

Base Isolation for Seismic Retrofitting of Flexible Residential Building

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1 Abstract

Cities facing post-seismic event trauma frequently make the choice of base isolation technology for the retrofitting or reconstruction of their strategic facilities to guarantee the continuity of the services critical to their population. Consequently, most hospital and emergency buildings are base isolated in earthquake prone cities. On the contrary, the technology is very seldom used for residential buildings. In cities where a large part of the private housing building stock is made of 8 to 12-storey high RC frame buildings, two reasons are usually put forward to discard retrofitting by base isolation: the supposed high cost of the isolation system and its low efficiency due to its structural flexibility.

Two recent case studies demonstrate the relevance of base isolation for the retrofitting of typical RC frame housing building. The design of the retrofitting of an 11-storey RC frame structure in Mexico City will first be presented. The second case study will detail the Moda Building in Istanbul, a 10-storey RC structure for which seismic retrofitting has recently been completed using base isolation.

The base isolation retrofitting of these two flexible buildings will be detailed in this paper, demonstrating the efficiency of such a retrofitting solution for residential building, both in terms of cost and dynamic behavior..

Keywords: Structural engineering; Seismic isolation; Residential building; RC frame structure; Practice case studies

2 Introduction

Buildings are commonly classified according to their stiffness in 4 categories: stiff structures for vibration periods $T < 0.3s$, medium stiff structures for $T \sim 0.3$ to $0.7s$, flexible structures for $T \sim 0.7$ to $1.5s$ and very flexible structures for $T > 1.5s$. Base isolation is amongst the most advanced techniques for seismic protection of new and existing stiff and medium stiff structures; moreover, an effective design of the isolation system allows the structure to be fully operational even after major earthquakes. This is of fundamental importance for critical facilities such

as infrastructures, hospitals, emergency operations and communications centres.. Seismic protection of stiff structures by base isolation has been widely reported on the past years, and has been the subject of many technical publications

On the contrary, this technology is very seldom used for residential buildings which, in the geographical zones considered in this paper, are in majority made of reinforced concrete frames having a maximum height of 40m (8 to 12 storeys). With such residential buildings, seismic isolation is often discarded as a retrofit option for two main reasons: it's supposed low efficiency due to the