PEAK acoustics



Noise Impact Assessment

Client:	Carl Hughes
Site:	6 – 8 Egerton Street, Wrexham, LL11 1LW
Reference No.	2005242NR
Revision:	0.0
Date of Issue:	09/07/2024

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Executive Summary

A noise assessment has been undertaken at 6 – 8 Egerton Street, Wrexham in relation to the proposed change of use of the 1st and 2nd floors to residential apartments.

Environmental noise monitoring has been undertaken at the site from the 7th – 10th June 2024. Noise affecting the development was determined to be primarily from road traffic, pedestrians and external plant.

A glazing and ventilation scheme has been given 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	37(31)	*Double Glazing: 4/16/10*	N/A	*Multi-Room Heat Recovery System*
Bedrooms	51(46)	*Laminated Double Glazing: 12.8SC/16/16.8SC*	N/A	*Multi-Room Heat Recovery System*

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

Assessment of the internal noise transmission between the ground floor commercial use and 1st floor flat has been undertaken based on details provided by the client.

Noise levels are expected to be within the NR30 criteria during the operational periods of the commercial unit.

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1. Introduction

1.1. Proposal

It is proposed to convert the 1st and 2nd floor of 6 – 8 Egerton Street into apartments. The floors are currently vacant commercial spaces above a Chip Shop.

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. Planning Conditions

The applicant has received conditional planning approval, WRR P/2024/0251 from Wrexham Council. The following planning conditions require discharging:

Condition 7:

"No part of the development shall commence until a scheme of noise insulation and attenuation measures between each floor and the floor with the commercial use as well as any wall with any neighbouring commercial usage in compliance with Building Regulations Guidance: Part E - Resistance to the Passage of Sound, has been submitted to, and approved in writing by, the Local Planning Authority. The measures as are approved shall be fully implemented in strict accordance with the scheme prior to first occupation / use of the development and shall thereafter be permanently retained."

Condition 8:

"No part of the development shall commence until a noise survey has been carried out, and a detailed report of the survey findings has been submitted to, and approved in writing by, the Local Planning Authority. The noise survey shall determine noise levels for both Day (07:00 - 23:00 hours) and Night (23:00 - 07:00 hours), having regard to Planning Policy Wales (PPW) Guidance, Technical Advice Note (TAN) 11 - Noise. The report of the noise survey findings shall include:

a) Noise levels arising from day / night time activities in the vicinity of the proposed development site and the impact upon the existing or proposed accommodation, and

b) A detailed scheme of noise insulation and / or attenuation measures so designed to safeguard the amenity of the existing or occupants of the proposed accommodation hereby approved.

The measures as are approved shall be fully implemented prior to the first occupation / use of the development."

1.4. Assessment Guidance Documentation

Technical Advice Note (TAN) 11, issued by the Welsh Government, provides guidance on using the planning system to reduce the adverse effects of noise. The document outlines how noise should be assessed in land-use planning and suggests measures for noise control to protect public health and the environment. TAN 11 covers a range of topics, including methods for noise measurement, the impact of different noise sources, and strategies for mitigating noise through planning and design.

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.

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."*

Where necessary, mitigation recommendations will be given to comply with the requirements of the National Planning Policy Framework (2021) and TAN11. Further information on all guidance documentation can be found in **Appendix H**.

2. Environmental Noise Survey

2.1. Survey Measurement

To assess the environmental noise levels affecting the proposed development, an unattended noise survey was undertaken at the site from the 7th – 10th June 2024. This period was selected to capture events and noise levels across weekday and weekend periods from Egerton Street and the surrounding area as well as noise from other nearby residential and commercial sources.

A shorter comparative measurement has also been undertaken to the rear of the site to investigate the variation in noise levels to the rear.

Measurements of $L_{Aeq,T}$ and L_{AFmax} were logged in 5- minute intervals in accordance with the provisions of BS7445 - *'Description and Measurement of Environmental Noise'*.

2.2. Measurement Location

Measurement M1 was positioned out of a 1st floor front window overlooking Egerton Street. The microphone was positioned approximately 4.5 metres above ground level. A -3dB correction is applied to measured data to account for proximity to the building façade.

Measurement M2 was positioned at ground-floor level to the rear of the site. The microphone was positioned approximately 1.7 metres above ground level.

The site and monitoring locations are shown below in **Figure 1**.

