C 153

Effects of roof orientation on the thermal performance of passive buildings

Sri Lanka has a warm humid climatic condition. In majority of single storey houses, the indoors are somewhat thermally uncomfortable, especially in the afternoon and during the night. Generally, when the indoor temperature is above 30 ^{o}C, it is difficult to provide thermal comfort with natural means. Thus it is useful to determine the effects of the roof orientation on the indoor temperatures.

For this study, a double pitched asbestos roof with a ridge in east-west direction and north-south direction was considered as two cases. The house selected was properly planned with many desirable passive features like properly oriented windows with shading devices and light colours. The effects of flat and sloping ceilings were also investigated. For this study, computer simulations are carried out using DEROB-LTH program. The climatic conditions are simulated by using the average climatic data available for the month of June for Colombo.

The indoor temperature result indicates that there was no significant effect due to the roof orientation. The flat ceiling gave a marginally lower temperature (less than 0.5 ^{o} C) than the sloping celing in most case. The maximum indoor temperatures reached about 31.5 ^{o} C when the outdoor of single story houses by relying on the orientation. It will be essential to use roof insulation that will cut own part of the thermal gains. It is also shown that the effects of windows on undesirable orientations (east or west) can have a much prominent effect on indoor temperatures than the orientation of the roof.