THE UNIVERSITY OF ADELAIDE

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

# EARTHQUAKE RESPONSE OF REINFORCED CONCRETE FRAMES WITH MASONRY INFILL PANELS

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# ABSTRACT

Infill walls substantially influence the strength and stiffness characteristics of framed structures, their energy dissipating capacity and considerably reduce the period of oscillation. If frames are designed taking into account the presence of infill walls, the walls might have a beneficial effect on their performance during earthquakes. This research is a theoretical investigation into the lateral response of reinforced concrete frames with brick masonry infill panels. A review of the literature describes the main trends in the solution of the problem of infilled frames. This research made use of the two main approaches: the finite element method for static analysis and the diagonal strut analogy for dynamic analysis. Eight models were investigated to qualitatively assess the influence of the relative stiffness of the frame and the wall, the length to height ratio and the presence of a construction gap on the overall response of the frame-wall system.

The static analysis was performed using the finite element program "Images - 3D" to investigate the behaviour of the frame-wall system in the elastic range of the masonry material. However, non-linear spring elements modelled the frame-wall interface. Strength and stiffness values of the wall panel at yield were derived from the results of the static analysis and were later used in the non-linear dynamic analysis.

The dynamic analysis was carried out using the non-linear analysis program "Ruaumoko". A model of a reinforced concrete frame braced with one diagonal was developed. The frame elements and the diagonal elements were able to develop non-linear deformations thanks to the variety of non-linear hysteresis rules available in "Ruaumoko". Two generalised types of models were developed: one for the case of perfect fit (which was assumed to correspond to the realistic situation of a gap equal to or less than 5mm) and one for the case of presence of a construction gap (which was assumed to correspond to any gap size more than 5mm). The response of these models under cyclic loading was verified by comparison with experimental results by other researchers.

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