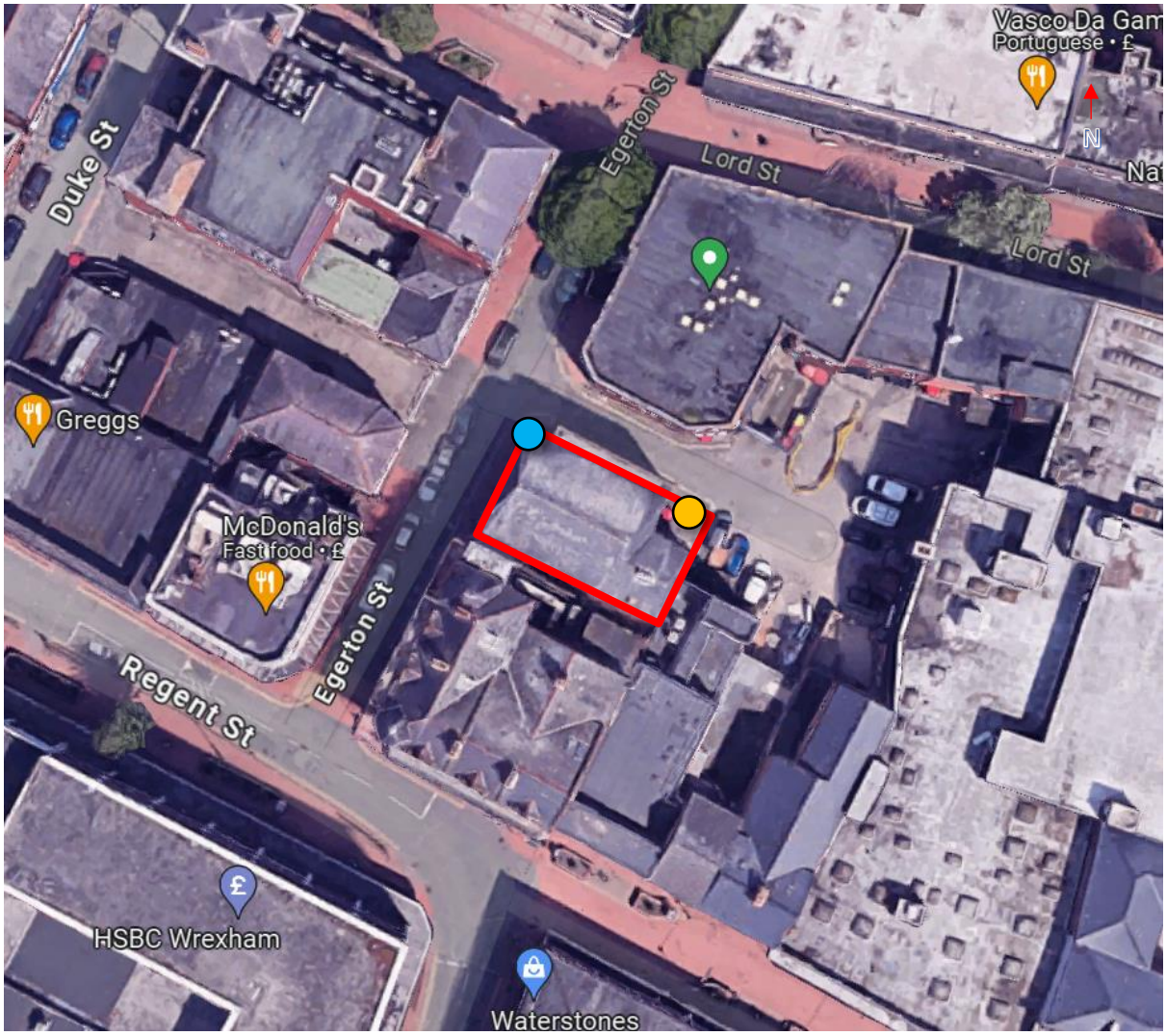


Figure 1: Site & Measurement Locations – google.com/maps

Monitoring Location (M1)

Monitoring Location (M2)

Site Boundary

2.3. Site Descriptions

The site is located on Egerton Street in central Wrexham. This is a small side street accessed via Regent Street to the South. The ground floor of the site is the Wrexham Fish Bar which operates between 11am and 3pm excluding Sundays. To the North of the site is a mixed use commercial building with retail at ground floor level. To the East of the site is a small car park accessed via a small access road to the North of the site. To the South of the site is Lloyds bank. On the opposite side of Egerton Street to the East are retail units including a charity shop with offices above. There is also a 24h McDonald's takeaway at the corner of Regent Street and Egerton Street.

2.4. Noise Affecting the Development

The primary noise sources affecting the development were identified as road traffic with cars, vans, motorcycles etc passing the front of the site regularly. Also pedestrians to the front of the building conversing. Multiple items of A/C plant were observed to the rear of the site on neighbouring buildings. Secondary sources were noted as birdsong and air traffic.

2.5. Environmental Noise Survey Results

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.**

Measurement	Date(s)	Period	L_{Aeq} (dB)	Typical* L_{AFmax} (dB)
M1	7th June 2024	Day (10:20 – 23:00)	57	-
	7th – 8th June 2024	Night (8hr)	57	83
	8th June 2024	Day (16hr)	57	-
	8th – 9th June 2024	Night (8hr)	59	94
	9th June 2024	Day (16hr)	55	-
	9th – 10th June 2024	Night (8hr)	52	76
	10th June 2024	Day (07:00 – 11:55)	58	-

Table 1: Environmental Measurement Summary

** The given 'Typical' L_{AFmax} levels are an average of the spectra of the noisiest 10 events of the night-time period.*

Measured noise levels place the site within Noise Exposure Category C from TAN11 which states:

> *"Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise".*

Façade elements specified within this assessment will be based on achieving internal noise levels which comply with internal guidelines taken from the BS8233 standard.

