Saving Courtyards, Saving Energy in Vernacular Shophouses

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Abstract

Providing a central source of central air and light, courtyards play an important role in many traditional shophouses (see figure 1) in Southeast Asia. People in this region instinctively knew that the temperatures in their courtyards felt cooler, more comfortable than outside temperatures. It is well-known that a courtyard once existed, which is so constructed that it gives protection against the environmental temperature, and thereby assure itself as valuable today as they were in the past [1]. However, this style cannot benefit again from their role as a temperature regulator only in modern development, especially in Taiwan (see figure 2).

Current technology does not seem to accommodate the range of facility types and do not particularly provide an integrated approach to vernacular buildings. In general, the environmentally designed building must meet much higher comfort and performance levels than vernacular architecture, the model for a less energy-hungry building. If the modern artificial conditions were not properly applicable to the vernacular cultures, it would become an energy-hungry architecture again [2]. Besides the need to build a brand new building, there are also the requirements of harmonization between the building and the nature in terms of daylight and ventilation. Locating in hot humid climate zone, the shophouse buildings in Taiwan or Southeast Asia are naturally ventilated except for humid summer days when mechanical cooling is necessary.

This paper discusses a reassessment of the inner environment in the context of changing life styles with some current examples. We review and examine how spatial advantages of the courtyards may be influenced by culture and climate and associated issues of daylight and ventilation,

expectation and adaptation. Finally, we discuss how incorporating these factors into future comfort standards might yield further improvements to this specialized internal environment.

This paper explores the capabilities of Radiance and CFD to model these features; especially in hot humid climatic conditions. Thus establishing a knowledge base and understanding of software available for the study of urban microclimates and for evaluating courtyard performance. The simulation results are compared with on-site measurements; and potential design improvements are evaluated. The case studies are intended to support and guide future studies of visual and wind comforts with simulations (see figure 3 & 4) and, therefore contribute to improved environmental quality in historical areas.

Keyword：Courtyard; Shophouse; Simulation