Earthquake Resistant Design of Open Ground Storey Building

ABSTRACT

Open ground building (OGS) has taken its place in the Indian urban environment due to the fact that it provides much needed parking facility in the ground storey of the building. Surveys of buildings failed in past earthquakes show that this types of buildings are found to be one of the most vulnerable. Presence of infill walls in the frame alters the behavior of the building under lateral loads. However, it‟s common industry practice to ignore the stiffness of infill wall for analysis of framed building. Design based on such analysis results in under-estimation of building moments and shear forces in the columns of ground storey and hence it may be one of the reasons responsible for the failure observed. IS code 1893:2002 allows the analysis of open ground storey RC framed building without considering infill stiffness but with a multiplication factor of 2.5 in compensation for stiffness discontinuity. As per the code” The columns and Beams of soft storey building are to be designed for 2.5 times the storey shears and bending moments calculated under seismic loads of bare frames. However, as experienced by the engineer at design offices, MF of 2.5 in not realistic for low and mid rise buildings. This calls for assessment and review of the code recommended multiplication Factor for low rise and mid rise OGS buildings. Therefore objective of this study is to check the applicability of multiplication factor of 2.5 and to study the effect of infill strength and stiffness in seismic analysis of OGS buildings. Three Different models of existing RC framed building with open ground storey located in Seismic Zone V is considered for the study using commercial Etabs Software. Infill Stiffness with openings was modeled using a Diagonal Strut approach. Linear and Non-Linear analysis is carried out for these models and results were compared.

Keywords: Infill Walls, Equivalent Diagonal Strut, Open First Storey, Response Spectrum Analysis, Equivalent Static Analysis, Multiplication Factor, Pushover Analysis