AVAL CONSULTING GROUP.
CIVIL, ENVIRONMENT & STRUCTURAL ENGINEERS

Noise Impact Assessment

City House, Sutton Park Road, Sutton, SM1 2AE

Macar Living (City House) Ltd

February 2024

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Project Information

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Disclaimer

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1. Introduction

1.1 Overview

Aval Consulting Group Ltd has been commissioned to carry out a noise impact assessment at City House, Sutton Park Road, Sutton, SM1 2AE, for the proposal of demolition of the existing commercial building and the construction of a new part-5, part-13-storey mixed-use building, with commercial office units on the lower levels, residential on upper levels. This is hereby referred to as the 'purposed development'.

1.2 Objective

The local authority requires evidence from a noise impact assessment that prevailing noise levels at the proposed site will not exceed internal noise levels suitable for habitation. BS:8233 guidance suggests that prior to developing a scheme, details of the measures should be considered so that internal sound levels within all habitable rooms do not exceed 35 dB(A) LAeq,16hours (07:00- 23:00); and internal sound levels within all bedrooms that do not exceed 30 dB(A) LAeq, 8hours (23:00-07:00).

The purpose of the noise impact assessment is to ensure that the proposed scheme and its usage are suitable for habitation in relation to the prevailing noise in the surrounding area's environment. If needed, mitigation measures will be provided.

Predicted noise impact will be determined at the proposed development through the following assessments:

- 24-hour background survey
- Predicted internal noise levels as per BS:8233
- Assessment of night-time noise events/exceedances as per ProPG and WHO Guidelines for Community Noise
- Construction Measures as per BS:5228

1.3 Site Proposal and Location

Figure 1.1 shows the proposed development location. The site is currently a 3-storey commercial office space, with the ground floor as reception, and parking on the south boundary of the site, situated between the edge of Sutton Park Road to the west and Cheam Road to the north. There is a tower block to the south approximately 100m away and a church to the east approximately 20m. The National Rail line runs Southern rail and Thameslink trains underground about 200m south of the site.

The predominant noise sources on site were observed to be:

- Traffic noise on Cheam Road
- Traffic noise on Sutton Park Road

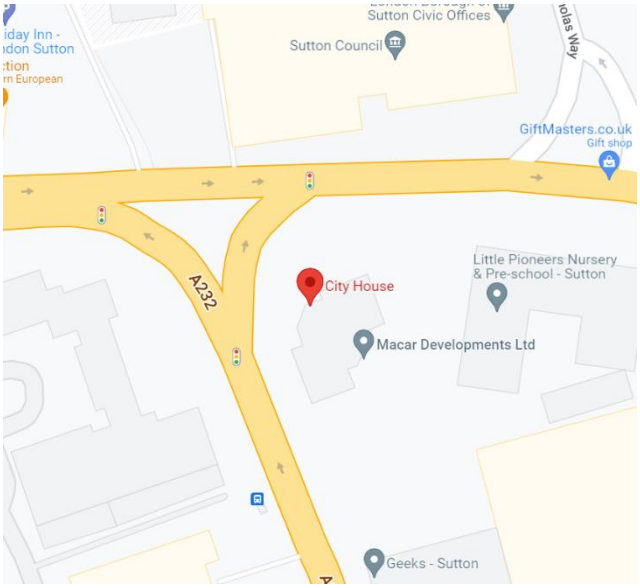


Figure 1.1 Site location (Source: Google Maps)

2. Relevant Noise Standards

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

2.1 The 'National Planning Policy Framework (NPPF)

The updated December 2023 version of the 'National Planning Policy Framework (NPPF)'[1] contains information and general guidance to Local Authorities in relation to considering and taking into account noise. The National Planning Policy Framework (NPPF) guidance reinforces that noise should be taken into account considering planning policies and decisions. Some of the guidance contained in the 'National Planning Policy Framework (NPPF)' includes the following:

- Paragraph 180e: "…*preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability*…"
- Paragraph 191a,b: "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should*:

  (a) *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life…*

  (b) *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;…*"
- Paragraph 193: *Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues, and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

In conjunction with the 'National Planning Policy Framework (NPPF)', 'The Noise Policy Statement for England (NPSE)'[2], dated March 2010, states the following regarding a long-term vision of government noise policy:

"Noise Policy Statement for England Aims:

- *The first aim of the NPSE:*

  Avoid significant adverse impacts on health and quality of life from environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development.
- *The second aim of the NPSE:*

  Mitigate and minimize adverse impacts on health and quality of life from environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development.

[1] The National Planning Policy Framework (2023) https://www.gov.uk/guidance/national-planning-policy-framework
[2] Noise Policy Statement for England (NSPE) https://www.gov.uk/government/publications/noise-policy-statement-for-england

- *The third aim of the NPSE:*

  Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development."

In terms of the NPSE, the impact of noise can be categorised by the following terms:

- NOEL – No Observed Effect Level – The level where no effect can be detected
- LOAEL – Lowest Observed Adverse Effect Level – The level where adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level – The level where significant adverse effects on health and quality of life may occur.

The NPSE further states that:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors, and at different times."

No specific guidance is detailed or given in the 'National Planning Policy Framework (NPPF)', or 'The Noise Policy Statement for England (NPSE)' in terms of acceptable acoustic criteria/noise criteria in order to achieve the 'NOEL, LOAEL, or SOAEL'. Therefore, it is considered necessary to refer to alternate national guidance, preferably standardised or regulated such as an appropriate British Standard (BS), or in the absence of this, alternate World Health Organisation (WHO) guidelines, etc.

The British Standard 8233: Sound Insulation and Noise Reduction for Buildings/Code of Practice BS 8233: Sound Insulation and Noise Reduction for Buildings/Code of Practice states that for different spaces, there might be a range of noise levels that are considered acceptable.

2.2 WHO 'Guidelines for Community Noise'

Where noise is assessed against the 'Absolute Level', then this can be split into separate daytime and night-time legislation. The WHO 'Guidelines for Community Noise' state in 4.2.7 "Annoyance Responses" that:

"During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55 dB; or moderately annoyed with L_{Aeq} levels below 50dB. Sound pressure levels during the evening and night should be 5-10 dB lower than during the day…."

The guidance goes on to provide a daytime[3] internal acoustic criteria relative to critical health effect(s) that of 35 dB $L_{Aeq,16\ hour}$, and a night-time[4] level of 30 dB $L_{Aeq,8\ hour}$ / 45 dB L_{AFmax} linked with dwelling indoors. Therefore, assuming a maximum external noise level of 50 dB $L_{Aeq,t}$ during the daytime, (considering a 15 dB reduction in noise via a partially open window) an internal noise level of 35 dB $L_{Aeq,t}$ should be achieved.

During the night-time periods, a further publication; WHO Night Noise Guidelines For Europe' published in 2009 states that:

"Below the level of 30 dB $L_{night,outside}$, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night,outside}$ are harmful to health. However, adverse health effects are observed at the level above 40 dB $L_{night,outside}$, such as self-reported sleep disturbance, environmental insomnia, and increased use of somnifacient drugs and sedatives. Therefore, 40 dB $L_{night,outside}$ is equivalent to the LOAEL for night noise….. The LOAEL of night noise, 40 dB $L_{night,outside}$, can be considered a health-based limit value of the night noise guidelines (NNG) necessary to protect the public,

[3] daytime is typically between 07:00 h and 23:00 h.

[4] night-time is between 23:00 h and 07:00 h.

including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise."

Therefore, where absolute levels need to be referenced, a maximum daytime noise limit of 50 dB $L_{Aeq,t}$ can be considered, with the LOAEL for night of 40 dB $L_{night,outside}$ being considered.

2.3 IEMA (Institute of Environmental Management & Assessment)

IEMA also defines the sensitivity of receptors according to the table below

Very Substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 2.1 Effect Descriptors (Guidelines For Environmental Noise Assessment, 2014)

2.4 The British Standard 8233: Sound Insulation and Noise Reduction for Buildings/Code of Practice

BS 8233: Sound Insulation and Noise Reduction for Buildings/Code of Practice provides acceptable noise levels. Table 4 of British Standard BS 8233 reproduced below (Table 2.1) provides appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

Activity	**Location**	**07:00 to 23:00 (Day Time)**	**23:00 to 07:00 (Night Time)**
Resting	Living Room	35 dB $L_{Aeq,\ 16\ hour}$	-
Dinning	Dining Room/area	40 dB $L_{Aeq,\ 16\ hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,\ 16\ hour}$	30 dB $L_{Aeq,\ 8\ hour}$

Table 2.2: British Standard recommended indoor noise levels for dwellings (Source: British Standard BS: 8233)

In addition, the WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009 makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB L_{AFmax}. The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night. The WHO document recommends that steady, continuous noise levels should not exceed 55 dB L_{Aeq} on balconies, terraces, and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB L_{Aeq}.

BS 8233 also states that the ambient noise levels in non-domestic buildings should not normally exceed the design ranges in the table below.

Activity	Location	Design Range dB $L_{Aeq,T}$
Speech or telephone communications	Department store, Cafeteria, canteen, Kitchen	50-55
	Concourse Corridor, circulation space	45-55
Study and work requiring concentration	Library, gallery, museum	40-50
	Staff/meeting room, training room	35-45
	Executive office	35-40
Listening	Place of worship, counselling, meditation, relaxation	30-35

Table 2.2: Typical Noise levels in non-Domestic Buildings (Source: British Standard BS: 8233)

3. Noise Survey

3.1 Overview

This section provides the details of the methodological approach taken to assess the anticipated noise levels produced by the site, as well as the prevailing acoustic environment representative of that where existing noise-sensitive receptors are present. Establishing the current acoustic environment was achieved by 24-hour monitoring of noise levels at the site and where applicable establishing the key noise indicators namely $L_{Aeq,T}$, $L_{A90,T}$, $L_{A10,T}$ and L_{AFmax}, as described in Appendix A.

