

琉球大学学術リポジトリ

熱帯インドネシアにおける伝統的住宅の熱環境制御に関する研究

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A Study on Thermal Environmental Control of Traditional Houses in Tropical Indonesia

Adrianus Bannepadang

Abstract:

Over three hundred tribes and hundreds of styles of their traditional houses are counted in thousands of islands of tropical Indonesia. These traditional houses which mainly follow local traditional rules are also designed by local climate, material and technical backgrounds. “Tongkonan” in Toraja region of Sulawesi island is one of the most characteristic traditional houses famous for its unique design and as a representation of Austronesian style. The main purposes of this study are to evaluate thermal comfort levels of local houses in Toraja area based on a field survey and to derive traditional ancestors’ wisdom to live in tropical zone comfortably. Full-scale measurements were carried out in three types of houses: one is a pure traditional house, Tongkonan, the second is a traditional house modernized from Tongkonan, the third is a modern house of international style. Quantitative thermal environmental data obtained by the measurement of air temperature and humidity in and around the houses, surface temperature on the walls of the houses, and solar radiation and wind speed were measured in three types of houses were used for the analysis in this study. The results of the measurements indicate that the outdoor air temperature in the early morning is 21 - 22°C which is rather cooler in the tropical zone because of the high altitude. Then, the temperature rapidly increases around 28 - 31°C in the daytime by the strong solar radiation. The daily average indoor air temperature of the pure Tongkonan is 21 - 25°C. It is lower than that of the modernized traditional house by 2°C - 4°C. Traditional Tongkonans are built of natural materials, especially they are roofed with bamboos that encourage natural ventilation and protect solar radiation. It is the main reason of this temperature difference between two types of Tongkonans. It is found that the air temperature in the pure Tongkonan highly reflects effects of geographical location and solar radiation. The results of this study indicate that the environmental factors, particularly natural ventilation have a significant effect on indoor thermal comfort. Pure traditional houses in Toraja, Tongkonan, have some unique technologies for good thermal performance in this region. These technical elements will be utilized for thermal control of indoor space in modern houses.