A study on the seismic behavior of Tehran tele-communication tower by considering the site conditions

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Milad telecommunication multipurpose tower in Tehran, 435 meters high will be the forth tallest tower in the world at the time of its completion. Same as other tall towers, as a special structure, the seismic behavior of this tower can not be dealt with as other ordinary structures. Furthermore, the issue of seismic design of such systems has not been addressed sufficiently in the existing codes. One of the most important factors, which should be considered in this regard, is the site conditions. This thesis is an attempt for studying this effect.

At first, a brief review has been performed on the theory of soil-structure interaction, and various available computer programs for modeling soil seismic behavior have been investigated for finding out their capabilities and shortcomings. Then the natural frequencies of the tower and its underneath soil have been calculated by using SAP and EDUSHAKE programs respectively. Finally, by using FLUSH computer program, the whole soil-structure system has been modeled and the two cases of absence and presence of the tower have been compared. The results of the latter case have been also compared with the case of tower on rigid foundation as well as simplified case of soil-structure interaction, in which the surrounding soil has been substituted by simple linear springs. As the final design check, the "mean + one sigma" results of the time history analyses, which have been obtained by using normalized bedrock records, have been compared with that of the pushover analysis of the tower in the DBE level, which shows the seismic capacity of the tower.

Based on the numerical results it can be concluded that the present design of the tower is conservative and the factor of safety in its seismic design is satisfactory. An important point, which should be noted here, is the effect of the tower presence on the surface Peak Ground Acceleration (PGA) values in the neighboring area of the tower, which are significantly influenced by the dynamic behavior of the tower to a radius of 400 meters from its centerline – specially in the range of long periods. This effect should be taken into account in the seismic design of the surrounding structures of the tower, particularly the high rise buildings.