WOOD & GRIEVE ENGINEERS

NOW PART OF Stantec

MEMO

FROM: Alex Kobler - Wood and Grieve Engineers now part of Stantec (WGE)

PROJECT: Sandstone Precinct – Education Building DATE: 27 February 2020

SUBJECT: Natural Ventilation Requirement (DA Condition B27)

The Sandstone Precinct – Education Building is a renovated change-of-use 5-star hotel development located at 35-39 Bridge St, Sydney. The DA Conditions of consent include a clause (B27) regarding the need for natural ventilation, which states:

the Applicant is to provide a natural ventilation strategy to the satisfaction of the Secretary, prepared in consultation with the Government Architect NSW. This strategy is to demonstrate that the spaces created by the roof extension to the Education Building will be comfortable for the intended use throughout the year, by exploring and implementing all reasonable opportunities to maximise the use of natural ventilation rather than mechanical ventilation and having regard to industry best practice.

Wood and Grieve Engineers have explored all reasonable opportunities to maximise the use of natural ventilation over mechanical ventilation while trying to maximise the sustainability and maintaining industry best practice. Upon coordination with the engineering and architectural teams, it was concluded that there are no practical avenues to employ meaningful natural ventilation strategies to the roof extension of the Education building. The team does not believe this is an appropriate design solution for the Education Building extension nor is in line with the building use expectations. The rationale behind this conclusion is outlined below:

Acoustic Compliance

Acoustic compliance for the Education Building extension involves reducing the impact of noise from the site's immediate environment of Sydney CBD including traffic, pedestrian/public noise, construction works, alarms, events, etc.

To respond to the acoustic impacts and demonstrate acceptable noise levels, the Education Building extension is proposed to be fitted with double glazing units (DGU) systems throughout to demonstrate acoustic requirements. The façade system will be provided with reflective blinds as well as DGU with low-E coating to the extension floor levels. This system has been selected for acoustic, thermal and comfort reasons, and exceeds the requirements of NCC Section J. A minimum Section J compliant façade could be single glazed, however a double glazed system has been used in preference to ensure acoustics and energy.

The implementation of DGU systems are in line with the requirements of the Sydney DCP which are adopted to hotels for noise control. As there are 26 bus routes near the site, the team's design solution necessitates non-

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operable DGU systems as a measure of improving acoustic comfort for the guest as buses commencing operation early in the morning is not an acceptable acoustic outcome for guest comfort.

Per the attached WGE Acoustic memorandum dated 14 August 2018 requested by the DRP, natural ventilation for the guest rooms or any other areas in the building is not achievable for the Education Building, including the new roof extension. The implementation of natural ventilation through the building will result in compromising the internal noise criteria of the City of Sydney Central DCP.

Mechanical Air-conditioning System Operation & Controls

Introducing mixed mode ventilation imposes challenges in designing appropriate room temperature controls to the mechanical air-conditioning systems to account for:

- Variable occupancy rates of the rooms including the changes between weekday and weekend periods (the time when guests wake up and exit rooms can be quite variable between the two periods). Such variability may potentially cause reduced thermal comfort if controls are not set up properly;
- Interaction with curtains and blinds which can impede the effectiveness of natural ventilation. The provision of blinds are intended to aid thermal performance and give amenity to the occupants;
- Integration of automated blind systems for when the guest are out of the room in the afternoon the blinds would come down and then go up when guests re-enter the room;
- Prioritising natural ventilation over mechanical ventilation across all hotel guestrooms when ambient conditions are ideal;

While mixed mode ventilation offers thermal comfort in a cost-effective manner, this removes the guest needs for acoustic privacy and can diminish air quality and occupant's health through the introduction of uncontrolled, unfiltered air. The removal of occupancy comfort does not align with the expectation of a 5 Star hotel experience. In addition, mixed-mode strategies can yield excess HVAC energy consumption if the occupants decide to open their windows when the room temperature controls demands for mechanical ventilation.

NCC Section J – Building Fabric Compliance

While the Education Building extension is capable of meeting the minimum NCC Section J requirements with a low-E single glazed outcome, it was not considered to be an appropriate design solution for the project due to being prone to scratching as the high performance coating has to be applied internally. Furthermore, there are maintenance implications to preserve the high performance coating which plays a role towards the system's thermal performance outcome.

In place of this, a low-E double glazed unit system has been selected to ensure a high level of efficiency is achieved in the development. This is also in line with acoustic, mechanical and architectural aspects to enhance the building environmental performance.

Building Function & Expectations

The expectations for a 5-Star quality hotel in Sydney are designed to be an enclosed, conditioned space which do not rely on nor are designed to allow for natural ventilation. This is evident by the standard set in a number of recent hotel developments in the Sydney region which are designed with full height, non-operable glazing façade such as 1 Alfred St, 4-6 Bligh St, Sofitel Darling Harbour, Crown Hotel, and the Darling Habour W Hotel.

The Meriton Suites development in Sydney was mentioned by the City of Sydney as a precedent offering that provides mixed-mode ventilation in the Sydney CBD. The project team note the product is akin to a serviced apartment (suite) offering. While both are NCC Class 3, these are two different market offerings with different expectations for quality, finish, length of stay, activities occurring, and size.

4-6 Bligh Street - Hotel

One Circular Quay - Hotel

Sofitel Darling Harbour - Hotel

W Hotel - Darling Harbour


Crown Hotel

Guest preference revolves around less complicated rooms for short term stays. Providing guests with complicated instructions and needing to personalise their environment through openable windows is not a preferred outcome. Further complications around operable windows to guests may involve acoustic privacy, unstable thermal comfort levels if temperature controls are not designed appropriately, and potential damages to unattended rooms with windows left opened by wind-driven rain and gust.

