NOISE IMPACT ASSESSMENT

DALC
Developer and Landlord Certification

12, Harpsfield Broadway, Hatfield, AL10 9TF

3rd April 2022

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Chartered Institute of Environmental Health

IEngineer

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This report has been compiled by Deane Austin Ltd (DAA) with all reasonable skill, care and diligence in accordance with generally accepted acoustic consultancy principles. Information contained in this document contains confidential and commercially sensitive information and shall not be disclosed to third parties.				

1.0 INTRODUCTION

DAA Group has been appointed to carry out a Noise Impact Assessment at 12, Harpsfield Broadway, Hatfield, AL10 9TF to support a Planning Application for a proposed erection of part four, part single storey rear extension and erection of a mansard roof extension to facilitate the creation of six new residential dwellings formed of 2 x studio and 4 x 2b4p units. Ground floor to be changed from a A3 restaurant to a A4 drink establishment in accordance with:

- National Planning Policy Framework 2021 (NPPF)
- National Planning Practice Guidance (NPPG)
- BS8233:2014 Guidance on sound Insulation
- Welwyn Hatfield Borough Council Draft Local Plan 2016

This report presents the results of background noise levels and outlines any necessary mitigation measures.
The technical content of this assessment has been provided by a Tech member of the Institute of Acoustics.

The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration

2.0 NOISE CRITERIA

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The Department for Communities and Local Government introduced the National Planning Policy Framework (NPPF) in March 2012. The latest revision of the NPPF is dated July 2021.

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework where local Councils can produce their own local and neighbourhood plans which reflect the needs of their communities.

In conserving and enhancing the natural environment, the planning system should prevent both new and existing development from contributing to, or being put at, unacceptable risk from environmental factors including noise.

Planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development. Conditions may be used to mitigate and reduce noise to a minimum so that adverse impacts on health and quality of life are minimised. It must be recognised that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them. Reference is made within NPPF to the Noise Policy Statement for England (NPSE) as published by DEFRA in March 2015.

2.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

The long-term vision of the NPSE is stated within the documents scope, to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development'. The policy aims are stated to:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The application of NPSE should mean that noise is properly taken into account at the appropriate time (for example in planning applications or appeals) where it must be considered alongside other relevant issues. The guiding principles of Government policy on sustainable development should be used to assist in the implementation of the NPSE.

The NPSE should apply to all types of noise apart from occupational noise in the workplace. The types of noises defined in the NPSE includes:

- Environmental noise from transportation sources;
- Neighbourhood noise which includes noise arising from within the community; industrial premises, trade and business premises, construction sites and noise in the street

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, as follows:

- **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.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

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2.3 ProPG: PLANNING AND NOISE

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.

ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design' as outlined in ProPG.

ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

2.4 ACOUSTICS VENTILATION AND OVERHEATING

The AVO Guide includes:

* an explanation of ventilation requirements under the building regulations and as described in Approved Document F, along with typical ventilation strategies and associated noise considerations;
* an explanation of the overheating assessment methodology described in CIBSE TM59; potential acoustic criteria and guidance relating to different ventilation and overheating conditions, for both environmental noise ingress and building services noise;
* and a worked example of the application of the AVO Guide including indicative design solutions.

The AVO Guide is intended for the consideration of new residential development that will be exposed predominantly to airborne sound from transport sources, and to sound from mechanical services that are serving the dwellings in question. Although the policy coverage is limited to England, the approach may be applicable in other parts of the UK.

The AVO Guide is intended to contribute to the practice of good acoustic design, as emphasised in the Professional Practice Guidance on Planning and Noise (ProPG). In particular

2.5 BRITISH STANDARD BS 8233:2014

British Standard Code of Practice BS8233:2014 'Sound insulation and noise reduction for buildings' provides recommended guideline value for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation Guidelines for Community Noise 1999 (WHO).

Activity	Location	07:00 to23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,\ 16hour}$	
Dining	Dining room/area	40 dB $L_{Aeq,\ 16hour}$	
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,\ 16hour}$	30 dB $L_{Aeq,\ 8hour}$

2.4.1 Indoor ambient noise levels for dwellings

The WHO guideline noise criteria set an internal sleep disturbance noise limit of 45dB LAmax,F which should not be exceeded on a regular basis.