3.2 Background Noise Monitoring and Nearest Receptors

The 24-hour background noise monitoring survey was carried out in the existing site, in a location deemed representative of the background noise level that would be experienced by the residential receptors in the proposed development.

Both noise monitors were installed in restricted spaces hence free-field conditions were not achieved, and a correction factor of 3dB has been applied.

- Location 1 – Facing Cheam Road
- Location 2 – Facing Sutton Park Road

Figure 3.1 Noise monitoring locations

3.3 Noise Survey Periods

Noise monitoring was carried out for 24 hours to determine the prevailing background levels. Details of the survey period have been tabulated below.

Locations	Start Date	Start Time	End Date	End Time
1	22/11/2022	16:20	23/11/2022	16:20
2	22/11/2022	16:20	23/11/2022	16:20

Table 3.3 Noise Survey Periods

3.4 Weather Conditions and observations

During the 24-hour survey, it was mostly clear, with some clouds in the early evening. Wind speeds reached a maximum of 7 m/s, the temperature ranged from an overnight low of 5 C to a daytime high of 11 C, and 4.8mm precipitation was recorded (source: Worldweatheronline).

Weather conditions throughout this survey period were deemed suitable for the measurement of environmental noise in accordance with BS7445: Description and Measurement of Environmental Noise.

3.5 Details of Noise Monitoring Equipment

The details of the equipment used for all noise monitoring have been tabulated below. The sound level meter used for this survey was a Class 1 device which has been laboratory calibrated, as well as field calibrated on-site before and after monitoring (no calibration drift was recorded).

Equipment	Serial Number	Date of Last Calibration
BSWA 308 Class 1 Sound Level Meter	590144	25/10/2021
BSWA 308 Class 1 Sound Level Meter	580273	01/02/2021
BSWA CA111 Class 1 Calibrator (UKAS)	550282	23/07/2021

Table 3.4 Noise Equipment Details

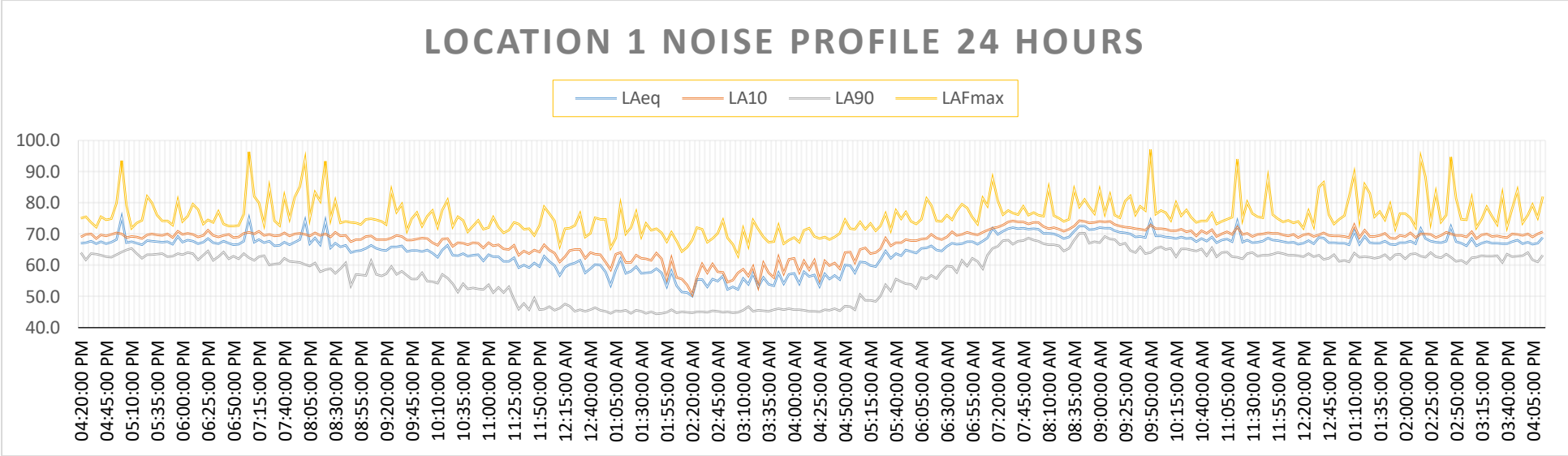
4. Survey Results

4.1 Background noise levels

Measurements were obtained in 1-second intervals and have been summarised below for the daytime and night-time values. A graph is presented in Figure 4.2 for the full 24-hour period (in 5-minute intervals), with a second graph in Figure 4.3 isolating the L_{Amax} events (1-minute intervals) during the night-time period.

	Noise Monitoring Location 1 - Facing towards Cheam Road		Noise Monitoring Location 2 - Facing towards Sutton Park Road	
Indicator All values in dB(A) (3dB correction applied)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
L_{Aeq}	66	58	65	58
L_{A10}	68	63	68	62
L_{A90}	58	42	57	42
L_{Amax}	94	78	97	77

Table 4.1 Background noise survey results



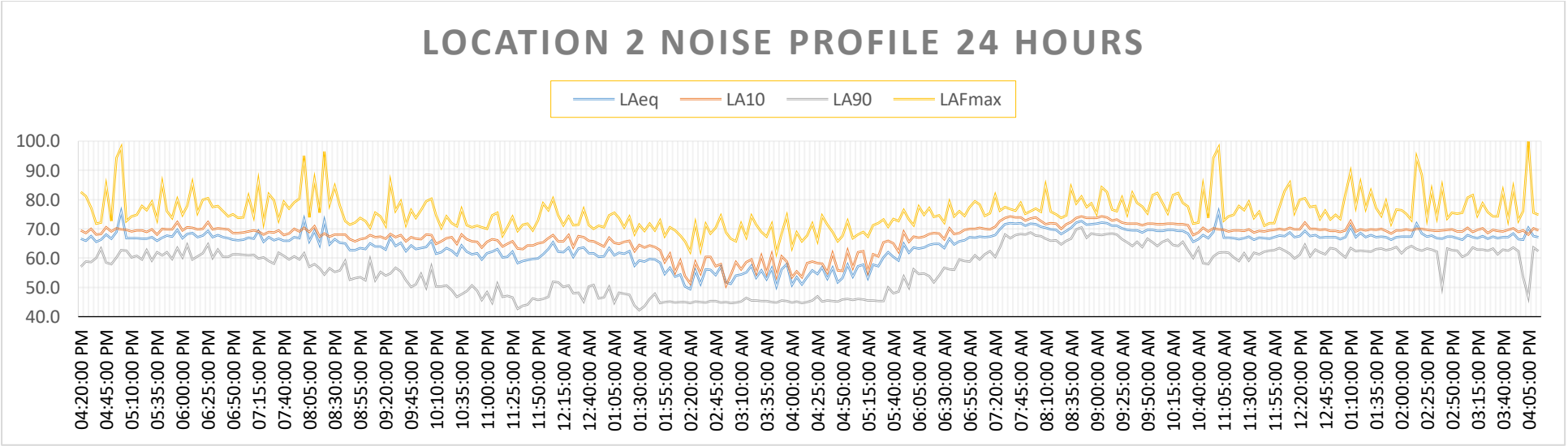
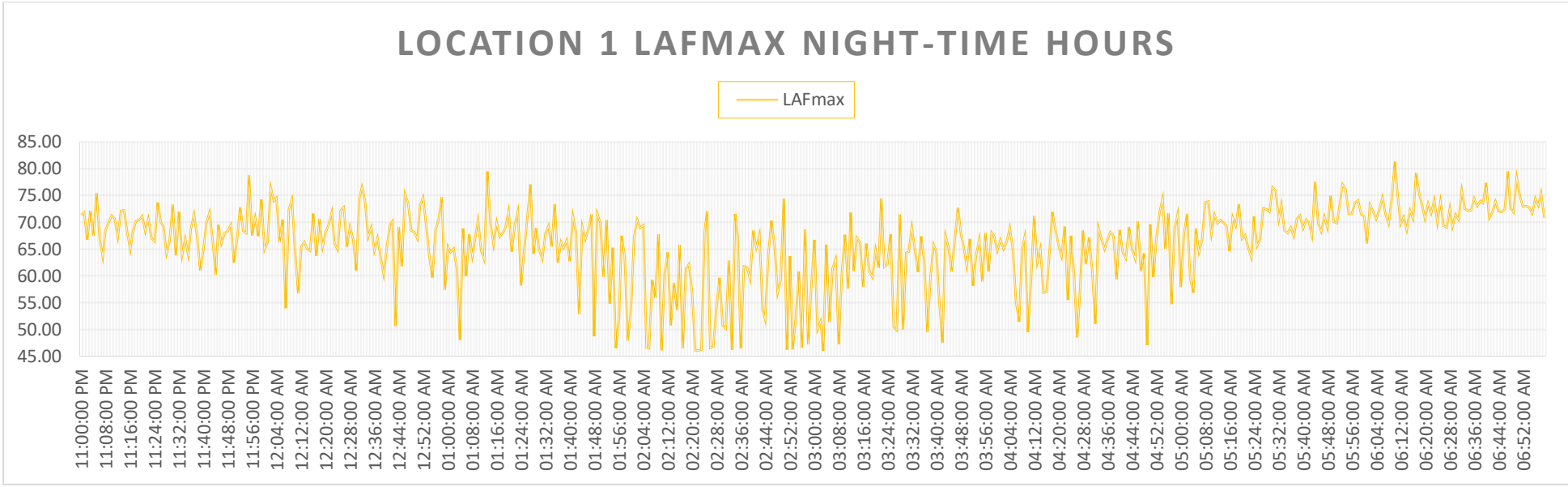


