

Multi-modal Analysis of Vibration and Meteorological Data for Structures on the World Heritage Site “ Battleship Island”

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ABSTRACT

Hashima Island in Nagasaki City in the south of Japan was registered as a World Cultural Heritage in 2015 [1]. The island was an offshore city that prospered as an undersea coal mine from the 1800s, and had a population density higher than that of Tokyo. The shape of the island resembles that of a battleship, so it is also referred to as “Gunkanjima” (or Battleship Island). As a result of the effect of the energy policy from the 1970s onwards the mine closed on 15th January 1974. Thereafter Battleship Island became unoccupied, but a group of building structures that are degrading with time under the severe natural environment remain. The authors have installed various types of sensors on the group of structures on Battleship Island, and are performing monitoring [2]. Building No. 3 contributes most to the resemblance of the silhouette of this island to a battleship. It is the most important among the structures of Battleship Island and must be preserved. A new vibration monitoring system was installed on Building No.3 in May 2019. Building No. 3 is a 4-story reinforced concrete structure; a total of four accelerometers were installed on the first story and the rooftop on both sides of the rectangular plan, and vibration measurements for the structural health monitoring [3] have been carried out over several months. Every two hours microtremor measurements are performed for 10 minutes, and in addition when vibrations exceeding a certain level occur such as during typhoons, vibration measurements are taken. On the other hand, meteorological sensors were installed on the rooftop of Building No. 3 in October 2017, measuring items such as air temperature, humidity, atmospheric pressure, wind direction, wind velocity, sunlight intensity, and rainfall. This paper presents the results of analysis of the dynamic properties of Building No. 3, obtained from a multi-modal analysis of the vibration data and the meteorological data.

REFERENCES

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