2.6. Weather Conditions

Daytime temperatures of between 13 - 15°C were noted during the survey with winds of 4 – 9m/s. Detailed weather conditions are given in **Appendix C**.

2.7. 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**.

2.8. Front Vs Rear Comparison

Comparison of the simultaneous measurement period of measurements M1 and M2 are given below:

Measurement	Date(s)	Period	L_{Aeq} (dB)	Difference (dB)
M1	7th June 2024	10:40 – 11:00	55	-
M2			55	0

Table 2: M1 vs M2 Measurement Comparison

Average noise levels measured simultaneously at the front and rear of the site during the daytime period were the same. The data from the M1 measurement will be used within the BS8233 assessment.

3. Internal Noise Level Assessment

3.1. 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.

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 $L_{Aeq,8hour}$

Table 3: Indoor Ambient Noise Levels for Dwellings

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.

> *"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."*

Review of elevated noise events from the measurement equipment indicates that pedestrians passing and talking/shouting as well as high level exhaust noise from mopeds and motorcycles were frequent over the weekend period at night.

The location of the site means that it is affected by noise from pedestrians during the day and night, either visiting the ground floor chip shop or passing to and from the 24h McDonald's at the end of the road late at night and early morning.

BS4142 gives guidance on rating penalties to be applied to Specific Sound Levels to correct for characteristics that make the sound more noticeable at the NSR location such as tonality, impulsivity and intermittency. Section 9.2 of BS4142:2014 gives commentary on these characteristics and appropriate penalties:

"Tonality
For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity
A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Other sound characteristics
Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency
When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

Noise from the observed sources (pedestrians / vehicle exhausts) has a clearly perceptible tonality and so a +4dB penalty will be applied to the BS8233 criteria.

An additional +3dB penalty will also be applied to account for intermittency.

The total rating penalty applied to noise level criteria is 7dB.

The rating-adjusted assessment criteria are provided below:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	28 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	33 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	28 dB $L_{Aeq,16hour}$	23 dB $L_{Aeq,8hour}$

Table 4: Assessment Criteria

The average night-time L_{Amax} criteria for the assessment will be 45dB $L_{Amax,F}$.

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

Period	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
Daytime *(1hr)*	61	-
Night *(1hr)*	65	94

Table 5: Assessment Noise Levels

3.3. Internal Noise 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 'HDS Architectural Services' 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.**

4. Sound Insulation Scheme

4.1. External Building Envelope

Material build-up of the façade will significantly dictate the noise levels within the proposed dwelling. For the purposes of this report, the heavyweight construction of the façade is assumed to provide a minimum sound reduction of 49 dB R_w.

Where the roof is to be utilised as a voided loft space with thermal insulation, no further details are required. If the proposed dwelling has rooms within the roof space, the additional material build-up will be assumed at a minimum sound reduction of 39 dB R_w.

4.2. 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 3.

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	37(31)	*Double Glazing: 4/16/10*	N/A	*Multi-Room Heat Recovery System*
Bedrooms	51(46)	*Laminated Double Glazing: 12.8SC/16/16.8SC*	N/A	*Multi-Room Heat Recovery System*

Table 6: Glazing & Ventilation Scheme

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.*

5. Internal Noise Levels

It is determined that by using mitigation as specified in **Table 6** for the building façades, the outcome summarised in the following table is achieved.

Internal Space	Noise Parameter	Internal Noise Level (dB)	Within Design Criteria?
Living Room	Daytime $L_{Aeq,\ 16hr}$	27	Yes
Bedroom	Daytime $L_{Aeq,\ 16hr}$	21	Yes
	Night-time $L_{Aeq,\ 8hr}$	19	Yes
	Night-time $L_{Amax\ F}$	45	Yes

Table 7: Internal Noise Levels

The following statements are inclusive of the criteria rating penalties applied from section 3.1:

For the daytime assessment for living areas, the desirable limit of BS8233:2014 suggests a guideline of 28 dB $L_{Aeq,16hr}$ for resting conditions, and up to 33 dB is considered acceptable for necessary developments.

All results, with the implementation of the derived sound insulation scheme given in **Table 6**, would place the internal daytime noise levels below 28 dB, therefore within the desired limit.

For the night-time assessment for bedrooms, BS8233:2014 suggests a desirable guideline of 23 dB $L_{Aeq,\ 8hr}$ for sleeping conditions, with an acceptable limit of 28 dB $L_{Aeq,\ 8hr}$.

