Mechanical behavior of slender bi-modulus beam-column under different boundary conditions and loading patterns has been simulated by the proposed method. The influence factors on the ultimate bearing capacity of slender beam and columns have been studied. The results show that as the ratio of tensile modulus to compressive modulus increases, the error of the simulation employing the same elastic modulus theory exceeds the engineering permissible error.

Keywords : bi-modulus, ultimate capacity, beam-column, nonlinearity

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