PEAK acoustics

Noise Impact Assessment

Client:	**Stuart Howden**
Site:	**Ginnell Farm, Broad Lane, Rochdale, OL16 4PU**
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Executive Summary

A noise assessment has been undertaken at Ginnell Farm, Broad Lane, Rochdale, OL16 4PU in relation to the proposed development of 6 residential houses.

Environmental noise monitoring has been undertaken at the site from 24th – 25th September 2024. Noise affecting the development was determined to be primarily from road traffic on the M62.

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	45	Passive Thru-Wall Vent: Passivent Fresh 80dB
Bedrooms	51 (46)	Laminated Double Glazing: 12.8SC/16/16.8SC	N/A	Heat Recovery System: Multi-room Heat Recovery System
Dining Rooms	30 (26)	Double Glazing: 4/16/4	40	Acoustically Treated Trickle Vent (Open): Titon Xtra Sound Attenuator V75+C50

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

Noise levels within external amenity spaces are discussed within section 6 and are shown within the site plans in **Appendix G.**

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1. Introduction

1.1. Proposal

It is proposed to develop the site at Ginnell Farm to include 6 residential dwellings houses. The site currently consists of a derelict bungalow and outbuildings.

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

No planning application is understood to have yet been submitted. Pre-application guidance has requested a noise impact assessment be submitted.

1.4. Assessment Guidance Documentation

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 the Noise Policy Statement for England (2010). 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 24th – 25th September 2024. This period was selected to capture events and noise levels on a typical weekday from the M62 motorway and Broad Lane as well as noise from other nearby residential and commercial sources.

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

Monitoring position M1 is located to the Southern boundary of the site. The microphone was positioned approximately 1.7 metres above ground level. A -3dB correction has been applied the measured data to account for proximity to a flat reflective surface (outbuilding façade).

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

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

Monitoring Location (M1)

Site Boundary (Approx.)

2.3. Site Descriptions

The site is located on the outskirts of Rochdale at the junction of Ginnell Farm Avenue and Broad Lane (B6194). The site is also adjacent to the M62 Motorway between junction 20 and 21 which sits to the South side of the site. To the North and West of the site is a housing estate.

2.4. Noise Affecting the Development

The primary noise source affecting the development was identified as road traffic from the M62. Secondary sources were noted as bus stops on Broad Lane with intermittent buses.

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	24th & 25th September 2024	Day (16hr Aggregate Periods)	74	-
	24th – 25th September 2024	Night (8hr)	69	78

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.

2.6. Weather Conditions

Daytime temperatures of between 10 - 12°C were noted during the survey with winds of 1 – 3m/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**.

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 2: 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."*

In considering the noise climate affecting the proposed development, as discussed in Section 2.4, it is deemed appropriate to use guidelines set out in BS8233 and ProPG to ensure the internal criteria set out by the WHO for internal noise maxima L_{Amax} and internal L_{Aeq}.

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)	75	-
Night (1hr)	74	78

Table 3: 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 not been provided and so standard dimensions from BS8233 have been assumed and can be found in **Appendix F**.

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.

It is assumed that there will not be rooms within the roof spaces of proposed dwellings.

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 2:

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	45	Passive Thru-Wall Vent: Passivent Fresh 80dB
Bedrooms	51 (46)	Laminated Double Glazing: 12.8SC/16/16.8SC	N/A	Heat Recovery System: Multi-room Heat Recovery System
Dining Rooms	30 (26)	Double Glazing: 4/16/4	40	Acoustically Treated Trickle Vent (Open): Titon Xtra Sound Attenuator V75+C50

Table 4: 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 4** 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 $L_{Aeq,\ 16hr}$	34	Yes
Bedroom	Daytime $L_{Aeq,\ 16hr}$	30	Yes
	Night-time $L_{Aeq,\ 8hr}$	30	Yes
	Night-time $L_{Amax\ F}$	37	Yes

Table 5: Internal Noise Levels

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

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

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

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

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

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

6. External Amenity Areas

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

External daytime noise levels were measured on-site at position M1 (Figure 1)

Measurement Position	Noise Parameter	Garden Noise Level (dB)	BS8233 Criteria	Attenuation Required (dB)
M1	Daytime $L_{Aeq, 16hr}$	77	50 – 55 dB $L_{Aeq, 16hr}$	22+

Table 6: External Amenity Area Assessment

The external noise levels measured on site are significantly above the 'acceptable' guideline given in the BS8233 standard.