Figure 4.2 Background survey 24-hour noise profile graphs



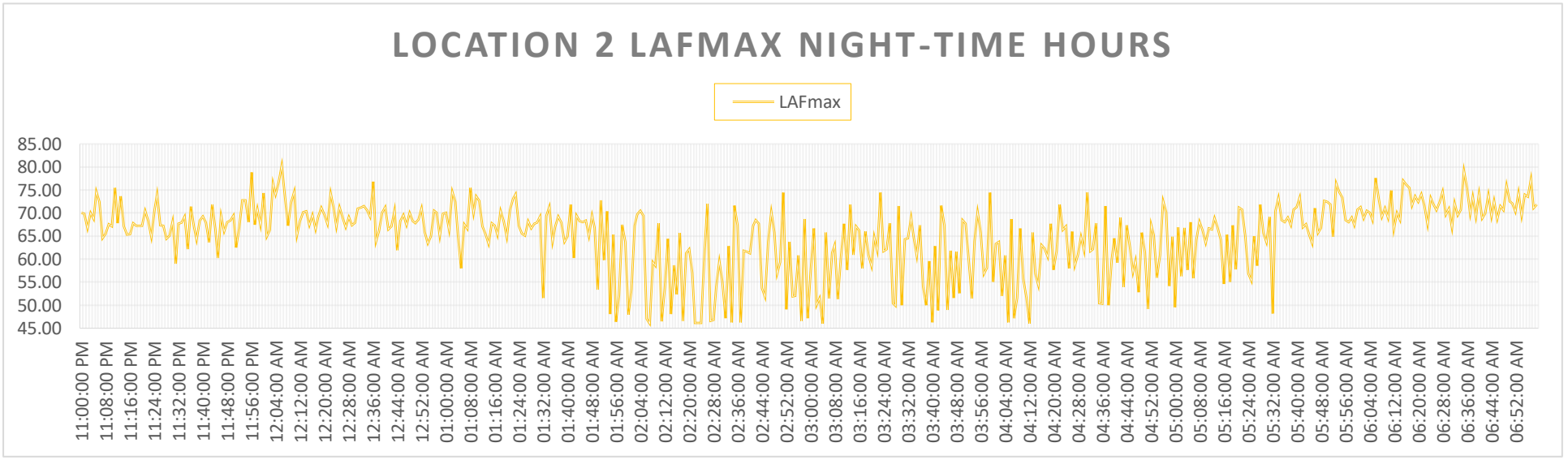


Figure 4.3 Background survey LAFmax night-time noise graphs

5. Noise Impact Assessment

The measured external noise levels have been compared with the WHO and BS:8233 target internal noise levels (see Section 2 of this Report) to derive the required noise reduction of façade/windows.

The internal target levels for bedrooms are based on guidelines laid out by BS:8233

- Day-time (07.00-23.00 hrs): 35 dB(A)
- Night-time (23.00-07.00 hrs): 30 dB(A)

5.1 Residential Attenuation Requirements based on External Noise for façade towards Sutton Park Road.

Referring to Section 4 of this Report and considering the nature of the noise from the external surroundings, the prevailing levels of noise recorded were compared to the BS:8233 criteria mentioned in the above paragraph.

It was found that a minimum attenuation level of 65 – 35 = **30** dB is required during daytime and a minimum attenuation of 58 – 30 = **28** dB during the night- time.

ProPG and the WHO community noise guidelines also recommend that the peak noise in bedrooms should not exceed 45 dB LAmax more than 10 times per night. ProPG, Section 2.11 mentions that if there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F}$ > 60 dB, the site should not be regarded as having a negligible risk. It further mentions that "behavioural awakening, is likely to occur where the maximum sound level at the façade of a building with partially open windows is above:

- 85 dB $L_{Amax,F}$ (where the number of events exceeding this value is ≤ 20); or
- 80 dB $L_{Amax,F}$ (where the number of events exceeding this value is > 20)"

Based on the night-time LAmax value recorded (refer to LAFmax graphs in Section 4), the west facing of the proposed development cannot be defined as having a negligible risk for sleep disturbance.

Since the location of the proposed development is in a busy area, the highest measured L_{Amax} value of 77 dB has been used to provide a robust assessment and it was found that a minimum attenuation level of 77 – 45 = **32** dB is required to meet the above mentioned Pro Pg and WHO criteria.

Therefore, based on the highest outcome from the above assessments, a noise reduction of **32 dB(A)** is required to prevent noise disturbance internally during the night-time hours.

5.2 Residential Attenuation Requirements based on External Noise for the façade towards Cheam Road and remaining facades.

Referring to Section 4 of this Report and considering the nature of the noise from the external surroundings, the prevailing levels of noise recorded were compared to the BS:8233 criteria mentioned above.

It was found that a minimum attenuation level of 66 – 35 = **31** dB is required during daytime and a minimum attenuation of 58 – 30 = **28** dB during the night- time.

Since the location of the proposed development is in a busy area, the highest measured L_{Amax} value of 78 dB has been used to provide a robust assessment and it was found that a minimum attenuation level of 78 – 45 = **33** dB is required to meet the above mentioned Pro Pg and WHO criteria.

Therefore, based on the highest outcome from the above assessments, a noise reduction of **33 dB(A)** is required to prevent noise disturbance internally during the night-time hours.

5.3 Commercial Office Attenuation Requirements based on External Noise for façade towards Sutton Park Road and remaining facades.

Referring to Section 4 of this Report and considering the nature of the noise from the external surroundings, the prevailing levels of noise recorded were compared to the BS:8233 criteria.

It is noted that the commercial office units only operate during the daytime, and typically within the hours of 8am – 6pm. Therefore, only daytime readings have been considered. It is assumed that it would be an executive office and therefore, as per BS8233, the recommended maximum noise levels are 40dB L_{Aeq}

Hence was found that a minimum attenuation level of 65 – 40 = **25** dB is required during daytime.

Therefore, based on the highest outcome from the above assessments, a noise reduction of **25 dB(A)** is required to prevent noise disturbance internally during the daytime hours.

5.4 Commercial Office Attenuation Requirements based on External Noise for façade towards Cheam Road.

Referring to Section 4 of this Report and considering the nature of the noise from the external surroundings, the prevailing levels of noise recorded were compared to the BS:8233 criteria.

As stated in Section 5.3, the offices are only operational during day-time and so, the maximum noise level is to be 40dB L_{Aeq}.

Hence was found that a minimum attenuation level of 66 – 40 = **26** dB is required during daytime.

Therefore, based on the highest outcome from the above assessments, a noise reduction of **26 dB(A)** is required to prevent noise disturbance internally during the daytime hours.

6. Outline Mitigation Measures

Mitigation measures need to be in place to minimise the potential negative impacts in order to ensure that the internal noise limits are achieved, we would recommend the following scheme of mitigation measures as outlined below.

6.1 Non-Glazed Elements

The non-glazed building façade elements of the proposed development are believed to consist of masonry. Based on the external noise levels, all external walls must achieve an acoustic performance of > **33** dB for the residential unit facades towards Cheam Road and an acoustic performance of > **32** dB for the residential unit facades towards Sutton Park Road and the remaining facades.

Non-Glazed elements commercial unit facades facing towards Cheam Road require an acoustic performance of > **33** dB. Non-Glazed elements commercial unit facades facing towards Sutton Park Road and remaining facades require an acoustic performance of > **32** dB.

6.2 Glazed Elements

It is proposed that glazing with an acoustic performance of > **33 dB** should be implemented for the residential unit glazed elements towards Cheam Road.

It is proposed that glazing with an acoustic performance of > **32 dB** should be implemented for the residential unit glazed elements towards Sutton Park Road and the remaining facades. Examples of glazing options to achieve this acoustic performance are attached in Appendix C.

Glazed elements at commercial unit facades facing towards Cheam Road require an acoustic performance of > **33** dB. Glazed elements at commercial unit facades facing towards Sutton Park Road and remaining facades require an acoustic performance of > **32** dB.

6.3 Separating Floors and Walls

For adjoined dwellings where occupants share a wall, staircase, corridor, or floor, it is necessary that separating elements are designed in accordance with the Building Regulations 2010 Approved Document E.

For new purpose-built flats, this guidance requires all separating walls to have an airborne acoustic performance of $D_{nT,w} + C_{tr}$ > **45 dB**.

Separating floors and staircases requires an airborne acoustic performance of $D_{nT,w} + C_{tr}$ > **45 dB,** and an impact $L_{nT,w}$ < **62 dB**.

With regards to the separating floor between the commercial office units and flats, the airborne acoustic floor performance may need to be enhanced to prevent noise disturbance in the flats above. If the commercial unit is likely to contain a café, restaurant, or another noisy environment, there is a risk that noise levels through the floor may exceed BS:8233 limits based on the 45 dB minimum performance requirement of Building Regulations Part E.

In the instance that a café, restaurant, or other noisy environment is likely to occupy this space, it is recommended that the airborne performance of this separating floor is increased to > 55 dB. Based on the example of coffee machines/blenders (which can operate around 85-90 dB), this enhanced performance would reduce the risk of internal noise levels exceeding 35 dB during day-time hours in the flats above. Night-time hours have not been considered as operating times for the commercial unit are restricted between 08:00 – 22:00. Since details on the specific equipment and noise emission levels are not available at this stage, it is proposed that the exact performance of the separating floor can be suitable conditioned.

