EVALUATION OF SEISMIC RESPONSE OFTALL BUILDINGS WITH FRAMED TUBESKELETONS IN HIGH SEISMIC AREAS

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ABSTRACT

In this research, the performance abilities associated with tube type lateral load resistant framed systems are studied in order to assess the seismic response parameters of steel tall buildings subjected to both far and near-field earthquake records. For this purpose, four 30 story structural models with framed tube based skeletons were selected and designed. The plans of models are squared shape. The structural response parameters have been computed and obtained by conducting a number of non-linear dynamic time history analyses. The structural models have been designed according to the Iranian seismic code 2800(third edition). Findings from this study reveal that, mean maximum demands and the dispersion in the peak values were extremely higher for near-fault records than far-fault motions. The maximum story drift for the studied models was determined and compared with the “life safety” and “collapse prevention” performance limits, as recommended by FEMA 356.

INTRODUCTION

According to the engineering buildings observations associated with structural failures during the last earthquake tremors, there are some absolute uncertainties about the risks of near-fault ground motions on structures with conventional constructions. The subject of building resistance to the wind and earthquake loadshas been the main point in the designation of new structural systems.Moreover, increasing building height as well as keeping its deflection within an appropriate restriction, is another crucial point which would lead to minimizing materials usages. Structures response parameters under earthquakesare fundamentally different from those caused by wind or gravity loads. It is obvious thatmuch more detailed analyses and conceptual explanations would be faced when subjected to strong earthquake loads(Coull and Bose 1975, Bungaleand Taranah 2005).

One of the systems used in the construction of tall buildings are rigid tubular forms whichcan provide the structural efficiency for different levels. Generally, a framed tube skeleton can be defined as a three-dimensional system that providesvery stiff structural bentswhich form a "tube" around the perimeter of the building. This system consists of closely spaced exterior columns tied at each floor level by spandrel beams to produce a huge bent containing orthogonal rigidly frame panels which entirely forms a rectangular tube type cantilever system. The behavior of a framed-tube structure is more complex than a simple closed tube element. This concept was approved in regards to combined shear-flexure behavior of framed tube structures (Smith and Coull 1976, Ali and Moon 2007).