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RECONCILING NATURAL VENTILATION WITH AIR TIGHTNESS

By John Stamp, technical consultant, Kawneer architectural aluminium systems

In light of what we now know about the energy consumption of buildings, the trend in the 1970s and '80s for fully sealed, fully air-conditioned commercial buildings looks like one of the more lamentable periods in the recent history of our construction industry.

According to the Sustainable Development Commission, around 50% of carbon emissions come from the construction and operation of our built environment. So it is no wonder the Government has made energy efficiency in buildings a priority in its drive to meet its commitments under the Kyoto Protocol.

Whereas macho, energy-demanding office buildings were the status symbol of the go-getting '80s boom, lean, efficient, naturally ventilated buildings are the must-have in today's environmentally conscious era. However, clients still want large, high-rise, prestigious office buildings but without the stigma of a massive carbon footprint.

The pursuit of naturally ventilated building solutions is more than just the latest trend; it forms a vital component of a larger framework of environmental measures. The reduction of fossil fuel consumption and the emission of greenhouse gases are a tenet of Government policy and are enshrined in legislation. The Building Regulations have always included requirements relating to ventilation – originally driven by the desire for a healthier environment, rather than issues of sustainable development – but today they are more demanding than ever.

Part F is the relevant part of the Building Regulations, governing 'Means of Ventilation'. And while it is primarily concerned with ensuring there is an "adequate means of ventilation for people in the building", the influence of air movement on the energy efficiency of the building is demonstrated by the link between Part F and Part L – 'Conservation of Fuel and Power'.

Both Part F and Part L of the Regulations have been significantly revised over the past 10 years and with each revision, the connection between ventilation and energy consumption has been strengthened to such a degree that now any change to either regulation must be reflected in the other.

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The most recent revision of Part F was completed in 2006 and came into force in April of that year. The revision took into account the aspiration implicit in the latest version of Part L of the regulations that natural ventilation should be preferred to energy-wasteful ventilation systems. A consequence was a revival of interest in what was almost unheard of in the air-conditioned buildings of the 1980s property boom - windows that could be opened.

Vertical sliding and horizontal sliding sash-style windows started to go out of style back in the early 1970s when the vogue for air-conditioned buildings in the UK was gathering momentum. By the end of the 1980s, they were virtually unavailable; opening a window compromises the performance of a forced ventilation system and they were therefore considered undesirable.

However, in the 1990s, building services engineers began exploring the benefits of natural ventilation again and the simple pleasure of being able to open your office window began to look like a possibility once more. Other factors have also come into play, such as specific requirements on the ventilation of certain types of building where air quality is deemed especially critical, namely hospitals and schools.

Today, Parts F and L of the Building Regulations recognise the age-old benefits of using the “stack” effect to exhaust stale air from a building and draw fresh air in from outside. But the potentially conflicting requirements of energy conservation and natural ventilation have had to be reconciled in the process.

In the most recent revision of Part L, also introduced in 2006, is the mandatory air pressure testing of new buildings to ensure a minimum level of air-tightness. The reason for this is simple. If warm air is allowed to leak uncontrolled from the building, the energy consumed in heating that air is lost. By the same token, cold draughts entering the building reduce the ambient temperature inside and place an extra load on the heating system.

The challenge to Part F is instantly apparent: how to address the need for air-tightness in a building that relies on natural ventilation for its interior air quality.

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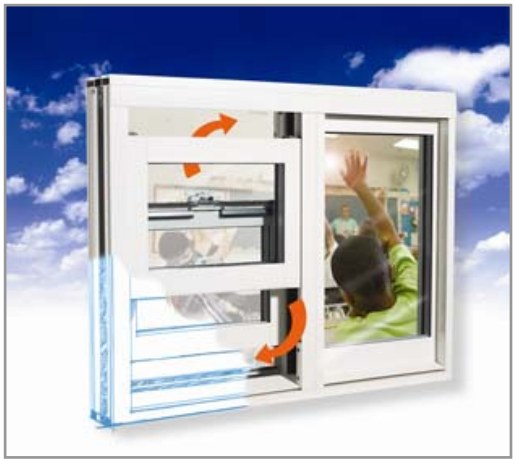
The relationship between energy conservation and natural ventilation hinges on a number of complex calculations relating to surface areas, interior volumes and air flow rates. Here at Kawneer, we have had to carry out the sort of calculations that, in the past, would have been completely irrelevant to window design and manufacture.

Our response to the growing requirement for windows that open has been the development of a range of modern vertical and horizontal sliding and pivoting windows designed to meet the needs of building designers and the requirements of Part F (and L) of the Building Regulations.

One window in particular, the AA®3610 vertical sliding window, has been developed specifically with the latest Part F requirements in mind. An aluminium-framed window designed for double-sliding, single-sliding and fixed lights in any combination, the unit is thermally broken to minimise heat loss and effectively sealed to ensure optimum air-tightness when closed. Trickle ventilation – now a mandatory requirement for windows under Part F – is also provided.



The window is designed for both top and bottom panes to open to allow natural ventilation within a 100mm restricted clear opening as required by the relevant British Standard (BS 8213). It can be opened fully if required by overriding the restrictor. The restricted opening is a necessary safety feature designed to eliminate the risk of occupants falling out of the window. But it also serves to limit the airflow in and out of the window and therefore enable accurate calculations of the ventilation provided.

Utilising the same principle employed by traditional Victorian vertical sliding sash windows, the AA®3610 uses the “stack effect” by which warm stale air rises and exhausts via the top window opening and cool fresh air is drawn in via the bottom. Other Kawneer windows designed along similar principles are the AA®602TE pivot and the AA®3610LS linked sash vertical sliding window.

With precisely calculated clear-air values, it is possible for building services engineers and designers to calculate the optimum number of windows required in any given façade to meet the requirements of Part F.

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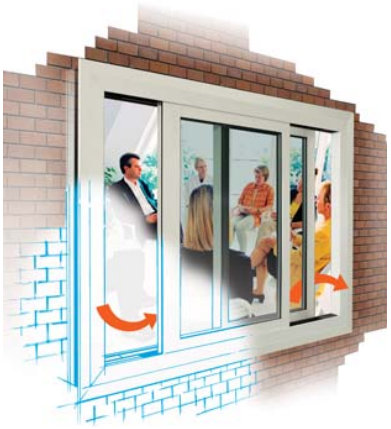

It is no accident that these new window products, including the AA®3110 horizontal sliding window, have found particular favour in the educational and health sectors where air quality is a major consideration. But products which enable designers to reconcile the demands of both Part F and Part L of the Building Regulations will find favour in many other building sectors too.

ENDS

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