Thesis Title	A Two Dimensional Model of Heat Transfer of Roof Solar Collector with a Study of Discharge Coefficient
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ABSTRACT

To reduce the mechanical cooling energy cost of new housing built in a hot and humid region, the design should maximize the natural ventilation and minimize the fraction of sun energy absorbed by a dwelling. This objective is accomplished by using the roof structure to act as a solar collector. The roof solar collector design (RSC) used CPAC Monier concrete tiles and gypsum board. Field measurements of performance indicated that with equal free inlet-outlet openings of about half gap cross-section, the RSC would induce the highest rate of air flowrate. The RSC can reduce the temperature differences between room and ambient down to 3-5 $^{\circ}$C. With both units of RSC of 3 m^2 surface area, the average number of induced air change is about 4-5 ACH.

A two dimensional model of RSC was developed. The simulation result showed a few disagreements with the experimental results and followed the ambient conditions well. Therefore, the developed model is valid. Thus, it could be used for estimating the performance of the system towards an application design of RSC's system.

Based on numerical model and experiment results, estimation of the discharge coefficient (Cd) of the RSC -which depended mainly on the ratio between the surface area of the openings and gap was made. The values of Cd were found to be in the order of 0.45 to 0.85.

Keywords : Roof Solar Collector / Natural ventilation / Openings / Discharge Coefficient