ENHANCING INDOOR AIR QUALITY

IN SCHOOLS WITH WINDOW AUTOMATION

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INTRODUCTION

In 2017, the ABS reported that there were 9,444 schools in Australia, a 30-school increase from the previous year's figure, and an upward trend that is predicted to continue in the years to come.[1] In NSW alone, it is estimated that an additional 164,000 public education spaces will be required by 2031 in order to adequately cater for population expansion.[2] As the demand for educational institutions across the country continues to grow, Australian architects and specifiers must work to understand the unique design requirements that such institutions involve.

Furthermore, beyond the increasing number of schools across the country, many existing institutions are choosing to renovate and bring their facilities up to date in order to meet contemporary standards for health, performance and sustainability. Against this backdrop, it is critical that architects understand the impact of their designs on student health and wellbeing – particularly given that children have different levels and perceptions of comfort compared to adults.

Research conducted by bodies such as the World Green Building Council has shown a clear relationship between indoor air quality and student performance, representing just one way in which the decisions of architects and specifiers can have long term and, perhaps, unintended effects.

These findings have shown that the number of student sick days increases proportionately to CO2 levels in classroom; thermal comfort corresponds with a higher level of academic performance; and quieter, acoustically controlled environments are more conducive to higher student performance.[3]

In this whitepaper, we take a closer look at window design – specifically window automation – and how this can be harnessed to boost indoor air quality and meet elevated health and performance outcomes in schools and other educational facilities.

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UNDERSTANDING THE REQUIREMENTS

Section F of the National Construction Code (NCC) Volume 1 establishes the health and amenity requirements for non-residential buildings, including schools and other educational facilities, which are categorised as Class 9b buildings. Within that, FP4.3 details the specific performance requirements for ventilation, mandating that “a space in a building used by occupants must be provided with means of ventilation with outdoor air which will maintain adequate air quality”.[4] The deemed-to-satisfy provisions are explored further within F4.5, F4.6 and F4.7, including such provisions as a minimum size requirement of openings as 5 per cent of the floor space of the area to be ventilated, and the types of space that a window or similar may open onto.[5]

Tying into this is Section J of the NCC Volume 1, which establishes energy efficiency requirements for Class 9b buildings along with other non-residential projects. These performance requirements are detailed under JP1 and JP3 of Section J, and outline the need for a building and its services to contain features that both utilise a sufficient source of energy and facilitate efficient use of energy appropriate to its various uses and functions.

Critically, when considering window design JP1 references the need for a building to include features that facilitate the efficient use of energy for sealing the building envelope against air leakage and, conversely, for utilising air movement to assist heating and cooling whenever appropriate. Window automation allows this transition to occur seamlessly, by enabling natural ventilation when- and wherever possible according to the requirements outlined in Section F4 on health and amenity. In doing so, thermal comfort may be maximised for students and other occupants whilst minimising a building's environmental impact. As determined by J5.2, any compliant air conditioning system cannot “adversely affect ventilation required by… Part F4”.[6]

When understanding the requirements for natural ventilation and its impacts on both health and energy usage, it is nonetheless important for architects and specifiers to keep in mind that the guidelines given in the NCC are the minimum accepted standard. Taking steps beyond what is written, such as by implementing window automation systems, is a simple way to improve the lives of building occupants further.

WINDOW AUTOMATION: A DESIGN SOLUTION

Window automation, like any other design challenge, requires the consideration of a variety of aspects in order to ensure maximum effectiveness in tackling issues of health, performance and sustainability. The remote operation of a window is a three-part mechanical solution, comprising the following key elements:

1. The actuator, i.e. the component responsible for physically opening and shutting the window. The two typical window types – awning and louvre windows – each require a specific type of actuator, although there are a number of other characteristics architects and specifiers must consider when selecting one. These include:
   - Fitness for purpose
   - Compliance with wind loads to which the building will reasonably be exposed (i.e. the necessary strength required to keep windows closed during wind events)
   - Noise levels: high levels of classroom noise – including that created by window actuators – can enhance stress in students and make learning and concentration difficult, with every additional 10dB of noise is effectively perceived as a doubling in sound levels.[7] Choose an actuator that operates quietly; while conventional models operate at or above 60dB, advanced technologies are available that operate at less than 35dB – the recommended level of background noise in classrooms, according to the Association of Australasian Acoustical Consultants.[8]
   - Safety: advanced actuators incorporate safety features such as "anti-pinch functions", which prevent entrapment of limbs or other body parts.
   - Size: slim-line, discreet actuators enable concealment for aesthetic purposes.
   - Additional functions including interaction with building management systems (BMS), enabling more precise operation and easier monitoring of facilities. Any necessary maintenance requirements can be streamlined and associated costs reduced as faults and inefficiencies can be pinpointed exactly.

2. Cabling should be determined by the supplier at tender stage in accordance with functionality, window locations, desired control panel location, and the chosen actuator. Careful consideration of each of these factors can facilitate significant cost savings, given that this can account for up to 30 per cent of the cost of a commercial window automation installation.

3. Controls should provide a clear, direct interface between users and the actuator. Advanced panel technologies should be harnessed wherever possible to reduce panel cost and size without compromising functionality.

