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Seismic characteristics in the vernacular architecture of Meghalaya

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The tribes of Meghalaya, India, are the indigenous inhabitants of the Khasi and Garo hills. The region is well-known for its infamous seismic activity. It is located in the highest risk zone (V) in terms of earthquake vulnerability in India. Tribal architecture has evolved in response to these vulnerabilities. Khasi and Garo tribes North-East India have mastered the art of building on slopes and terrains due to the sloppy topography of their indigenous habitation. Closely-knit tribes build houses out of locally available natural materials such as bamboo, cane, timber, wood from rubber trees, and dried palm leaves. The research examines the seismic resistance characteristics of the documented dwellings of the Garo and Khasi tribes, as well as how these inherent characteristics influence the spatial heterogeneity of traditional architecture.

The physical and structural characteristics of vernacular houses were identified and studied during field excursions. Photogrammetric documentation technique used to comprehensively document the structures and their immediate surroundings in order to construct precise mesh models and comprehend them in their totality. In Khasi villages, narrow lanes link closely spaced buildings, and stone stairs lead to each house entrance. Buildings are constructed in little depressions beneath the crests of hills to provide shelter from storms and heavy winds. Khasi homes are built on a plinth, and some have a raised wooden floor in the walls. The Khasis carve traditional houses into symmetrical oval or egg-like shapes, with roofs that resemble an overturned boat. The ground plan of the Khasi house is rectangular, with a half-circular section in the front area of the building as shown in Figure 1. Khasi houses are built with the east in mind. Some natives attributed the resemblance to eggs to the traditional belief that eggs are a source of life, and that the eggshell protected the contents of the egg in the same way that traditional houses protect their occupants[1]. Local traditions dictate that Garo traditional settlements be built on a hilltop or on a slope leading down to a river, with houses often built-in clusters around a central dancing or ritual space. Garo houses are constructed by members of the Garo tribe from locally sourced materials such as bamboo, timber, and cane, amongst other things. These structures are used for a variety of purposes, including granaries and bachelor's apartments, among others. The ground plan of the Garo house is rectangular, with a half-circular section in the front area of the building. It can be accessed through the entrance porch with a pitched roof at the front as shown in Figure 2.

The construction materials employed in both styles of architecture are clearly similar—bamboo, wood, cane, reed, thatch, mud, and coir—with a few exceptions, such as the use of stone by only Khasis. When it comes to structural systems, however, the inclusion of these materials into different building components varies. Despite the fact that these homes are all responding to the same environmental concerns, there is a significant difference in overall building design and material integration amongst tribes. They've discovered a

variety of strategies to be self-sufficient and resilient. The differences in the construction methods of the two

types of dwellings in Meghalaya reveal the varied nature of their location, setting, culture, and tribal habits, as well as the severity of climate and disasters and the availability of resources locally. Detailed results will be presented in the full-length paper.

References

- [1] B. I. O. Dahunsi and A. K. Mittal, "Earthquake resistant characteristics of traditional Khasi houses in Shillong, India," *WIT Trans. Ecol. Environ.*, vol. 113, pp. 159–168, 2008, doi: 10.2495/ARC080161.

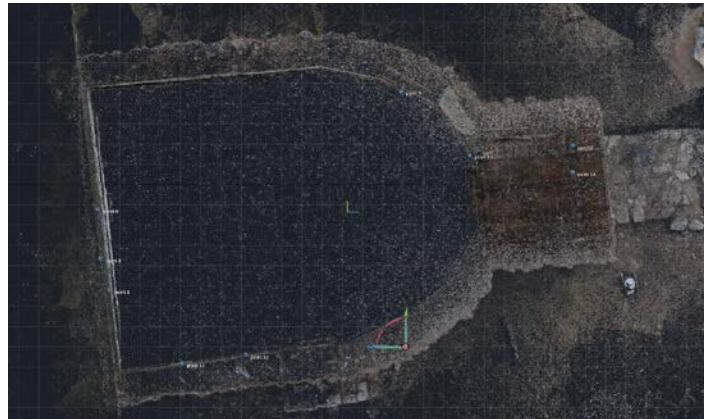


Figure 1 Plan of vernacular house of Khasi Tribe



Figure 2 Plan of vernacular house of Garo Tribe