Effect of Vertical Irregularities on Buildings in Different Seismic Zones of India

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Abstract

Vertically irregular buildings are frequently constructed all over the world for both functional and aesthetic reasons. However, post-earthquake fact-finding survey studies reported that buildings with vertical irregularities were extremely seismically vulnerable. As a result, it is critical to investigate the causes of their high seismic vulnerability in order to enhance their performance. The vertical irregularities in the buildings are caused by asymmetric distributions of mass, stiffness, and strength. These irregularities in the structures results in the floor rotations (torsional response) in addition to floor translations. In this study, the seismic behaviour of vertical irregular buildings located in different seismic zones of India are assessed. The vertical irregular building configurations such as step back, set back, step back-set back, and split foundation are considered in this study. The analysis is performed using finite element software. From the study, it is observed that the performance of vertically irregular building is different in different seismic zones.

Keywords: Include a list of not more than 10 keywords, for example: post-tensioning; anchors; slabs; walls; high-rise buildings.

Keywords: Irregular Building; Seismic Zone, Earthquake resistant design.

1 Introduction

India's seismicity and topography pose significant challenges for building design, as the country is located in a region that is prone to earthquakes and home to a diverse range of geographical features[1]. Several regions of India are classified as high or moderate seismic zones, and buildings and infrastructure in these areas must be designed to withstand seismic forces, including ground shaking, liquefaction, and landslides[2]. Building codes [2] and regulations in India take into account these factors to ensure that buildings and infrastructure are safe and resilient. India's seismic activity is classified into four seismic zones based on the level of seismic activity. These seismic zones are defined in the Indian Standard code of practice for earthquake-resistant design of structures, IS 1893. Zone 2 covers parts of northern India, including Delhi, and is considered a moderate seismic zone. The zone is characterized by low-to-moderate seismicity, and the earthquakes here are usually of small magnitude. Zone 3 covers most of northern and eastern India, including the Himalayan region, and is considered a moderate to high seismic zone. The zone is characterized by moderate-to-high seismicity, and earthquakes of moderate to large magnitude are common. Zone 4 covers parts of Gujarat, Maharashtra, and

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