

Title Effect of Buildings Plan Curvature and Diaphragm Modeling on Lateral Response of Tall Building

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Abstract

Floor and roof systems in buildings act as an important role to transfer the lateral load to vertical lateral load resisting (VLLR) elements through diaphragm action. Diaphragm flexibility is one of the major concerns for different configurations of buildings. In this study, the effect of rigid and flexible floor diaphragm assumptions for various curvatures of buildings in plan is presented. A typical sixty stories straight building (rectangular in plan) is taken from the Philippines and changing from straight configuration to various curved shaped buildings like 60 degree, 120 degree and 180 degree configurations in plan by keeping overall dimensions constant in each configurations. This research is especially focused on the lateral load effects on different configurations of buildings due to these rigid and flexible floor diaphragms. All the building configurations are analyzed assuming both rigid and flexible floor diaphragm assumptions for different analyses cases like equivalent static analysis (IBC-2006), two response spectrum analyses (IBC-2006 spectrum and El Centro spectrum) and time history analysis (EL Centro ground motion). The analysis results are presented in terms of story shear, story moment, diaphragm CM displacement and story drift. The analysis results show that the structural responses are more for flexible floor diaphragm than rigid floor diaphragm assumption. Moreover, the diaphragm effect is found to be significant if the curvature of buildings in plan is more and even more significant in weaker direction than in stronger direction

Keywords Lateral Load, Vertical Lateral Load Resisting Elements, Rigid Diaphragm, Flexible Diaphragm, Curved Shaped Building, Equivalent Static Analysis, Response Spectrum Analysis, Time History Analysis, Structural Responses, Weaker direction, Stronger direction