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Investigation on dynamic instability of concrete-filled steel tubular column

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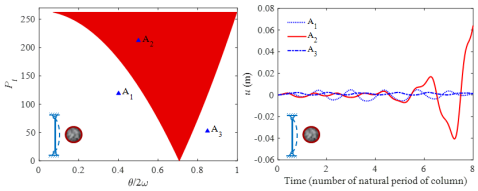
A new method for evaluating the dynamic instability of concrete-filled steel tubular (CFST) column under axial periodic excitation is proposed. The unified equations of dynamic instability of CFST column are explicitly derived based on the differential equations of lateral vibration and the Galerkin method. By employing the theory of Bolotin, the equations of boundary frequencies can be formulated in the format of eigenvalue problem. Subsequently, the regions of dynamic failure can be rigorously constructed by solving the eigenvalue problem. Numerical investigations have been conducted to investigate the applicability and effectiveness of the proposed approach. It is demonstrated that the CFST column, especially those with high slenderness ratios, would become dynamically unstable when the magnitude of the excitation is well below the static buckling load of the column.



(a) Failure regions (b) Dynamic responses

Figure 1: Failure regions and dynamic responses of pin-ended CFST column.

Recent Publications

1. Huang Y Q, Liu A R, Pi Y L, Lu H W, Gao W (2017) Assessment of lateral dynamic instability of columns under an arbitrary periodic axial load owing to parametric resonance. *Journal of Sound and Vibration*; 395: 272-293.

2. Liu A R, Lu H W, Fu J Y, Pi Y L, Huang Y Q, Li J, Ma Y W (2017) Analytical and experimental studies on out-of-plane dynamic instability of shallow circular arch based on parametric resonance. *Nonlinear Dynamics*; 87: 677-694.

Biography

Youqin Huang has his expertise in evaluating the dynamic stability of structures. He has constructed a fresh method to investigate the stability of structure subject to arbitrary parametric excitation. He has also studied the stability of long span wind-sensitive roofs under stochastic wind loads or joint actions of wind and snow, and proposed a method to calculate the equivalent static wind load for the stability design in practical engineering.

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