Implementation of the derived sound insulation scheme given in **Table 6** would place the internal continuous night-time noise levels below 23 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 6** would place the internal $L_{Amax,F}$ night-time events below 45 dB, therefore within the criteria.

6. External Amenity Areas

Plans provided by the applicant do not show any associated external amenity for the site and so this has not been assessed.

7. GF – 1F Internal Transmission – NR30

7.1. Assessment

The ground floor Fish & Chip shop operates between 11am and 3pm. Internal noise transmission from the ground floor commercial area to the 1st floor flat will therefore be assessed to NR30 to reflect guideline internal noise levels for living rooms and bedrooms during the daytime as stated within BS8233.

Outside of normal opening hours, only residual noise is likely to be present within the ground floor.

7.2. Noise Sources – Ground Floor

Typical internal noise sources within the ground floor unit including patron noise from raised voices and kitchen extract equipment associated with fryers has been used to assess the noise transmission. Spectral noise data has been sourced from Peak Acoustics' data library for these sources and combined to determine a representative noise level of 80dBA within the ground floor unit. This is considered to represent a busy period of operations.

Source	63	125	250	500	1k	2k	4k	dBA
Extract System (internal)	62	62	74	76	73	71	67	-
Human Speech (raised)	37	48	61	65	61	56	50	-
Total Internal Noise Level	**62**	**62**	**74**	**76**	**73**	**71**	**67**	**80**

Table 8: Internal Noise Sources (Chip Shop)

7.3. Separating Floor / Ceiling Construction

Following discussions with the Client and Architect, the existing floor/ceiling partition between the ground floor and 1st floor has been modelled as a concrete slab with a depth of 200mm.

The above specification has been modelled using 'Insul' sound insulation modelling software. The modelled specification and performance is provided within **Appendix J** and summarised below:

SRI	63	125	250	500	1k	2k	4k	Rw
Existing Floor Specification (200mm concrete)	44	44	47	54	61	66	71	**59**

Table 9: Existing Floor Specification Performance

7.4. Predicted Noise Transmission

Noise transmission has been calculated based on an assumed worst case internal level of 80dBA within the Chip Shop and a partition specification equal to or exceeding the one given in Table 9.

Source	63	125	250	500	1k	2k	4k
Internal Noise Level (Chip Shop)	62	62	74	76	73	71	67
Internal Noise Level (1F Flat)	18	18	27	22	12	5	-4
NR30	59	48	40	34	30	27	25
Internal Noise Level (Flat) Vs NR30	**-41**	**-30**	**-13**	**-12**	**-18**	**-22**	**-29**

Table 10: NR30 Comparison

Internal noise levels within the 1st-floor flat are calculated to achieve NR30 based on the modelled floor partition performance.

8. Conclusions

A noise assessment has been undertaken at 6 – 8 Egerton Street, Wrexham in relation to the proposed change of use of the 1st and 2nd floors to residential apartments.

Environmental noise monitoring has been undertaken at the site from the 7th – 10th June 2024. Noise affecting the development was determined to be primarily from road traffic, pedestrians and external plant.

A glazing and ventilation scheme has been given to ensure conditions in habitable rooms remain within the design criteria.

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

Assessment of the internal noise transmission between the ground floor commercial use and 1st floor flat has been undertaken based on details provided by the client.

Noise levels are expected to be within the NR30 criteria during the operational periods of the commercial unit.

9. Uncertainty

The background monitoring equipment is subject to a 1dB error margin, however, calibration before and after measurements allows the drift within the margin to be monitored and thus demonstrates that minimal drift occurred throughout the measurements.

9.1. Accuracy of Partition Modelling

Predictive modelling of partitions for sound insulation is of limited accuracy, particularly for dense or complex partitions and overall performance is also dictated by flanking and quality of workmanship. While it is a useful tool in predicting sound insulation performance, the number of variables that affect performance in real-world conditions means that Peak Acoustics do not guarantee the results. Where further information is required on the performance of the finished partition, this can be determined via sound insulation testing.

APPENDIX A – Measurement Details

Measurement(s)	Kit	Start Date	Start Time	End Date	End Time
M1	A3	07/06/2024	10:20	10/06/2024	11:55
M2	A7	07/06/2024	10:40	07/06/2024	11:00

APPENDIX B - Equipment Details

Kit	Equipment	Make	Model	Class	Serial Number
A3	Sound Meter	Svantek	971	1	41980
A3	Pre-Amp	Svantek	SV18	1	44331
A3	Microphone	ACO	7052E	1	60249
A7	Sound Meter	Svantek	977A	1	69273
A7	Pre-Amp	Svantek	SV12L	1	71601
A7	Microphone	ACO	7052E	1	68217
4	Calibrator	Svantek	SV33	1	90107

APPENDIX C - Meteorology Details

Date	Temp C°	Wind Speed m/s	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
07/06/2024	15	6	W	54	0.0	6/8
10/06/2024	13	4	NW	60	0.0	4/8

