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Effect of Stiffness and Strength of URM Infill Walls on Seismic Demands and Response of RC Buildings with Open Ground Storey

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Abstract

In urban reinforced concrete buildings, ground storeys are usually left open to facilitate parking. The earlier and common practice of designing frame members in the open storeys using a scale factor increases member sizes and thereby improves its stiffness and strength. But, this improvement needs to be seen relative to the stiffness and strength of the masonry infill panels in the upper storeys; performance of improved (with increased member sizes and reinforcement) members in open ground storey buildings is largely dependent on the type of masonry infill panels, namely, soft and weak masonry or stiff and strong masonry, present in the storeys above. The effect of type of masonry infills on seismic response of buildings with open ground storey, designed for different seismic demands, is discussed in this paper. Nonlinear static analysis investigations are presented on formation of undesirable storey collapse mechanism in such open ground storey buildings with stiff and strong masonry infills in upper floors. On the other hand, over-designing the open ground storey frame members leads to storey mechanism in the first storey, when infills are soft and weak. Therefore, it is recommended that any solution for improving earthquake behaviour of buildings with open ground storey should also consider stiffness and strength of masonry infills in adjacent storeys. In addition, this study suggests that design of columns for shear demand with increase in drift demand cannot be overlooked, especially in buildings located in high seismic regions. Thus, it is recommended that special confining reinforcements be provided throughout the height of column, as against the current practice of providing special confining reinforcement over a distance 2d from both ends alone, where d is the effective depth of the section, to avoid possible shear failure in columns be-fore flexural yielding.

Keywords: Open storey, Masonry infills, Shear demand, Nonlinear static analysis