

# Performance of low-cost sensors on ambient vibration measurement and structural health monitoring system

Nakhorn Poovarodom<sup>1,\*</sup>, Amorntep Jirasakjamroonsri<sup>1</sup>, Nuttaphon Magteppong<sup>1</sup>, Teraphan Ornthammarath<sup>2</sup>, Pennung Warnitchai<sup>3</sup>

<sup>1</sup>Thammasat University

<sup>2</sup>Mahidol University

<sup>3</sup>Asian Institute of Technology

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## ABSTRACT

Structural Health Monitoring (SHM), which involves continuously monitoring response of a building to environmental conditions during storms or seismic events, is an efficient and accurate tool for evaluating ability of the building to withstand natural forces such as wind and earthquake. In Thailand, such systems are not widespread due to their high cost and the lack of locally developed solutions that can support the system in the long term. Nevertheless, past seismic events have made residents in northern regions, and Bangkok acutely aware of the vibrations caused by these events. This heightened awareness has raised concerns about the post-event structural integrity of buildings. It has led to business interruptions for companies and organizations occupying these buildings. Therefore, it is advisable to install SHM systems in important buildings to continuously monitor their behavior. The benefits of installing SHM systems in buildings include immediate post-event safety assessment, providing occupants with information on the building's safety for future use. This research presents the development of a cost-effective and highly efficient SHM system for assessing the impact of earthquakes on structures. The process involved designing and constructing a vibration monitoring system and a data processing unit. The initial testing of this equipment was carried out against reference equipment to assess its capabilities. The study primarily focused on evaluating the equipment's performance in monitoring vibrations at ambient levels. Furthermore, the system was successfully installed in a 14-story hospital building in Chiang Rai, a 14-story hospital building in Chiang Mai, and a 37-story building in Bangkok. The installation allowed for the clear and precise detection and recording of vibrations caused by several seismic events. The findings serve as valuable guidelines for future applications of this system in various types of buildings.

**Keywords:** Structural health monitoring, earthquake impact assessment, vibration monitoring system, cost-effective, building safety assessment