EFFECT OF INFILLS ON TORSION AND SOFT STOREY IN A CONVENTIONAL RESIDENTIAL BUILDING IN TEHRAN-IRAN

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ABSTRACT

Masonry infill walls are usually consideredas non-structural elements, so analysis and design of structures are based on the bare frames.Butmany experiences of past earthquakes show that some designed and constructed buildings by engineers have been damaged during earthquakes because of disregarding the negative effects of walls.

The main goal of this paper is to evaluate the amount of overall detrimental effects of infill walls such as torsion and soft storeyin conventional buildings.A5-storey residential building in Tehran has been selected as a case study.For studying the effects of infill walls in seismic behaviour of structures, simulations have been performed with and without walls to compare construction condition with design condition based on linear static method. To model infill walls an equivalent compression diagonal strut has been used.

As a result of this case study it can be said that the building in construction condition will suffer torsion because of infill walls which are not modelled in design process but connected to the structure in implementation. Since this research has been done on a residential building in southern lot with the most symmetrical arrangement of infill walls, it increases the importance of studying arrangements and connections of walls in other buildings such as ones located in northern or corer lots. Contrary to the initial impression that there is a soft storey in urban buildings because of parking and open spaces on ground floor, in buildings with architectural design similar to the analysedone, due to the high stiffness ratio of the structure on ground floor to the upper floors, soft storey would not happen with a high safety factor.

INTRODUCTION

Nowadays structural engineers usually consider masonry infill walls as non-structural elements during analysis and design process of buildings (MondalandJain, 2008;Tsai and Huang, 2009; Rodrigues et al, 2010; Pradhan et al, 2012;Noorifardet al, 2014) and only calculate their weight. Consequently, analysis and design of the structures are based on the bare frames without the effects of infills(MostafaeiandKabeyasawa, 2004; Pradhan et al, 2012; Noorifardet al, 2014).Experiences of past earthquakes show that some designed and constructed buildings by engineers have been damaged during earthquakes because of disregarding the negative effects of walls(Tabeshpour, 2009; Rodrigues et al, 2010).Althoughseismicstandardssuch asstandard No. 2800implicitly takeinto accountinfill walls in calculation and determination of seismic forces butthey areoftenneglected.In fact, despite special attention to seismic resistant design of structures, disregarding to infill walls willcauseloss of lifeand property(Mahdi Tet al, 2010).