3.0 SITE SURVEYS

3.1 SITE DESCRIPTION

The application site is located Harpsfield Broadway runs parallel to Comet Way, on the opposite side of the road from The Galleria complex and car-park. Immediately to the rear (west) of the application site is a bus interchange and hotel.

The dominant source of Noise is road traffic noise from the surrounding roads. (See Figure 3.1)

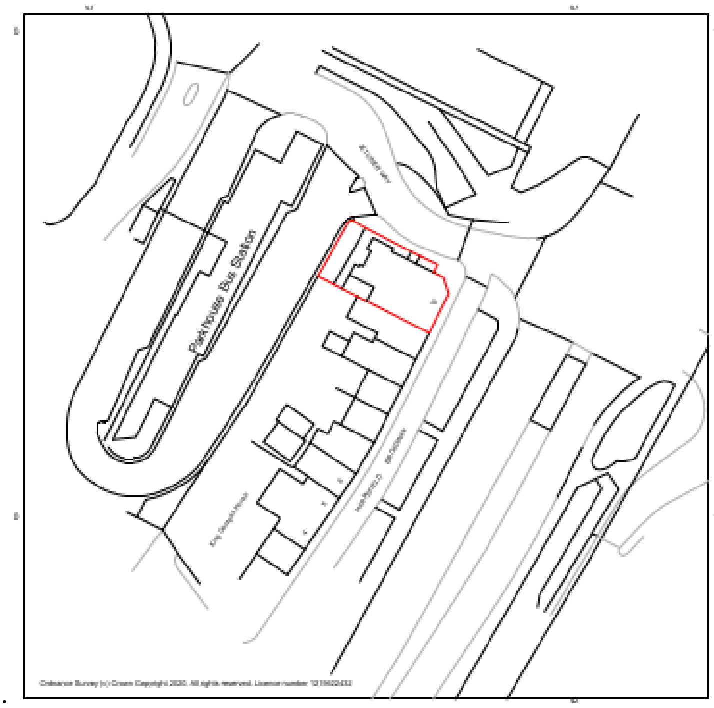


Figure 3.1 – Proposed Site

3.2 ENVIRONMENTAL SITE SURVEY PROCEDURE

Measurements were carried out free field (See figure 3.2) and logged over a 24hr period between the 15th and 16th March 2022.

The measurements were taken to establish the ambient sound level at the site, with respect to criteria of BS8233:2014.

The weather was suitable conditions to carry out the noise survey.

