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Local wisdom to a sustainable non-engineered brick building

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Abstract

With the increase of wealth, people tend to modernize their houses by replacing the traditional wooden houses to brick buildings. Unfortunately most of these "modern non-engineered buildings" collapsed during earthquake, while the traditional wooden houses remain undamaged. In previous studies, the authors have shown that the strength of the traditional building was in the construction of the columns which were not fixed to the ground but rested on top of flat stones, hence simulating friction base dampers.
In this study a typical non-engineered brick building is used as a prototype, it is also assumed that this building is built properly. Two types of building are considered, the first one has its tie beams anchored to the foundation. While in the second one, the tie beams are not anchored to the foundation, allowing the building to slide thus simulating friction damper. Both non-engineered brick buildings are subjected to spectrum consistent earthquake excitations with several return periods. The prototype building with anchors is treated as pinned on the anchor locations, while the one without anchor is treated as friction base isolation. A third building assuming no infilling brick wall is also analyzed as a comparison. The result shows that the two buildings can stand to earthquake with a return period of 500 and 2500 year, however the one with pinned base suffers some small damages. However the bare frame already showed extensive damages due to 500 year earthquake. It is worth to note that the building with friction base attracts only 66% of the total base shear of the one with pinned base.

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*Keywords:*Friction base isolation; non-engineered brick building; seismic performance

1. Introduction

Although the first Indonesian earthquake code was introduced in 1971 [1], after more than forty years, despite all effort to disseminate the principle of good earthquake engineering design and construction, in recent earthquake events, such as Padang, October 2009, Bengkulu, September 2007, Yogya, Mei 2006, Nias, March 2005, a lot of

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modern buildings collapsed (Figure 1a), while traditional building such as Northern Nias, *Omo Hada* (Figure 1b) survived without any damage [2].

Fig. 1. (a) Nias 2005: Modern Building; (b) *Omo Hada* (Lase, 2005).

Fig. 2. (a) A three story shop house (Bengkulu September 17th 2007, private documentation); (b) Wooden house (Bengkulu September 17th 2007, private documentation).

Fig. 3. (a) *Uma Lengge*; (b) Base of *Uma Lengge*.