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Seismic Vulnerability Assessment of Low-Rise Reinforced Concrete Buildings in Kathmandu, Nepal

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ABSTRACT

In seismically active cities like Kathmandu, there often exists a need to assess the seismic vulnerability of a large number of poorly designed buildings within a short period of time. Traditional analysis techniques do not work because they require building data that are either inaccurate or unavailable. One alternative to traditional analysis techniques is to use simple correlations like the Priority Index. This index uses basic building information such as floor area, column area, and wall area to estimate the seismic vulnerability of a building. Following the 2015 Nepal earthquake, 146 low-rise reinforced concrete buildings were surveyed in Kathmandu, Nepal. All data collected were made publicly available on DataHub (datacenterhub.org/resources/238). Indices such as the Wall Index (WI) and the Column Index (CI) were computed for each surveyed building and compared to index values obtained from similar surveys conducted in Turkey and Haiti. A plot of WI versus CI showed that 92% of all the points representing buildings with severe damage are bound by a line drawn from 0.2% WI to 0.4% CI. If this line is used as a threshold to identify the most vulnerable structures, 91% of the buildings surveyed in Kathmandu would have been classified as such. The indices used also showed good correlation with observed damage levels in Kathmandu. This correlation between vulnerability estimates and observed damage levels suggests that Priority Index can be used as a rapid and cost effective analysis tool to rank low-rise reinforced concrete buildings in terms of seismic vulnerability.

KEYWORDS

2015 Nepal Earthquake, Structural Engineering, Low-Rise, Reinforced Concrete, Priority Index