ANC ACOUSTICS & NOISE CONSULTANTS

Institute of Acoustics

AVO Guide Case Study 01

A HOUSING SCHEME IN NORTHERN ENGLAND

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Introduction

This case study, the first in a series, showcases the use of the Acoustics, Ventilation and Overheating Residential Design Guide (AVO Guide) at the planning stage of a new residential development in Northern England.

The Guide, written by expert practitioners and published by the Association of Noise Consultants and the Institute of Acoustics in 2020, sets out best-practice advice on how to achieve Good Acoustic Design by taking a holistic and integrated approach to assessing the predicted acoustic conditions in new dwellings, alongside consideration of the ventilation requirements and strategies to mitigate overheating.

The purpose of this short case study is to demonstrate the value of adopting the AVO Guide approach. It is intended for regulators, planners, Environmental Health Officers, developers, and design teams. A glossary of terms can be found here. The content has been anonymised.

AVO Guide

The Guide provides a detailed approach to resolving potentially competing regulatory and/or planning requirements, and avoiding incompatible design assumptions relating to acoustic, ventilation and overheating mitigation strategies.

It seeks to address, for example, the type of problem found in a recent study of planning applications in London. 85% of the 122 applications for major residential developments examined required closed windows to achieve reasonable noise conditions, while the overheating assessment relied on open windows for reasonable thermal conditions. The AVO Guide aims to join-up thinking, improve consistency in planning applications, and achieve better outcomes for occupants.

The Development

Planning approval was sought and has since been granted for a scheme of 30+ dwellings, a combination of houses, apartments, and bungalows. Like many developments, parts of the site are close to roads with traffic being a source of noise. Hence a Noise Impact Assessment was carried out in support of the planning application, using the three steps recommended in the AVO Guide. The principles of Good Acoustic Design, as described in ProPG: Planning and Noise were followed as a precursor to the application of the AVO Guide.

AVO Guide Step 01 – Quantify external noise levels

The overall objective of the Noise Impact Assessment was to understand the risk of adverse impacts from noise for the future occupants, including in the amenity areas, while factoring in the effect of providing sufficient ventilation and separately, mitigating overheating.

The first step was to measure external noise levels at three points on the proposed site, over a 24-hour period. The measurement positions were selected as those most exposed to noise from road traffic.

Areas of the development located in close proximity to the road were exposed to highest external noise levels.

Noise propagation across the site was modelled and the impact on different facades was calculated. Within the proposed design, this enabled thresholds to be identified at which different facade treatment was required. For the purpose of the assessment the site was demarcated into two zones, as indicated in Figure 1:

Figure 1: Site zones are outlined in blue and green and measurement positions indicated by red markers

Blue zone
Greater potential exposure to traffic noise due to proximity to roads

Green zone
Lower potential exposure to traffic noise due to shielding by other units on the site

AVO Guide Step 02 – Assess noise and ventilation

The key consideration at this stage is the impact different ventilation strategies may have on external noise ingress, i.e. how much traffic noise transfers into the buildings.

It was determined that a natural ventilation strategy, described as "System 1" in Approved Document Part F, required five standard background ventilators in each habitable room for these dwellings, along with intermittent extract fans in wet rooms. Plot types within the green zone were deemed to have sufficient control of external noise ingress with this number of trickle vents, and therefore there were no acoustic constraints to the ventilation strategy. Please refer to page 39 of the AVO Guide and always consider the sound insulation achieved with the actual number of trickle vents to be used in the dwellings in question.

"System 3", Mechanical Extract Ventilation (MEV) or "System 4", Mechanical Ventilation with Heat Recovery (MVHR) were also feasible, but were not required to control external noise ingress in the green zone.

For the plots in the blue zone, experiencing higher external noise levels, use of MEV or MVHR was recommended. "System 1" was not deemed suitable due to external noise ingress through the number of trickle vents required in habitable rooms. Calculations of external noise ingress through the relevant facade elements demonstrated how suitable internal noise levels are achieved.