6.4 Ventilation Strategy

6.4.1 Passive and Mechanical

The ventilation overheating risk assessment has been based on the requirements of the approved Part O document which states that " Windows are likely to be closed during sleeping hours if noise within a bedroom exceed the following limits;

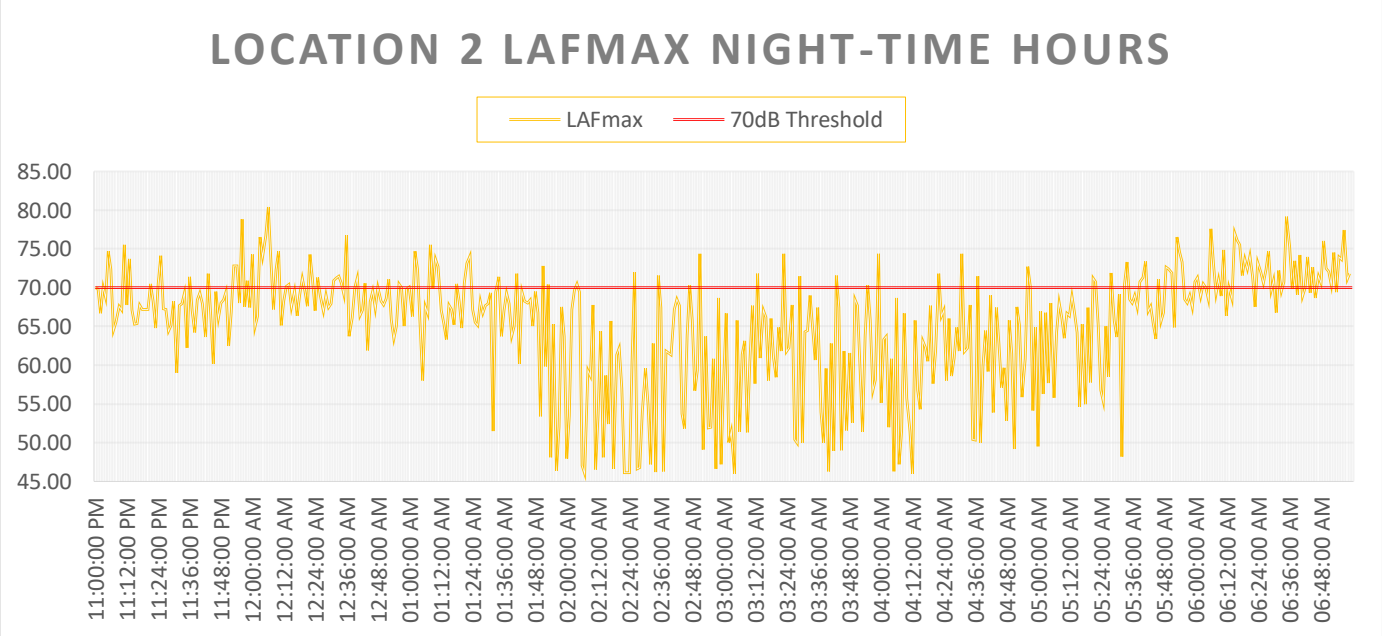
a) 40dB LAeq, T averaged over 8 hours (between 11pm and 7am).

b) 55dB LAFmax more than 10 times a night (between 11pm and 7am)."

It is understood that the design would incorporate partially open windows as a means of ventilation and it has been assumed that a partially open window would provide a noise reduction of 15dB.

When compared to the prevailing noise levels mentioned in Sections 4 and 5 of this report, the highest internal noise levels with open windows (in a bedroom) were determined as 66 - 15 = 51 dB during the daytime and 58 - 15 = 43 dB during night-time. Therefore, the 40dB (LAeq) (between 11pm and 7am) criteria mentioned in the Approved Part O document would be exceeded by 3dB, and this would be classed as LOAEL (Lowest Observed Adverse Effect Level).

The LF_{max} levels measured were filtered and based on the fact that an attenuation of 15dB would be achievable by partially open windows, the noise levels that should not be exceeded externally would be 55 +15 =70dB. A threshold line was plotted on the noise data graph and it was observed that the number of exceedances of the internal LFmax limit of 55dB would be over 10 times a night.



hence in conjunction with the Acoustics and Ventilation Residential Design Guide 2020, the proposed development was found to have a high risk during the daytime and high risk during the night-time.

It is proposed that the use of acoustic trickle vents with attenuation characteristics ≥ 32 dB, $D_{n,e,w.}$ can be implemented as a continuous ventilation strategy, and the required internal BS:8233 noise criteria (refer to Section 5 of this report) will be achieved with closed windows. Example trickle vent specifications are attached in Appendix C.

For hotter days where trickle vents would not provide adequate ventilation, it is likely that relying on open windows would result in noise levels exceeding the BS:8233 limits and cause sleep disturbance for residents.

Therefore, it is proposed that mechanical ventilation is installed in all bedrooms to provide residents with the ability to cool bedrooms without having to open the windows. Windows could be installed for the residents to open at their own choice.

This system should be designed and installed by qualified personnel who will ensure that conditions (e.g. infiltration rates) are being complied with as per Building Regulations part F and that a noise level of NR20 is not exceeded internally within rooms for habitation.

It is proposed that additional details can be secured as part of a post-planning condition.

6.5 Commercial unit and plant noise

Any externally mounted plant equipment associated with the ground floor commercial unit or mechanical ventilation in flats are unknown at this stage of the development but will be subject to a BS4142 assessment operating levels 1 meter from the façade of the building must remain below the prevailing background level (L90) measured. It is proposed this can be secured as part of a post-planning condition.

6.6 Construction Phase Mitigation Measures

6.6.1 Noise

The effects of noise can vary from a person to person. The negative impacts include a sensation of loudness, potential interference with speech communication, disturbance of work or leisure, and disturbance of sleep. It should be noted that within any neighbourhood, some individuals will be more sensitive to noise than others.

In order to assess instantaneous noise levels at any time, the instantaneous A-weighted sound pressure level, L_{pA} can be used. This will give an indication of the loudness and degree of speech interference from noise.

The most commonly used descriptor, however, is the equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$. The time period involved should always be stated as the figure is a mathematical average of all individual contributions of various sources during the reference period T. When assessing noise from individual events that may not always be present during a longer period L_{Aeq}, it can be useful to use a short reference period (e.g. 5min). As an alternative descriptor, the maximum sound pressure level, $L_{A(max),}$ or the one percentile level, L_{A01}, may be used.

Concerning noise levels, it is proposed that the absolute limit would be determined in accordance with BS5228-1:2009 and would be subject to an overall daytime noise limit of 75dB $L_{Aeq.}$

6.6.2 Vibration

The sensitivity of the human frame to vibration varies according to the axis of vibration relative to the human body (e.g. x, y, or z-axis) and the frequency of vibration. In general, except at very low frequencies, sensitivity is greater in the z-axis (i.e. head to foot). When setting vibration control targets it is reasonable to assume that people will normally be sitting or standing during the day and lying down during the night.

With an impulsive source of vibration, it is usual to measure the peak value attained from the beginning to the end of a drive. It is also usual to measure in terms of peak particle velocity

(P.P.V) if the risk of damage to the building is the primary concern and there is also an interest in human reaction. If the concern is purely for human tolerance, then acceleration is the preferred parameter.

Vibrations, even of very low magnitude, may be perceptible to people and can interfere with the satisfactory conduct of certain delicate activities, e.g. operating theatres, use of very sensitive laboratory weighing equipment, etc.

Nuisance from vibration is frequently associated with the assumption that, if vibrations can be felt, then damage is consequently inevitable; however, considerably greater levels of vibration are required to cause damage to buildings and structures than to be perceived by the human body.

Vibrations from site activities to the neighbourhood may, therefore, cause anxiety as well as annoyance and can disturb sleep, work, or leisure activities. As with noise, in any neighbourhood, some individuals will be more sensitive to vibration than others.

6.6.3 Noise and Vibration Monitoring Technology

The following factors are typically used to assess the likelihood of disturbance caused by noise and vibration generating activities.

- Site location

The relative location of a site in relation to noise or vibration-sensitive receivers will be a determining factor. The closer a site is to sensitive premises, the higher the likelihood of complaints due to noise and vibration emanating from the site.

- Ambient noise and vibration levels

It is understood that the site surrounding is generally representative of a typical busy urban mixed-use adjacent to an ‘A’ road. The ambient noise and vibration are predominantly related to the existing road traffic movement.

- Duration of site operations

In general, the longer the duration of all on-site operations, the more likely it is that noise or vibration from the site will potentially be an issue. In this respect, good public relations are very important. Local residents may be willing to accept a new status of noise and vibration if they know and understand the source and the duration of all operations. Therefore, all site operations are to be carried out according to a stated schedule. Changes are to be notified to the local authority in advance.

- Hours of work

For any noise-sensitive premises, some periods of the day will be more sensitive than others. Times of site operation outside normal weekday working hours will also need consideration.

Noise control targets for the evening period in such cases will need to be stricter than those for the daytime and, when noise limits are set, the evening limit may have to be as low as 10 dB(A) below the daytime limit. Very strict noise control targets should be applied to any site which is to operate at night.

- Site Operation

People's attitudes to noise are always influenced by their attitudes to the noise source itself. Noise and vibration generated from a site will tend to be accepted more willingly by local residents if they consider that the site operator is adopting the best practicable means to avoid unnecessary noise.

- Noise and vibration characteristics

In many cases, the particular identity of noise and vibration will affect people's judgement and appreciation of the signal itself. For example, the presence of a high-amplitude impulsive noise, accompanied by a vibration sensation would render the overall assessment slightly more onerous as "penalties" would need to be employed. These would comprise weightings to signals (e.g. 5dB (A) to a highly tonal or intermittent noise source).

6.6.4 Proposed Control Measures for Construction Noise

The contractor to ensure The Best Practicable Means (BPM) (as defined in Section 72 of the Control of Pollution Act 1974) will be used to reduce noise and vibration levels at all times. Where practicable the control measures set out in BS 5228:2009 + A1:2014 Part 1 & Part 2, Section 8 will also be implemented.