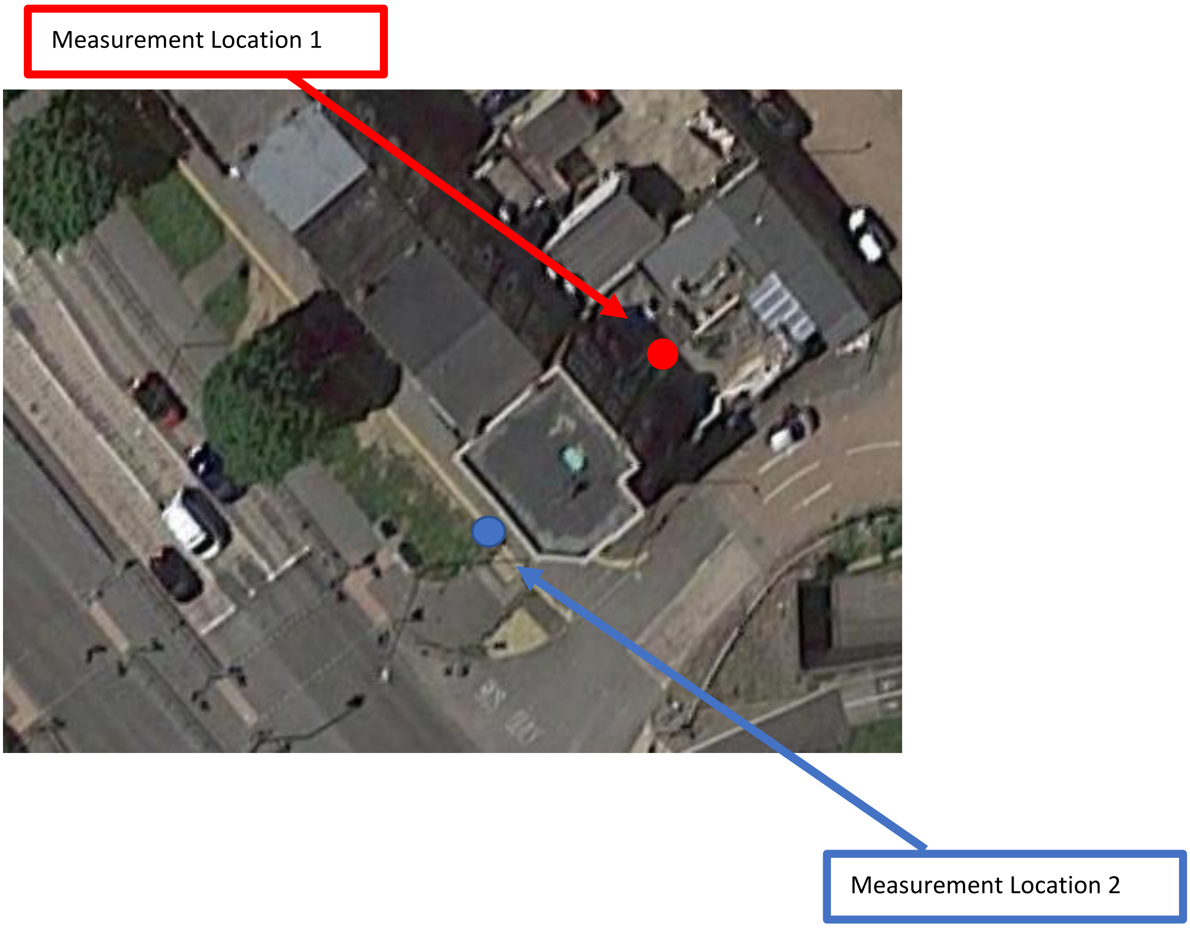


Figure 3.2 – Measurement Locations

3.3 EQUIPMENT

Instrument manufacturer	Cirrus Research Plc
Model	CR:171A Precision Computing Sound Level Meter
Serial Number	G303498
Microphone Type	MK:224
Serial Number	215146A
Calibrator	CR:515
Serial Number	96653
Cirrus CK: 508 Outdoor Kit	

Instrument manufacturer	Cirrus Research Plc
Model	IEC 61672-3:2013
Serial Number	G302987
Microphone Type	MK:224
Serial Number	214457A
Cirrus CK: 675 Outdoor Kit	
Type 1 Acoustic Calibrator	

The calibration of the sound level meters was verified in-situ before any measurements were taken, using the handheld calibrator and reference tone of 114dB at 1kHz. Validation checks at the end of the survey indicated that all instruments had operated within permitted tolerances for drift and measured level.

Copies of Calibration certificates are available upon request.

4.0 NOISE SURVEY

The following free-field sound levels have been derived for assessment of environmental noise break-in. It shall be noted that the data is 3dB below the information in Appendix A to equate from façade to free-field conditions.

A maximum value is provided for each night-time measurement period. Based on the World Health Organisation interpretation that for a noise to be regular it needs to occur several (i.e. more than two) times per hour; the LAmax(f) noise needs to be based upon an average of 10-15 events that are typical in nature. The aim of protecting against maximum noise levels is to ensure protection against typical intermittent noise levels rather than one-off events; whereby an arithmetic average of the 15 typical maximum events across each night period is used to determine values of dB LAmax(f) reported below. These have been summarised in table 4.1 and 4.2 below.

Measurement Data	Free Field Sound Pressure Level dB	
	Location 1	
Time	Average LAeq,T	Maximum LAMAX,(f)
07:00 – 23:00	56dB	65dB
23:00 – 07:00	52dB	60dB

Table 4.1 Measurement Levels

Measurement Data	Free Field Sound Pressure Level dB	
	Location 2	
Time	Average LAeq,T	Maximum LAMAX,(f)
07:00 – 23:00	70dB	84dB
23:00 – 07:00	66dB	81dB

Table 4.1.1 Measurement Levels

Leq, ff noise levels are taken as the continuous equivalent free-field sound pressure level outside the room elements under consideration.