From a hotel operator's perspective, operable windows does not add guest benefit and involves short- and long-term maintenance implications such as installation, cleaning, replacement to ensure functionality of operable windows and automatic operability controls (reed switches or the like).

While it is acknowledged there are precedents of hotels within the CBD that have the capability for mixed-mode, these examples are typically in spaces in taller buildings, without the low-frequency bus-borne sounds from a site surrounded by bus stops. Even with this, the building is capable of being efficient and providing the quality of amenity without natural ventilation capability in the Education building Extension.

Sustainability ESD Strategies

The Education Building has been designed to incorporate a variety of sustainability initiatives which address or exceed the ESD focus areas identified by Government Property NSW for the Sandstone Precinct. This is maintained through the façade system of the education building extension.

To provide a building with best practice energy efficiency, a high-performance façade has been proposed. The overall building façade performance far exceeds the minimum code requirements. The overall improvement in building façade performance beyond code exceeds the calculated energy benefit that would be achieved through implementing a mixed-mode strategy. Refer to WGE's *'Education Building Roof Extension – Energy Performance Analysis'* memorandum issued on 13 February 2020 for energy modelling assessment demonstrating the energy benefit associated with the current façade design. As such, it is believed this is an appropriate proposed performance solution from a sustainability perspective.

Beyond the façade, the following key ESD initiatives have been incorporated:

Energy

- Thermally efficient façade system selection to exceed the NCC requirements;
- Preservation of the existing sandstone building structure to retain excellent thermal mass for improved passive thermal performance of the building;
- Re-use of existing buildings allows the development to make use of the low window to wall ratio, high thermal mass and the buildings' inherent building energy performance. Performance glazing and secondary glazing layers will further improve building efficiency;
- New plant to the development includes high efficiency chillers, boilers, fans and pumps throughout. Control systems to the rooms and spaces will further drive energy efficiency.
- Guest room management systems with master switches to reduce energy consumption

Water

- All water fittings and fixtures meet high Water Efficiency Rating Scheme (WELS) ratings; and

Transport

- The location of the site provides a multitude of opportunities for public transport use, with close proximity to buses, train and ferries.

Materials

- Re-use of the existing building structure and façade of the Education Buildings which allows for a significant reduction of material usage, embodied energy and associated greenhouse gas emissions as compared to a new build construction;
- Existing materials are to be reused for the development to improve material efficiency

The above sustainability initiatives are implemented in lieu of providing natural ventilation strategies to significantly improve the overall environmental performance and the ecological state of the Education Building.

With the above considered throughout the design process, the Education Building has been designed to achieve energy-efficiency through the facade as demonstrated to the DRP at Meeting Number 8 (22 Aug, 2018). the DRP advised the following on the matter:

The proposed solution for the high levels (L6-9) is: Double glazed unit with low E coating; and for low levels within the existing building (up to L5) - Single clear glazing behind existing heritage windows. The Panel is satisfied with these options giving consideration to the duration and times of occupation and noting that there will also be blinds inside the windows, which will aid thermal performance and also give amenity to the occupants.

Based on the findings by the design team summarised in this memorandum, and the precedent set by numerous other equivalent buildings in the Sydney CBD, the team recommends the deletion of clause B27 as the current building use and typology of the Education Building presents no practical avenues for to employ meaningful natural ventilation strategies.

Alexander Kobler
Sustainability Section Manager, Principal | MIEAust CPEng NER BE RPEQ

WOOD & GRIEVE ENGINEERS

ENQUIRIES: OLIVIER GAUSSEN
PROJECT NO: 29212

14 August 2018

Make Architecture Pty Ltd
Level 2, 36 Carrington Street
SYDNEY NSW 2000

Attention: Tim Davies

Dear Tim,

RE: THE SANDSTONE BUILDINGS SYDNEY

WGE understand that there have been some request from the DRP in regards to the possibility to consider the introduction of natural ventilation into the design of the guestroom of the Education Building.

However, as per correspondence via email sent out by Alexander Kobler (Sustainability Project Engineer) on Tuesday, 7th August 2018, there are several acoustic constraints associated with the project. One of the constraints relates to the high traffic noise level environment surrounding the site including over 15 bus routes contributing to this noisy environment. Another constraint is the heritage limitations that make the natural ventilations not feasible for this project.

Due to its location in the Sydney City Central Business District (CBD), The Education building is prone to high traffic noise with the buses component representing the highest contribution. Based on WGE noise survey using noise loggers and peak-hour traffic measurements, it was found that The Education Building's façades are subject to an $L_{Aeq,15mins}$ of 62-72dB(A) and $L_{Amax,15mins}$ of 81-95dB(A). Given the current traffic conditions, a significant acoustic performance for the glazing will be required in order to ensure the compliance with the City of Sydney Central DCP and comfort of the guest staying in the Hotel with windows closed is achieved. This means that any natural ventilation scheme would have to achieve an equivalent acoustic performance as the glazing, which is physically very imposing.

Furthermore, The Education Building is also listed as a heritage significant building. We understand that the façade in the Heritage report (CMP) cannot be altered.

Therefore, it is very important for the proposed redevelopment to ensure the preservation of the existing sandstone façade. In other words, the heritage requirements restrict any natural ventilation opening through the facade, which is typically in a form of a defined open surface area covered a weatherproof grille / louvre.

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In conclusion, it is WGE opinion that natural ventilation for the guest rooms or any other areas in the building is not achievable for The Education Building. The implementation of natural ventilation through the building will result in compromising the internal noise criteria (CoS DCP and Client's Brief) and compromising the heritage sandstone.

Yours faithfully,

Olivier Gaussen
for **Wood & Grieve Engineers**

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Yours faithfully,

Olivier Gaussen
for **Wood & Grieve Engineers**