This paper reports on an experimental investigation of the effect of roof solar chimney design on indoor temperature and induced air change. Five lab-scale houses with different roof configurations were designed and tested. The roof and walls were made from CPAC monier concrete boards. The ceiling was made from gypsum board. The volume of each house was about 1.5 m$^3$. Three roofs were designed to act as a solar chimney whereas two houses with a flat gypsum ceiling served as references (one of them included 1 cm fiberglass insulation) so that no ventilation occurred. In addition, all the houses included two closed-windows located on the northern and southern sides. The three ventilated houses have a rectangular opening located below the northern window through which ambient air is admitted.

Experimental results showed that three solar chimney vented roofs could induce an airflow of 36 m$^3$/h approximately. The corresponding air change is about 24. Indoor temperature stratification varied depending on roof design. The model without a ceiling yielded a higher indoor air temperature than the other two models. The best roof configuration was that designed like a roof solar collector with a centred opening on the flat ceiling. Due to the solar chimney insulating efficiency combined with the induced air change, the indoor conditions, expressed in terms of temperature and air quality, are better than those of the house equipped with fibreglass. It is therefore demonstrated that roof solar chimney ventilation can be used for both reducing the cooling load in the house and providing agreeable indoor air conditions.