Location	T	Time	Free-Field Sound Pressure Level Leq, T dB re.20µPa							
			63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	A
1	16h	Day	52	53	41	48	44	40	33	56
	8h	Night	48	49	37	44	40	36	29	52
		Max	56	57	55	52	48	44	39	60
2	16h	Day	67	68	65	62	58	54	49	70
	8h	Night	62	63	61	58	54	50	45	66
		Max	77	78	76	73	69	65	60	81

Table 4.2 Summary of octave -band sound levels for break in assessment

5.0 PROPOSED LAYOUT DESIGN

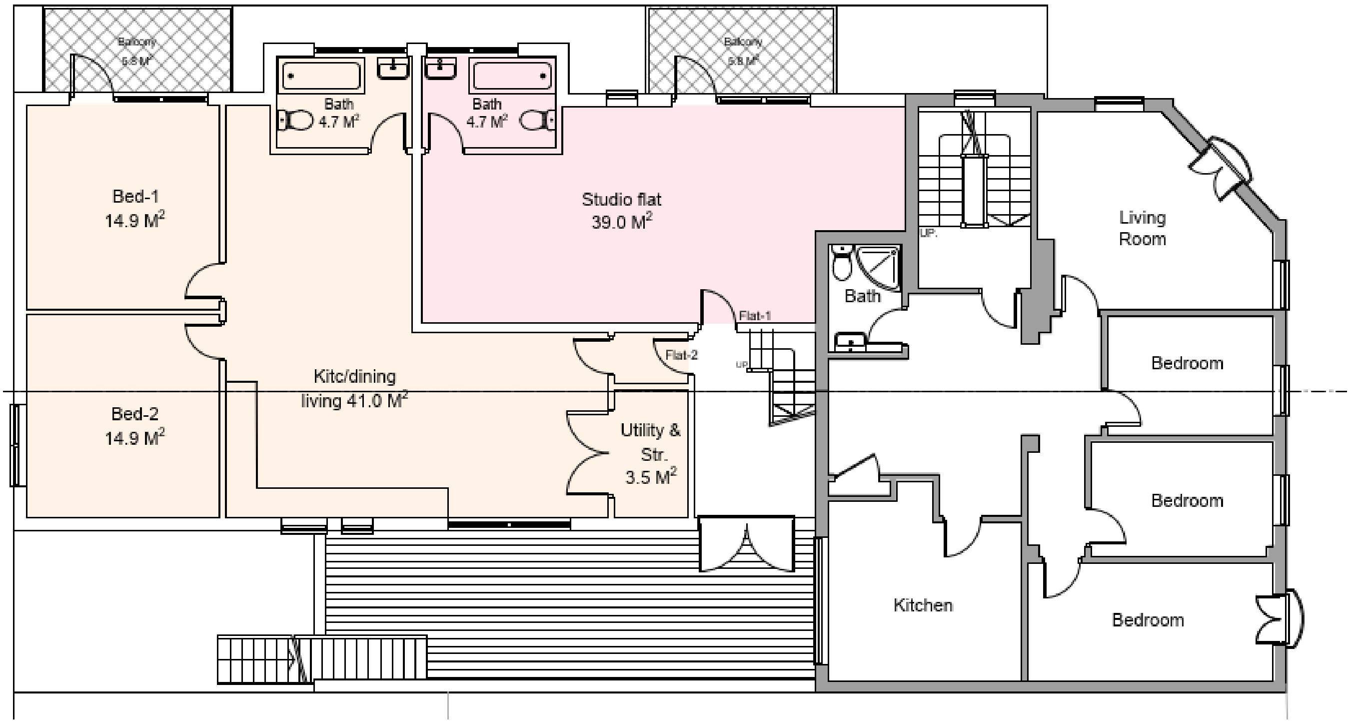
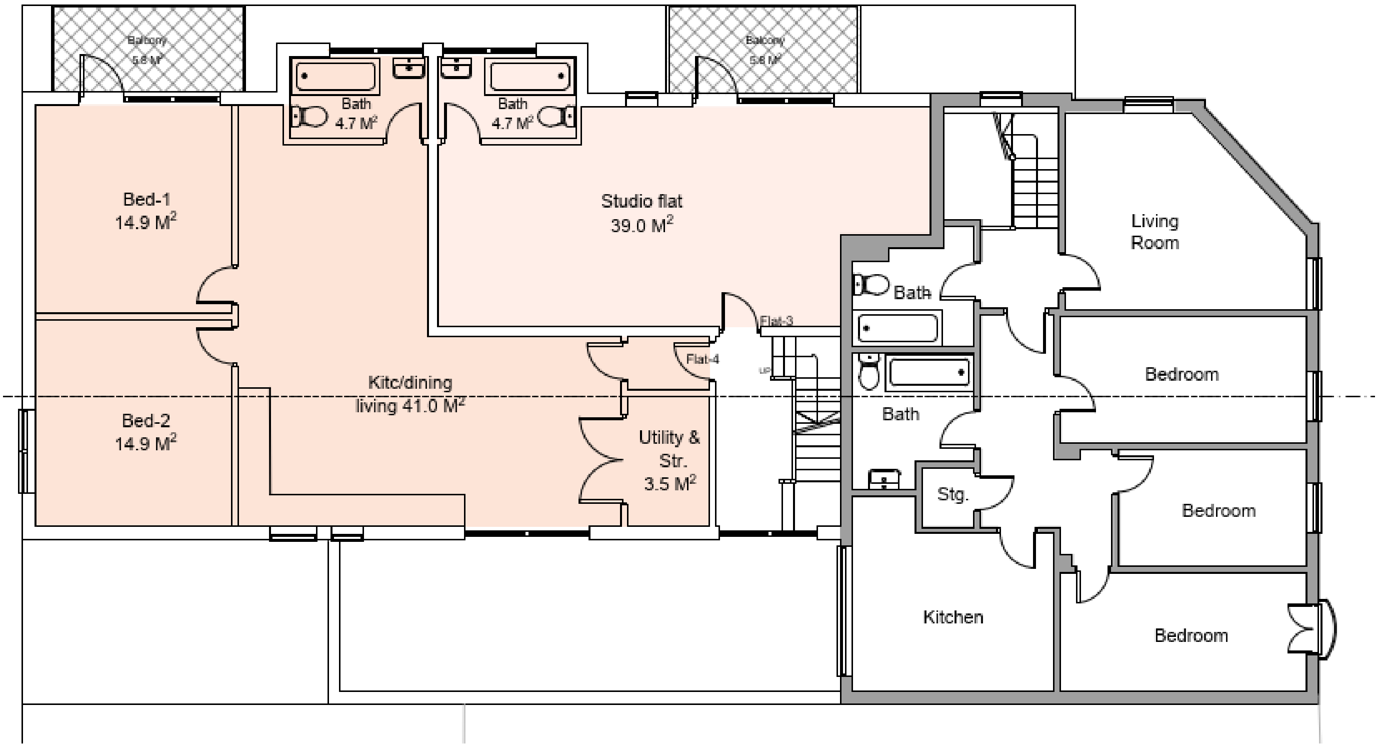
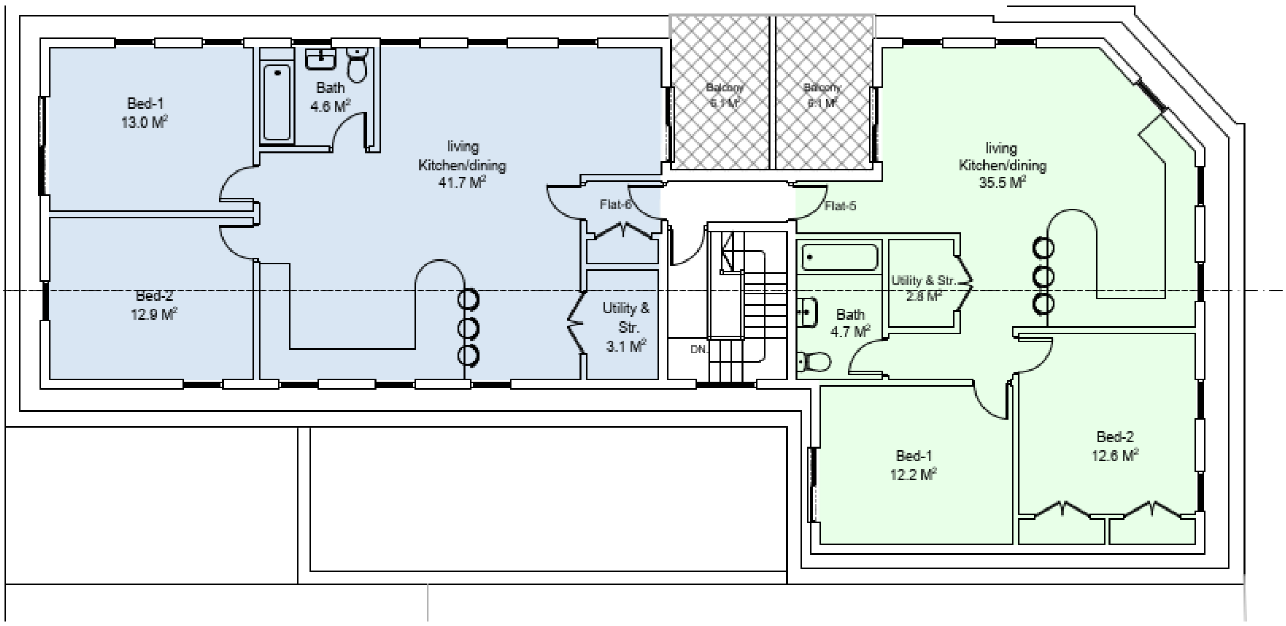


