

Nonlinear Inelastic Analysis for Steel Frames



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1 Introduction

In the steel framed structural analysis, there are two common methods: plastic hinge (PH) and distributed plasticity (DP). For the PH method [7, 10–12], two plastic hinges are assumed to be appeared only at two ends of beam-column members when the yielding criteria obtains. This method is simple and efficient in the computational time but in some cases the accuracy is not satisfy. Otherwise, the distributed plasticity [1, 3, 5, 6, 8, 9] can be obtained the higher accuracy depending on beam-column methods, shell element methods, or solid element methods. This method can consider directly initial residual stresses and yielding along the member length. An advanced analysis at least must consider geometric nonlinearity and yielding of materials, besides residual stresses, geometric imperfections, panel zones, etc., should be taken into accounting. Nowadays, the powerful development of computer technology and science permits that big data problems can be solved in a short time so that the safety of buildings is more concerned by structural design engineers.

In this work, the authors employ SF established on the beam-column finite element method for developing two plastic hinge and plastic fiber methods for nonlinear analysis of 3D frames. This paper presents briefly the procedures and algorithms

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