It is noted that the pre-app response from the council indicates that an acoustic fence / barrier will be required to be extended along the boundary with the M6 prior to occupation. This is likely to improve the external noise levels at the site, generally a 5 – 10dB reduction may be achieved depending on the proximity to the fence and height of the receiver.

The current indicative layout of the site prioritises larger rear gardens on the far side of the dwellings from the motorway which is logical in using the shielding provided by the building facades to give lower external noise levels in gardens.

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

"In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited. Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc.

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

The site is within an area where a compromise on external amenity noise limits is likely to be warranted. The location has excellent transport with the M62 adjacent.

For these reasons, this would likely be a sought-after location for residential development.

7. Conclusions

A noise assessment has been undertaken at Ginnell Farm, Broad Lane, Rochdale, OL16 4PU in relation to the proposed development of 6 residential houses.

Environmental noise monitoring has been undertaken at the site from 24th – 25th September 2024. Noise affecting the development was determined to be primarily from road traffic on the M62.

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.

APPENDIX A – Measurement Details

Measurement(s)	Kit	Start Date	Start Time	End Date	End Time
M1	A3	24/09/24	10:05	25/09/24	09:30

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
2	Calibrator	Svantek	SV33	1	83715

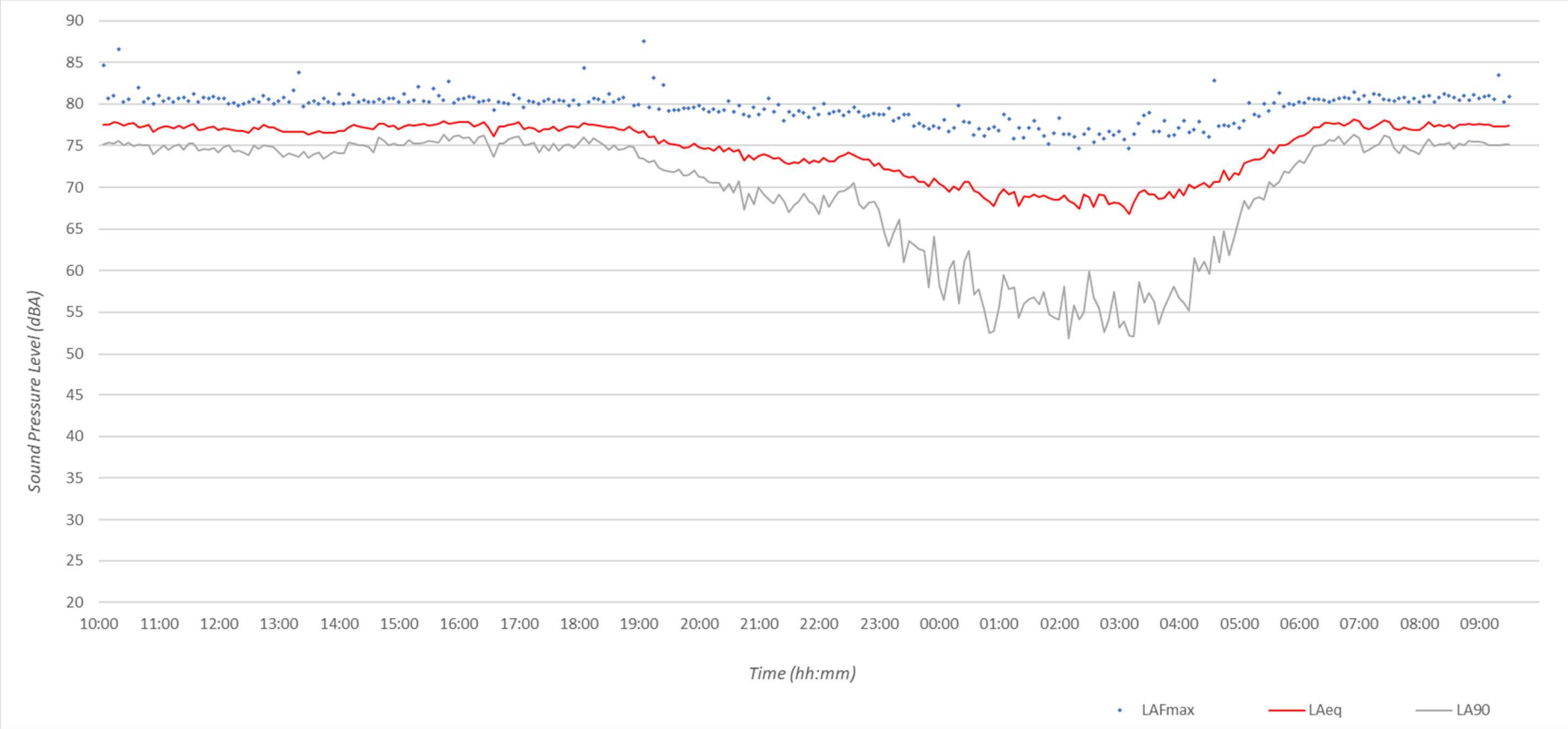
APPENDIX C - Meteorology Details

Date	Temp C°	Wind Speed m/s	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
24/09/2024	12	3	W	84	0	7/8
25/09/2024	10	1	SE	82	0	8/8

APPENDIX D - Calibration Details

Kit	Calibrator Ref Level (dB)	Deviation Before (dB)	Deviation After (dB)
A3	113.80	0.23	0.35

APPENDIX E – Noise Survey Time History



Environmental Noise Measurement M1 Time History: 24 – 25th September 2024

APPENDIX F – BS8233 Rigorous Design Calculations

Living Room

BS8233:2014 Façade Noise Break In Calculator

	125	250	500	1k	2k	dBA
Daytime External Noise Level - LAeq - 1 hour	65.4	62.6	67.8	72.9	66.7	75
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	10	11	12	12	12	A
