SUMMARY

This research work investigates the feasibility of applying passive and active stack systems to enhance the natural ventilation in public housing. The primary objective is to assess the status of natural ventilation in a typical 4-room HDB flat using scaled model in the wind tunnel, and to develop an effective passive or active stack systems to enhance natural ventilation in the flat.

Recent trends in excessive usage of air conditioning in residential buildings have discouraged the effort in finding the possibilities of using natural ventilation as part of the solution for thermal comfort and health. The problem, with single sided ventilation in bedrooms lead to low wind velocity during the nights is well identified. The study shows that the passive stack, incorporating the principle of airflow due to buoyancy, does not enhance the air velocity in the flat. However, the active stack, which operates based on the suction effect induced by a fan fixed at the top of the stack leads to substantial increase in the air velocity at the room.

Different sizes of stacks and different fan speeds are used to investigate the effect of these parameters on the air velocity. The potential of positioning the stack at different places is also explored. The air velocities are examined for different cases like wind tunnel fans off, wind tunnel fans on, doors closed and doors open. The results show that velocity is increased significantly with the use of active stack. It was also found that the velocity increases with the increase in stack size and fan speed. Even the smaller stacks are found to be successful in providing velocities desired for thermal comfort condition. For larger stacks, high velocities were achieved even without any wind. The economic feasibility of providing such type of stack in the HDB flat is well validated.