INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Shear Behavior of Columns in Masonry Infilled RC Frames under Lateral Loads**

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SHORT ABSTRACT

Reinforced concrete (RC) frame buildings with unreinforced masonry infills are widely used in developing countries with high seismicity. Even though the presence of infills has a significant influence in enhancing the strength, stiffness and energy dissipation, these are frequently neglected in the seismic design calculations. The increase in lateral stiffness of infilled frames leads to attract larger forces, and the confining columns should have sufficient capacity to resist the increase in shear demand near the contact zones with infill. This local adverse effect of infill is more pronounced in ground storey columns leading to collapse of the entire structure, especially where one-sided imbalanced contact exists between columns and infill. Therefore, the primary objective of the present study was to investigate the effect of infill on shear demand and failure of columns, and develop methodologies to prevent or delay the shear failure of columns. Prior to the development of methodologies, it is important to understand the modelling and design requirements of current earthquake standards concerning the design of masonry infilled RC frames. At the same time, the realistic evaluation of shear failure of columns requires suitable material and analytical models. To develop a nonlinear material model, a detailed material characterisation needs to be carried out, as most of the times the nonlinear properties of masonry significantly vary due to their composite nature and geographical dependancy.

In the current study, the nonlinear material characteristics of fly ash brick masonry and its constituents were determined under different loading conditions (compression, tension and shear). Simple empirical relations were proposed to estimate the strength and modulus of fly ash brick masonry under compression and shear. A preliminary experimental study was carried out to assess the recommendations of the current seismic standards on design of masonry infilled RC frames by investigating half-scale frames under in-plane slow cyclic loading. From the study, it was found that the columns were susceptible to shear failure even though special detailing requirements of earthquake standards were followed. The existing analytical macromodel was improved by simulating the effect of infill along the contact length between column and infill. From the analytical study, it was perceived that the improved analytical model predicted the shear failure of columns. To prevent or delay the shear failure of columns, three methodologies (increasing the dimensions of the columns to consider the effect of infill, using weak and soft masonry to reduce the effect of infill on columns, and decreasing the frame-interaction using collector beams in infills) were adopted in the current study. It was found that the methodologies were feasible options in delaying the shear failure of columns without compromising the other functional requirements.