The following noise and vibration control measures to be included as a minimum:

- Choice of methodology/technique for operations (including site layout) will be considered in order to eliminate or reduce emissions at sensitive locations;
- Fixed items of construction plant will be electrically powered in preference to diesel or petrol-driven;
- If any specialise fabrication is required, this will be undertaken off-site if possible;
- Noisy plant will be kept as far away as possible from sensitive areas;
- Each item of the plant used will comply with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701 where reasonably available;
- Equipment will be well-maintained and will be used in the mode of operation that minimizes noise and shut down when not in use;
- Vehicles shall not wait or queue on the public highway with engines running (unless the engine is required to power the operation of the vehicle e.g. concrete wagon);
- Where possible deliveries will be arranged on a just-in-time basis to prevent vehicles from queuing outside of the site and
- All materials will be handled in a manner that minimizes noise.

6.6.5 Temporary Noise Barrier or Noise Insulation

Table E2 of BS 5228-1:2009+A1:2014 provides an example of time periods, averaging times, and noise levels associated with the determination of eligibility for noise insulation.

Noise insulation, or the reasonable costs thereof, will be offered by the developer or promoter to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed scheme, where the construction of the development causes, or is expected to cause, a measured or predicted airborne construction noise level that exceeds either of the following at property lawfully occupied as a permanent dwelling: the noise insulation trigger levels presented in Table E.2 for the corresponding times of day; and a noise level 5 dB or more above the existing pre-construction ambient noise level for the corresponding times of day; whichever is the higher; and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months."

Table 6.1: An extract from BS Standard (Table E2 of BS 5228-1:2009+A1:2014)

Examples of time periods, averaging times and noise levels associated with the determination of eligibility for noise insulation

Time	Relevant time period	Averaging time, *T*	Noise insulation trigger level dB $L_{Aeq,T}$ [A)]
Monday to Friday	07.00 – 08.00	1 h	70
	08.00 – 18.00	10 h	75
	18.00 – 19.00	1 h	70
	19.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Saturday	07.00 – 08.00	1 h	70
	08.00 – 13.00	5 h	75
	13.00 – 14.00	1 h	70
	14.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Sunday and Public Holidays	07.00 – 21.00	1 h	65
	21.00 – 07.00	1 h	55

A) All noise levels are predicted or measured at a point 1 m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.

6.6.6 Proposed Vibration Control Measures

This section presents an assessment of the potential risk regarding vibration generated by the construction works detailed in this document and the associated adverse effects on the surrounding area.

Estimated vibration levels have been evaluated against guidance presented in relevant British Standards to assess the likelihood of both structural damages to neighbouring buildings and the human response of the occupants.

Building Damage

According to BS 7385 Part 2 for residential or light commercial buildings, the threshold for the onset of potential cosmetic damage (i.e. formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces) to buildings varies with frequency. This ranges from a PPV of 15 mm/s at 4Hz, rising to 20mm/s at 15 Hz, and to 50 mm/s at and above 40Hz for transient vibration. BS 7385: Part 2 also states that the probability of building damage tends towards zero at 12.5 mm/s peak component particle velocity.

Subjective Response

According to guidance provided in BS 5228 Part 2, the threshold of vibration perceptible to humans lies around 0.14 to 0.3 mm/s. The Standard also indicates that a PPVs of around 1 mm/s in residential environments, as a first estimate, are likely to cause complaints, but can be tolerable provided prior warning and explanation of the works is given to residents; whilst, vibration magnitudes of around 10 mm/s are likely to be intolerable for more than a very brief exposure to this level.

As the exact equipment that will be used during the construction phase is not known, we propose the following criteria:

- 5 mm/s p.p.v. ‘soft’ limit; when exceeded, the contractor should temporarily halt works. Works should only be resumed after consultation with the local residents, and with extreme caution and
- 10 mm/s p.p.v. ‘hard’ limit; when exceeded, the contractor should stop work. Works should only continue after a thorough structural examination of the adjacent property,

subsequent consultation with the local residents, and then with extreme caution. Should significant damage be identified, alternative methods of land remediation operations should be adopted.

6.7 Residual Impact

6.7.1 Construction Phase

Following the implementation of mitigation measures in accordance with the BS 5228-1 & 2 guidance, the residual impact is considered negligible. It is proposed that construction operations shall be limited to the following days and hours:

- 08:00 to 18:00hrs Monday to Friday;
- 08:00 to 13:00hrs Saturday;
- No construction operations on Sundays or public holidays;
- HGV movements shall not be permitted outside these hours during the construction phase without prior written approval from the Local Planning Authority; and
- Installation of equipment on-site shall not be permitted outside these hours without prior written approval from the Local Planning Authority.

7. Conclusions

An environmental noise survey has been undertaken for the proposed development at City House, Sutton Park Road, Sutton, SM1 2AE, allowing the assessment of daytime and night-time levels likely to be experienced by the proposed development.

Predicted noise levels allowed a robust noise insulation proposal to be made to comply with a minimum value for required attenuation, which would, in turn, provide internal noise levels for all residential and commercial office environments of the development commensurate to the relevant design standard.

Mitigation measures have also been provided for the construction phase as per BS5228.

No further mitigation measures should be required in order to protect the proposed habitable spaces from external noise intrusion.

It can, therefore, be concluded that the proposed development is not considered to conflict with any national, regional, or local noise planning policy.

Appendix A: Noise Indicators

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Reference Time Interval, T

The specified time interval over which an equivalent continuous A-weighted sound pressure level is determined.

$L_{Aeq,T}$

The A-weighted equivalent continuous sound level. This is the sound level of a notionally steady sound having the same energy as the fluctuating sound over a specified measurement period, T.

$L_{A10,T}$

The A-weighted sound level exceeded for 10% of the specified measurement period, T.

L_{Amax}

The highest short duration A-weighted sound level recorded during a noise event.

L_{A90}

The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, T.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible

3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

Appendix B: Proposed Site Plans

01 DRG Proposed

Site Plan

1:500@A3

0 5m 10m 15m 20m

N

Revision	Date	Description
P0	XX/01/24	Planning Issue

Project
City House, Sutton
Sutton Park Road, SM1 2AE

Drawing Title
Site Plan
Ground Floor Level

Drawing Number	Revision
0816-WPA-0100-P-Site	P0
Scale @ A3	**Revision Date**
1:500	

Drawing Purpose
PLANNING

WIMSHURST PELLERITI

The Mews,
6 Putney Common, SW15 1HL

0208 780 2206
Info@wp.uk.com
wimshurst-pelleriti.com

Appendix C: Glazing and trickle vent example mitigation

PILKINGTON

Pilkington **Optiphon**™

Laminated Glass for noise control

NSG GROUP

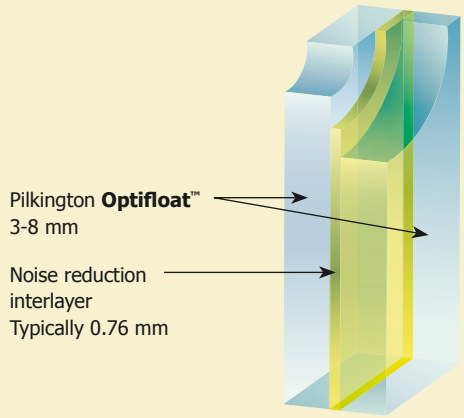
Pilkington **Optiphon**™

Laminated glass for superior noise insulation

Pilkington **Optiphon**™ is the ideal choice of glass in situations where there is excess noise from road, rail or air traffic, or various other sources, such as factories, nightclubs or neighbours.

Pilkington **Optiphon**™ is a high quality acoustic laminated glass incorporating a special PVB (PolyVinyl Butyral) interlayer. It offers excellent noise reduction without compromising on light transmittance or impact performance.

The desired acoustic performance can be achieved through combining various thicknesses of glass with a PVB interlayer. With a large variety of product combinations, Pilkington **Optiphon**™ offers the opportunity to achieve specific noise reduction requirements.



Note: Pilkington **Optiphon**™ can also be manufactured with other products, including coated glass

Benefits

- Special PVB interlayer for enhanced sound insulation performance
- A thinner and lighter glass for the equivalent acoustic performance
- Available in jumbo and LES sizes
- All products achieve safety class 1(B)1 (EN 12600) and are available to meet security classes in accordance with EN 356
- A high acoustic performance can be achieved when used in Insulating Glass Units (IGUs)
- Can also be used to improve noise insulation in a triple glazing construction

As well as reducing intrusive noise, Pilkington **Optiphon**™ can be combined with other Pilkington products for a multi-functional glazing solution with additional benefits, such as:

- Thermal insulation with Pilkington **K Glass**™ / Pilkington **Optitherm**™ (coating in position 3 in IGU)
- Solar control with Pilkington **Suncool**™ (coating in position 2 in IGU)
- Self-cleaning with Pilkington **Activ**™ (coating in position 1 in IGU)

Sound insulation data for Pilkington **Optiphon™**

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						R_w (C; C_{tr})	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington **Optiphon™**	22	26	31	37	40	40	36 (-1; -4)	36	35	32
8.8 mm Pilkington **Optiphon™**	27	29	34	38	40	43	37 (0; -2)	37	37	35
10.8 mm Pilkington **Optiphon™**	26	30	35	39	40	46	38 (-1; -3)	38	37	35
12.8 mm Pilkington **Optiphon™**	29	32	36	41	42	51	40 (-1; -3)	40	39	37
16.8 mm Pilkington **Optiphon™**	31	33	38	41	43	54	41 (-1; -3)	41	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington **Optiphon™**	21	28	37	48	48	54	40 (-2; -6)	40	38	34
6 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	25	27	38	48	47	55	41 (-2; -6)	41	39	35
8 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	21	30	39	47	50	55	42 (-3; -8)	42	39	34
10 mm / 16 mm argon / 8.8 mm Pilkington **Optiphon™**	28	31	42	45	50	58	44 (-2; -6)	44	42	38
10 mm / 20 mm argon / 8.8 mm Pilkington **Optiphon™**	28	36	43	47	49	58	46 (-2; -6)	46	44	40
8.8 mm Pilkington **Optiphon™** / 16 mm argon / 12.8 mm Pilkington **Optiphon™**	28	36	45	53	56	64	48 (-2; -7)	48	46	41
10.8 mm Pilkington **Optiphon™** / 24 mm argon / 16.8 mm Pilkington **Optiphon™**	35	41	48	53	55	65	52 (-2; -6)	52	50	46
12.8 mm Pilkington **Optiphon™** / 20 mm argon / 16.8 mm Pilkington **Optiphon™**	35	45	49	50	54	65	51 (-1; -4)	51	50	47

Measurements undertaken in accordance with BS EN ISO 10140 and Rw (C; C_{tr}) determined in accordance with BS EN ISO 717-1.
For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm.
To calculate performance data for Pilkington products, please use our Spectrum online calculator at https://spectrum.pilkington.com/
For glass combinations to achieve an R_w value higher than 52 dB, please contact us for more details.

