ABSTRACT

Infilled frames have sustained the interest of researchers for a very long period of time. Most of the codes of practices still do not specify any guidelines for incorporating them as lateral load resisting systems. Considerable amount of work has been reported in literature on behavior of un-reinforced brick masonry infilled Reinforced concrete frames under earthquake loads but not much work has been done on the behavior of reinforced rat trap masonry infilled frames. However, studies on reinforced rat-trap masonry walls for racking loads have been reported in literature. Provision of reinforced concrete shear walls in the plane of the loads at selected locations is widely resorted to for lateral load resistance due to wind and earthquakes. Masonry infill though considered as non-structural element largely affects the strength, stiffness and ductility of the framed structure during when lateral loads occur due to wind and earthquakes. The infill is relatively brittle and has low tensile strength compared to steel or reinforced concrete (RC) bounding frame. Providing reinforcement in the masonry combines the advantages of masonry and reinforcement. Grouting hollow spaces renders more solidity and bond, while can be economical compared to RC shear walls.

Stress strain behavior of grouted and ungrouted rat-trap masonry has been determined by conducting compression tests on masonry prisms and mechanical properties have been determined for using in finite element formulations.

The basic investigation of infilled frames under seismic loads begins with the estimation of the natural frequencies of the structure or system under consideration. Experimental studies have been carried out on two dimensional reinforced concrete frames under different configurations of masonry infill in addition to bare frames using shake table. The models are subjected to base acceleration with three different earthquake spectra corresponding different zones of India and earthquake of Kobe Japan. Natural frequency and peak acceleration are experimentally evaluated. This experimental program is carried out at Central Power Research Institute (CPRI), Bangalore.

Finite element models are developed to evaluate the natural frequency and peak acceleration response. The numerical and experimental results are compared to validate the model. Multi-storey (four) RC frames with and without infill are employed for study, along with soft ground storey. Finite element models of fully infilled frames and frames
with stilt floor have been analyzed for three aspect ratios & three different earthquake spectra. Linear elastic analysis is carried out for studying the deformation, stress and acceleration response. The study is carried out with five different type of infill masonry on fully infilled frames and infilled frames with stilt floor.

The results are quite satisfying in terms of strength, stiffness and acceleration response of frames for dynamic loading generated by earthquakes. Rat-trap masonry with reinforcement in hollow spaces with grout can be a very effective lateral load resisting system in all zones for moderately tall structures while its effectiveness for very tall structures needs investigation.