APPENDIX D - Calibration Details

Kit	Calibrator Ref Level (dB)	Deviation Before (dB)	Deviation After (dB)
A3	113.80	0.44	0.46
A7	113.80	0.65	0.87

APPENDIX E – Noise Survey Time History

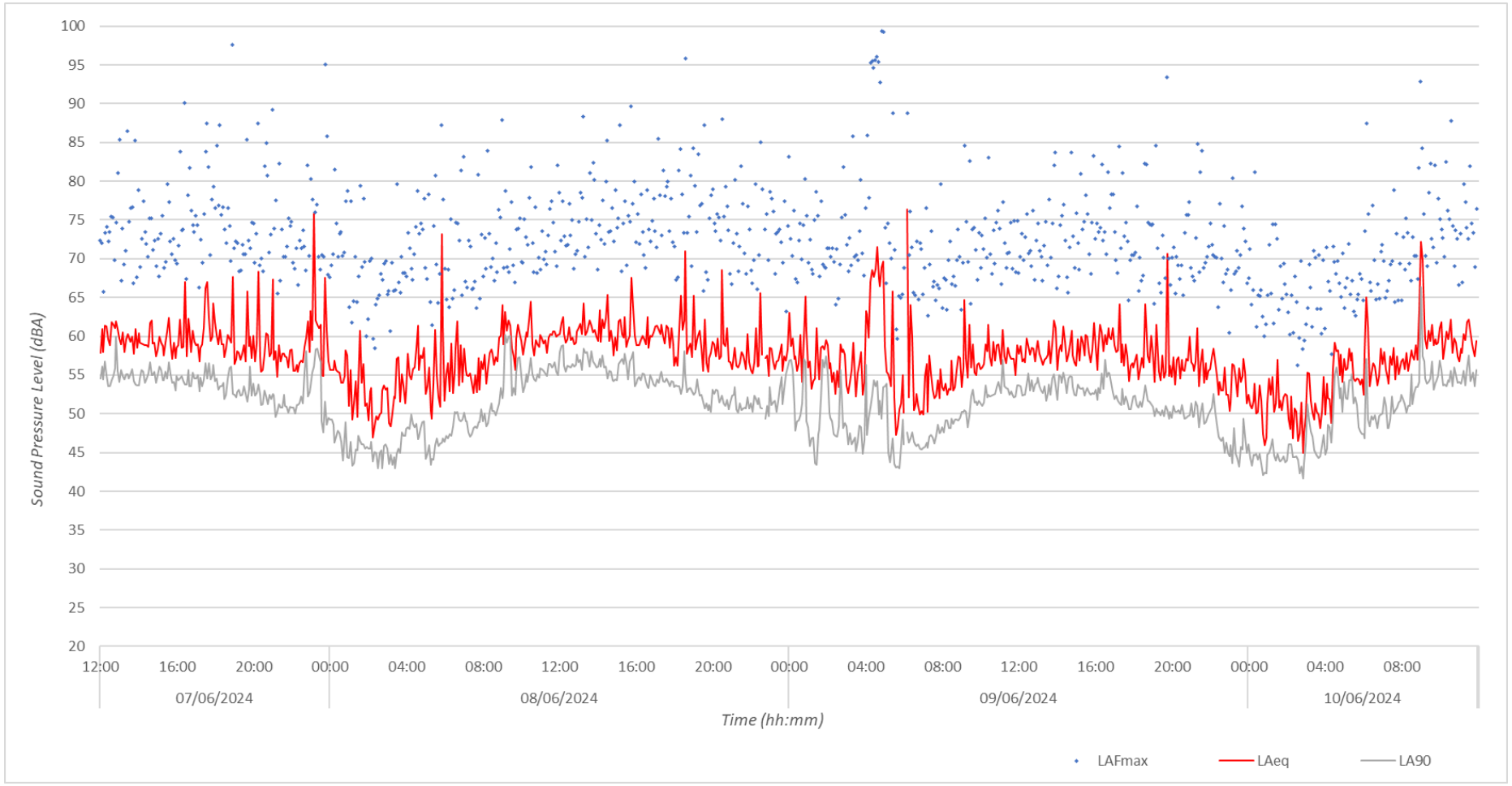


Figure 2: Environmental Noise Measurement M1 Time History

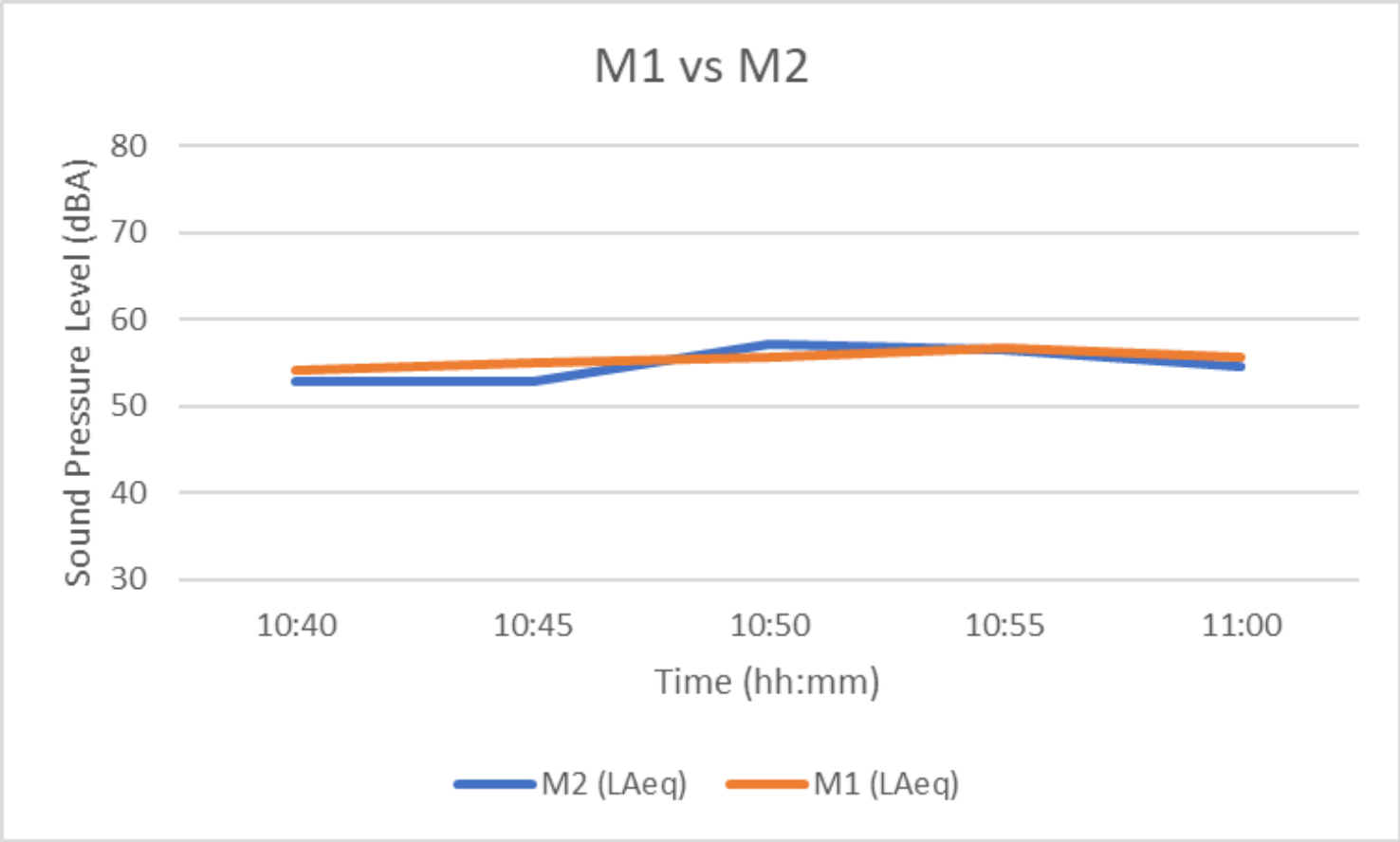


Figure 3: M1 vs M2 Comparative Measurement - 7th June 2024.

APPENDIX F – BS8233 Rigorous Design Calculations

1F Living Room

BS8233:2014 Façade Noise Break In Calculator

	125	250	500	1k	2k	dBA
Daytime External Noise Level - LAeq - 1 hour	62.6	60.9	58.8	55.9	50.9	61
Night-time External Noise Level - LAeq - 1 hour						
Night-time Lmax Noise Levels - 10 times per night						

Room Properties					Room Coefficient					
Width (m)	Height (m)	Depth (m)	Glazing	Reverb Time	14	15	16	17	16	A
4	2.4	7	2.6	0.7	0.8	0.7	0.7	0.7	0.7	RT

Façade Construction		SRI (Sound Reduction Index)					Rw
Wall Construction	Brick and block, 75mm cavity, 60mm Fibreglass	31	46	43	49	56	49(44)
Roof Construction	Not Within Roof Space	0	0	0	0	0	N/A
Glazing Spec	4 / 16 / 10	27	23	33	41	48	37(31)
Ventilation Spec	Heat Recovery System	0	0	0	0	0	N/A

Calculation Results			125	250	500	1k	2k	dBA
Daytime Internal Noise Level - LAeq	Target Value <	28	20.2	24.8	19.7	12.6	2.0	27.2
Night-time Internal Noise Level - LAeq	Target Value <							
Internal LAmax Noise Levels	Target Value <							

Sound Insulation Requirement

	Minimum Sound Insulation Requirement		Suitable Systems
Glazing	**37(31)**	dB $R_{W(+Ctr)}$	*Double Glazing*
			4 / 16 / 10
Ventilation	**N/A**	$D_{n,e,w+Ctr}$	*Heat Recovery System*
			Multi-room Heat Recovery System