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Sound insulation data for standard products

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						R_w (C; C_{tr})	R_w	R_w+C	R_w+C_{tr}
	125	250	500	1000	2000	4000				
Single glazing										
4 mm Float Glass	17	20	26	32	33	26	29 (-2; -3)	29	27	26
6 mm Float Glass	18	23	30	35	27	32	31 (-2; -3)	31	29	28
8 mm Float Glass	20	24	29	34	29	37	32 (-2; -3)	32	30	29
10 mm Float Glass	23	26	32	31	32	39	33 (-2; -3)	33	31	30
12 mm Float Glass	27	29	31	32	38	47	34 (0; -2)	34	34	32
6 mm Laminated Glass	20	23	29	34	32	38	32 (-1; -3)	32	31	29
8 mm Laminated Glass	20	25	32	35	34	42	33 (-1; -3)	33	32	30
10 mm Laminated Glass	24	26	33	33	35	44	34 (-1; -3)	34	33	31
12 mm Laminated Glass	24	27	33	32	37	46	35 (-1; -3)	35	34	32
16 mm Laminated Glass	26	31	30	35	43	51	36 (-1; -3)	36	35	33
Insulating glass units										
4 mm / (6 - 16 mm) / 4 mm	21	17	25	35	37	31	29 (-1; -4)	29	28	25
6 mm / (6 - 16 mm) / 4 mm	21	20	26	38	37	39	32 (-2; -4)	32	30	28
6 mm / (6 - 16 mm) / 6 mm	20	18	28	38	34	38	31 (-1; -4)	31	30	27
8 mm / (6 - 16 mm) / 4 mm	22	21	28	38	40	47	33 (-1; -4)	33	32	29
8 mm / (6 - 16 mm) / 6 mm	20	21	33	40	36	48	35 (-2; -6)	35	33	29
10 mm / (6 - 16 mm) / 4 mm	24	21	32	37	42	43	35 (-2; -5)	35	33	30
10 mm / (6 - 16 mm) / 6 mm	24	24	32	37	37	44	35 (-1; -3)	35	34	32
6 mm / (6 - 16 mm) / 6 mm Laminated	20	19	30	39	37	46	33 (-2; -5)	33	31	38
6 mm / (6 - 16 mm) / 10 mm Laminated	24	25	33	39	40	49	37 (-1; -5)	37	36	32

The above are generally accepted values for generic products taken from EN 12758. They are conservative values that can be used in the absence of measured data.
Data for laminated glass is based on pvb interlayers (excluding acoustic pvb interlayers). Glass thickness for laminated glass excludes interlayer thickness.
Data can be adopted for air or argon gas-filled cavities

Technical Definitions

Sound Reduction Index

R_w is the weighted sound reduction, in decibels, which incorporates a correction for the ear's response.

C and C_{tr} are the spectrum adjustments, which are the values added to R_w to take account of the characteristics of particular sound spectra. Typical noise sources for each spectrum adaptation terms are given below.

Relevant spectrum adaptation term C

Type of noise source:

- Living activities (talking, music, radio, TV)
- Children playing
- Railway traffic at medium and high speed
- Jet aircraft, short distance away
- Motorway traffic >50 mph
- Factories emitting mainly medium and high frequency noise.

Relevant spectrum adaptation term C_{tr}

Type of noise source:

- Urban road traffic
- Railway traffic at low speeds
- Aircraft, propeller driven
- Jet aircraft, long distance away
- Music with low frequency bass sounds
- Factory emitting mainly low and medium frequency noise.

CE marking confirms that a product complies with its relevant harmonised European Norm.
The CE marking label for each product, including declared values, can be found at www.pilkington.com/CE

Pilkington United Kingdom Limited
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Telephone 01744 692000 Fax 01744 692880
pilkington@respond.uk.com
www.pilkington.co.uk

8222 – January 2020

Acoustic Ventilation

Noise attenuating ventilation

About Acoustic Ventilation

Fresh air in or out – no noise.

The Acoustic Ventilation range ensures the required level of ventilation is provided whilst reducing the transfer of noise when dwellings are situated close to busy roads and airports. A full range of window and wall ventilators are available, including the highest performing product in the UK.

Need help specifying a product?

If you can't work out which product you need, or how to provide ventilation in the most efficient way for your homes we can help you! Our dedicated team of Area Managers and Technical Advisors understand the impact of specifying products into new and existing homes.

Call us with your questions or email us at

orders@greenwood.co.uk

Head Office
01276 605800

Customer Services
01276 408404

Technical Services
01276 408402

Noise pollution

Noise is a nuisance and the last thing that you want in the comfort of your own home. In new build, particularly, it has become an increasing issue as a result of brownfield re-development and density planning guidance notes. What this has meant is that homes have more probability of being sited close to busy roads, railways and airports, meaning more noise which has an impact on the domestic environment.

Noise guidance covers three specific areas;

- Planning permission
- Internal noise levels
- Ventilation system noise levels

All three are relevant to ventilation as all systems require external penetrations in the façade of the building which can allow noise transfer.

Considering noise and domestic ventilation together

If life was simple then noise issues would be simply dealt with by swapping standard products for acoustic products.

In some circumstances, this may be achievable. However, the nature of acoustic products means that they are generally larger than their standard counterparts, meaning a like-for-like installation cannot always be achieved. Multiple installations, to achieve higher ventilation rates, of the same product can also affect acoustic performance.

With this in mind, noise and ventilation must be considered together at the design stage, especially as the noise factor may actually pre-determine the method of ventilation that can be used within the dwelling. This sometimes means that certain building elements can no longer be used as a source of ventilation, e.g. windows.

In this instance it may be essential to provide acoustic ventilation solutions that provide the necessary airflow, but reduce noise transfer. Whole house systems that have limited penetrations in the façade of a building often work well, however a whole range of individual products, such as airbricks and wall ventilators, are available with reductions of up to 55dB.

The best thing to do is ask – too often buildings have been built and then acoustic ventilation has been thought about, thus reducing options and sometimes meaning costly re-works on-site.

What is acceptable noise?

"It is imperative that acoustic ventilation is considered at the design stage, as the noise factor may pre-determine the entire method of ventilation that is most suitable for the dwelling."

Measuring sound and attenuation

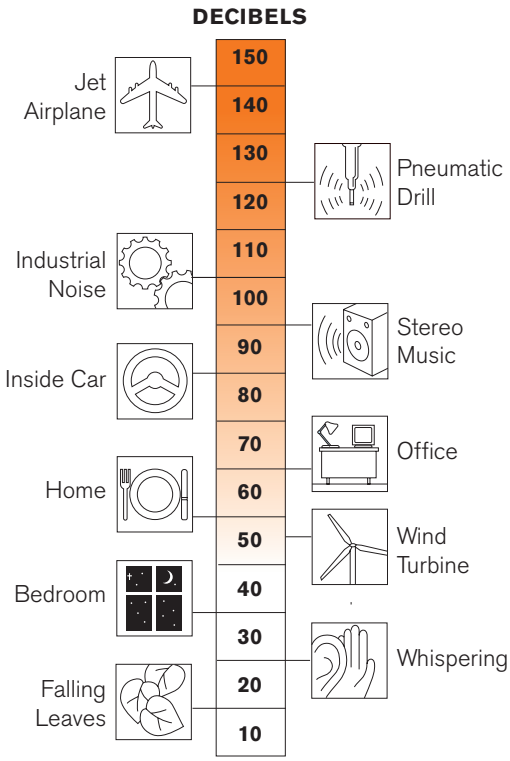
Sound can be measured in two ways:

- Intensity/loudness of sound is measured in decibels (dB)
- Pitch of sound is measured in frequency of vibrations per second

The decibel scale runs from the faintest sound the human ear can detect (0dB) to over 180dB that is similar to the noise a rocket creates during a launch.

Acoustic ventilation solutions from Greenwood have been independently tested to the latest test standard: BS EN ISO 717-1: 1997 and include varying performance as different frequencies, e.g. pink noise/white noise.

Copies of all test data are available on request.



Acoustic values and denominations

Dn,e,w: Single value 'weighted average' of the total single Dn,e values within the frequency range. This value denotes the characteristic of the acoustic element and acoustic consultants prefer using this as reference for product requirements. All Greenwood passive solution performance information is presented as Dn,e,w.

Dn,e: Single acoustic insulation value at a given frequency, measured during acoustic test for small building elements. Frequency range from 100 – 3150Hz in 1/3 octave bands.

C: Known as 'pink noise'. Refers to internal noise and some specific external noise sources.
Types of noise: Railway traffic at medium/high speeds, highway road traffic > 80km/h, jet aircraft at short distance and factories emitting medium and high frequency noise.

Ctr: Known as 'road traffic noise' or the transfer of outdoor noise to indoor noise and focuses on the lower spectrum of the frequency range.
Types of noise: Urban road traffic, railway traffic at low speeds, jet engines at large distance, disco music and factories emitting low and medium frequency noise.

