



EFFECT OF MASONRY WALLS ON NATURAL PERIOD OF 8-STOREY RC MOMENT RESISTING BUILDINGS

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Abstract

Masonry infills are considered as non-structural elements in the design of buildings. Design codes, make structures more flexible because in calculating the natural period of RC buildings they don't consider effect of masonry infill properties Such as: stiffness of infill, infill thickness and percentage of opening in panels. Empirical equations of design codes have been developed according to the observed period of real buildings during ground motions. In this paper, we try to present a method to calculate the natural period of RC moment structures with considering masonry infill properties. In this case, the natural periods of RC moment building have been calculated by the three-dimensional FE modeling method and modal eigenvalue analysis by including the effect of the masonry panels, then the results of the finite element method are compared with results of seismic design codes. Finally, the formula for calculating the natural period of RC buildings have been presented.

Keywords: Natural Period, Masonry Infill, RC Moment Frame, Building Design Codes.

1. INTRODUCTION

Iranian code for seismic resistant design of buildings (standard 2800) [1] give the empirical relation to forecast the natural period of buildings. This equation is based on the type of structure (reinforced concrete or steel), kind of seismic resistance system (frame, shear wall, etc.), and height of the building [2]. With the wide availability of high-speed personal computers it is now possible to develop a rigorous finite element (FE) model of a structure and determine its natural period by means of the exact eigenvalue analysis or by any rational method like the Rayleigh's method [3]. The infills cause that displacement of buildings be limited, therefore lateral stiffness of the buildings are increased. Increasing of the stiffness of structures, causes that a larger force applied to structures during an earthquake. Finally, the structure may be demolished because the structure didn't design for this force [4,5]. We have been tried to present a new formula for calculating the natural period by changing the original specifications of masonry infill such as stiffness of infill, thickness of infill and opening percentage of infill. For analysis of the models we used the finite element method. Also, their influence on the natural period of reinforced concrete structures have been evaluated.

Iranian code for seismic resistant design of buildings (standard 2800) [1], for calculating the natural period of the RC moment building, has presented formula (1):

$$T = 0.07H^{3/4} \quad (1)$$

H: Height of the structure (m). If the building has masonry infill walls, the value obtained from this equation should be multiplied by 0.8.

2. FE-MODELING AND ANALYSIS OF RC MOMENT FRAMES WITH INFILL

Three important parameters, which can change the mass and stiffness of structures, are infill material (stiffness of infill), infill thickness and opening percentage of panels [4]. To evaluate the influence of these