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

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

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

1F Bedroom 1

BS8233:2014 Façade Noise Break In Calculator

	125	250	500	1k	2k	dBA
Daytime External Noise Level - LAeq - 1 hour	62.6	60.9	58.8	55.9	50.9	61
Night-time External Noise Level - LAeq - 1 hour	56.3	57.3	60.2	59.0	59.3	64
Night-time Lmax Noise Levels - 10 times per night	76.1	83.5	86.3	86.6	89.6	93

Room Properties				
Width (m)	Height (m)	Depth (m)	Glazing	Reverb Time
3.5	2.4	3	3	0.6

Room Coefficient					
6	6	7	8	7	A
0.6	0.6	0.6	0.5	0.5	RT

Façade Construction		SRI (Sound Reduction Index)					Rw
Wall Construction	Brick and block, 75mm cavity, 60mm Fibreglass	31	46	43	49	56	49(44)
Roof Construction	Not Within Roof Space	0	0	0	0	0	N/A
Glazing Spec	12.8SC / 16 / 16.8SC	34	41	47	53	61	51(46)
Ventilation Spec	Heat Recovery System	0	0	0	0	0	N/A

Calculation Results			125	250	500	1k	2k	dBA
Daytime Internal Noise Level - LAeq	Target Value <	28	18.1	12.5	14.6	8.5	-2.5	20.7
Night-time Internal Noise Level - LAeq	Target Value <	23	11.8	9.0	16.0	11.6	5.9	19.1
Internal LAmax Noise Levels	Target Value <	45	31.5	35.1	42.0	39.1	36.2	45.2

Sound Insulation Requirement

	Minimum Sound Insulation Requirement		Suitable Systems
Glazing	**51(46)**	dB $R_{W(+Ctr)}$	*Laminated Double Glazing*
			12.8SC / 16 / 16.8SC
Ventilation	**N/A**	$D_{n,e,w+Ctr}$	*Heat Recovery System*
			Multi-room Heat Recovery System

