

## **Performance assessment of Residential building considering functional modification and its strengthening using fiber reinforced polymer technique.**

**Abstract**— The beam column joint is the crucial zone in a reinforced concrete moment resisting frame. It is subjected to large forces during severe ground shaking and its behavior has a significant influence on the response of the structure. The performance of the building is well characterized by the capacity of beam- column joint. Basically, those joints develop large shear under seismic action and undergo brittle shear failure with development of shear hinges. So, reinforced concrete beam- column joints need ductile detailing to resist high shear forces during severe earthquakes. In context of Nepal, due to rapid urbanization and costly land in city areas residential buildings are being modified structurally as well as functionally. Such modifications have compromised the performance of the structure and increased the vulnerability during severe earthquake. This paper aims to assess the performance of a residential building modified to an office building, that is functional modification, using pushover analysis and presents a solution to strengthen it using glass fiber reinforced polymer (GFRP). Design-oriented approach is applied in strengthening the building elements as it is suitable for direct use in practical design. In this paper, Turkish earthquake code 2007 is referred to incorporate the design- oriented approach. It is found that the use of single GFPR layer increased the global displacement ductility 3 times the original while shear capacity of column increased by 26.79%. It is found that functional modification has lowered the performance of the building and concluded that the use of GFRP layer has significantly increased the performance of building from ultimate collapse to immediate occupancy level.

**Keywords**—*Fiber reinforced polymer (FRP), beam- column joint, ductility, pushover analysis, performance point, design- oriented approach.*