ASSESSMENT OF SEISMIC RESPONSEPARAMETERS OF TALL BUILDINGS WITH TUBE IN TUBE STRUCTURAL SKELETON

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ABSTRACT

In this research, the basic response parameters of the nonlinear dynamic behavior of steel tall buildings with tube in tube structural skeleton were studied. The studied model consists of an exterior braced-tube system and an interior framed-tube.A number of nonlinear dynamic time history analyses were conducted for the studied model under influencing of an ensemble of free field pulse type ground motions. The studied model is a 30-story steel tube in tube structure which contains several beam, bracing and column elements. The designation process has been completed for all of the elements, members sections and the connection zones based on the Iranian national building code (steel structures - part 10). The confirmations of the principle of strong column and weak beam in all connections and the assessment of strength of panel zones have been considered in the designation process. A number of diagonal girders are used in the skeleton of the studied structure to connect efficiently the exterior braced tube to the interior rigid framed tube systems. This improvement would cause an efficient and better distribution of lateral loads between the two resistant bents of the entire structure. The other helpful advantage is to attain to the minor stress ratios in member sections to achieve the more economical structure.

INTRODUCTION

This paper investigates the consequences of well-known characteristics of far-fault and near-fault ground motions on the seismic response of tall buildings with tube in tube structural skeleton. Additionally, pulse-like ground motions are utilized in a separate study to gain further insight into the effects of high-amplitude pulses on structural demands. The studied structural model with a new configuration of resistant bents has been designed based on the Iranian seismic code 2800. This new configuration of flexural and shear bents can be considered as an efficient engineering design criterion in the designation process of flexible tall structures, especially those ones which are constructed in near fault zones (Movahed et al 2014).

The buildings were designed for equivalent static loads but it seems that their overall performances under dynamic loading caused by strong ground shaking still to be unknown (Yousuf and Bagchi 2010). On the other hand, the recorded strong motions in near fault areas contain large amplitude and long period pulses in their acceleration and velocity time histories (Shung and Lili 2007). The mentioned wave-like features can be generally viewed in the first part of velocity time history of various strong earthquake records which are influenced by forward directivity effects (Lee et al 2000). Near-field ground motions with directivity effects usually tend to have high PGV/PGA ratio, may contain distinct pulses in acceleration, velocity, and