THE IMPORTANCE OF AN INTEGRATED SOLUTION

Specification of the three components that make up a window automation system should ideally be undertaken by a single contractor. Placing responsibility on a single party ensures that the system will function properly as a whole, i.e. that each component works in tandem with the next and that the overall configuration provides the desired functionality.

This is also important from a practical standpoint, allowing maximum transparency and cohesion across costing, technical capabilities, installation requirements, and efficiency of the three independent components.

When designing for schools, there are further opportunities for integration of window automation with existing systems to optimise operations and comfort. Not otherwise possible with manually operated windows, an automated system can be integrated with the BMS – as previously mentioned – and connected to the school security system, closing windows when the building is not occupied. Wind and rain sensors can also ensure closure during inclement weather, while a "night purge" function can be implemented to exhaust stale air and CO2 from the classroom. Furthermore, windows will automatically close should a loss of power occur, preventing them from becoming stuck open if the back-up batteries fail.

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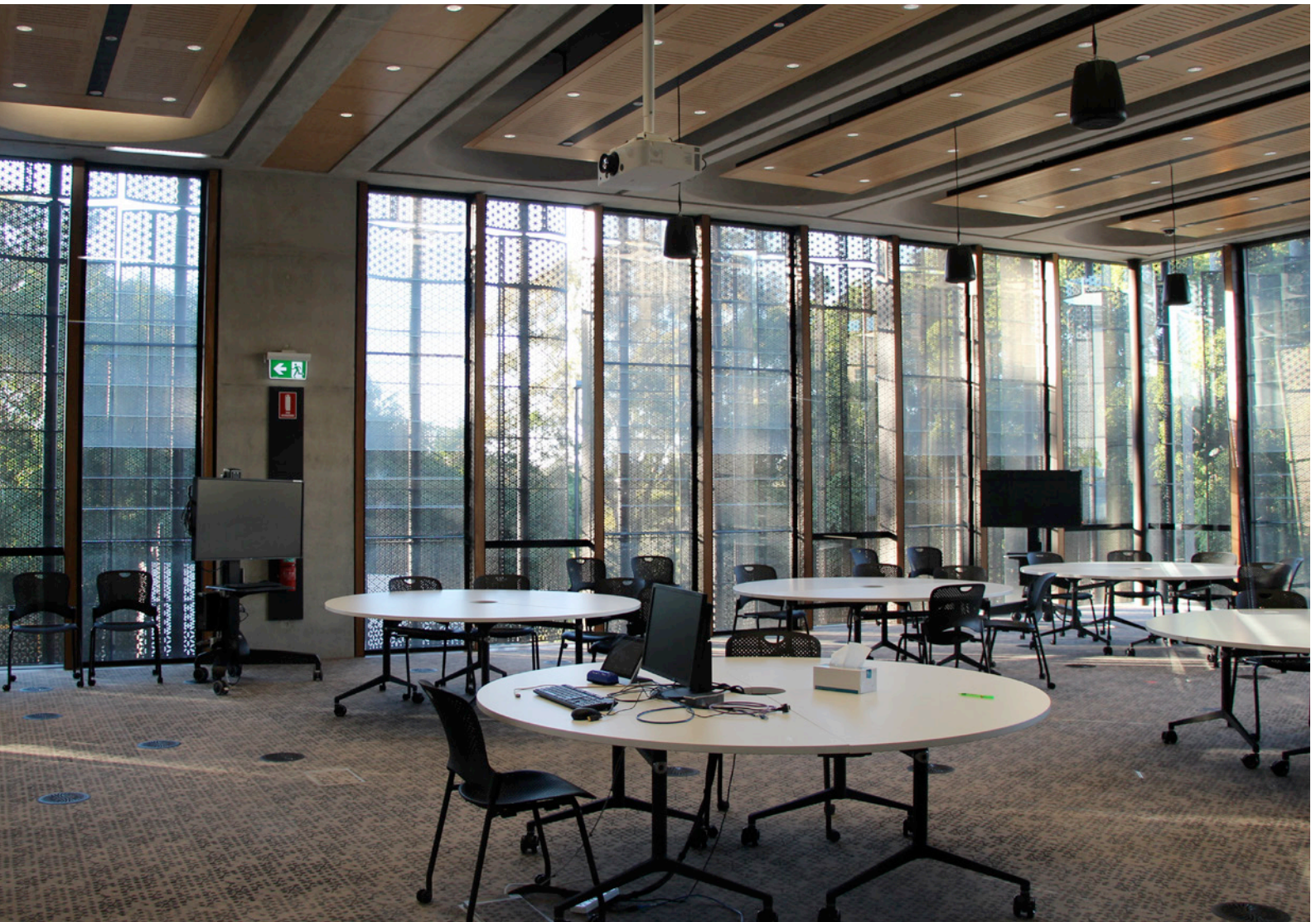

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Based in Sydney, Melbourne and Brisbane, EBSA Pty Ltd is a leading Australian manufacturer and supplier of window automation and louvre installations, combining functionality and aesthetics.

Driven by a strong focus on sustainability and safety, EBSA avails of the latest in window and automation technology to deliver systems that support the natural flow of light and air in contemporary commercial, residential and educational buildings, promoting health, performance and sustainability in all three. The company's commitment to quality and innovation has made them a favoured choice amongst Australia's architects and specifiers designing within these sectors.

For more information about EBSA, their services and product range, visit ebsa.com.au

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