

Increment of material usage in construction of four storey reinforced concrete building due to seismic design

ABSTRACT

Malaysia is fortunate because it is located outside the Pacific Ring-Fire region which is seismically active. However, it still exposes to earthquake hazard from Far-Field earthquake from neighbouring countries. In Peninsular, it is exposes to Sumatra-Andaman earthquake from Indonesia. In East Malaysia, to states namely as Sabah and Sarawak are expose to Philippines earthquake. Besides, Malaysia also experienced earthquakes from local faults such as Bukit Tinggi in 2007. On 5th June 2015, a moderate earthquake with $M_w6.1$ occurred in Ranau, Sabah which caused 18 fatalities. The same event also caused damage to 61 buildings around Ranau and Kundasang. For the sake of safety, construction of new buildings in Malaysia has to consider seismic design. This paper presents a study to evaluate the increment of construction materials used due to consideration of seismic design. A typical four-storey generic reinforced concrete school building had been used as model. This study adjusted the value of reference peak ground acceleration, ag_R in modelling, analysis, and design process. The concrete grade was fixed as C30. Four soil types had been considered for all models with seismic design consideration. Findings from this study demonstrate that the consideration of seismic design caused the increment of steel reinforcement around 16% to 32% for beam and 1% to 14% for column. In term of cost of structural work, consideration of seismic design increases the cost in range of 2% to 5% compared to the nonseismic design. Therefore, it is worth for Malaysia to fully implement the seismic design in new development.