5	2.4	4	1.5	0.7	0.7	0.7	0.7	0.6	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	Passive Thru-Wall Vent	42	43	43	49	64	45

Calculation Results			125	250	500	1k	2k	dBA
Daytime Internal Noise Level - LAeq	Target Value <	35	22.1	25.7	29.1	30.3	17.0	33.9
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	**45**	$D_{n,e,w+Ctr}$	*Passive Thru-Wall Vent*
			Passivent Fresh 80dB

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

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

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

Bedroom

BS8233:2014 Façade Noise Break In Calculator

	125	250	500	1k	2k	dBA
Daytime External Noise Level - LAeq - 1 hour	65.4	62.6	67.8	72.9	66.7	75
Night-time External Noise Level - LAeq - 1 hour	65.1	61.9	67.9	72.5	66.6	74
Night-time Lmax Noise Levels - 10 times per night	75.1	72.4	74.2	76.2	71.2	79

Room Properties					Room Coefficient					
Width (m)	Height (m)	Depth (m)	Glazing	Reverb Time	7	7	8	8	8	A
3	2.4	4	1.5	0.6	0.7	0.7	0.6	0.6	0.6	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 <	35	22.4	13.5	25.2	27.1	15.1	30.3
Night-time Internal Noise Level - LAeq	Target Value <	30	22.2	12.8	25.2	26.7	15.0	30.1
Internal LAmax Noise Levels	Target Value <	45	32.1	23.3	31.5	30.5	19.7	36.5

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

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

Dining Room

BS8233:2014 Façade Noise Break In Calculator

	125	250	500	1k	2k	dBA
Daytime External Noise Level - LAeq - 1 hour	65.4	62.6	67.8	72.9	66.7	75
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	10	11	12	12	12	A
5	2.4	4	1.5	0.7	0.7	0.7	0.7	0.6	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 / 4	24	18	26	40	45	30(26)
Ventilation Spec	Acoustically Treated Trickle Vent (Open)	40.7	38.8	35.8	42.3	43.9	40

Calculation Results			125	250	500	1k	2k	dBA
Daytime Internal Noise Level - LAeq	Target Value <	40	23.3	30.6	35.2	34.1	26.8	38.9
Night-time Internal Noise Level - LAeq	Target Value <							
Internal LAmax Noise Levels	Target Value <							

Sound Insulation Requirement

	Minimum Sound Insulation Requirement		Suitable Systems
Glazing	**30(26)**	dB $R_{W(+Ctr)}$	*Double Glazing*
			4 / 16 / 4
Ventilation	**40**	$D_{n,e,w+Ctr}$	*Acoustically Treated Trickle Vent (Open)*
			Titon Xtra Sound Attenuator V75+C50

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

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

APPENDIX G – Site Plans

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.