Figure 5.0 – Proposed Layout Design – Ground Floor



5.0.1 - Proposed Layout Design – Second Floor



5.0.2 - Proposed Layout Design – Loft

5.1 EXTERNAL SOUND LEVELS

It shall be read from Table 4.2 in Section 4.0 of this report, that the external sound levels taken by means of average equivalent or maximum sound levels exceed the World Health Organisation requirements for external noise as described by Community Noise Guidelines (1999) in Section 2.5 of this report.

5.1.1 Pro PG Acoustic Design Statement

The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources. New apartments, flats and houses are the most common type of new residential development, however the guidance can also be applied to other types of residential developments such as residential institutions, care homes etc. As such it is directly applicable to this development.

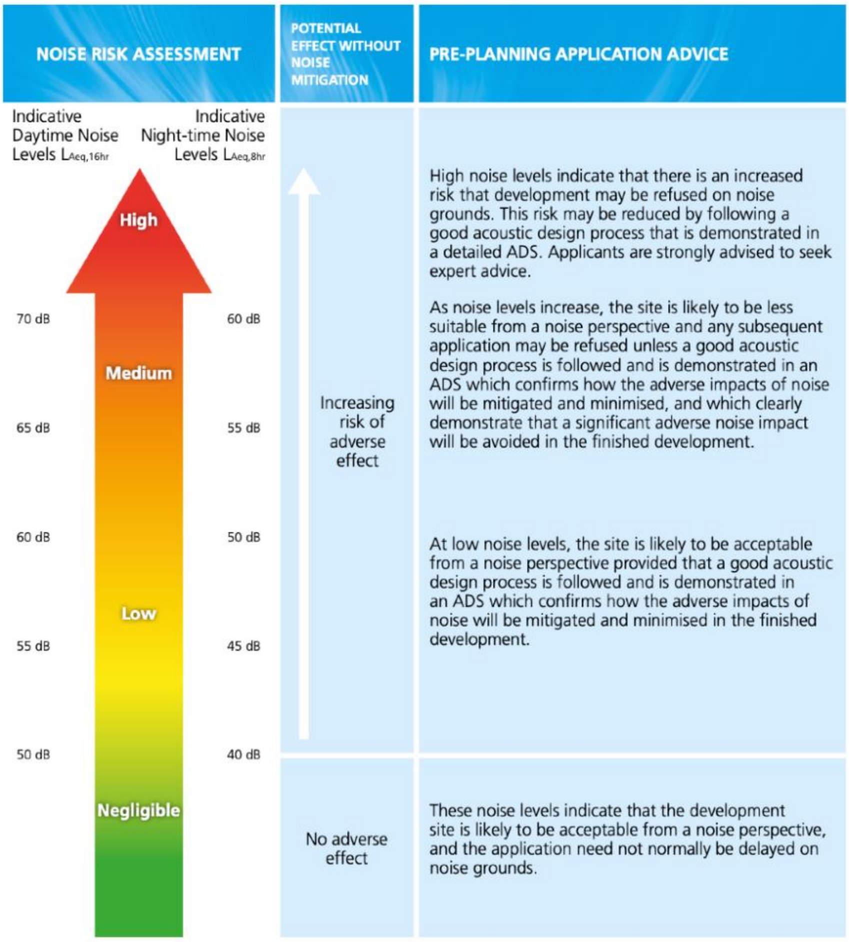


Figure 5.1 - ProPG Noise risk assessment guide

The following table assesses the ProPG noise risk for the measured data. The purpose of this is to provide a view of the noise risk at the site.

Location 1	Daytime $L_{Aeq, 16hr}$ 07:00 – 23:00	Night-time $L_{Aeq, 8hr}$ 23:00 – 07:00
Noise Level	56dB	52dB
ProPG Noise Risk	MEDIUM	MEDIUM

Location 2	Daytime $L_{Aeq, 16hr}$ 07:00 – 23:00	Night-time $L_{Aeq, 8hr}$ 23:00 – 07:00
Noise Level	70dB	66dB
ProPG Noise Risk	HIGH	HIGH

Table 5.1.1 : ProPG Stage 1 Assessment table

ProPG states that "Particular care should be taken to ensure that any noise events (as quantified by LAmax,F) have been properly identified and assessed". On attendance, the greatest LAFMax events were found to be generated by traffic noise.

5.2 FAÇADE SOUND INSULATION

In accordance with the assessment guidance in Annex G of BS 8233:2014, the sound insulation performance of the building can be estimated by simple calculation from the free-field noise

