

Fresh thinking

Since the coalition Government axed the Building Schools for the Future programme the emphasis in the education sector has shifted away from rebuilding towards refurbishment. Andrew Saxon explains why this means a different approach needs to be taken towards ventilation.



Following the cancellation of BSF, many school estates managers have been left with the challenge of how to make their ageing schools good — appropriately, cost-effectively and efficiently. A key consideration in any new school construction is ventilation, in accordance with Part L2 and Part F of the Building Regulations, as well as Building Bulletins (BB) 93 and 101.

Though primarily aimed at newbuild schools, the BB documents are also viewed as Best Practice frameworks for the improvement of existing buildings. Indeed, BB101 states ‘...when the building is being refurbished...the designer should aim to meet the requirements of BB101...’ So, when refurbishing existing premises, school managers face the dilemma of whether to follow newbuild guidelines for ventilation systems, or to take a different approach.

The need for fresh air in schools has been widely recognised for some time, with stale, stagnant air of course causing uncomfortable conditions. But what’s more, studies have shown that because humans expel carbon dioxide, there can be a high concentration of this gas in densely occupied, confined areas such as classrooms, resulting in lethargy, sleepiness and reduced concentration — affecting pupils and teachers. BB101 states teaching and learning spaces should be provided with

a minimum daily average of five litres per second of fresh air per person, and should also be capable of being ventilated at a rate of at least eight litres per second per person at any occupied time. It also calls for CO₂ levels averaged over normal school hours to not exceed 1,500ppm (parts per million) in classrooms, and it is assumed this will be achieved by providing ventilation at the levels mentioned.

Natural selection

In accordance with BB101, fresh air can be introduced using either natural or mechanical ventilation, but the emphasis is definitely on the former. The UK’s focus on energy efficiency and the reduction of carbon emissions means the use of natural ventilation — the process of supplying and removing air without energy-consuming mechanical systems — has been largely encouraged in new schools. Indeed even BB87, the predecessor to BB93 and BB101, suggested that natural ventilation should be chosen over mechanical ventilation.

Natural ventilation is often ‘wind-driven’, achieved via operable windows and/or trickle vents, or through the temperature and pressure differences between spaces — known as the ‘stack effect’. However, while these methods use very little energy, our calculations and research have shown that the exclusive use of natural ventilation will

not always adequately refresh the air, especially in existing buildings.

Most importantly, much depends on the building design. For natural ventilation to work successfully, a school must be carefully designed in accordance with CIBSE *Applications Manual AM10: Natural ventilation in non-domestic buildings*. And whereas this is possible for a new construction — for example the building and its windows/vents can be positioned to best harness the wind — it is expensive and difficult, even impossible, to modify an existing building in this way.

In addition, natural ventilation is highly dependent on external weather conditions, which in our country vary widely, and are largely unpredictable — so different results will be achieved day-to-day. On a typical day the wind might gust over a range of speeds, at varying times. Or one day might be very windy, the next might be still. Perhaps a newbuild can be cleverly designed to make allowances for this — but a retrofit project cannot.

It is also worth considering that, to achieve adequate ventilation, windows would have to be opened wide, for very long periods of time. Noise pollution and security issues might make this impractical, and in the winter internal heated air will escape as fresh air is drawn in — leading to cold and wasting energy.

Hybrid systems

An alternative solution that still follows guidelines while improving comfort for teachers and pupils is the use of mixed mode/hybrid ventilation. Combining natural ventilation with mechanical backup, this approach can work in any building, regardless of age, size, shape or design, and no matter what the external weather conditions are.

Mixed mode/hybrid solutions, such as Innovair School from Biddle, work in natural ventilation mode unless the CO₂ level rises and comfort conditions deteriorate — when mechanical ventilation kicks in to introduce more fresh air. Comfort is maximised and only the energy required is used; minimising consumption and reducing costs and carbon emissions.

The key benefit to this approach is that it is controllable. In comparison, with natural ventilation there is no satisfactory way of controlling the fresh air supply, which often severely compromises thermal comfort. For example, a typical classroom



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(30 children and one teacher) will not always need 2,48l/sec of fresh air, but a mixed mode/hybrid product can supply it when it's required, based on occupancy and CO₂ levels, and detected through the use of CO₂ sensors.

Though natural ventilation will sometimes be the right avenue for appropriately designed newbuild projects, we have to accept that refurbishment projects require different thinking. School estates managers looking for a cost-

effective, energy efficient solution can turn to mixed mode/hybrid ventilation to provide controlled fresh air, supplied only when it is needed — giving them the best of both worlds.

■ Andrew Saxon is marketing manager at Biddle Air Systems

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