17th Symposium on Earthquake Engineering
November 14-17, 2022
IIT Roorkee, India
Paper No. 52

Structural Behaviour Assessment of Existing Reinforced Concrete Buildings under Earthquakes

Nagapurna Chandan Thammishetti[1], Gopi Krishna K[2]

[1]Research Scholar, Department of Civil Engineering, National Institute of Technology Warangal, India.
[2]Associate Professor, Department of Civil Engineering, National Institute of Technology Warangal, India.

Abstract

The reinforced concrete (RC) buildings are a common sight in any urban environment and are often treated as a safe habitat. However, these myths have proved futile during devastative earthquakes (Bhuj (2001), Manipur (2016), Nepal (2015), Sikkim (2011) etc.,) which has exposed the weakness of engineered buildings in facing the eventuality. In view of this, seismic codes have undergone revisions with time to provide a safe and functional RC building design under earthquake forces. However, given the research updates resulting in revisions of seismic codes, there is a need to evaluate the performance of existing RC buildings ensuring conformity of latest code regulations. It has been reported that most of the existing RC buildings were constructed with or without seismic provisions and are proved to be vulnerable during a disastrous earthquake event. Hence, due to the necessity and importance of transforming these vulnerable building stocks into safe functional buildings, seismic structural assessment of RC buildings is a necessity. Therefore, RC multistoried building existing in Warangal city, Telangana State is considered as case study to visualize the structural behavior under earthquake forces. The nonlinear static analysis is performed on the structural model of the existing Multistoreyed RC building to evaluate its inelastic behavior. The outcome of this analysis envisages the structural capacity and its performance under design earthquake forces in terms of response parameters i.e., absolute horizontal displacement, inter storey drift (IDR) and ductility. Further, suitable repair/strengthening measures necessary for the building structure to remain functional at the chosen performance objective during its serviceable lifetime can be proposed. Moreover, the structural assessment of modified / strengthened structural model conforming to the latest IS (Indian Standard) codal provisions for the chosen performance objective, portray its structural behaviour and non-linear capacity achieved under design seismic load. It can be observed from the results, that existing old RC building possess limited or no ductility and modified /strengthened RC building structure has improved capacity and ductility. This approach of ensuring the functionality of the RC building configuration for the chosen performance objective needs to be extended for all existing RC buildings in any urban environment to arrive at safe functional and resilient habitat for the mankind.

Keywords: Nonlinear static analysis, Strengthening measures, Inelastic behaviour