

Comparative Evaluation of Selected Retrofitting Techniques for Seismic Performance of RC Buildings



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ABSTRACT

Nepal lies within a highly active seismic belt, as the 2015 Gorkha Earthquake made evident by exposing the structural fragility of many reinforced concrete (RC) buildings constructed with little attention to seismic detailing. Lacking adequate lateral load-resisting systems, such buildings undergo excessive storey drift and displacement during ground motion. Retrofitting offers a practical and economical means of improving their resilience, yet engineers are often left to choose among competing methods with limited comparative guidance, particularly where both structural performance and cost must be weighed together. This study evaluates and compares the seismic performance and relative cost efficiency of three widely adopted techniques-shear wall addition, RC column jacketing, and fiber-reinforced polymer (FRP) wrapping-applied to a typical multi-storey RC building. A representative structure lacking proper seismic design was modeled in ETABS and analyzed using the linear static and response spectrum methods to establish its baseline condition. Storey drift, lateral displacement, base shear, and fundamental time period were extracted and checked against the acceptance limits of NBC 105 and IS 1893 to identify seismic deficiencies. Each retrofitting technique was then applied individually to the base model, and the strengthened configurations were re-analyzed under identical loading conditions to ensure an equitable comparison. The improvement achieved by each method was assessed and supplemented by an approximate cost estimation based on material quantities and standard unit rates, allowing performance gains to be related to economic feasibility. The study is expected to clarify the comparative effectiveness of the three techniques and to identify the most suitable balance of seismic performance and cost for the Nepalese context, thereby providing practical guidance for the strengthening of vulnerable RC building stock.

KEY WORDS:

seismic retrofitting; reinforced concrete buildings; column jacketing; FRP wrapping; ETABS