Note: Both C and Ctr are commonly referenced together with Dn,e,w values for example Dn,e,w 35(-1;-3) meaning the product provides 34dB insulation for C noise and 32dB for Ctr noise.

Noise transfer

BS8233: 1999 Sound Insulation and Noise Reduction in Buildings defines a reasonable standard of internal noise for habitable rooms:

Room type	BS8233 design criterion road traffic noise; LAeqT		Time period
	Good	Reasonable	
Living/Dining	30dB	40dB	Daytime 07.00–23.00
Bedroom	30dB	35dB	Nighttime 23.00–07.00

The issue of noise

Since the 1950s the development of home entertainment products, brownfield sites and growth in transport has increased noise levels within the domestic environment. This increase has coincided with a decline in community spirit between neighbours and, with people becoming less tolerant of noise, complaints have increased.
Section 79 of the Environmental Protection Act (England & Wales) and Control of Pollution Act (Scotland) both cover statutory nuisances including 'noise emitted from premises so as to be prejudicial to health or a nuisance'.
Regulations, standards and guidelines in respect of planning building design, construction and use are numerous and becoming more complex. This has led to a review of existing methodology and the controls used to ensure compliance.

Building Regulations ADF 2010

Noise from continuously running systems has also moved up the agenda and suggested sound power levels where continuously running systems are used should not exceed the following levels:
Bedroom/living rooms
An upper limit of 30dB(A) weighted sound power level
Kitchens/bathrooms
An upper limit of 35dB(A) weighted sound power level

2500EA / 5000EA

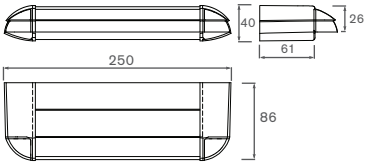
Acoustic window ventilator

Physical specification

All measurements in millimetres unless otherwise indicated

Materials: Aluminium Alloy

2500EA Acoustic



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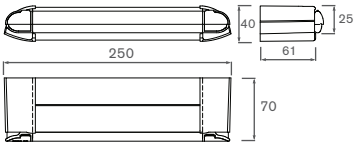
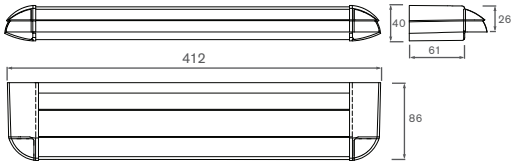


Internal

5000EA Acoustic



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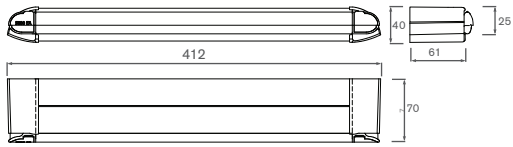


Internal

Installation

1. Prepare the window frame with the correct slot sizes.

2. Use the self tapping screws to install the acoustic parts.

3. Use standard pyramid vent screws to install the canopy and vent.

2500EA Acoustic slot size

Height: 13mm

Length
192mm

5000EA Acoustic slot size

Height: 13mm

Length	Central gap	Length
172mm	10mm	172mm

The best of both worlds... achieves Building Regulations' EA requirements along with fantastic acoustic performances up to 45dB(A)

Features and benefits

- Smallest acoustic window vents providing 2500mm² or 5000mm² equivalent area ventilation on the market
- Achieves the best acoustic performance for window ventilators available within the UK – up to 45dB(A)
- A simple, yet adaptable, solution to meet required specification/ Building Regulation requirements incorporating both high levels of equivalent area ventilation and acoustic noise reduction
- Modularity of acoustic sets provides flexibility for installation and acoustic performance
- Aesthetically pleasing design which is easy to open and control by the homeowner
- Excellent airtightness performance with upward air deflection to reduce the risk of draughts
- May require add on section in some window installations

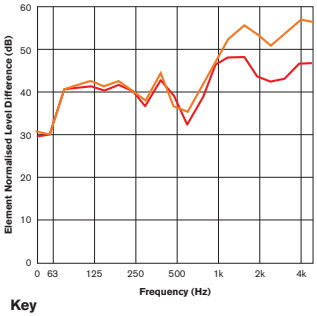
Sets comprise of:

1 EA vent + 1 external acoustic module – providing noise reduction with discreet internal aesthetics.

1 EA vent + 2 acoustic modules (for internal and external install) – providing maximum noise reduction.

Performance

2500EA acoustic performance

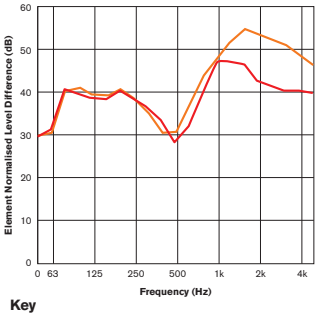


Key

2500EAW.AC1

2500EAW.AC2

5000EA acoustic performance



Key

5000EAW.AC1

5000EAW.AC2

Models, control options and key data

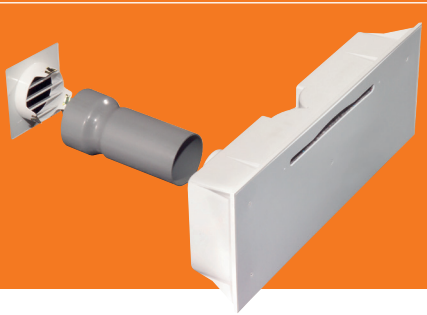
			Acoustic performance				
Product code	**Description**	**Controls**	**Dn,e,w**	**Dn,e,w (C)**	**Dn,e,w (Ctr)**	**Equivalent area mm²**	**Colour**
2500EAW.AC1 *	Vent + 1 Acoustic External Module	Front	42dB(A)	41dB	40dB	2670	White
2500EAW.AC2 *	Vent + 2 Acoustic Modules	Front	45dB(A)	43dB	42dB	2670	White
5000EAW.AC1 *	Vent + 1 Acoustic External Module	Front	39dB(A)	38dB	37dB	5350	White
5000EAW.AC2 *	Vent + 2 Acoustic Modules	Front	42dB(A)	40dB	38dB	5350	White

* Pricing is variable depending on quantity ordered - please call for details

UKAS ACCREDITATION INDEPENDENTLY ACCREDITED TEST INFORMATION

MA3051

Acoustic wall ventilator



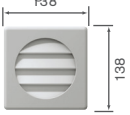
Physical specification

All measurements in millimetres unless otherwise indicated

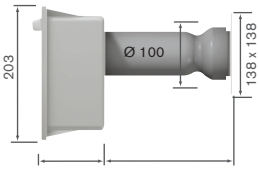
Weight: 2.65kg

Materials:

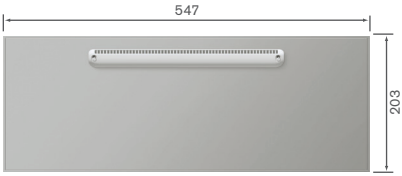
PVC: Casing for wall vent, duct, external grille and internal ventilator. Acoustic lining and material inside wall vent.



External grille



Side



Internal

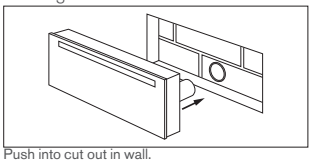
Features and benefits

- Highest performing acoustic background ventilator
- Provides acoustic attenuation to Dn,e,w 55dB(A)
- 2500mm² equivalent area performance
- Suitable for external wall thicknesses of 140mm and above
- Can be installed in internal wall constructions of between 100mm and 150mm
- Supplied with internal controllable vent and white/sand external grilles
- Conforms to acoustic requirements of Noise Insulation Regulations (NIR) 1975, one of only a small number of products available in the UK

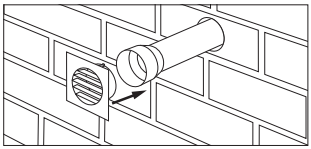
Installation

Instructions are provided with product including wall template for cut out. Bonding compound is required to complete installation.

Protective strip to protect internal unit until decoration is complete within dwelling.



Push into cut out in wall.



Push fit external grille.

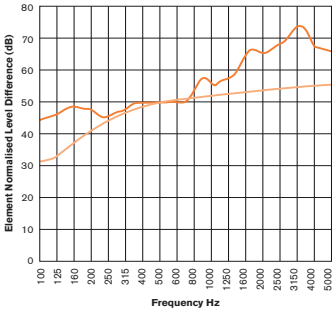
Performance

Key

MA3051

NIR 1975

Acoustic performance
Dn,e,w: Average weighted performance across frequency range
C: Pink noise
Ctr: Road noise



Models, control options and key data

		Acoustic performance			
Product code	**Operation**	**Dn,e,w**	**Dn,e,w (C)**	**Dn,e,w (Ctr)**	**Equivalent area mm²**
MA3051 *	Internal controllable trickle ventilator	55dB	54dB	52dB	2500

* Pricing is variable depending on quantity ordered - please call for details

UKAS ACCREDITATION INDEPENDENTLY ACCREDITED TEST INFORMATION

AWV39

Acoustic wall ventilator

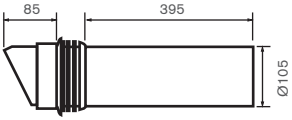
Physical specification

All measurements in millimetres unless otherwise indicated

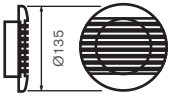
Weight: 0.74kg

Materials: PVC

External grille (supplied separately)



Internal

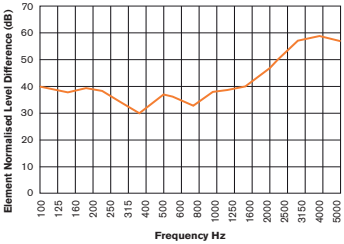


Side

Features and benefits

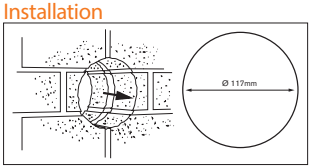
- Designed for use in refurbishment applications
- Provides acoustic attenuation to Dn,e,w 39dB
- 2500mm² equivalent area performance
- Suitable for wall thicknesses 255–370mm

Performance

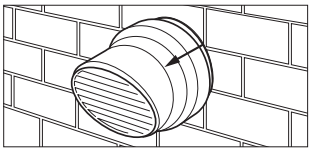


Acoustic performance
Dn,e,w: Average weighted performance across frequency range
C: Pink noise
Ctr: Road noise

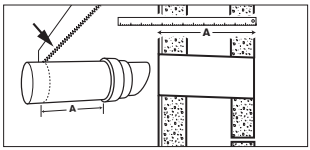
Installation



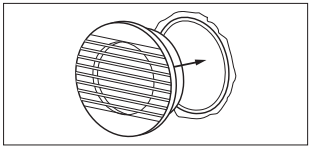
Using a 117mm core drill, cut a hole through wall.



