OPENABLE WINDOWS IN RESIDENTIAL DEVELOPMENTS – ACOUSTIC COMFORT VS THERMAL COMFORT

DESIGN BRIEFING NOTE

Councils are increasingly requiring residential developments in noisy areas to be ventilated so that future occupants do not have to rely on open windows to prevent overheating.

This is to protect residents from the situation during warmer months where they either have to keep their windows closed and tolerate uncomfortably high internal temperatures or open their windows and tolerate unacceptably high internal noise levels. This design briefing note sets out a process to achieve adequate ventilation in residential developments so that windows can remain closed. The process is outlined in Attachment 1 below and is designed to achieve the noise criteria set out in BS8233:2014 - Guidance on sound insulation and noise reduction for buildings. It is compliant with current legislation, regulations and guidelines and is based on our extensive experience in the acoustic design of residential developments.

As shown in Appendix 1, where windows need to be kept closed to protect residents from external noise; mechanical ventilation will invariably be required.

The mechanical ventilation systems and associated ductwork will normally need to be more powerful than standard systems in order to achieve the high ventilation rates required to offset overheating in habitable rooms during summer. This can have significant implications for equipment costs and space requirements inside ceiling voids to accommodate the larger ductwork required to carry the increased volume of air movement.

The mechanical ventilation systems will also need to be designed so that noise from the systems themselves do not disturb residents (i.e. noise from supply air and extract air grilles etc). Recent research indicates that residents can be disturbed by noise from mechanical ventilation systems over around 25 dB LAeq. We therefore generally recommend that, where possible, mechanical systems are designed to achieve noise levels around this level under normal background ventilation rates. However, it is generally appropriate to adopt higher noise limits for the mechanical systems when they running at the higher ventilation rates required to offset overheating.
It should be noted that there is no requirement in the Building Regulations to consider the impact of open windows on internal noise levels in habitable rooms (although there is a requirement to control overheating under Part L1A of the Building Regulations). Therefore, this matter will only normally require assessment at the request of the Local Authority as part of the planning process. For information, relevant parts of the Building Regulations are summarised in Attachment 2.

However, developers may want to consider the implications of relying on openable windows to control thermal comfort under their duty of care to future residents.

**ADDITIONAL INFORMATION**

Cass Allen Associates are a specialist Acoustics consultancy focused on the development, construction and environmental industries.

We are a full member of the Association of Noise Consultants and all consultants are either full Corporate or Associate members of the Institute of Acoustics (MIOA or AMIOA). Senior staff are Chartered Engineers (CEng).

We are experienced in the design and testing of large developments for major developers (e.g. Barratt Homes, Berkeley Homes, Bouygues, Morgan Sindall, Bovis, Crest Nicholson, Durkan, Galliard, Gladedale, Hill Partnerships, Kier Group, Mulalley, Mace Group, Taylor Wimpey, Telford Homes, United House).

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ATTACHMENT 1 – THERMAL COMFORT VS ACOUSTIC COMFORT FLOW DIAGRAM

Does the Council require that dwellings are ventilated so that windows can remain closed in higher noise environments?

(YES/NO)

YES - Are the noise levels at the facade of the residential property higher than:

Daytime - 55 dB LAeq
and/or
Night-time - 50 dB LAeq

(YES/NO)

YES – Does the SAP assessment indicate that habitable rooms will overheat with closed windows in summer based on the current ventilation strategy?

(YES/NO)

YES - Use the SAP assessment tool to calculate the minimum ventilation rates required to prevent the habitable rooms from overheating.

The ventilation system should then be designed to achieve the required rates

NO – It’s up to the developer/client to decide whether they should provide residents with upgraded ventilation so that windows can remain closed at all times. At present, it is common practise to NOT provide upgraded ventilation.

NOTES
The facade criteria are based on achieving BS8233:2014 internal noise criteria including a +5 dBA correction and assuming a 15 dBA reduction in noise across a facade with an open window, as per BS8233 guidance.

Where regular individual noisy events occur during the night-time, it may also be appropriate to assess maximum noise levels (L_Amax) affecting bedrooms.

NO - no issue. Open windows can be used to control thermal comfort whilst still achieving acceptable internal noise levels

NO (this is unlikely) - no issue. Open windows are not required to control thermal comfort

NOTES
The required ventilation rate to avoid overheating should not be as high as the requirement for “purge” ventilation, which is for the short-term removal of pollutants, smells etc and defined as 4 air changes per hour in Building Regulations Part F.

Openable windows are acceptable for short-term purge ventilation in noisy environments provided overheating is dealt with as above.
PART E (2003 including 2004 amendments) – Resistance to the Passage of Sound

- Part E does not contain any requirements in relation to the sound insulation provided by external facades nor limits for acceptable levels of external noise ingress in habitable rooms. There is also no mention of the use of openable windows to control thermal comfort and the impact this has on sound insulation.

PART F (2010) - Ventilation

- Part F of the Building Regulations requires that all residential buildings are adequately ventilated including provision for background ventilation and purge ventilation.
- Purge ventilation is specified as a rate of 4 air changes per hour and is normally provided by openable windows.
- Part F states that "ventilation may also provide a means to control thermal comfort but this is not controlled under the Building Regulations. Part L addresses minimising energy use due to the effects of solar gain".
- Part F goes on to say "Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations."

PART L1A (2013) – Conservation of Fuel and Power

- Part L1A states that reasonable provision should be made to limit solar gains and notes that solar gains can be limited by an appropriate combination of window size and orientation, solar protection through shading and other solar measures, ventilation (day and night) and high thermal capacity.
- Part L1A states that SAP 2012 Appendix P contains a procedure enabling designers to check whether solar gains are likely to be excessive and that reasonable provision can be considered to be achieved if a SAP assessment indicates that the dwelling will not have a high risk of high internal temperatures.
- Therefore, under Part L1A of the building regulation a SAP assessment should be carried out to assess whether overheating is likely to occur, and where necessary, the design of the development should be modified to prevent overheating.

To summarise the above, there is a requirement to control overheating under Part L1A of the Building Regulations, however, there is no requirement in the Regulations to consider the impact of open windows on internal noise levels in habitable rooms.