PEAK acoustics

Noise Impact Assessment

Client:	Shailesh Patel
Site:	1-3 Coldharbour Lane, Hayes, UB3 3HF
Reference No.	TB1307224NR
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Revision History

Revision	Date	Author	Description
0.0	02/09/2022	T. Brown	Original report
0.1	31/10/2022	T. Brown	Site plans in Appendix G updated from Rev D to Rev F at client request.

Executive Summary

An Environmental Noise Assessment has been undertaken at 1-3 Coldharbour Lane, Hayes, UB3 3HF where it has been proposed to develop a mixed-use building incorporating 2 retail units and 9 new dwellings across 5 floors.

Environmental noise monitoring was undertaken at the site on Wednesday 17th August 2022 from 7:40 am to 9:30 am. Noise affecting the development was determined to be from road traffic, local businesses, pedestrians and bus services. Secondary noise sources were noted as birdsong and occasional car horns.

A glazing and ventilation scheme has been specified to ensure conditions in habitable rooms remain within the desired design criteria of BS8233:2014. The derived scheme is summarised below.

Glazing & Ventilation Scheme

Internal Space	Glazing		Ventilation	
	Minimum Performance R_w *(+*C_{tr}*)*	*Example Specification*	*Minimum Performance* $D_{ne,W}$,+$C_{tr\ (Open)}$	*Example Specification*
Living Areas	39 (33)	*6 / 16 / 9.5*	45	*Passive thru-wall vent: Passivent Fresh 80dB*
Bedrooms	34 (29)	*4 / 16 / 6*	45	*Passive thru-wall vent: Passivent Fresh 80dB*
Dining Rooms	34 (29)	*4 / 16 / 6*	45	*Passive thru-wall vent: Passivent Fresh 80dB*

External amenity spaces have been considered and it is calculated that noise levels within these areas exceed the acceptable guidelines from BS8233:2014. Additional context and discussion of relevant guidance have been provided. A compromise on noise limits is deemed acceptable to provide external amenity, particularly given the urban environment surrounding the development.

Contents

1. Introduction

1.1. Proposal

It is proposed to construct a mixed-use building at 1 – 3 Coldharbour Lane, Hayes, UB3 3HF hereafter referred to as 'the site'. The site is currently a single-storey retail unit.

1.2. Reason for Assessment

A noise assessment is to be submitted as part of the planning application to ensure desirable noise levels are met within the habitable rooms of the proposed development and external amenity areas. The assessment aims to provide a sound insulation scheme for the development.

1.3. Local & National Planning Policy

Guidance for the assessment of noise affecting new residential development is given in the National Policy Framework (NPPF). Section 15 of the NPPF states:

> *"174. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
> *E) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of…noise pollution."*

Section 185 further states:

> *"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:*
>
> 1. *Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
> 2. *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

Section 187 states:

> *"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."*

To avoid and mitigate adverse noise effects on health arising from and impacting new development, the NPPF makes reference to NPSE. The Noise Policy Statement for England (NPSE) was published in March 2010 and covers all forms of noise other than occupational noise.

The Noise Policy Statement for England (NPSE) states the following aims in paragraph 2.2.

> **NOEL – No Observed Effect Level.**
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> **LOAEL – Lowest Observed Adverse Effect Level**.
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> **SOAEL – Significant Observed Adverse Effect Level.**
> *This is the level above which significant adverse effects on health and quality of life occur.*

The NPSE does not define the SOAEL numerically, stating in paragraph 2.22:

> *"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. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the "NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

There is no local or national guidance on how the three terms should be defined numerically, it is for the assessor to collate and interpret appropriate guidance on noise, such as may be found in British Standards, and correlate the guidance with the concepts of NOEL, LOAEL and SOAEL.

At this time, the local authority has asked that noise be considered and a noise assessment submitted as part of the planning application.

1.4. Design Criteria & Assessment Standards

Guidance on the assessment and design criteria will be drawn from BS8233:2014 - *Guidance on sound insulation and noise reduction for buildings.* Table 4 in Section 7.7.2 of this standard suggests indoor ambient noise levels for dwellings. A summary of this criteria is given below.

Desirable internal noise levels are to be maintained as given in BS8233:2014:

- *<35dB $L_{Aeq,\ 16hr}$ within living areas during the day (07:00 – 23:00)*
- *<35dB $L_{Aeq,\ 16hr}$ within bedrooms during the day (07:00 – 23:00)*
- *<40dB $L_{Aeq,\ 16hr}$ within dining areas during the day (07:00 – 23:00)*
- *<30dB $L_{Aeq,\ 8hr}$ within bedrooms at night (23:00 – 07:00)*

Additional guidance will be drawn from 'ProPG: Planning & Noise' which was published "*to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.*"

2. Site Description

2.1. Site Description

The site sits between Coldharbour Lane and East Ave. To the North and East of the site are predominantly small shopfronts and retail units. The Western façade of the site sits on East Avenue, opposite Hayes North Telephone Exchange. There is a cycle lane running past the South-East façade and a pedestrian crossing. To the south of the site is a mini-roundabout.

Site Boundary (approx.)

Figure 1: Site and Area – earth.google.com

3. Environmental Noise Survey

3.1. Survey Measurement

To assess the environmental noise levels affecting the proposed development, an attended noise survey was undertaken at the site on 17/08/2022 between 7:40 am and 9:30 am. This period was selected to capture the morning rush-hour period. An unattended measurement was not possible as there was no available secure location to install monitoring equipment for an extended period. Measurements captured the primary sources of noise affecting the site including rush-hour traffic, busses and businesses opening up.

Measurements of $L_{Aeq,T}$ and L_{AFmax} were logged in 1- minute intervals in accordance with the provisions of BS7445 - *'Description and Measurement of Environmental Noise'*.

3.2. Measurement Location

Monitoring position M1 is located at the south end of the site. The microphone was positioned approximately 1.7 meters above ground level and away from any reflective surfaces.

The monitoring location is shown in **Figure 2** in Section 3.5.

3.3. Weather Conditions

Daytime temperatures of 19°C were noted during the survey with winds up to 2m/s. Detailed weather conditions are given in **Appendix C**.

3.4. Measurement Equipment

Measurement equipment complies with accuracy requirements for common environmental noise measurement standards. Equipment was calibrated before and after use and no significant drift occurred during measurements. Up-to-date calibration certification can be provided upon request. A detailed equipment list is given in **Appendix B** with calibration information in **Appendix D**.

3.5. Monitoring Location

The site and unattended noise monitoring location are shown in Figure 2 below.

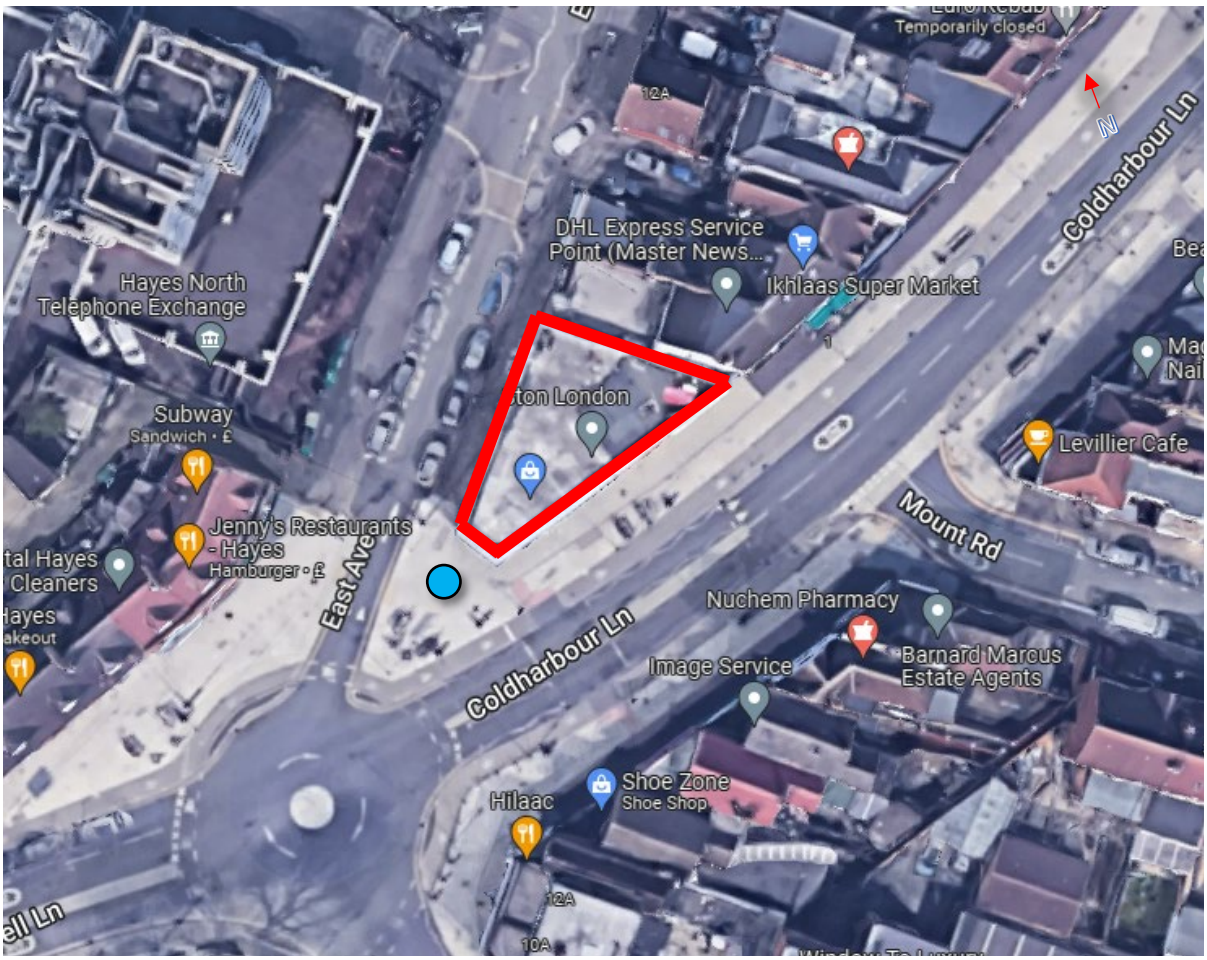


Figure 2: Site & Measurement Locations – earth.google.com

Monitoring Location (M1) *Site Boundary (Approx.)*

3.6. Noise Affecting the Development

The primary noise source affecting the development was identified to be road traffic. Secondary sources were noted as pedestrians, car horns and birdsong.

3.7. Environmental Noise Levels

The results from the noise monitoring location M1 are summarised below.

The full-time history of the noise monitoring data is given in **Appendix E.**

Table 1. – Environmental Measurement Summary

Measurement	Date(s)	Period	L_{Aeq} (dB)	Typical* L_{AFmax} (dB)
M1	17th August 2022	Day *(1hr)*	66	-

4. Internal Noise Level Assessment

4.1. Design Criteria

BS8233:2014 - *Guidance on sound insulation and noise reduction for buildings* suggests indoor ambient noise levels for dwellings in Table 4, Section 7.7.2. These are summarised below.

Table 2. – Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233 states that the guideline values given above are for 'noise without character', further stating:

> *"Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate."*

Table 4 of BS8233 also has accompanying notes that were subject to additions in ProPG. The relevant notes with the additions of ProPG are given below.

> *"NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB LAmax,F more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."*

> *"NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

In considering the noise climate affecting the proposed development, as discussed in Section 3.6, it is deemed appropriate to use guidelines set out in BS8233 and ProPG to ensure the internal criteria set out by the WHO for internal noise maxima L_{Amax} and internal L_{Aeq}.

4.2. Assessment Noise Levels

In the interest of a robust assessment, the loudest of the measurement intervals, subject to irregular events, are to be considered in the assessment of internal noise levels and determining the sound insulation scheme.

The data collected during the attended measurement will be used for both day and night-time periods of the assessment. It is noted that night-time noise levels at the site are likely to be lower than those used within the assessment.

The resultant external noise levels for the assessment of internal ambient noise levels are summarised in the table below.

Table 3. – Assessment Noise Levels

Period	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
Daytime *(1hr)*	66	-
Night *(1hr)*	66	84

4.3. Internal Noise Level Calculations

Internal noise levels have been calculated to demonstrate that the proposed dwellings can achieve the desired design criteria when appropriate glazing and ventilation systems are utilised.

Internal arrangements of the dwellings have been submitted by the client, proposed drawings by '*Wighton Architects'* have been used to scale room and glazing dimensions and can be found in **Appendix G**.

Assessment is not required for each individual room therefore a worst-case situation will be used in which the worst affected rooms/floors will be used.

Calculations of internal ambient noise levels have been undertaken using the 'rigorous calculation' method given in Annex G2 of BS8233:2014. Full details of the calculations are provided in **Appendix F.**

5. Sound Insulation Scheme

5.1. Glazing and Ventilation

The following glazing and ventilation scheme for the development has been derived with a view of achieving the internal noise level criteria given in Table 2.

Table 4. – Glazing & Ventilation Scheme

Internal Space	Glazing		Ventilation	
	Minimum Performance R_w *(+*C_{tr}*)*[1]	*Example Specification*[2]	*Minimum Performance* $D_{ne,W}$ *,+*$C_{tr\ (Open)}$	*Example Specification*[3]
Living Areas	39 (33)	*6 / 16 / 9.5*	45	*Passive thru-wall vent: Passivent Fresh 80dB*
Bedrooms	34 (29)	*4 / 16 / 6*	45	*Passive thru-wall vent: Passivent Fresh 80dB*
Dining Rooms	34 (29)	*4 / 16 / 6*	45	*Passive thru-wall vent: Passivent Fresh 80dB*

N.B. Note that other glazing configurations and ventilators can achieve the given minimum performance requirements.

[1] *The sound insulation value of the glazing should take into account the glass as well as the frame and perimeter seal.*

[2] *Example glazing specification format given as 'XXmm Float / 16mm Air gap / XXmm Float'*

[3]] *It is noted that BS8233 section 7.2.2 states 'If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level'. This statement implies that the use of closed windows and an alternative means of ventilation is acceptable.*

Habitable rooms should therefore be provided with passive wall or window ventilators that meet or exceed the acoustic performance given in the table above for the relevant zones whilst providing an open area equivalent to an open window in order to negate the need for open windows for the purposes of ventilative cooling. In the event this cannot be provided, a mechanical ventilation system may need to be incorporated. The given values for ventilators are based on a single ventilator per room. Where more than one ventilator is proposed, the performance of each will increase by 10·log(N), where 'N' is the number of ventilators within the room. I.e., if 2 No. ventilators are to be fitted within a living room, each ventilator should achieve a minimum 35 dB $D_{ne,W}$ *,+Ctr (Open).*

6. Internal Noise Levels

It is determined that by using mitigation as specified in **Table 4** for the building façades, the outcome summarised in the following table is achieved.

Table 5. – Internal Noise Levels

Internal Space	Noise Parameter	Internal Noise Level (dB)	Within Design Criteria?
Living Room	Daytime $L_{Aeq,\ 16hr}$	33.5	Yes
Bedroom	Daytime $L_{Aeq,\ 16hr}$	28.9	Yes
	Night-time $L_{Aeq,\ 8hr}$	28.9	Yes
	Night-time $L_{Amax\ F}$	43.4	Yes

For the daytime assessment for living areas, the desirable limit of BS8233:2014 suggests a guideline of 35 dB $L_{Aeq,16hr}$ for resting conditions, and up to 40 dB is considered acceptable for necessary developments.

All results, with the implementation of the derived sound insulation scheme given in **Table 4**, would place the internal daytime noise levels below 35 dB, therefore within the desired limit.

For the night-time assessment for bedrooms, BS8233:2014 suggests a desirable guideline of 30 dB $L_{Aeq, 8hr}$ for sleeping conditions, with an acceptable limit of 35 dB $L_{Aeq, 8hr}$.

Implementation of the derived sound insulation scheme given in **Table 4** would place the internal continuous night-time noise levels below 30 dB, therefore within the desirable category.

For the night-time assessment for bedrooms, ProPG suggests that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night.

Implementation of the derived sound insulation scheme given in **Table 4** would place the internal $L_{Amax,F}$ night-time events below 45 dB, therefore within the criteria.

7. External Amenity Areas

Average external daytime noise levels were measured as 66 dB $L_{Aeq,1hr}$ at position M1, this is 11dB above the acceptable guideline limit for external amenity areas.

Taking into account the notes from the ANC residential design guide, approximate noise levels within the balcony areas are expected to be between 4 – 10 dB lower than this, particularly if absorption is fitted to balcony soffits or other surfaces.

Figure 3. ANC Residential Design Guide

Table B-5 Examples of passive ventilation solutions providing enhanced sound insulation

Design option	Description and references	Approximate Level Difference (external free field level – internal reverberant level)	Improvement relative to a window providing a similar amount of ventilation
Standard opening windows	Window(s) open sufficiently to provide a ventilation free-area equivalent to 2% of the floor area. [42]	13 dB	0 dB
Open windows with sound attenuating balconies	Window(s) as above. Balconies may have a solid balustrade or be enclosed to a further degree (maintaining an open area for ventilation). Absorption may be provided to the balcony soffit or potentially to other surfaces. [49, 50, 51]	17 – 23 dB	4 – 10 dB

This would place the noise level in these areas closer to the 55dB acceptable guideline limit.

Guidance is also taken from BS8233:2014 section 7.7.3.2. stating:

"In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited. Other locations, such as

balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc.

In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

The balcony/amenity areas proposed for the site are relatively small and may well be used as specified within the standard for drying washing or growing pot plants etc.

The site is within an area where a compromise on external amenity noise limits is likely to be warranted. The location has excellent transport links with Bus and Cycle routes directly outside. It sits half a mile from the nearest railway station providing services into central London. It is within 5 miles of Heathrow and the M4 motorway and just 10 miles from London City Centre.

In the immediate vicinity of the site there are food shops, clothes shops, banks, pharmacies and newsagents.

For these reasons it is likely that this would be a very highly sought-after location for residential flats and apartments.

8. Sound Insulation to Retail Units

The guidance in Approved Document E (ADE) regarding commercial uses is simply that a higher standard of sound insulation may be required between spaces separating domestic and non-domestic purposes, and that the appropriate level of sound insulation required will depend on the noise generated in the non-domestic space.

For guidance, an improvement of +10dB compared with the normal residential sound insulation requirements might typically be suitable for general commercial use. A review of the proposals for the constructions separating the various spaces within the development may be required at a later stage. Such an assessment can be undertaken once the proposed plans have been confirmed and detailed construction proposals are available for review.

9. Conclusions

A noise assessment has been undertaken at 1 – 3 Coldharbour Lane, Hayes, UB3 3HF in relation to the proposed development of the site into a 5-storey mixed-use building incorporating dwellings on floors 1 to 4 and commercial use on the ground floor.

Environmental noise monitoring was undertaken at the site on 17/08/2022 between 7:40 am and 9:30 am. Noise affecting the development was determined to be primarily from rush-hour traffic, busses and businesses opening up.

A glazing and ventilation scheme has been specified to ensure conditions in habitable rooms remain within the design criteria of BS8233:2014.

Internal noise levels are anticipated to be within the guidelines of BS8233:2014 with comments from ProPG.

External amenity noise levels are calculated to exceed the guidelines of BS8233:2014 however discussion and context have been provided which show that a compromise on noise criteria may be preferable given the urban location of the development.

APPENDIX A – Measurement Details

Measurement(s)	Kit	Start Date	Start Time	End Date	End Time
M1	A2	17/08/2022	07:40	17/08/2022	9:30

APPENDIX B - Equipment Details

Kit	Equipment	Make	Model	Class	Serial Number
A2	Sound Meter	Svantek	971	1	40305
A2	Pre-Amp	Svantek	SV12L	1	32484
A2	Microphone	ACO	7052E	1	56663
3	Calibrator	Svantek	SV33A	1	43086

APPENDIX C - Meteorology Details

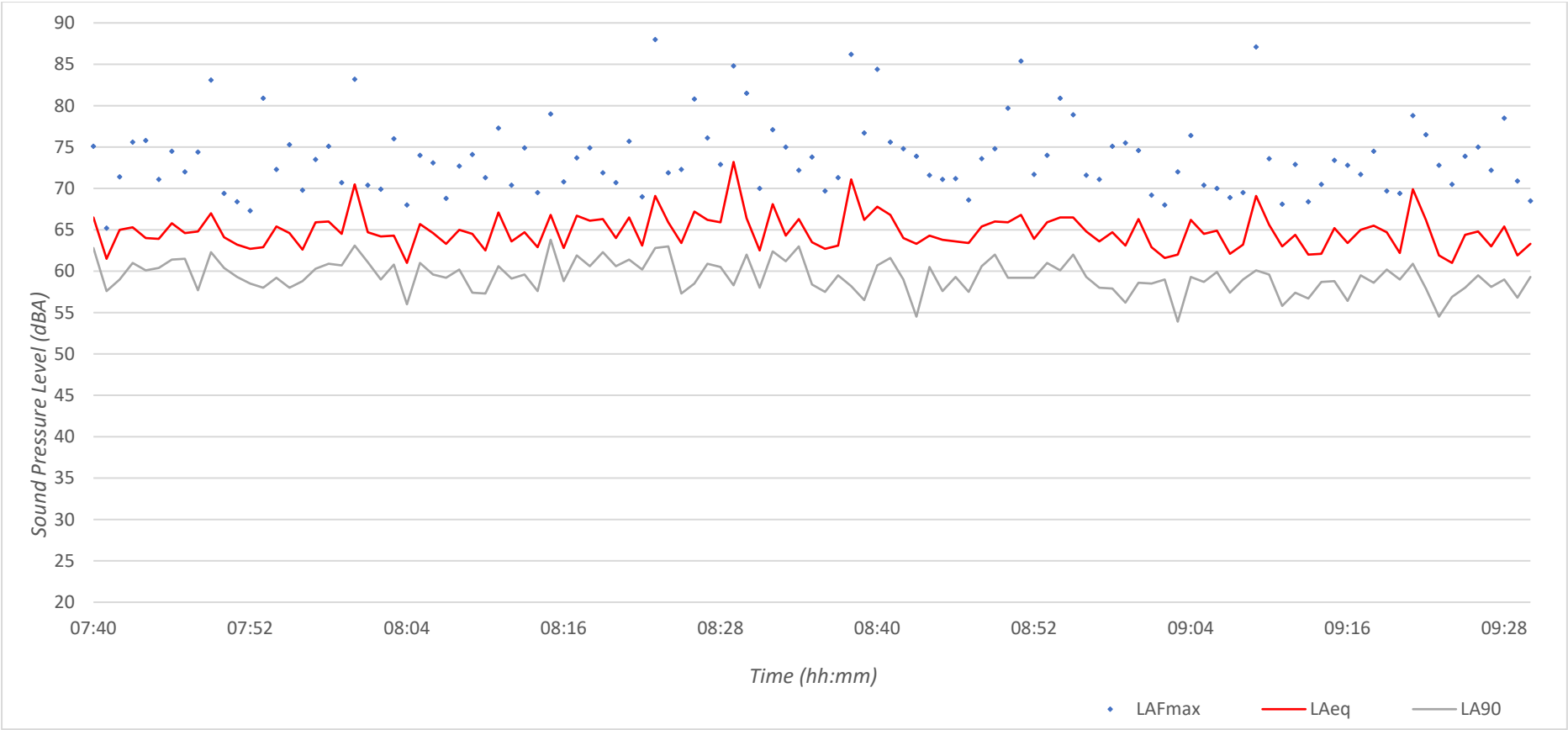
Time	Temp C°	Wind Speed m/s	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
07:40	19	1	S	90	5	6
09:30	20	2	SSW	7	5	7

APPENDIX D - Calibration Details

Kit	Calibrator Ref Level (dB)	Deviation Before (dB)	Deviation After (dB)
A2	113.9	1.93	2.05

APPENDIX E – Noise Survey Time History

Environmental Noise Measurement M1 Time History: Wednesday 17th August 2022



APPENDIX F – BS8233 Rigorous Design Calculations

Living Rooms - Daytime LAeq

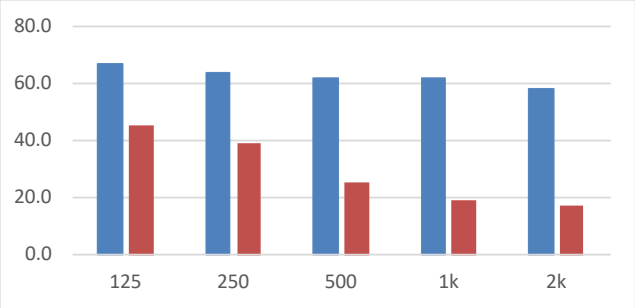
Room Properties

Room Width (m)	5.5
Room Depth (m)	6.5
Room Height (m)	2.4
Glazed Area (m^2)	9.0
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R_{w+Ctr}	41	45	45	54	58
Roof, dB R_{w+Ctr}	41	45	45	54	58
Glazing, dB R_{w+Ctr}	24	26	39	45	42
Vents, $D_{n,e,w+Ctr}$	42	43	43	49	64

Noise Levels, dB



External Level	66.0 dB LAeq
Internal Level	33.5 dB LAeq
Insertion Loss	32.5 dB LAeq

Sound Insulation Requirement

	Minimum Sound Insulation Requirement		Suitable Systems
Glazing	**39(33)**	dB $R_{W(+Ctr)}$	Double Glazing *6/16/9.5*
Ventilation	**45**	$D_{n,e,w+Ctr}$	Passive thru-wall vent *Passivent Fresh 80dB*

Suitable systems given as reference only. Other products that achieve the required sound insulation values are available.

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	4.78E-05	4E-05	3.8E-05	1E-05	3E-07
Term 2	0.002714	0.0017	8.6E-05	2E-05	4.3E-05
Term 3	2.53E-05	1E-05	1E-05	1E-06	5E-07
Term 4	0	0	0	0	0
Internal, dB L_{eq}	45.2	39.1	25.3	19.2	17.2
Internal, dB LAeq	29.1	30.5	22.1	19.2	18.4

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Passive thru-wall vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10\log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{ss}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right) + 10\log_{10}\left(\frac{S}{A}\right) + 3$$

Bedrooms Day & Night LAeq

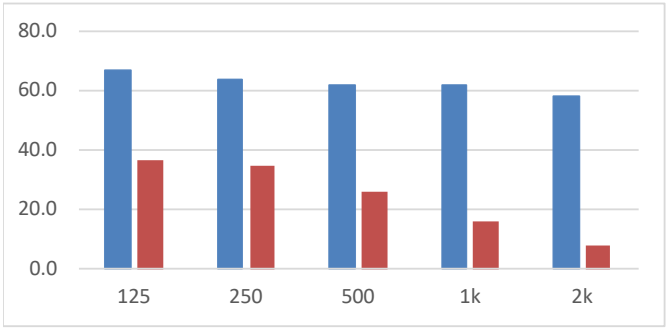
Room Properties

Room Width (m)	4.0
Room Depth (m)	3.0
Room Height (m)	2.4
Glazed Area (m^2)	1.0
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R_{w+Ctr}	41	45	45	54	58
Roof, dB R_{w+Ctr}	41	45	45	54	58
Glazing, dB R_{w+Ctr}	24	21	29	43	43
Vents, $D_{n,e,w+Ctr}$	42	43	43	49	64

Noise Levels, dB



External Level	66.0 dB LAeq
Internal Level	28.9 dB LAeq
Insertion Loss	37.1 dB LAeq

Sound Insulation Requirement

	Minimum Sound Insulation Requirement		Suitable Systems
Glazing	**34(29)**	dB $R_{W(+Ctr)}$	Double Glazing *4/16/6*
Ventilation	**45**	$D_{n,e,w+Ctr}$	Passive thru-wall vent *Passivent Fresh 80dB*

Suitable systems given as reference only. Other products that achieve the required sound insulation values are available.

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	6.57E-05	5E-05	5.2E-05	1E-05	4.1E-07
Term 2	0.000415	0.0008	0.00013	5E-06	5.2E-06
Term 3	7.12E-05	3E-05	2.8E-05	4E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L_{eq}	36.8	34.9	25.9	16.1	7.9
Internal, dB LAeq	20.7	26.3	22.7	16.1	9.1

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Passive thru-wall vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10\log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right) + 10\log_{10}\left(\frac{S}{A}\right) + 3$$

Bedrooms - Night LAmax

Room Properties

Room Width (m)	4.0
Room Depth (m)	3.0
Room Height (m)	2.4
Glazed Area (m^2)	1.0
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R_{w+Ctr}	41	45	45	54	58
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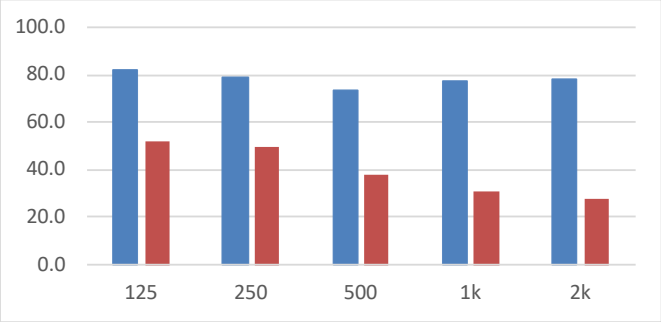
Noise Levels, dB



External Level	84.0 dB LAmax
Internal Level	43.4 dB LAmax
Insertion Loss	40.6 dB LAmax

Sound Insulation Requirement

	Minimum Sound Insulation Requirement		Suitable Systems
Glazing	**34(29)**	dB $R_{W(+Ctr)}$	Double Glazing *4/16/6*
Ventilation	**45**	$D_{n,e,w+Ctr}$	Passive thru-wall vent *Passivent Fresh 80dB*

Suitable systems given as reference only. Other products that achieve the required sound insulation values are available.

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	6.57E-05	5E-05	5.2E-05	1E-05	4.1E-07
Term 2	0.000415	0.0008	0.00013	5E-06	5.2E-06
Term 3	7.12E-05	3E-05	2.8E-05	4E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L_{eq}	52.1	49.7	37.7	31.3	27.7
Internal, dB LAeq	36.0	41.1	34.5	31.3	28.9

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Passive thru-wall vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10\log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right) + 10\log_{10}\left(\frac{S}{A}\right) + 3$$

APPENDIX G – Site Plans


1 Proposed East Elevation
1 : 100
2 Proposed South Elevation
1 : 100
3 Proposed North Elevation
1 : 100
REVISIONS
Planning
Shailesh Patel
1-3 Coldharbour Lane, Hayes Town, UB3 3EA
Proposed Elevations
01/07/2022
1 : 100 @ A1
WIGHTON ARCHITECTS
215/02 (02)003
C

APPENDIX H – Acoustic Terminology

To aid the understanding of acoustic terminology and the relative difference between noise levels the following background information is provided.

We perceive sound when the ear detects fluctuations in air pressure (sound waves), which are then processed by the brain and perceived as sound. Humans can hear an incredibly wide range of sound intensities ranging from jet engines to fingertips lightly brushing against each other. This range is quantified using a logarithmic scale called the decibel scale (dB). The comfortable range of the decibel scale typically ranges from 0dB (the threshold of hearing) to around 140dB. Here are some examples of common environments and their typical noise levels.

Noise Level	Environment
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a moving car
60 to 70 dB(A)	Typical high street
100 to 110 dB(A)	Fire alarm at 1 metre away
140 dB(A)	Threshold of pain

Terminology

dB (decibel) – A unit used to quantify the pressure level of sound. Defined as 20 times the logarithm of the ratio between the root-mean-square pressure of a given sound field and a reference pressure level ($2x10^{-5}$ Pa – threshold of hearing).

$L_{Aeq,\,T}$ – The equivalent continuous sound pressure level over a stated period. It quantifies a fluctuating sound level over a given period as the equivalent continuous sound level over which the same amount of acoustic energy is contained over. This is A-weighted in order to assess human perception.

L_{Amax} – the maximum RMS A-weighted sound pressure level occurring within a specified time period; the time weighting is typically either Fast or Slow.

A-Weighting – A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

R_w – The Weighted Sound Reduction Index (R_w) is a number used to rate the effectiveness of a soundproofing system or material.

$D_{n,e,W}$ – The Weighted Sound Reduction Index specifically for ventilators.

C_{tr} – C_{tr} is a spectrum adaptation term which method is defined in BS EN ISO 717. The standard uses a reference curve to determine the weighted value of airborne sound insulation. The spectrum adaptation terms C and C_{tr} may are used to take into account different source spectra. 'C_{tr}' is the A-weighted urban traffic noise spectrum.