

Full Length Research Paper

Energy efficiency and thermal comfort influences of alternatives of single skin façade (SSF) and double skin façade (DSF) in tropical bungalow house

Saber Sabouri^{1,2*}, M. F. M. Zain² and M. Jamil²

¹Faculty of Architecture, Seraj Higher Educational Institute, Ark Alley, Shariati Cross, Tabriz, Iran.

²Faculty of Engineering and Built Environment, University Kebangsaan Malaysia, 43600 Bangi, Malaysia.

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Sustainable design is an important goal in architecture. Sustainability could be approached with low energy and high thermal comfort buildings. In this study, a bungalow house as a BASECASE model was simulated with “DesignBuilder” software based on “Energy Plus”. Then influence of double glazing, external blind and double skin façade (DSF) on energy consumption and thermal comfort of master bedroom (with cooling) and living room (without cooling) were explored. Results showed that outside blind with high reflectivity slats installed at daytime (8 A.M. to 6 P.M.) could save more cooling energy of master bedroom rather than double glazing. DSF (inner skin: clear, outer skin: double glazing) with full daytime internal blind would reduce energy consumption but its amount was less than other alternatives. If installation of inside blind of DSF is considered at daytime, energy saving difference between DSF and other alternatives would be decreased. DSF pulled down air temperatures of living room and ameliorated its thermal comfort condition. In living room, DSF presented best suitable comfort values. In master bedroom, integration of double glazing and external blind not only saved more energy, it also would give best annual thermal comfort condition.

Key words: Energy consumption, thermal comfort, double skin façade (DSF), single skin façade (SSF).

INTRODUCTION

Appropriate architecture design could decrease energy consumption and increase internal thermal comfort. Various façade designs have been studied in recent decades. Window to wall area ratio (WWR), window type, awning, projections, louvers, fins are instances of factors which would compose a façade. A façade could be defined as single skin façade (SSF) or double skin façade (DSF) (two skins of façade and cavity between them). It also could be airtight or ventilated (Loncour et al., 2004). In this study, façade design and its relation to energy efficiency of bungalow house was considered. Different façade details were examined for simulated BASECASE model. Various factors like different glazing, shading

and orientation were considered for SSF and DSF. Results of simulations were presented and discussed. In addition, some suggestions were proposed for façade design with respect to energy consumption.

LITERATURE REVIEW

A considerable amount of studies have been done about SSF and DSF. Most part of these studies was in European countries. Gratia and De Herde (2004, 2007a, b, c, d) simulated an office building with thermal analysis software (TAS) and evaluated performance and influence of DSF. They explored natural ventilation in double skin façade and its influence on temperature of DSF surfaces (Gratia and De Herde, 2004). They showed that DSF is not so energy efficient as it seems in first but it could have other advantages (Gratia and De Herde, 2007a).

*Corresponding author. E-mail: sbrsabouri@gmail.com. Tel: +60-172559425. Fax: +60-389252546.