

Seismic Analysis of Buildings Using Direct Displacement Based Design Method

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Abstract

This research presents a comprehensive study to perform the seismic analysis of buildings using Direct Displacement Based Method (DDBM), which is a viable and logical alternative to current force-based code approaches. This method is based on a concept of designing structures to achieve a specified performance limit state defined by strain or drift limits. The main objective of the paper is to examine analytically the use of DDBM in seismic design of different types of structural systems (frame, wall, and dual wall-frame buildings) and compare it with the traditional Force Based Design Method (FBDM). Using a developed Excel spread sheets for DDBM procedure, a set of buildings with different heights (2, 4,6,8,10,12,14,16,18, and 20 stories) and different structural systems (frame buildings, wall buildings, and dual wall-frame buildings) are analyzed and the results are compared with those of (Force Based Design Method) FBDM modeled using computer programs SAP and ETABS. This comparison proved that Direct Displacement Based Method is more reliable as it is based on a secant stiffness (rather than initial stiffness) representation of structural response, using a level of damping equivalent to the combined effects of elastic and hysteretic damping. This design method is extremely simple to apply and is very successful in providing dependable and predictable seismic response.

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