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Reliability Analysis of Steel Columns under Buckling Load in Second-Order Theory

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Abstract : For studying the overall instability of members of steel structures, there are several methods in which overall buckling and geometrical imperfection effects are considered in analysis. In first section, these methods are compared and ability of software to apply these methods is studied. Buckling loads determined from theoretical methods and software is compared for 2D one bay, one and two stories steel frames. To consider actual condition, buckling loads of three steel frames that have various dimensions are calculated and compared. Also, uncertainties that exist in loading and modeling of structures such as geometrical imperfection, yield stress, and modulus of elasticity in buckling load of 2D framed steel structures have been studied. By performing these uncertainties to each reliability analysis procedures (first-order, second-order, and simulation methods of reliability), one index of reliability from each procedure is determined. These values are studied and compared.

Keywords : buckling, second-order theory, reliability index, steel columns
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