

Seismic Analysis of Plane Frames Containing Cracks

A computer program has been developed based on fracture mechanics and finite element method to investigate vibration and response spectral characteristics of plane frames containing stationary cracks. The program has been validated using published experimental and theoretical studies. Very good agreement was observed. A local flexibility matrix is used to model the added flexibility at the cracked section. Then, the stiffness matrix for cracked plane frame elements is formulated with a dimension similar to that of common uncracked elements. Special post-processing subroutine, which produces graphical outputs for the vibration and response spectral analyses results, is also developed.

An extensive parametric study is carried out to investigate the relative effects of different parameters (geometrical parameters, support type, crack size, and crack location) of cracked and uncracked plane frames. The minimum number of vibration modes sufficient for adequate response spectral analysis is determined. Effect of input ground motion characteristics on seismic response (Overall drift variation & Spectral moment variation) of cracked and uncracked plane frames is also investigated.