Measure wall thickness and cut down plastic sleeve as required.



Push the sleeve through the wall. The seal will automatically sit between the sleeve and the external grille, providing a watertight fit.



Push fit internal grille.

Models, control options and key data

		Acoustic performance			
Product code	**External grille colour**	**Dn,e,w**	**Dn,e,w (C)**	**Dn,e,w (Ctr)**	**Equivalent area mm²**
AWV39B *	Brown	39dB	39dB	37dB	2500
AWV39W *	White	39dB	39dB	37dB	2500

* Pricing is variable depending on quantity ordered - please call for details

UKAS ACCREDITATION — INDEPENDENTLY ACCREDITED TEST INFORMATION

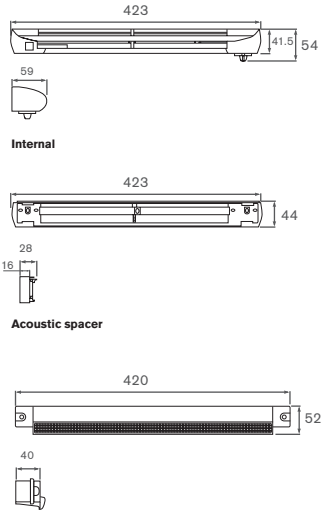
EAR42W

Acoustic window ventilator

Physical specification

All measurements in millimetres unless otherwise indicated

Materials: ABS



Features and benefits

- One of the best performing acoustic window ventilators available in the UK
- Provides an outstanding Dn,e,w; 42dB(A) for areas with high external noise transmission
- Humidity control to regulate supply of fresh air effectively throughout the day in response to changing indoor humidity levels
- Manual override control option for occupants to ensure a comfortable environment at all times
- Upward air deflection to eliminate replacement air causing draughts
- Manufactured from ABS – available in white as standard
- May require add on section in some window installations

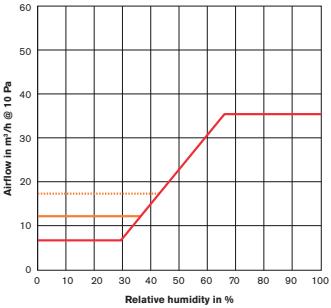
Slot size

Height: 12mm

Length	Central gap	Length
172mm	10mm	172mm

Route slot in window frame as required and screw ventilator over holes.

Performance



Key

EAR² 5-35m³/h

EAR² 17-35m³/h

EAR² 11-35m³/h

Acoustic performance
Dn,e,w: Average weighted performance across frequency range
C: Pink noise
Ctr: Road noise

Models, control options and key data

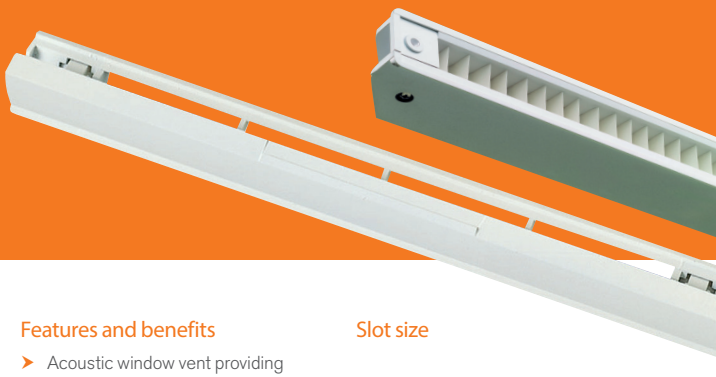
		Acoustic performance				
Product code	**Controls**	**Dn,e,w**	**Dn,e,w (C)**	**Dn,e,w (Ctr)**	**Equivalent area mm²**	**Colour**
EAR42W *	Bottom	42dB(A)	42dB	42dB	3912	White

* Pricing is variable depending on quantity ordered - please call for details

UKAS ACCREDITATION INDEPENDENTLY ACCREDITED TEST INFORMATION

DN Vent

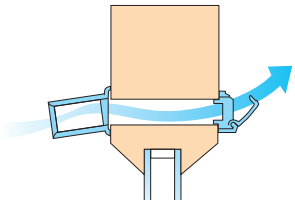
Acoustic window ventilator

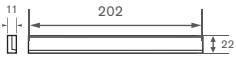


Physical specification

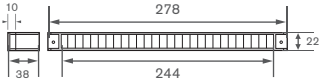
All measurements in millimetres unless otherwise indicated

Materials: ABS





1600DN (external)



2000D (internal)

Features and benefits

- Acoustic window vent providing attenuation up to Dn,e,w 37dB(A)
- 1400mm² equivalent area
- Internal unit (D Vent) provides upward deflection
- Suitable for installation up to two floors only

Slot size

External 1600DN

Height: 15.5mm

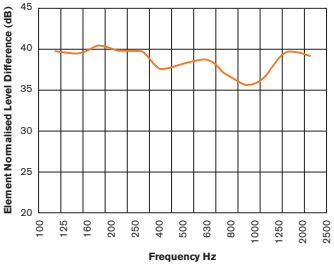
Length
240mm

Internal 2000D

Height: 15.5mm

Length
165mm

Performance



Acoustic performance
Dn,e,w: Average weighted performance across frequency range
C: Pink noise
Ctr: Road noise

Models, control options and key data

			Acoustic performance				
Product code	**Description**	**Controls**	**Dn,e,w**	**Dn,e,w (C)**	**Dn,e,w (Ctr)**	**Equivalent area mm²**	**Colour**
1600DNFW *	Complete unit with D Vent internal	Front	37dB(A)	36dB	34dB	1400	White

* Pricing is variable depending on quantity ordered - please call for details

UKAS ACCREDITATION INDEPENDENTLY ACCREDITED TEST INFORMATION

AAB

Acoustic airbrick

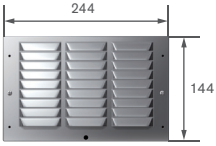
Physical specification

All measurements in millimetres unless otherwise indicated

Weight: 6.5kg

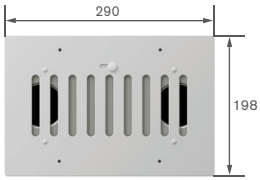
Materials:

Casing – pre-galvanised grey steel. Two steel plate baffles support the perforated aluminium airways encased in sound absorbent mineral wool. An outer baffle assembly and acoustic linings are set behind louvred external grille.



External fascia

Side



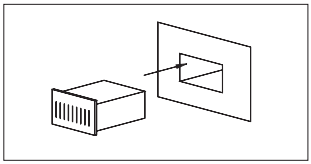
Internal fascia

Features and benefits

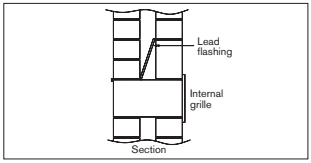
- Provides acoustic attenuation to Dn,e,w 46dB
- Acoustic background ventilator
- 2500mm² equivalent area
- Supplied with internal hit & miss and external louvred grilles

Acoustic performance
Dn,e,w: Average weighted performance across frequency range
C: Pink noise
Ctr: Road noise

Installation

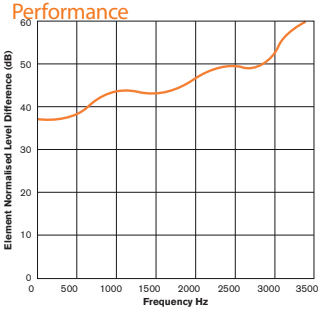


Existing dwellings: Cut an opening 240mm x 165mm through the wall.



New buildings: Build into inner leaf of cavity of wall at least one course above ventilator. Lead flashing to extend 100mm beyond the ventilator on each side.

Performance



Models, control options and key data

	Acoustic performance			
Product code	**Dn,e,w**	**Dn,e,w (C)**	**Dn,e,w (Ctr)**	**Equivalent area mm²**
AAB *	46dB	46dB	44dB	2500

* Pricing is variable depending on quantity ordered - please call for details

UKAS ACCREDITATION INDEPENDENTLY ACCREDITED TEST INFORMATION

Product ordering information

Product Selector

Ventilation Options	Page No.	Mounting Options	Control Options	Extract or replacement air ventilation	Airflow Performance	Acoustic performance (Dn,e,w)
AAB 	133	Wall	–	Replacement	2500mm²	46dB
MA3015 	134	Wall	–	Replacement	2500mm²	55dB
AWV39 	135	Wall	–	Replacement	2500mm²	39dB
EAR42W 	136	Window	B	Replacement	3925mm²	42dB(A)
DN Vent 	137	Window	F	Replacement	1400mm²	37dB(A)
2500EA 	138	Window	F	Replacement	2670mm²	45dB(A)
5000EA 	138	Window	F	Replacement	5350mm²	42dB(A)

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