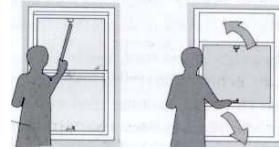


These application notes are for general guidance and information only. Users will need to undertake independent analysis for specific sites if any of these measures are to be implemented. Consideration should be given to engaging the services of a suitable consultant to assist with this task.

Summary

A mixed mode ventilation system combines the best aspects of both natural ventilation and mechanical ventilation / air conditioning. The basic philosophy is to open the windows and switch off the air conditioning to avoid the energy penalty and consequential environmental effects of year round air conditioning. Mixed mode systems are easy for occupants to use, the great majority of domestic houses operate successfully using mixed mode principles. There is also evidence of significant psychological and health benefits associated with naturally ventilating health facilities. There are many areas within health care facilities which could benefit from incorporating a mixed mode environmental conditioning system, where specific close temperature, and humidity control is not required utilising mixed mode with natural ventilation system in lieu of continuous air conditioning can save up to 30% of the energy costs associated with heating, cooling and ventilating.



Background

Buildings that are purely mechanically ventilated or air conditioned can suffer from a number of problems including, high energy consumption, poor indoor air quality and thermal comfort. However if a purely naturally ventilated solution is adopted it may be difficult to maintain the indoor environment within acceptable comfort limits at all times.

A mixed mode ventilation/air conditioning system is a two mode system which uses natural ventilation and mechanical ventilation at different times of the day or season of the year to provide a comfortable working environment and good indoor air quality. When the spaces are being naturally ventilated energy is saved by not having to operate fans and provide heating or cooling.

Recent research indicates that there maybe significant psychological and health benefits associated with naturally ventilating health facilities

Opportunities and Constraints

The temperate climate in many parts of Victoria will permit acceptable thermal conditions to be achieved for up to 40% of the year using a natural ventilation system. The degree to which heating or cooling will need to be provided at different times of the day or season is a function of both external climatic conditions, the building design and the effectiveness of the ventilation system ventilating the space. Studies have shown that a mixed mode ventilation system can provide users with a greater degree of control of their own environmental conditions and contribute to greater user satisfaction. The factors that improve the performance of a natural ventilation system are:

- Performance of the building façade; size of windows, type of glass and shading system, the insulation performance of the building and airtightness.
- Building form factors effect how well a building can be naturally ventilated;
 - Depth of building and distance between opening for cross flow ventilation and floor to ceiling heights (the taller the space the deeper it can be naturally ventilated)
- Maximise exposed thermal mass (masonry) to the interior of the occupied spaces to absorb heat gains in to the structure, which may reduce the peak cooling load. This heat gain can be purged from the structure, using a night ventilation strategy.
- Minimise internal heat gains; energy efficient lighting, flat screen monitors and energy efficient office equipment.

- Occupant Involvement so that the system is understood and easy to operate in its different modes (the benefit of increased user control should be explained).

Impact of Implementation

Retrofitting a mixed mode ventilation system may require the installation of operable windows or louvres in the building façade, together with a control system strategy which shuts off the mechanical ventilation / air conditioning system when the windows are open in natural ventilation mode. It could be uneconomic to retrofit natural ventilation systems in existing buildings which were designed to be air conditioned because of the cost associated with modifying the facades to install operable windows, however if a facade needs to be refurbished it may be economic to consider retrofitting operable windows. Many older hospital buildings were designed to be naturally ventilated and air conditioning was added in recent times. These buildings may be quite readily converted to naturally ventilated mixed mode systems. Where new construction is planned a mixed mode ventilation can be incorporated as part of the design with little or no cost penalty when compared to a conventionally air conditioned building.

User involvement is a key determinant in the success of a mixed mode natural ventilation system. The benefits derived from a mixed mode ventilation system including energy savings, increased user control of their environment and higher levels of comfort, needs to be clearly explained to the users early in the design process. The operation of the system in its various modes should be clearly explained to the occupants, and user training should be provided as part of the commissioning process.

The degree of automation of the operable windows/louvres, which can vary from being fully controlled to having no automation, may need to be carefully considered.

Analysis

Assuming that a mixed mode ventilation system can ventilate 70% of the floor area of the ward and office areas in a typical hospital, and that the windows can be opened when the external temperature is between 16 and 24degC, it is estimated operating a mixed mode system would save up to 30% of the energy costs associated with cooling and, ventilating these areas compared to a conventional air conditioning system which for a typical hospital could equate to approximately 9% of the total electrical usage costs for a hospital.

Conclusions

Incorporating mixed mode ventilation systems in health care facilities can achieve substantial energy savings and potentially provide psychological and health benefits. A mixed mode system can be readily incorporated in both new and existing health facilities in areas where close temperature control is not required. The performance of the mixed mode natural ventilation system will be optimised if attention is given to the passive building design, to minimise heat gains through the facades and through minimising lighting and equipment loads. Consideration should also be given to the amount of automation to be incorporated in opening and closing to the windows and how the heating and cooling is to be brought on when required. Clear operating instructions and user training are important in the successful operation of a mixed mode natural ventilation system.

References and Sources for Further Information

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