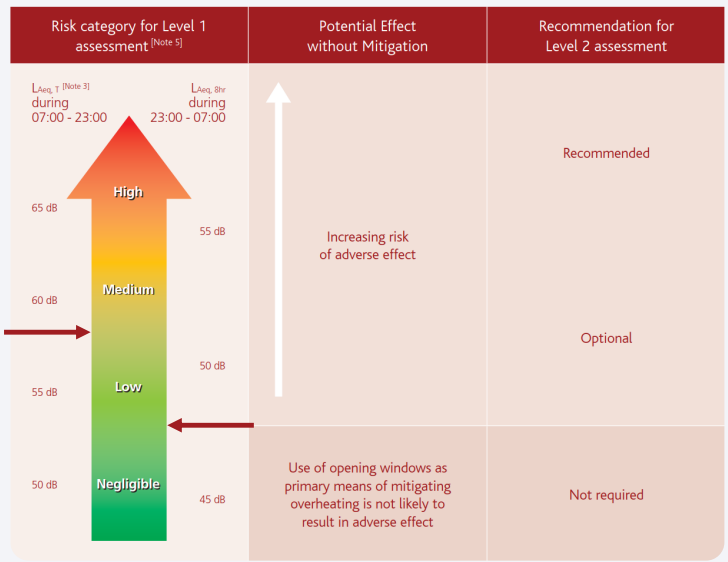
All rooms were calculated to have internal noise levels significantly below the guideline noise limits in the AVO Guide. Even the most affected room in the blue zone was predicted to have daytime internal average noise levels of just 31 dBA when assuming closed windows and the use of MEV (which only requires a single open trickle vent); well below the 35 dBA guideline limit.

AVO Guide Step 03 – Assess noise and overheating

The team began by using the Good Homes Alliance's Overheating Risk Tool to qualitatively assess the overheating risk at the site. This exercise suggested certain apartments (which were in the blue zone) could have a "low" to "medium" risk of overheating, but that open windows could be an option for mitigating this risk.

Using the measured external noise levels for that location, consideration was given to the impact of open windows on internal noise. Average external noise levels were calculated to be 58 dBA during the day and 48 dBA at night. As these levels are not classed in the AVO Guide as "high", further investigation of potential adverse noise impacts due to opening windows beyond this "Level 1" assessment was optional, according to the AVO Guide. See Table 1 below.

Table 1: Extract from the AVO Guide with red arrows added to indicate the external noise levels for the case study site



However, the design team decided to err on the side of caution and investigate further. A "Level 2" assessment calculates the risk of adverse impact from external noise, factoring in the potential duration of window opening. In this case, the team judged that a partially open window would provide 16 dB[1] of sound insulation against external noise, based on the relatively low risk of overheating for these dwellings - located in the north of England and all with cross-flow ventilation available. This meant estimated average internal noise levels were 42 dBA during the daytime, and 32 dBA at night. AVO diagrams were used to demonstrate that these levels were, again, well within the AVO Guide upper limits. This was also the case when considering maximum internal night-time noise levels.[2]

Hence the Level 2 assessment indicated that window opening should be acoustically suitable to mitigate overheating. Occupants should be able to find a reasonable balance that is acoustically and thermally comfortable without requiring alternative means to mitigate overheating such as a mechanical system to provide cooling.

Further information

This case study provides a practical example of how the AVO Guide can be used effectively to "square the circle" of meeting requirements to provide new housing schemes which are acoustically and thermally comfortable, as well as adequately ventilated for indoor air quality.

In this case the team were able to advise the Local Planning Authority that no specific additional acoustic measures would need to be applied to the building envelope to reduce external noise ingress, and that plots in the green zone could meet all requirements on noise levels and whole dwelling ventilation with a natural ventilation strategy, and opening windows to mitigate overheating.

For plots in the blue zone, more exposed to road traffic noise, MEV or MVHR for whole dwelling ventilation should be used. However, open windows were still considered to be acoustically suitable to mitigate overheating.

For more information, please contact info@theanc.co.uk

1. The overheating assessment for the building indicated that only a small free area (i.e. window opening) was required to provide the additional ventilation needed to avoid overheating. Based on this information, a 16 dB outside to inside level difference was calculated. However, in many buildings windows will need to be more fully open to avoid overheating and will provide significantly less attenuation. Additional information is provided in the AVO Guide and, in particular, reference should be made to paragraph 3.24, 3.25 and Appendix C.
2. See Table 3-3 on Page 23 of the AVO Guide.