

# Possibility of liquefaction and damage analysis of Thai Pagoda due to seismic hazard In Chiang Saen district

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## ABSTRACT

According to the legend of Yonok Nakorn, Yonok City fell due to the tremendous seismic hazard in 1000 B.E. The The Yonok City sank into the ground, and that area became a large water reservoir called the Viang Nong Lom. Investigating this legend, which happened in northern Thailand around 1500 years ago, is fascinating. Liquefaction after the seismic hazard is one possibility to explain this legend. This paper presents the possibility of liquefaction from the seismic in Chieng Saen district, which is Viang Nong Lom's location. According to the Mae Chan Fault, Chieng Saen has a high potential for seismic hazards. Consequently, probabilistic seismic hazard analysis in the Mae Chan Fault area was investigated. Then, the possibility of liquefaction was evaluated for various seismic hazard levels by using the soil investigation data and laboratory results of the soil in the area. The 3D laser scanning technology was also applied to collect the current geometrical morphology of the ancient pagoda in Chieng Saen. Finally, the nonlinear finite element analysis is used to simulate the damage investigation of a Thai Pagoda due to seismic and liquefaction hazards. The Chedi Luang Pagoda in Chieng Saen was a case study. The results indicate that the peak ground acceleration in Chieng Saen is in the range of 0.1-0.15g and 0.3-0.35g for the 475-year and 2475-year return periods, respectively. The soil investigation data reported that there is a possibility that liquefaction could occur in the South of Viang Nong Lom and some areas of Chieng Saen. Finally, some finite element solutions are reported to show the damaged contour on the pagoda surface and the deformation according to the seismic and liquefaction.

**Keywords:** Liquefaction, Seismic Hazard, Damage Analysis, Thai Pagoda, Finite Element Method, Chiang Saen