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

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

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

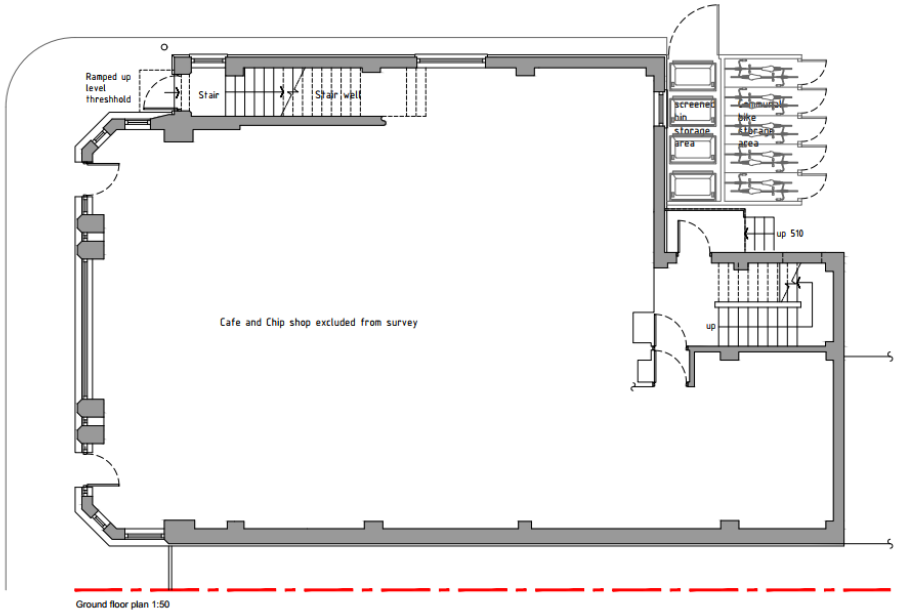
APPENDIX G – Site Plans



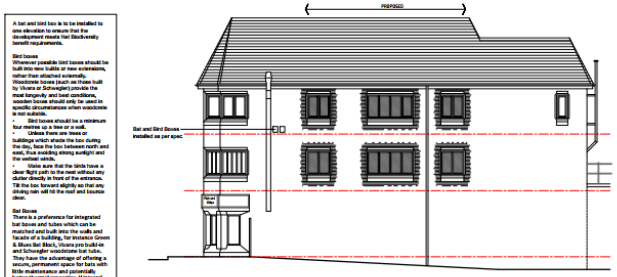
Front elevation 1:100

Side-01 elevation 1:100

Rear elevation 1:100



Ground floor plan 1:50



Side-02 elevation 1:100

Proposed

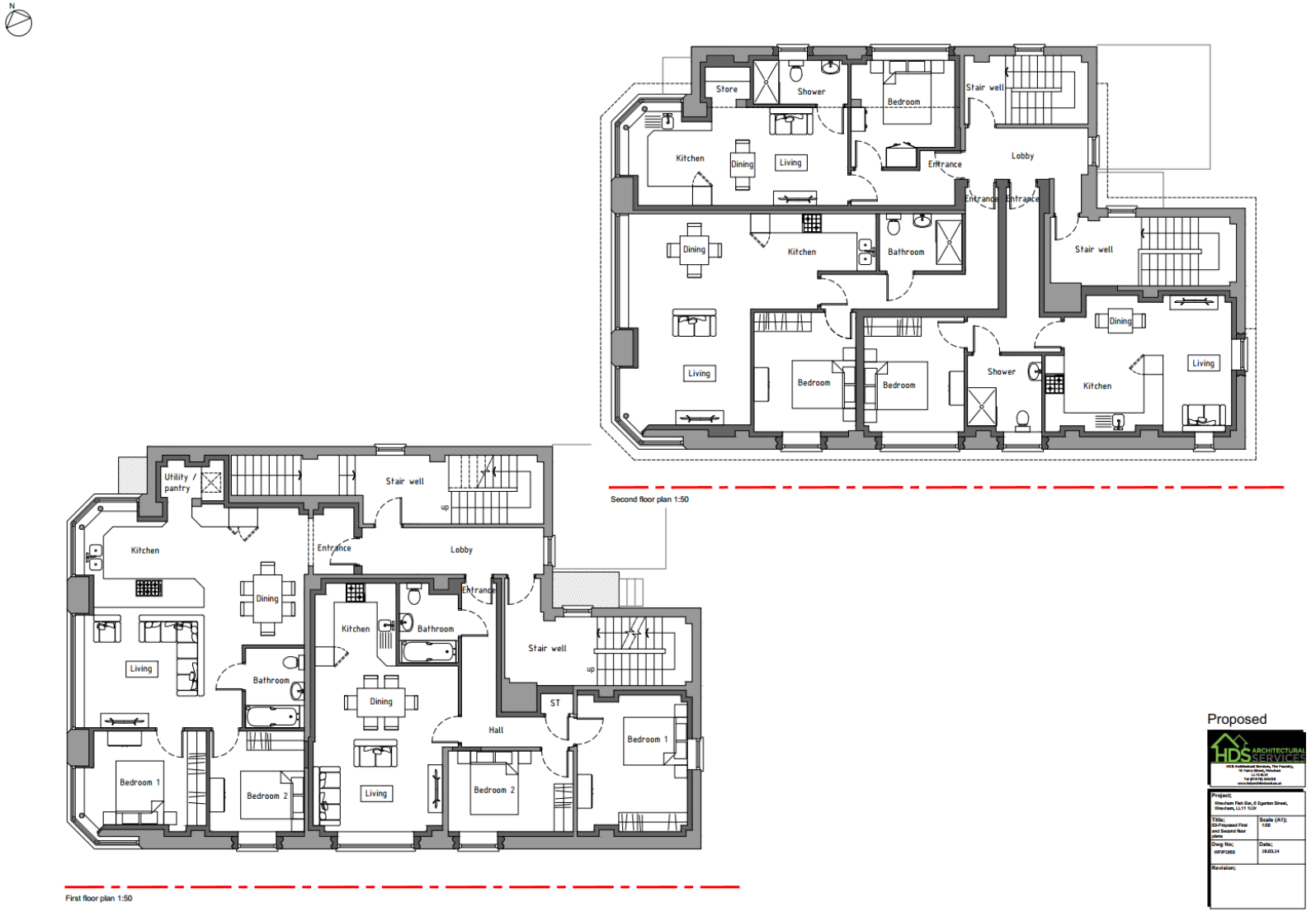


Figure 4: Site plans provided by HDS Architectural Services

APPENDIX H – Legislation, Policy and Guidance

Guidance for the assessment of noise affecting new residential development is given in the National Planning 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:*
>
> *A. 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;*
>
> *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."*

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 on 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.

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.

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."

APPENDIX I – 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 meter 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.

APPENDIX J – Modelled Partition Sound Insulation

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within Rw ±3 dB
- Key No. 5547
Job Name:
Job No.: Initials:tombr
Date:08/07/2024
File Name:Slab Floor.ixl

INSUL

Notes:



Rw 59 dB
C -2 dB
Ctr -5 dB

Panel Size = 2.7 m x 4.0 m
Partition surface mass = 468 kg/m²

System description

Panel 1 : 1 x 200 mm Concrete

freq.(Hz)	R(dB)	R(dB)
50	44	
63	44	44
80	45	
100	46	
125	45	44
160	43	
200	45	
250	47	47
315	50	
400	52	
500	55	54
630	57	
800	60	
1000	62	61
1250	63	
1600	65	
2000	67	66
2500	68	
3150	70	
4000	71	71
5000	73	

