# Effects of Infill Wall Models on Vibration Period and Seismic Response of a Building

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## ABSTRACT

Nonlinear Response History Analysis (NLRHA) is a dynamic method for analyzing structures subjected to earthquakes. This approach considers the nonlinear behavior of building materials and components, enabling the calculation of the responses during nonlinear behavior and often yielding accurate analysis results. To achieve this, it is essential to create a model that closely represents the configuration and material properties of the actual building. However, this process consumes significant computational resources. In practice, detailed modeling is typically considered for the primary structural components, such as columns, beams, and structural walls, while non-structural components are often simplified to reduce the analysis process. For instance, an infill wall with characteristics resembling a shell is often represented as an equivalent compression strut placed diagonally along the wall. This equivalent strut model primarily aims to simulate nonlinear behavior up to the infill wall's failure point. Nonetheless, during low-level vibrations or at the onset of an earthquake, many building components begin to exhibit linear behavior. In such cases, the equivalent strut model may provide less stiffness for resisting lateral forces than the actual wall, leading to a higher vibration period in the building model compared to the vibration period obtained from ambient vibration measurements. This disparity can adversely affect the accuracy of calculations. In this research, the objective is to investigate the impact of infill wall models on the response of a building model using nonlinear response history analysis methods by comparing the results of the building model using the elastic modulus of the equivalent strut with two values: (1) the value obtained from previous research and (2) a modified elastic modulus value adjusted to match the building model's vibration period with that obtained from actual building measurements. The research focuses on a 5-story reinforced concrete building and employs a 2D lumped-mass model. The model of the rigid frame is linear system, while the equivalent strut exhibits nonlinear behavior. The findings indicate that the vibration period of the building model, when using the recommended elastic modulus from testing, was higher than the vibration period obtained from actual building measurements. The responses of building modeling, such as shear forces, moments in columns, and equivalent strut forces, are discussed with vibration periods in different elastic ranges.

**Keywords**: Reinforced concrete building, Infill wall, Vibration period, Nonlinear response history analysis

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