Development of Methodology for Passive Design Strategies of Residential House in Indonesia

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Abstract:
Human thermal comfort research was done by numerous researchers around the world and still be an interesting topics at recent day even it has been started hundred years ago. A number of researches investigate thermal comfort in various kinds of building includes residential and office building. One of adorable themes in human thermal comfort research is about passive design strategies in residential house to achieved low energy demand. Yet, this kind of research is still lack in Indonesia. Laid between 6°08′ N – 11°15′ S and 94°45′-14°15′ E, Indonesia is traversed by the Equator. Based on Köppen-Geiger Climatic Classification, Indonesia has three different climate; fully humid, winter dry and monsoonal. Each of these climates has its own characteristic and need special deal for the passive design. A methodology proposed in this paper is to accommodate architect in design the passive strategy for each climate types in Indonesia. This methodology consists of six principle stages and at the end of stages, standard design corresponding to each climate types is expected to be developed.

Summary:
This paper will demonstrate the methodology development of passive design strategies of residential house in Indonesia. The proposed methodology is developed based on literature review of previous research in field of passive building design. In the methodology proposed, there are six principle stages in order to the implementation of passive design strategy; proper definition of thermal comfort and passive strategy, climate classification, setting up the energy performance target, developed strategy alternatives, modelling the alternatives, final optimum design. Properly definition of thermal comfort and passive design is the way to get posh understanding about relationship between thermal comfort and passive design. The second step is to classify climate characteristics in all Indonesian regions based on current data during a whole year period. This climate understanding is a foundation in early stage of passive design strategy because the strategy will determine and should be correspond to the climate type. Setting up the energy performance target is needed as comfort judgment was related to the pass experience of the occupant, which also bears to the climate type where they interact with. The development strategy alternative was the most intricate among all of the stages. It is necessary to get full understanding of climatic design principle in this stage. This principle derives from the requirement for creating human comfort in building using the element of the natural climate which varies throughout the year. There are nine principles that could be practically used, and certain combinations from the overall set of principles also allow to be expended. The following stage is a simulation of thermal performance inside the building to confirm the overall effect of chosen strategy. At the last stage, the final design is selected which fulfill the energy performance target in each climate type. The verification of energy efficiency and cost (initial and running cost) should also be done. This methodology developed may use for further research and the final design will also use as basic standard for passive house in Indonesia.

Reference: