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ENVIRONMENTAL NOISE SURVEY

35 Angel Lane Hillingdon London UB3 2QZ

04/04/2026

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REPORT No: 35AL290326UB32QZ **Date:** 29-30 March 2026

CLIENT PROJECT REFERENCE
35 Angel Lane, Hillingdon, London, UB3 2QZ

ENVIRONMENTAL NOISE SURVEY

PREPARED FOR:

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1. Summary

An environmental noise impact assessment was carried out at the premises at 35 Angel Lane, Hillingdon, London, UB3 2QZ, started on Sunday 29th March 2026 and finished on Monday 30th March 2026 in order to determine internal noise levels of the proposed residential units. A BS8233 and BS4142 noise assessment was carried out at the site. All worst-case situations were considered for this assessment.

A rigorous calculation method that is given in BS8233 and based on measured environmental noise levels, was used to determine interior noise levels in the proposed residential units. In accordance with BS8233:2014, and BS4142:2014+A1:2019 guidance, the results shown in table below shows that;

- The day internal noise levels in living rooms are within the desirable category of 35dB(A) $L_{Aeq,16hr}$.
- The night internal noise levels in bedrooms are in the desirable category of 30dBA $L_{Aeq,8hr}$.
- The maximum individual noise events in bedrooms do not exceed 45dB(A) L_{AFmax} of the desirable category.

A summary of internal noise levels of the proposed flats is given in table below.

1st Floor Room-1 (11.15m²)				
Internal Space	**Noise Parameter**	**Internal Noise Level**	**BS8233 Limit**	**Within Desirable Limit (BS8233)**
L/D (11.15m²)	Daytime $L_{Aeq,16hr}$	21	35	**Yes**
Bedroom (11.15m²)	Night-time $L_{Aeq,8hr}$	21	30	**Yes**
Bedroom (11.15m²	Night-time L_{AFmax}	43	45	**Yes**
2nd Floor Room-4 (10.42m²)				
Internal Space	**Noise Parameter**	**Internal Noise Level**	**BS8233 Limit**	**Within Desirable Limit (BS8233)**
L/D (10.42m²)	Daytime $L_{Aeq,16hr}$	18	35	**Yes**
Bedroom (10.42m²)	Night-time $L_{Aeq,8hr}$	18	30	**Yes**
Bedroom (10.42m²)	Night-time L_{AFmax}	38	45	**Yes**
3rd Floor Room-6 (14.55m²)				
Internal Space	**Noise Parameter**	**Internal Noise Level**	**BS8233 Limit**	**Within Desirable Limit (BS8233)**
L/D (14.55m²)	Daytime $L_{Aeq,16hr}$	22	35	**Yes**
Bedroom (14.55m²)	Night-time $L_{Aeq,8hr}$	22	30	**Yes**
Bedroom (14.55m²)	Night-time L_{AFmax}	42	45	**Yes**
L/D means Lounge/ Dinning				

The results given in Table above demonstrate that the predicted indoor ambient noise levels, $L_{Aeq,16hr}$ for day, $L_{Aeq,8hr}$ for night and L_{AFmax} for night in the proposed residential units do not exceed the guideline values that are set in Table 4 of BS8233:2014.

The summary of the difference between the Rating Level and Background Noise Level of noise sensitive receptors is given in Table below.

Noise sensitive receptor	Difference between The Rating Level and Background Level	
	Day dB(A)	**Night dB(A)**
Ground floor window of (33 Angle Lane)	**–4.5**	-
First floor window of (33 Angle Lane)	-	**– 2**

In accordance with BS4142:2014+A1:2019 guidance, the day and night Rating Levels $L_{Aeq,Tr}$ at nearest noise sensitive receptors do not exceed the background sound level $L_{A90,T}$ at the nearest noise sensitive receptor as shown in Table above. Therefore, the operation of the site as HMO indicates the specific sound source having a low adverse impact (***Low adverse impact likely***) at the nearest noise sensitive receptor.

We can confirm that the predicted internal ambient noise levels are within the standards set out in BS8233:2014 guidance and BS4142:2014+A1:2019 guidance. Also, we can confirm that there were not any structural borne noise and vibration from the noise sources nearby the site.

2. Introduction

2.1. Proposal

An environmental noise survey was carried out to assess noise levels at 35 Angel Lane, Hillingdon, London, UB3 2QZ, started on Sunday 29th March 2026 and finished on Monday 30th March 2026. This noise survey was prepared to support an outline application for converting existing site to 6 residential units with access secured, and all other matters reserved. The site has two floors including a ground floor. The site is located on Angle Lane.

2.2. Reason for Assessment

A noise assessment is required to specify mitigation measures to ensure environmental noise levels do not exceed guideline internal/external noise levels, as listed in BS8233:2014.

2.3. Assessment Standards & Justification

2.3.1 Guidance on Sound Insulation and Noise Reduction for Buildings BS8233 (2014)

BS8233:2014 contains useful advice relevant to the planning and design of new development, including new noise-sensitive development such as housing. BS8233 advocates a systematic approach to acoustic design as follows: i) assess the site, identify significant existing and potential noise sources, measure or estimate noise levels, and evaluate layout options. ii) Determine design noise levels for spaces in and around the building(s); iii) Determine sound insulation of the building envelope, including the ventilation strategy; iv) Identify internal sound insulation requirements; v) Identify and design appropriate noise control measures; and vi) Establish quality control and ensure good quality workmanship.

Section 5 of BS8233:2014 contains guidance on the sequence of stages to be followed in the planning and early acoustic design of a new development. Section 5.4 of BS8233:2014 outlines a general approach to determining appropriate noise control measures including the following suggested steps (which may be iterative): i. Check the feasibility of reducing noise levels and/or relocating noise sources. ii. Consider options for planning the site or building layout. iii. Consider the orientation of proposed building(s). iv. Select construction types and methods for meeting building performance requirements. v. Examine the effects of noise control measures on the requirements for ventilation, fire regulation, health and safety, cost, construction, design and management etc. vi. Assess the viability of alternative solutions. The designer should then decide which of the following options could be applied to reduce noise levels: i. Quietening or removing the source of noise. ii. Attenuating the sound on its path to the receiver. iii. Obstructing the sound path between source and receiver. iv. Improving the sound insulation of the building envelope. v. Using agreements to manage noise.

2.4. Measurements

Environmental noise survey was undertaken at the site in order to assess environmental noise emissions. The sound level meter was mounted onto a tripod at 1.4 metre above the ground at the site, and it was positioned at minimum 1 metre away from nearby walls/fences.

2.5. Sound Insulation and Noise Impact Assessment

2.5.1 Sound Insulation Assessment

The Building Regulations Approved Document E require a minimum sound insulation value of 43 dB ($D_{nTw} + C_{tr}$ dB) for floors, stairs, and walls, and 64 dB ($L_{nT,w}$ dB) for floor, and stairs of dwelling-houses and flats formed by material change of use (See Appendix F). The outcome summarised in Table 1 was achieved by using assumed standard construction details as specified in Appendix C, Appendix D, and Appendix E for the building façade.

Table 1: Noise Assessment Outcome

	1st Floor Room-1 (11.15m²)			
Internal Space	**Noise Parameter**	**Internal Noise Level**	**BS8233 Limit**	**Within Desirable Limit (BS8233)**
L/D (11.15m²)	Daytime $L_{Aeq,16hr}$	21	35	**Yes**
Bedroom (11.15m²)	Night-time $L_{Aeq,8hr}$	21	30	**Yes**
Bedroom (11.15m²	Night-time L_{AFmax}	43	45	**Yes**
	2nd Floor Room-4 (10.42m²)			
Internal Space	**Noise Parameter**	**Internal Noise Level**	**BS8233 Limit**	**Within Desirable Limit (BS8233)**
L/D (10.42m²)	Daytime $L_{Aeq,16hr}$	18	35	**Yes**
Bedroom (10.42m²)	Night-time $L_{Aeq,8hr}$	18	30	**Yes**
Bedroom (10.42m²)	Night-time L_{AFmax}	38	45	**Yes**
	3rd Floor Room-6 (14.55m²)			
Internal Space	**Noise Parameter**	**Internal Noise Level**	**BS8233 Limit**	**Within Desirable Limit (BS8233)**
L/D (14.55m²)	Daytime $L_{Aeq,16hr}$	22	35	**Yes**
Bedroom (14.55m²)	Night-time $L_{Aeq,8hr}$	22	30	**Yes**
Bedroom (14.55m²)	Night-time L_{AFmax}	42	45	**Yes**
L/D means Lounge/ Dinning				

2.6. Site & Measurement Location

The site is located in a residential area on Angle Lane. Noise levels were measured 1metre away from the ground floor façades of the site.

3. Environmental Noise Survey

3.1. Source under Investigation

The noise source identified on-site was mainly road traffic noise, pedestrian noise, and airplane noise.

3.2. Weather Conditions

Weather conditions were noted to be 2 degrees Celsius with a cloudy sky at the beginning of the measurements with a light wind, which was less than 2m/s, and 5 degrees Celsius at the end of the measurements with a mostly sunny sky and a wind, which was less than 4m/s. These weather conditions were checked against and confirmed using the Meteorology Office mobile application available on smart phone technology.

3.3. Measurement Equipment

Measurement equipment that was used for the survey complies with accuracy requirements for common environmental noise measurement standards. The noise monitoring equipment was calibrated before and after the measurements. No significant drift was recorded. A detailed equipment list is given in **Appendix A** with calibration information in **Appendix B.**

3.4. Measurement Results

Daytime noise level: The results from the measurements taken at the site, 16-hour noise level (dB $L_{Aeq,16hr}$) are summarised graphically in Figure 1 and numerically in the Table 2. The measured spectral data (dB $L_{eq,16hr}$) for the daytime is used to give a broadband noise level that is equal to dB $L_{Aeq,16hr}$.

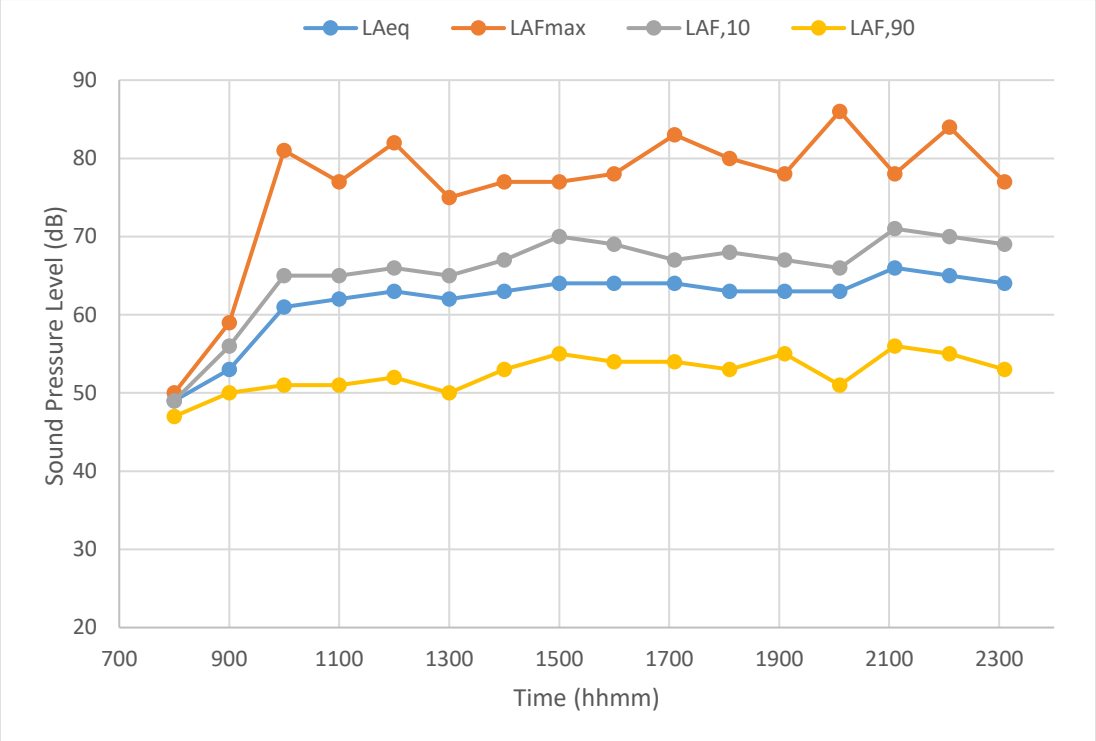


Figure 1: A graphical comparison of the noise indices at the site for the daytime 16-hours on.

Table 2a: Daytime 16-hour Noise Level (dB $L_{Aeq,16hr}$) *at the site*

#	Starting Time	Finishing Time	$L_{Aeq,1hr}$ (dB)	$L_{Amax,\ 1hr}$(dB)	$L_{A10,1hr}$ (dB)	$L_{A90,1hr}$ (dB)
1	07:00	08:00	49	50	49	47
2	08:00	09:00	53	59	56	50
3	09:00	10:00	61	81	65	51
4	10:00	11:00	62	77	65	51
5	11:00	12:00	63	82	66	52
6	12:00	13:00	62	75	65	50
7	13:00	14:00	63	77	67	53
8	14:00	15:00	64	77	70	55
9	15:05	16:05	64	78	69	54
10	16:05	17:05	64	83	67	54
11	17:05	18:05	63	80	68	53
12	18:05	19:05	63	78	67	55
13	19:05	20:05	63	86	66	51
14	20:05	21:05	66	78	71	56
15	21:05	22:05	65	84	70	55
16	22:05	23:05	64	77	69	53
Average Levels			**62**	**80**	**67**	**52**

Octave band noise spectra *dB* L_{eq} that were measured at the site are given in Table 2b.

Table 2b: Day time 16 hours octave band spectra, dB L_{eq}.

#	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz
1-16	55	52	52	55	51

Octave band maximum noise spectra *dB L_{Max}* that were measured at the site are given in Table 2c.

Table 2c: Day time 16 hours octave band maximum noise spectra, dB $\boldsymbol{L_{Max}}$.

#	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz
1-16	79	76	77	74	68

Night-time noise level: The results from the measurements taken at the site, 8-hour noise level (dB L_{Aeq}) are summarised in the Table 3. The measured spectral data for the night-time is used to give a broadband noise level that is equal to dB L_{Aeq}. But night-time noise levels are not higher than day-time noise levels. Therefore, for worst-case scenario, daytime noise levels are used to predict internal noise levels in bedrooms.

Table 3a: Night-time Noise Level (dB L_{Aeq}) *at the right side of the site.*

#	Starting Time	Finishing Time	$L_{Aeq,1hr}$(dB)	$L_{Amax,1hr}$(dB)	$L_{A10,1hr}$(dB)	$L_{A90,1hr}$(dB)
1	23:10	00:10	59	82	62	51
2	00:10	01:10	50	60	54	46
3	01:10	02:10	51	61	52	48
4	02:10	03:10	48	52	50	46
5	03:10	04:10	47	50	49	46
6	04:10	05:10	47	49	48	45
7	05:10	06:10	49	54	53	46
8	06:10	07:10	54	67	54	48
Average Levels			**53**	**73**	**55**	**47**

Octave band noise spectra *dB L_{eq}* that were measured *at the right side of the site* are given in Table 3b.

Table 3b: Night-time 8 hours octave band spectra, dB $\boldsymbol{L_{eq}}$.

#	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz
1-8	48	45	43	50	46

Octave band maximum noise spectra *dB L_{Max}* that were measured at the site are given in Table 3c.

Table 3c: Night-time 8 hours octave band maximum noise spectra, dB $\boldsymbol{L_{Max}}$.

#	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz
1-8	64	62	62	73	65

3.5. Observation

Noise level measurements were carried out at the site as shown in Tables 2-3. Observations and detailed notes were made of the significant noise sources, which contribute to each of the measured levels.

Road Traffic Noise: Road traffic noise from Angle Lane and Uxbridge Road was audible at the monitoring location, and it was subjectively loud during the measurement. It was dominant noise source.

Site Sound Sources: There were not any audible sound sources in operation at noise survey location during the measurements.

People Noise: Noise from pedestrians walking by the site was audible at measurement location

and was subjectively loud during the measurement.

Neighbourhood Sound Source: Household noise from nearby houses was audible at survey location but it was not subjectively loud.

Airplane Noise: Noise from airplanes was audible at the survey location and it was subjectively loud during the measurement.

Bird Noise: Sound from birds was audible at the survey location but it was not subjectively loud during the measurement.

Car-park Noise: Noise from car parking on the roadside of Angle Lane were audible at the survey location and it was subjectively loud during the measurement.

3.6. Uncertainty

The conclusion of this environmental noise survey is based on the noise monitoring undertaken at the site. The levels of uncertainty in the data and calculations are low given the robust measurements undertaken in noise monitoring and the confidence in the data statistical analysis.

4. BS4142:2014 + A1:2019 Noise Assessment

4.1. Criteria

BS4142:2014+A1:2019 provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. The key aspects of the BS4142:2014+A1:2019 are summarised below. The standard presents a method of assessing potential noise impact by comparing the noise level due to industrial sources (the Rating Level) with that of the existing background noise level at the nearest noise sensitive receiver in the absence of the source (the Background Sound Level). The Specific Noise Level - the noise level produced by the source in question at the assessment location - is determined and a correction applied for certain undesirable acoustic features such as tonality, impulsivity or intermittency. The corrected *Specific Noise Level* is referred to as the *Rating Level*. The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

a) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
b) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
c) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.
d) Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

BS4142:2014+A1:2019 criteria are given below.

Difference between the rating level and the background level	Assessment (All dependant on the context)
Around 10 dBA or more	*Indicates a significant adverse impact*
Around 5 dBA	*Indicates an adverse impact*
Below 5 dBA	*Lower the adverse impact*

Below 0 dBA	*Low adverse impact likely*

4.2. Day noise impact

Normal conversation at 1m has a sound pressure level between 40-60 dB(A). So, as a worst-case scenario, 60 dB(A) was used in the report. **So, day rating level $L_{Aeq\ Tr,1h}$ at the front of the site is 60 dB(A)**.

4.3. Night noise impact

Normal conversation at 1m has a sound pressure level between 40-60 dB(A). So, as a worst-case scenario, 60 dB(A) was used in the report. **So, night rating level $L_{Aeq\ Tr,1h}$ at the front of the site is 60 dB(A)**.

4.4. Distance attenuation

The noise sensitive receptors to noise sources were noted to be front window of ground floor and first floor of 33 Angle Lane. The noise levels at window of the noise sensitive receptors can be predicted using outdoor sound propagation equation.

- Distance attenuation at 3 metres (front window of ground floor of 33 Angle Lane) from the noise sources is 9.5 dB(A) using a 1 metre distance from the noise source.
- Distance attenuation at 4 metres (front window of first floor of Angle Lane) from the noise sources is 12 dB(A) using a 1 metre distance from the noise source.

4.5. Barrier attenuation

Screening of the noise units to prevent line of sight to the sound source would reduce noise levels at the receivers. *Theory of outdoor sound propagation suggest that if the line-of-sight is significantly cut by a barrier/wall then a 10dB(A) reduction can be expected. If the line-of-sight is just cut by a barrier/wall, then a 5dB(A) reduction might be expected.*

The line-of-sight of windows is not cut by any barrier and/or walls, then no reduction might be expected.

4.6. BS41424142:2014 + A1:2019 Assessment for nearest receptors

4.6.1. Ground floor front window (33 Angle Lane)

The predicted Rating Levels $L_{Aeq,Tr}$ at the receptor are 4.5dB(A) below background noise level at the ground-floor window level of noise sensitive receptor for *day* as calculated in table below.

In accordance with BS 4142:2014+A1:2019 guidance and criteria, ***the rating level does exceed the background sound level. This is an indication of the specific sound source having a low adverse impact (Low adverse impact likely).***

BS4142:2014+A1:2019 Assessment	Day dB(A)
Specific Sound Level	**60**
Characteristic penalty	0
Façade correction	-3
Distance attenuation at 3m	-9.5
Line-of-site cut significantly	0
Rating Level at receptor point	47.5
Daytime Background Level, L_{A90}	**52**
Difference between rating level and background level	**-4.5**

4.6.2. First floor front window (33 Angle Lane)

The predicted Rating Levels $\boldsymbol{L_{Aeq,Tr}}$at the receptor are 2dB(A) below background noise level at the first-floor window level of noise sensitive receptor for *night* as calculated in table below.

In accordance with BS 4142:2014+A1:2019 guidance and criteria, ***the rating level does exceed the background sound level. This is an indication of the specific sound source having a low adverse impact (Low adverse impact likely).***

BS4142:2014+A1:2019 Assessment	Night dB(A)
Specific Sound Level	**60**
Characteristic penalty	0
Façade correction	-3
Distance attenuation at 4m	-12
Line-of-site cut significantly	0
Rating Level at receptor point	45
Daytime Background Level, L_{A90}	**47**
Difference between rating level and background level	**-2**

4.6.3. External amenity: rear garden of 33 Angle Lane

BS8233:2014 provides a desirable guideline of 50dB $L_{Aeq,16hr}$ for external amenity spaces and an acceptable guideline of 55dB $L_{Aeq,16hr}$ for noisier environments.

Nearest external amenity space is the rear garden of 33 Angle Lane, which is approximately 2-meters from the members of the site using the rear garden. The predicted daytime Rating Level $\boldsymbol{L_{Aeq,Tr}}$at the external amenity space is 49dBA. Therefore, Rating Level $\boldsymbol{L_{Aeq,Tr}}$at the external amenity space is in the desirable category of BS8233:2014.

BS4142:2014+A1:2019 Assessment	Day dB(A)
Specific Sound Level	**60**
Characteristic penalty	0
Façade correction	0
Distance attenuation at 2m	-6
Line-of-site significantly cut by fences	-5
Rating Level at receptor point	49

4.6.4. External amenity: rear garden of 37 Angle Lane

BS8233:2014 provides a desirable guideline of 50dB $L_{Aeq,16hr}$ for external amenity spaces and an acceptable guideline of 55dB $L_{Aeq,16hr}$ for noisier environments.

Nearest external amenity space is the rear garden of 37 Angle Lane, which is approximately 2-meters from the members of the site using the rear garden. The predicted daytime Rating Level $\boldsymbol{L_{Aeq,Tr}}$at the external amenity space is 34.7dBA. Therefore, Rating Level $\boldsymbol{L_{Aeq,Tr}}$at the external amenity space is in the desirable category of BS8233:2014.

BS4142:2014+A1:2019 Assessment	Day dB(A)
Specific Sound Level	**60**
Characteristic penalty	0
Façade correction	0
Distance attenuation at 2m	-6
Line-of-site significantly cut by fences	-5

Rating Level at receptor point	49

5. BS8233:2014 Noise Assessment

5.1. Criteria

For desirable internal and external noise levels to be maintained, the assessment criteria are given in BS8233:2014 as:

- 35dB $L_{Aeq,16hr}$ within living rooms (07:00 – 23:00).
- 30dB $L_{Aeq,8hr}$ within bedrooms (23:00 – 07:00).
- 45dB L_{Amax} should not be regularly exceeded within bedrooms (23:00 – 07:00).
- <55dB $L_{Aeq,16hr}$ within external amenity spaces.

5.2. External Noise Analysis

Measured noise levels are shown in Tables 2-3, and they are characterised by environmental noise climate, which is dominated by road traffic noise, by noise from pedestrians/public using Angle Lane.

5.3. Internal Noise Levels

Internal noise levels were calculated in order to demonstrate that the proposed conversion of existing site to 6 residential units can achieve suitable internal noise levels inside rooms, when the suggested appropriate glazing, ventilation systems, walls and ceiling/roof systems are used.

In order to describe the likely internal exposure to environmental noise at the site, it is suggested using data from BS8233:2014 on standard construction materials. This will include all elements of the exposed living room and bedroom façades closest to the noise sources. A summary of assumed standard construction details is provided within Appendix C, Appendix D, and Appendix E.

5.4. Daytime Internal Noise Levels

The desirable limit of BS8233:2014 suggests a guideline of 35dB $L_{Aeq,16hr}$ for resting conditions, and up to 40dB considered acceptable for necessary developments. Considering the insulation with 6-12-6 Double Glazing unit, hit and miss trickle ventilation, wall, and roof/ceiling, daytime environmental noise internally would be reduced from 60dB $L_{Aeq,16hr}$ to interior levels of 21dB $L_{Aeq,16hr}$ (First Floor Room-1, 11.15m^2), 18dB $L_{Aeq,16hr}$ (Second Floor Room-4, 10.42m^2), and 22dB $L_{Aeq,16hr}$ (Third Floor Room-6, 14.55m^2).

The assumed standard of construction would place the internal levels in dining/living areas as below 35dB. Therefore, daytime internal levels in dining/living areas are within the desirable category.

5.5. Night-time Internal Noise Levels

BS8233:2014 suggests a desirable guideline of 30dB $L_{Aeq,8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq,8hr}$. Individual noise events (Measured with fast time-weighted Maximum) should not normally exceed 45dB L_{AFmax} (as in BS8233:2014).

Considering the insulation with 6-12-6 Double Glazing unit, *hit and miss trickle ventilation*, wall, and roof/ceiling, night-time environmental noise in bedrooms would be reduced from 60dB $L_{Aeq,8hr}$ to interior levels of 21dB $L_{Aeq,8hr}$ (First Floor Room-1, 11.15m^2), 18dB $L_{Aeq,8hr}$ (Second Floor Room-4, 10.42m^2), and 22dB $L_{Aeq,8hr}$ (Third Floor Room-6, 14.55m^2).

Maximum individual noise events would be reduced from 83dB L_{AFmax} to internal levels of 43dB L_{AFmax} (First Floor Room-1, 11.15m^2), 38dB L_{AFmax} (Second Floor Room-4, 10.42m^2), and 42dB L_{AFmax} (Third Floor Room-6, 14.55m^2).

The assumed standard of construction would place the internal continuous levels in bedrooms as below 30dB $L_{Aeq,8hr}$ and maximum noise level as below 45dB L_{AFmax}. Therefore, night-time internal noise levels in bedrooms are in the desirable category.

6. Vibration

In addition to the control of airborne noise transfer, it is essential to consider the transfer of noise as vibration to the proposed dwellings. It is also important to consider the transmission of vibration from the roads to the building façade.
A subjective analysis of the ground borne vibration was carried out at the site. Hard ground/surfaces and the existing walls around the building were checked. Based on subjective assessment, no vibration from the noise sources and vibration sources (Angle Lane) was observed at the site. There were not any structural borne noise and vibration from the noise sources at the site.

7. Sound Insulation Scheme

The recommended minimum requirements in terms of glazing and ventilation are given in Table 4. This is to ensure desirable internal noise levels are achieved. Detailed specifications could be found in Appendix C, Appendix D, and Appendix E.

Table 4: Façade Specifications

Internal Space	**Glazing**		**Ventilation**	
	Minimum Performance R_w+C_{tr}	**Suggested Specification**	**Minimum Performance, $D_{nT,w}+C_{tr}$ (open)**	**Suggested Specification**
Living Rooms	33	6-12-6 Double Glazing	32	Hit & Miss Trickle, Ventilators
Bedrooms	33	6-12-6 Double Glazing	32	Hit & Miss Trickle, Ventilators

7.1. Sound Insulation Assessment for floors and party walls

Sound insulation performance of the proposed flats is given in Appendix C, Appendix D, and Appendix E.

The internal floor between ground floor and first floor, and between first floor and second floor: With the regard to noise emanating from the shop to noise sensitive flat above the site, BS 8233:2014 states that "Airborne sound insulation is mainly considered for intermediate floors between spaces containing either noise sources or noise-sensitive occupants. For a ground floor where there is neither an appreciable noise source nor a noise-sensitive occupant below the floor, the floor is only of interest if it could contribute to flanking transmission. A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. Following approval and implementation of the scheme, a test shall be undertaken to demonstrate that the attenuation measures carried out as part of the approved scheme are effective and achieve the specified criteria. All works, which form part of the approved scheme, shall be completed before the use commences".

To control the transfer of noise from the ground floor residential units to upper-floor residential units, existing ceiling and a platform floor with absorbent material as shown in Figure 2 has been suggested. 100mm mineral wool quilt with minimum density 20kg/m^3 should be used to fill the cavity between timber battens of existing floor. In addition to existing floor, a new platform floor with absorbent material should be used. **(See Approved Document E, page 61**

section 4.31/4.32/4.33/4.34 for details). A minimum of two 15mm layers of board material fixed together with joints staggered, minimum total mas per unit are 25kg/m^2. The floating layer should be laid loose on a resilient layer. The resilient layer should be mineral wool, minimum thickness 50mm, density 80 to 120kg/m^2. Proposed new ceiling scheme will reduce noise level significantly and satisfy the required minimum sound insulation value of 43dB that is set by Approved Document E.

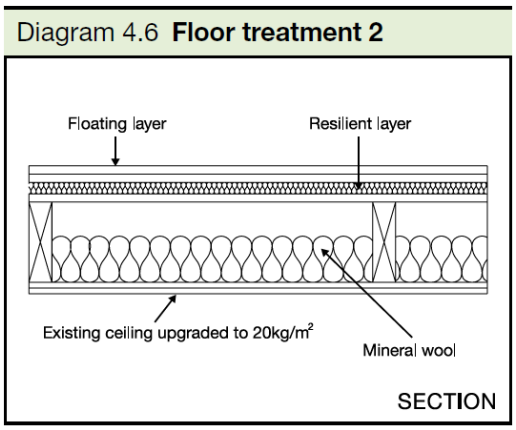


Figure 2: Suggested new ceiling scheme for additional sound insulation for the floor between ground floor and upper floors, and a platform floor with absorbent material. ***(Approved Document E, page 61 section 4.31/4.32/4.33/4.34 for details).***

The party walls: Approved Document E condition states that "The scheme shall achieve a minimum airborne sound insulation value of 43dB (D_{nTw} + C_{tr} dB) for all floors, stairs, and walls, and an impact sound insulation value of 64dB ($L_{nT,w}$ dB) for all floors and stairs". To control the transfer of noise between party walls, a sound insulation scheme given in Figure 3 is suggested to achieve a minimum airborne sound insulation value of 43dB (D_{nTw} + C_{tr} dB).

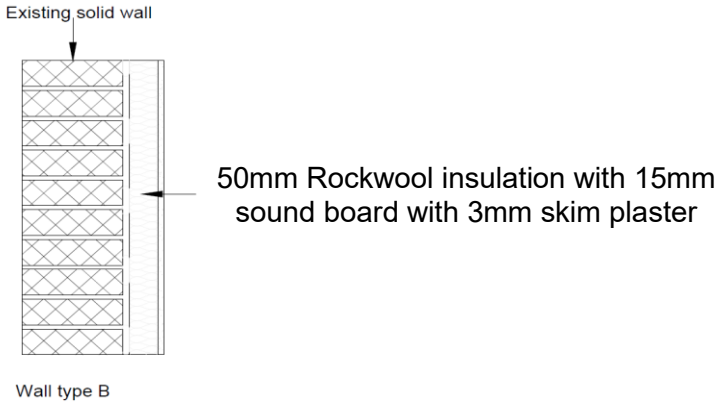


Figure 3: Upgrade of insulation to internal Party Wall.

The external walls of the flats: Approved Document E condition states that "The scheme shall achieve a minimum airborne sound insulation value of 43dB (D_{nTw} + C_{tr} dB) for all floors, stairs, and walls, and an impact sound insulation value of 64dB ($L_{nT,w}$ dB) for all floors and stairs". To control the transfer of noise through external walls from outside to the proposed residential units, a sound insulation scheme given in Figure 4 is suggested to achieve an airborne sound insulation value higher than 43dB (D_{nTw} + C_{tr} dB). Proposed external wall scheme in Figure 5 will reduce noise level significantly and satisfy the required minimum sound insulation value of 43dB that is set by Approved Document E.

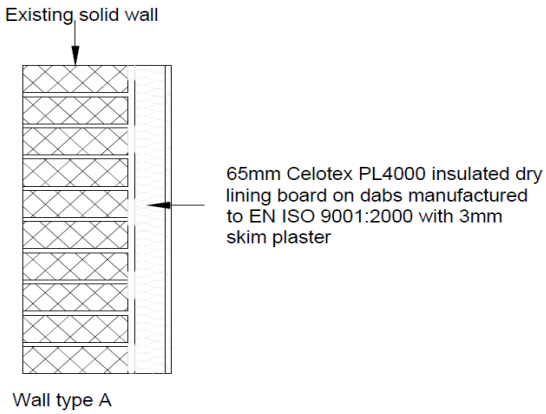


Figure 4: Upgrade of insulation to external walls of the flats.

8. Conclusion

An environmental noise survey was undertaken at the site in order to determine internal noise levels of proposed flats. A BS8233 noise assessment was carried out at the site. All worst-case situations were considered for this assessment. A rigorous calculation method that is given in BS8233 and based on measured environmental noise levels was used to determine interior noise levels in the proposed residential units.

In accordance with BS8233:2014 guidance:

- The daytime internal noise levels in living room are within the desirable category of 35dB(A) $L_{Aeq,16hr}$.
- The night-time internal noise levels in bedrooms are in the desirable category of 30dBA $L_{Aeq,8hr}$.
- The maximum individual noise events in bedrooms do not exceed 45dB(A) L_{AFmax} of the desirable category.

The summary of the difference between the Rating Level and Background Noise Level of noise sensitive receptors is given in Table below.

Noise sensitive receptor	Difference between The Rating Level and Background Level	
	Day dB(A)	**Night dB(A)**
Ground floor window of (33 Angle Lane)	**–4.5**	**-**
First floor window of (33 Angle Lane)	**-**	**– 2**

In accordance with BS4142:2014+A1:2019 guidance, the day and night Rating Levels $L_{Aeq,Tr}$ at nearest noise sensitive receptors do not exceed the background sound level $L_{A90,T}$ at the nearest noise sensitive receptor as shown in Table above. Therefore, the operation of the site as HMO indicates the specific sound source having a low adverse impact (***Low adverse impact likely***) at the nearest noise sensitive receptor.

The results given in Table 1 demonstrate that the predicted indoor ambient noise levels, $L_{Aeq,16hr}$ for day, $L_{Aeq,8hr}$ for night and L_{AFmax} for night in the proposed residential units do not exceed the guideline values that are set in Table 4 of BS8233:2014.

We can confirm that the predicted internal ambient noise levels are within the standards set out in BS8233:2014 guidance.

Also, we can confirm that there were not any structural borne noise and vibration from the noise sources nearby the site.

9. References

- *BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings".*
- *Approved Document E, the building regulation 2010. HM Government.*
- *BS4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound".*

10. Appendixes

10.1. Appendix A: Equipment details

Description of the Equipment used for measurements

Equipment	Description	Quantity	Serial No
Norsonic SLM	Type 1 sound level meter, NOR140	1	1403870
Norsonic	½ inch microphone	1	1225
Norsonic	Preamplifier	1	1209
Norsonic Calibrator	Class 1 Calibrator (114 dB)	1	Nor-1251-32544

10.2. Appendix B: Calibration Details and measurement set-up

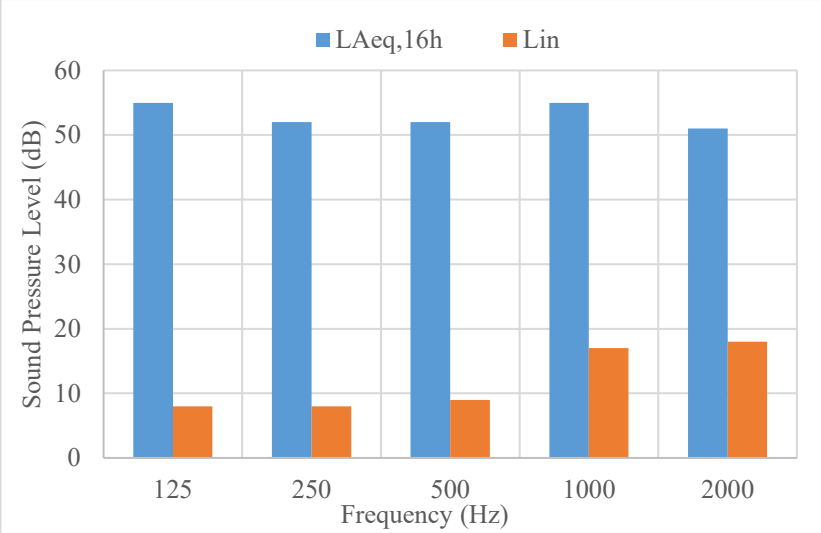
Noise monitoring location at the front of the site.

Calibration Details				
Calibrator Ref Level (dB)	**Level Before (dB)**	**Deviation Before (dB)**	**Level After (dB)**	**Deviation After (dB)**
114	113.9	-0.10	114.10	0.10

10.3 Appendix C: First Floor Room 1

BS8233:2014 Specification Calculations / Construction Details, Day - Room -1 (11.15m²), First Floor

Room Properties		Sound Insulation Properties					
Room Width (m)	3.333	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	3.345	Wall, $R_{w,Ctr}$ (dB)	40	44	45	51	56
Room Height (m)	2.634	Ceiling, $R_{w,Ctr}$ (dB)	28	34	40	45	49
Glazed Area (m²)	3	Glazing, $R_{w,Ctr}$ (dB)	26	29	33	28	24
Is dwelling on top floor?	No	Vents, $D_{new,Ctr}$ (dB)	37	36	35	36	34



External Level **60 dB** L_{Aeq}

Internal Level **21dB** L_{Aeq}

Insertion Loss **39dB** L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+C_{tr}}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+C_{tr}}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

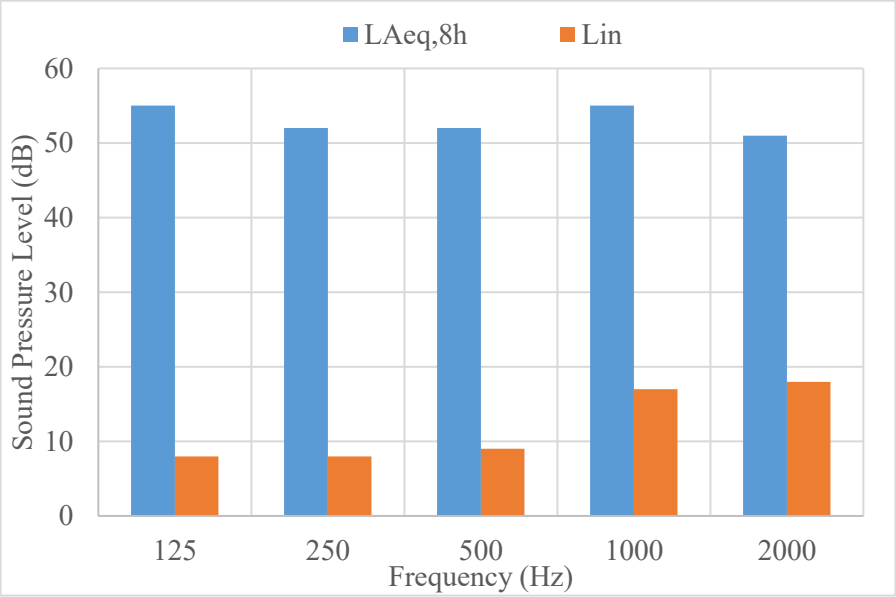
	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	2.27274E-05	2.8612E-05	3.60204E-05	2.8612E-05	4.5347E-05
Glazing	0.000858361	0.0004302	0.000171266	0.000541589	0.001360411
Wall	6.5828E-05	2.62066E-05	2.08166E-05	5.22891E-06	1.65353E-06
Ceiling	0.002012706	0.000505569	0.000126993	4.01588E-05	1.59875E-05
External, L_{eq} (dB)A	**55**	**52**	**52**	**55**	**51**
Internal L_{Aeq} (dB)A	**8**	**8**	**9**	**17**	**18**

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

BS8233: 2014 Specification Calculation Summary
Night – Room -1 (11.15m²), First Floor

Room Properties		Sound Insulation Properties					
Room Width (m)	3.333	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	3.345	Wall, $R_{w,Ctr}$ (dB)	40	44	45	51	56
Room Height (m)	2.634	Ceiling, $R_{w,Ctr}$ (dB)	28	34	40	45	49
Glazed Area (m²)	3	Glazing, $R_{w,Ctr}$ (dB)	26	29	33	28	24
Is dwelling on top floor?	No	Vents, $D_{new,Ctr}$ (dB)	37	36	35	36	34



External Level **60dB** L_{Aeq}

Internal Level **21dB** L_{Aeq}

Insertion Loss **39dB** L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

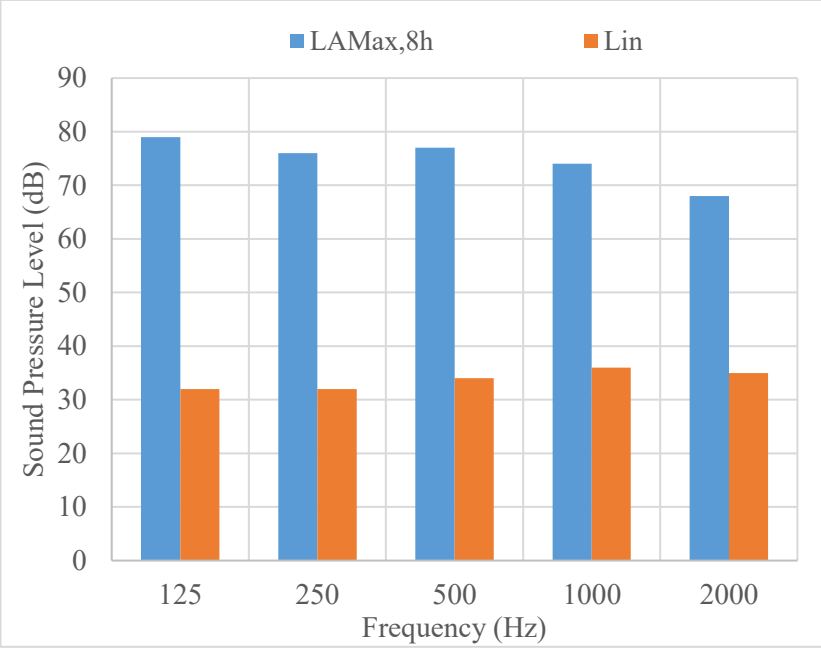
	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	2k
Vents	2.27274E-05	2.8612E-05	3.60204E-05	2.8612E-05	4.5347E-05
Glazing	0.000858361	0.0004302	0.000171266	0.000541589	0.001360411
Wall	6.5828E-05	2.62066E-05	2.08166E-05	5.22891E-06	1.65353E-06
Ceiling/Floor	0.002012706	0.000505569	0.000126993	4.01588E-05	1.59875E-05
External Level (dB)A	55	52	52	55	51
Internal Level (dB)A	8	8	9	17	18

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

BS8233: 2014 Specification Calculation Summary
Maximum Levels, Bedroom-1 11.15m^2), First Floor

Room Properties		Sound Insulation Properties					
Room Width (m)	3.333	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	3.345	Wall, $R_{w,Ctr}$ (dB)	40	44	45	51	56
Room Height (m)	2.634	Ceiling, $R_{w,Ctr}$ (dB)	28	34	40	45	49
Glazed Area (m^2)	3	Glazing, $R_{w,Ctr}$ (dB)	26	29	33	28	24
Is dwelling on top floor?	No	Vents, $D_{new,Ctr}$ (dB)	37	36	35	36	34



External Level **83dB** L_{AMax}

Internal Level **41dB** L_{AMax}

Insertion Loss **42dB** L_{AMax}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			Suitable Systems
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	2.27274E-05	2.8612E-05	3.60204E-05	2.8612E-05	4.5347E-05
Glazing	0.000858361	0.0004302	0.000171266	0.000541589	0.001360411
Wall	6.5828E-05	2.62066E-05	2.08166E-05	5.22891E-06	1.65353E-06
Ceiling	0.002012706	0.000505569	0.000126993	4.01588E-05	1.59875E-05
External Level (dB)A	79	76	77	74	68
Internal Level (dB)A	32	32	34	36	35

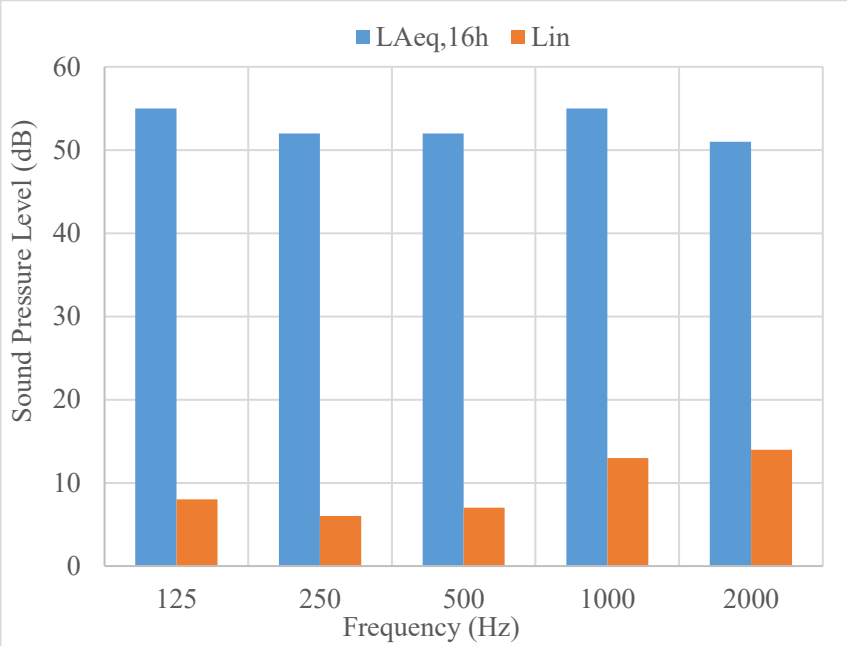
Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

10.4Appendix D: Second Floor Room-4

BS8233:2014 Specification Calculations / Construction Details, Day, Room-4 (10.42m^2), Second Floor

Room Properties		Sound Insulation Properties					
Room Width (m)	2.438	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.274	Wall, Rw,Ctr (dB)	40	44	45	51	56
Room Height (m)	2.526	Ceiling, Rw,Ctr (dB)	28	34	40	45	49
Glazed Area (m^2)	1	Glazing, Rw,Ctr (dB)	26	29	33	28	24
Is dwelling on top floor?	No	Vents, Dnew,Ctr (dB)	37	36	35	36	34



External Level **60dB** L_{Aeq}

Internal Level **18dB** L_{Aeq}

Insertion Loss **42dB** L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

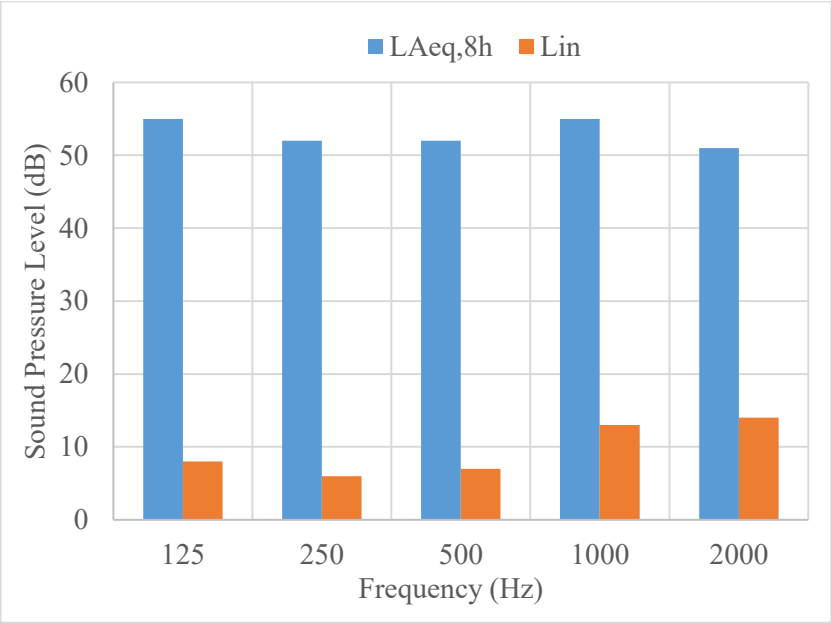
	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	3.23991E-05	4.079E-05	5.135E-05	4.079E-05	6.464E-05
Glazing	0.000407881	0.0002044	8.138E-05	0.0002574	0.0006464
Wall	8.3762E-05	3.335E-05	2.649E-05	6.653E-06	2.104E-06
Ceiling	0.002681644	0.0006736	0.0001692	5.351E-05	2.13E-05
External L_{eAeq} (dB)A	55	52	52	55	51
Internal L_{Aeq} (dB)A	8	6	7	13	14

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

BS8233: 2014 Specification Calculation Summary
Night – Room-4 (10.42m^2), Second Floor

Room Properties		Sound Insulation Properties					
Room Width (m)	2.438	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.274	Wall, Rw,Ctr (dB)	40	44	45	51	56
Room Height (m)	2.526	Ceiling, Rw,Ctr (dB)	28	34	40	45	49
Glazed Area (m^2)	1	Glazing, Rw,Ctr (dB)	26	29	33	28	24
Is dwelling on top floor?	No	Vents, Dnew,Ctr (dB)	37	36	35	36	34



External Level **60dB** L_{Aeq}

Internal Level **18dB** L_{Aeq}

Insertion Loss **42dB** L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

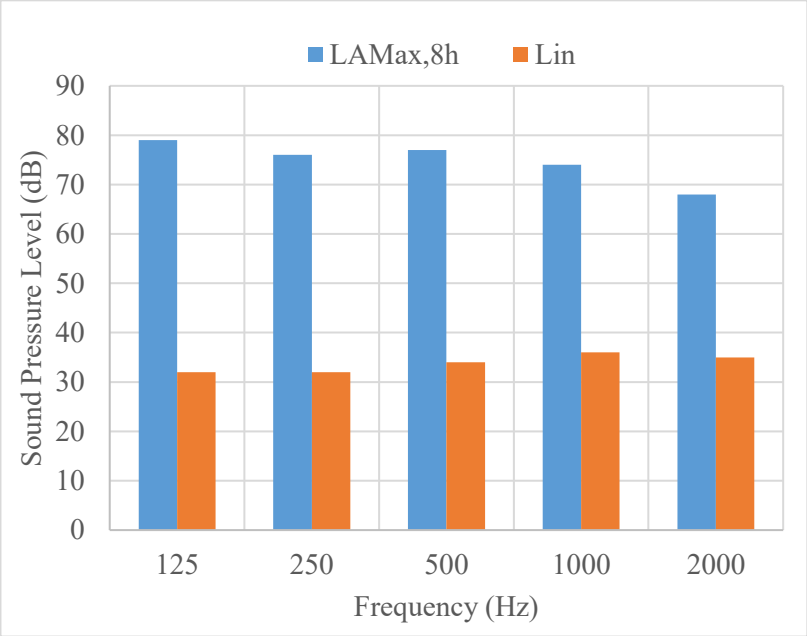
	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	3.23991E-05	4.079E-05	5.135E-05	4.079E-05	6.464E-05
Glazing	0.000407881	0.0002044	8.138E-05	0.0002574	0.0006464
Wall	8.3762E-05	3.335E-05	2.649E-05	6.653E-06	2.104E-06
Roof	0.002681644	0.0006736	0.0001692	5.351E-05	2.13E-05
External Level (dB)A	55	52	52	55	51
Internal Level (dB)A	8	6	7	13	14

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

BS8233: 2014 Specification Calculation Summary
Maximum Levels– Room-4 (10.42m²), Second Floor

Room Properties		Sound Insulation Properties					
Room Width (m)	2.438	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.274	Wall, Rw,Ctr (dB)	40	44	45	51	56
Room Height (m)	2.526	Ceiling, Rw,Ctr (dB)	28	34	40	45	49
Glazed Area (m²)	1	Glazing, Rw,Ctr (dB)	26	29	33	28	24
Is dwelling on top floor?	No	Vents, Dnew,Ctr (dB)	37	36	35	36	34



External Level **83dB** L_{AMax}

Internal Level **38dB** L_{AMax}

Insertion Loss **45dB** L_{AMax}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	3.23991E-05	4.07881E-05	5.13491E-05	4.07881E-05	6.46447E-05
Glazing	0.000407881	0.000204425	8.13829E-05	0.000257355	0.000646447
Wall	8.3762E-05	3.33462E-05	2.64879E-05	6.65345E-06	2.10401E-06
Ceiling	0.002681644	0.000673599	0.0001692	5.35058E-05	2.13011E-05
External Level (dB)A	79	76	77	74	68
Internal Level (dB)A		30	32	32	31

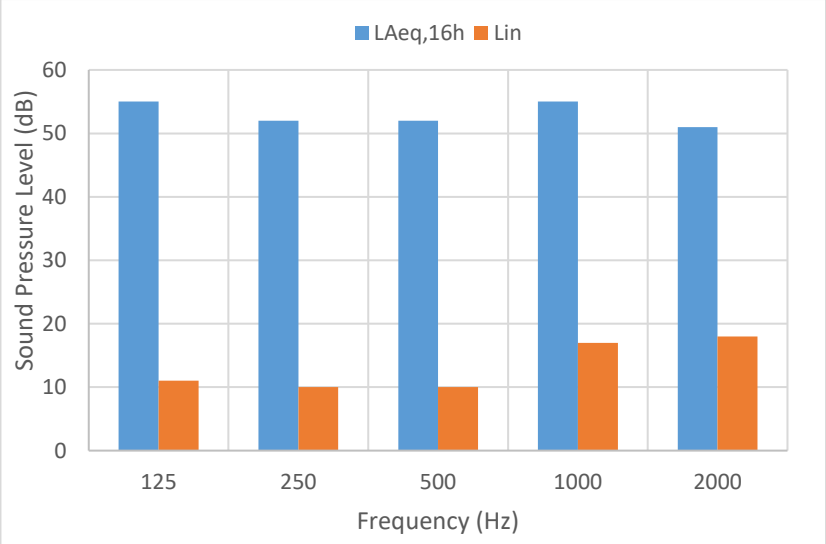
Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

10.5 Appendix E: Third Floor Room-6

BS8233:2014 Specification Calculations / Construction Details, Day – Room-6 (14.55m²), Third Floor (Loft Level)

Room Properties		Sound Insulation Properties					
Room Width (m)	3.44	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	4.23	Wall, $R_{w,Ctr}$ (dB)	40	44	45	51	56
Room Height (m)	2.2	Roof, $R_{w,Ctr}$ (dB)	28	34	40	45	49
Glazed Area (m²)	2.5	Glazing, $R_{w,Ctr}$ (dB)	26	29	33	28	24
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	37	36	35	36	34



External Level **60dB** L_{Aeq}

Internal Level **22B** L_{Aeq}

Insertion Loss **38dB** L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

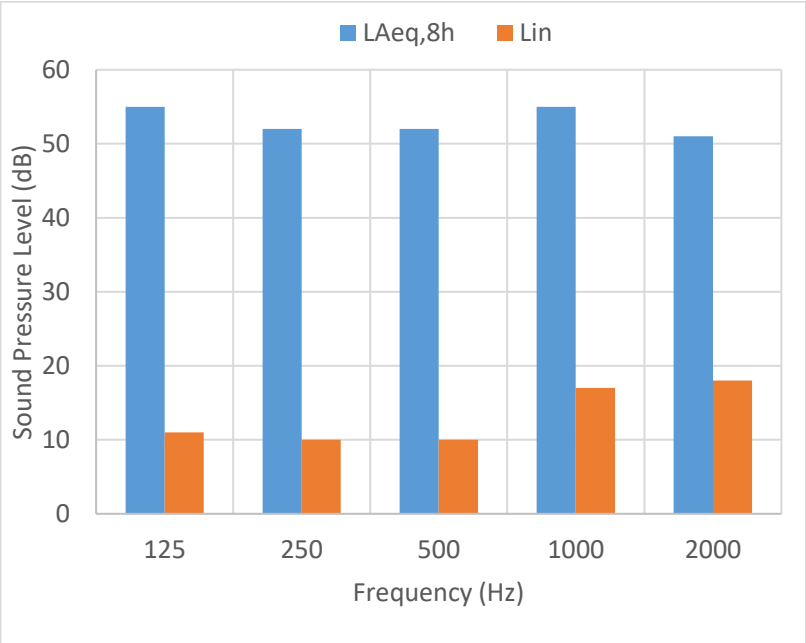
	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	9.0205E-06	1.136E-05	1.43E-05	1.136E-05	1.8E-05
Glazing	0.000283903	0.0001423	5.665E-05	0.0001791	0.00045
Wall	8.86976E-05	3.531E-05	2.805E-05	7.046E-06	2.228E-06
Ceiling	0.001584893	0.0003981	0.0001	3.162E-05	1.259E-05
External level (dB)A	55	52	52	55	51
Internal Level (dB)A	11	10	10	17	18

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

BS8233: 2014 Specification Calculation Summary
Night- Room-6 (14.55m^2), Third Floor (Loft Level)

Room Properties		Sound Insulation Properties					
Room Width (m)	3.44	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	4.23	Wall, $R_{w,Ctr}$ (dB)	40	44	45	51	56
Room Height (m)	2.2	Roof, $R_{w,Ctr}$ (dB)	28	34	40	45	49
Glazed Area (m^2)	2.5	Glazing, $R_{w,Ctr}$ (dB)	26	29	33	28	24
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	37	36	35	36	34



External Level **60dB** L_{Aeq}

Internal Level **22 dB** L_{Aeq}

Insertion Loss **38 dB** L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

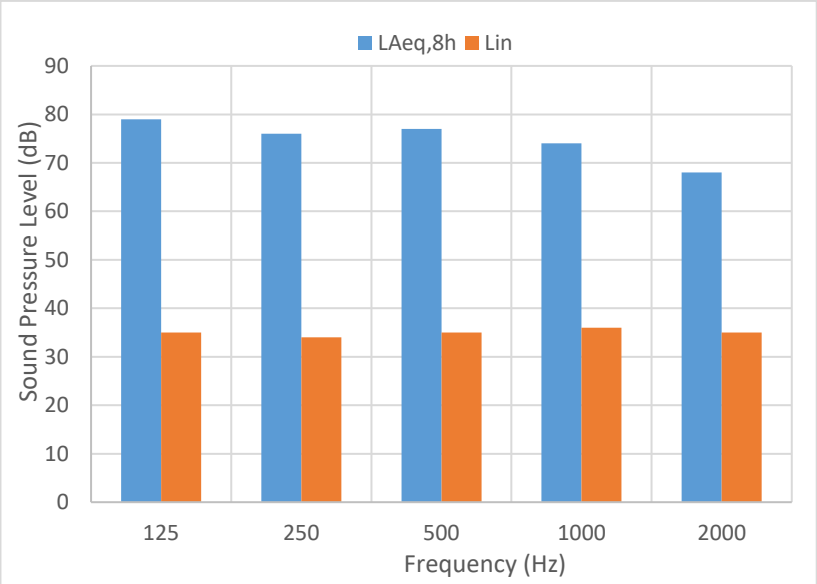
	Transmission coefficients				
Frequency, Hz	125	250	500	1k	2k
Vents	9.0205E-06	1.136E-05	1.43E-05	1.136E-05	1.8E-05
Glazing	0.000283903	0.0001423	5.665E-05	0.0001791	0.00045
Wall	8.86976E-05	3.531E-05	2.805E-05	7.046E-06	2.228E-06
Roof	0.001584893	0.0003981	0.0001	3.162E-05	1.259E-05
External Level (dB)A	55	52	52	55	51
Internal Level (dB)A	11	10	10	17	18

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

BS8233: 2014 Specification Calculation Summary
Maximum Levels, Room-6 (14.55m²), Third Floor (Loft Level)

Room Properties		Sound Insulation Properties					
Room Width (m)	3.44	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	4.23	Wall, $R_{w,Ctr}$ (dB)	40	44	45	51	56
Room Height (m)	2.2	Roof, $R_{w,Ctr}$ (dB)	28	34	40	45	49
Glazed Area (m²)	2.5	Glazing, $R_{w,Ctr}$ (dB)	26	29	33	28	24
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	37	36	35	36	34



External Level **83dB** L_{AMax}

Internal Level **42dB** L_{AMax}

Insertion Loss **41dB** L_{AMax}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			**Suitable Systems**
Glazing	**33**	dB $R_{w+}C_{tr}$	6-12-6 Double glazing
Ventilation	**32**	dB $D_{new+}C_{tr}$	Hit & miss trickle vent Titan Trimvent XS13 4400EA

	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	9.0205E-06	1.136E-05	1.43E-05	1.136E-05	1.8E-05
Glazing	0.000283903	0.0001423	5.665E-05	0.0001791	0.00045
Wall	8.86976E-05	3.531E-05	2.805E-05	7.046E-06	2.228E-06
Ceiling	0.001584893	0.0003981	0.0001	3.162E-05	1.259E-05
External Level (dB)A	79	76	77	74	68
Internal Level (dB)A	35	34	35	36	35

Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

10.6 Appendix F: Building Regulations Approved Document E

Table 1: Building regulation Table 1a, E1.		
Dwelling-houses and flats – performance standards for separating walls, separating floors, and stairs that have a separating function		
	Airborne Sound Insulation $D_{nT,w}+C_{tr}$dB (min. value)	Impact Sound Insulation $L_{nT,w}$ dB (max. value)
Purpose build dwelling-houses and flats		
Walls	45	-
Floors and stairs	45	62
Dwelling – houses and flats formed by material change of use		
Walls	**43**	**-**
Floors and stairs	**43**	**64**

Building Regulations Table 1b, E1

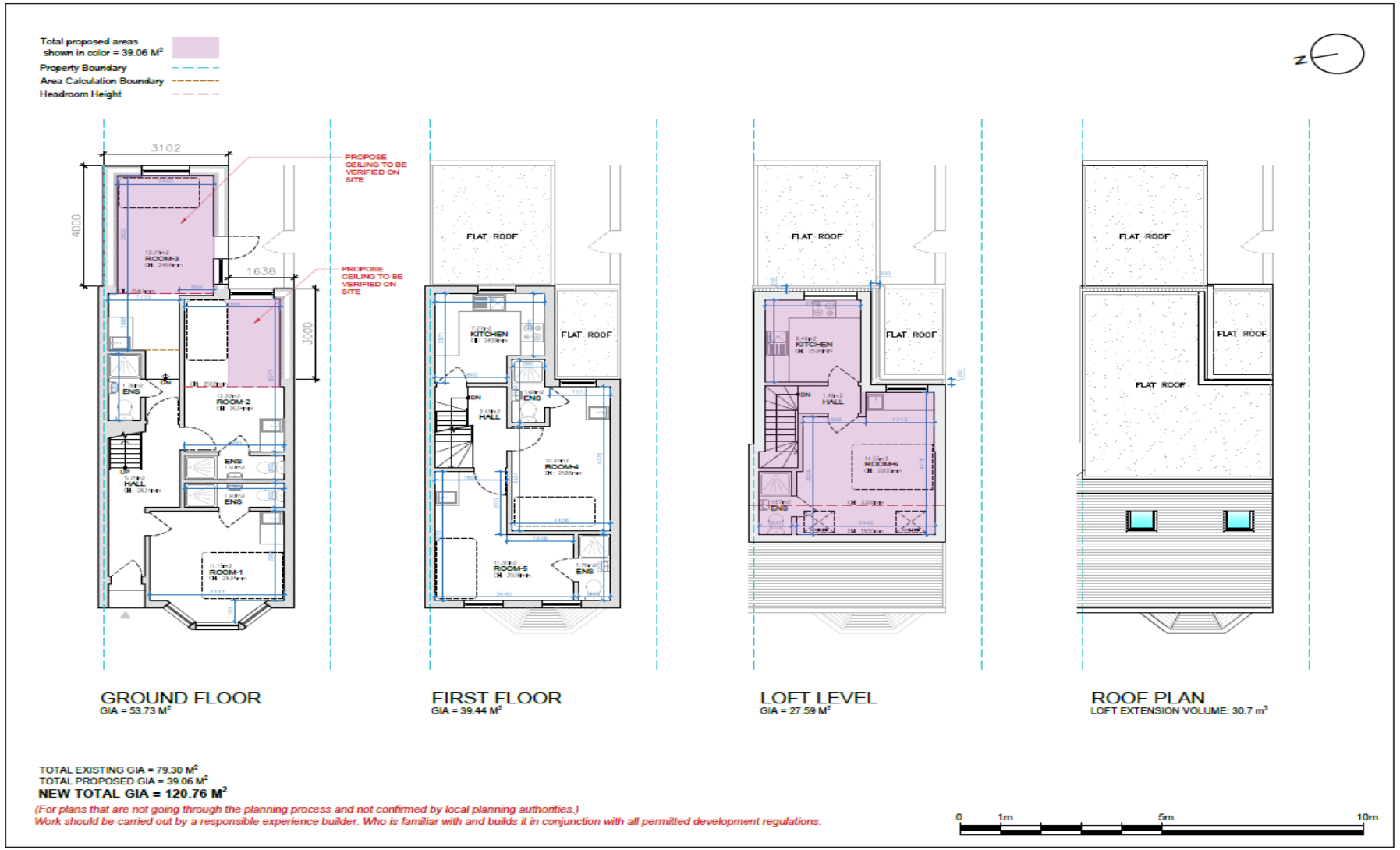
Table 2: Building Regulation Table 1b, E1		
Rooms for residential purposes – performance standards for separating walls, floors, and stairs that have a separating function.		
	Airborne Sound Insulation $D_{nT,w}+C_{tr}$ dB (min. value)	Impact Sound Insulation $L_{nT,w}$ dB (max. value)
Purpose build dwelling-houses and flats		
Walls	43	-
Floor and stairs	45	62
Dwellings – houses and flats formed by material change of use		
Walls	43	-
Floors and stairs	43	64

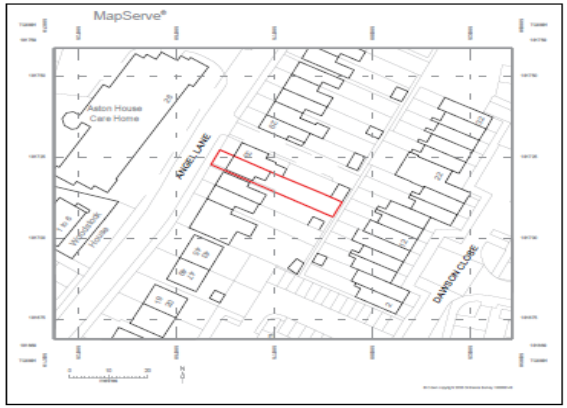
10.7Appendix G: Acoustics terminology

Parameter	**Description**
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing ($20x10^{-6}$ Pascals).
Ambient noise level	The totally encompassing sound in a given $L_{Aeq,T}$ situation at a given time, usually composed of sound from many sources near and far.
Background noise level	The A-weighted sound pressure level of the $L_{A90,T}$ residual noise at the assessment position exceeded for 90% of a given time interval T, measured using the fast response and reported to the nearest whole dB.
Rating level $L_{Ar,T}$	The specific noise level plus any adjustment for the characteristic features of the noise.

Residual noise level	The ambient noise level at the assessment $L_{Aeq,T}$ position in the absence of the noise source under investigation.
Specific noise level	The equivalent continuous A-weighted noise $L_{Aeq,T}$ level produced by the source over a given reference time interval.
$L_{Aeq,T}$	The A-weighted equivalent continuous noise level over the time period T (typically T= 16 hours for daytime periods, T = 8 hours for night-time periods). This is the sound level that is equivalent to the average energy of noise recorded over a given period.
$L_{n,T}$	The noise level exceeded for n% of the time over a given period T. e.g., L90, the noise level exceeded for 90% of the time (background noise) level.
L_{Max}	The maximum noise level measured.
$L_{eq,ff}$	The equivalent continuous sound pressure level outside the room elements under consideration
A_0	A reference absorption area of 10 m^2 and is independent of frequency;
S_f	The total facade area in square metres (m^2) of the room in question;
S_{wi}	The area in square metres (m^2) of the windows of the room;
S_{ew}	The area in square metres (m^2) of the external wall of the room;
S_{rr}	The area in square metres (m^2) of the ceiling of the room
S	The total area in square metres (m^2) of elements through which sound enters the room, i.e. $S_f + S_{rr}$;
$D_{n,e}$	The insulation of the trickle ventilator measured according to BS EN ISO 10140;
R_{wi}	The sound reduction index (octave band value) of the window (see Annex C BS EN ISO 10140)
R_{ew}	The sound reduction index (octave band value) of the external wall (see Annex C BS EN ISO 10140);
R_{rr}	The sound reduction index (octave band values) of the roof/ceiling (see Annex C BS EN ISO 10140);
A	The equivalent absorption area of the receiving room being considered (see Annex C BS EN ISO 10140);
3	A correction factor

10.8 Appendix H: Plans for proposed flats





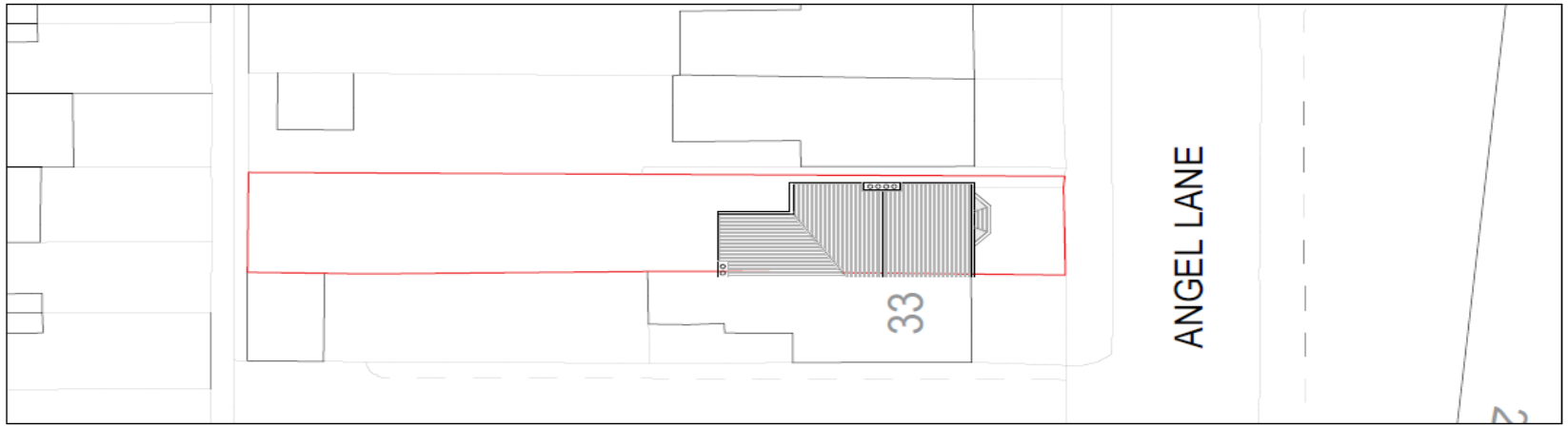
OS Map

0 25m 50m 100m

SCALE 1:1250

N

Property Boundary



Location Plan

0 1m 5m 10m 20m

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N