CALCULATION		A	B	(A-B) +5
Location	Period	Free-Field Noise Levels LAeq,T dB	BS8233/WHO Internal Noise Guidance Criteria LAeq, T dB	Typical Insulation Specification dB Rw
1	**Day 07:00 – 23:00**	**56**	**35**	**26**
	Night 23:00 – 07:00	**52**	**30**	**27**
		60	**45**	**20**
2	**Day 07:00 – 23:00**	**70**	**35**	**40**
	Night 23:00 – 07:00	**66**	**30**	**41**
		81	**45**	**41**

Table 5.2 - Sound insulation estimate using the simple calculation method of BS8233

Following the rigorous calculation method of Annex G of BS 8233:2014, it can be shown that a suitable standard of residential amenity can be achieved with façade sound insulation of at least 29Rw for the Rear Façade (Location 1) and 42Rw for the front façade (Location 2).

5.3 SPECIFICATION OF GLAZED UNITS

The minimum sound reduction index (SRI) value required for the glazed elements to be installed is shown in Table 5.3 and 5.3.1

Glazing Configuration – 3mm/ 18mm / 3mm							
Frequency, Hz/dB					Rw	Rw + C	Rw +Ctr
125	250	500	1K	2K	**29**	28	25
14	19	25	34	43			

Table 5.3 – Required Glazing Performance (Location 1)

Glazing Configuration – 10.38mm Lamiglass/ 16mm/ 10.38mm Lamiglass							
Frequency, Hz/dB					Rw	Rw + C	Rw +Ctr
125	250	500	1K	2K	**42**	41	38
32	38	40	40	46			

Table 5.3.1 – Required Glazing Performance (Location 2)

The sound reduction performance stated above must be achieved by the glazing system as a whole in its installed condition. The specification therefore applies to both the glazing element and all seals on any openable part of the system. It should be confirmed with any supplier that the full glazing system supplied complies with the requirements stated in Table 5.3 and 5.3.1. Data has been used from Guardian Glass.

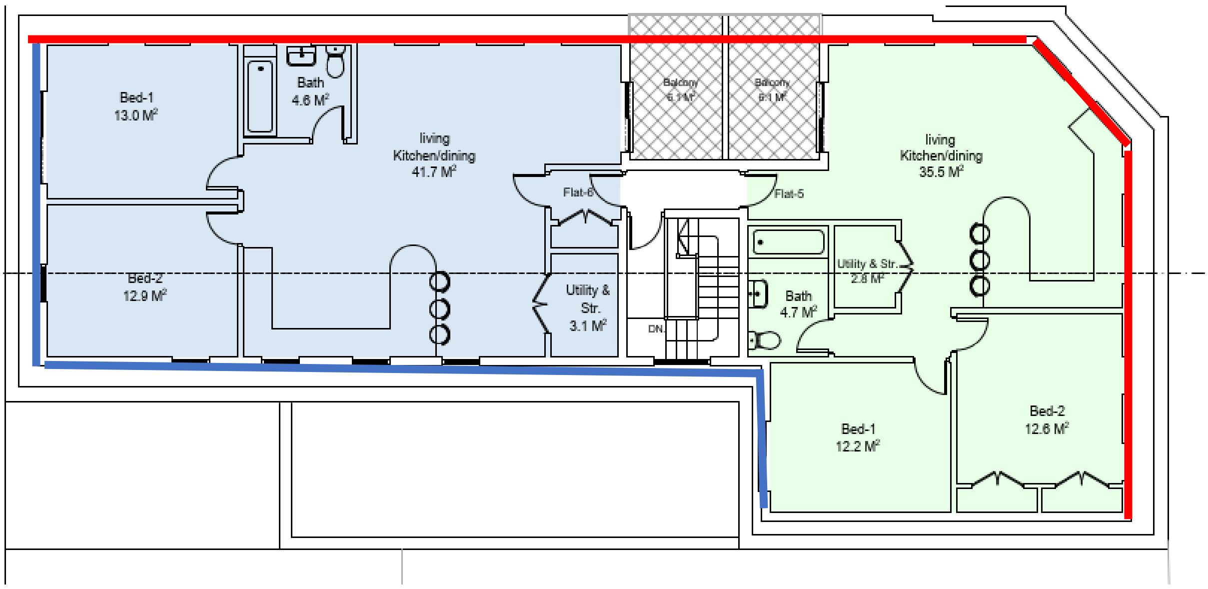


Figure 5.3.2 – Glazing Location

Location 1	
Location 2	

5.4 INTERNAL NOISE CRITERIA

Monitoring Period	Noise Criteria LAMAX	No. times exceeded LAMAX
07:00 – 23:00	55dB	0
23:00 – 07:00	45dB	0

Table 5.4 – Noise Criteria LAMAX - Back façade (Location1)

Monitoring Period	Noise Criteria LAMAX	No. times exceeded LAMAX
07:00 – 23:00	55dB	1
23:00 – 07:00	45dB	3

Table 5.4.1 - Noise Criteria LAMAX - Front façade (Location 2)

Monitoring Period	Noise Criteria LAeq	Internal Noise Level
07:00 – 23:00	35dB	32dB
23:00 – 07:00	30dB	30dB

Table 5.4.3 - Noise Criteria LAeq - Back façade (Location 1)

Monitoring Period	Noise Criteria LAeq	Internal Noise Level
07:00 – 23:00	35dB	31dB
23:00 – 07:00	30dB	27dB

Table 5.4.4 - Noise Criteria LAeq - Front façade (Location 2)

6.0 VENTILATION AND OVERHEATING

It is recognised that incident environmental noise levels shown in table 4.2 would themselves cause adverse effects on health and quality of life if left unmitigated. It is therefore understood that a reliance on natural ventilation, or opening windows, in these areas would be inappropriate due to the potentially adverse effect on future occupants of the development.

Ventilation to habitable rooms will require acoustically treated ventilation.
We therefore recommend provision of one of the following acoustic ventilation options:

- Acoustically screened wall mounted mechanical (i.e. powered) acoustic ventilators such as Titon 'Sonair F+'

- Mechanical Ventilation with Heat Recovery (MVHR) would be to provide each flat with whole house supply and extract ventilation. This comprises of mechanical unit/s that provide both supply and extract to each apartment individually; whereby inlet and outlet ducts would need to be run to the façade or in a riser to the roof. This type of system can also be incorporated with heat recovery built in if desired.

- Positive Input Ventilation (PIV) - Positive Input Ventilation (PIV) also sometimes known as positive pressure ventilation work as a whole house ventilation system and create fresh and healthy living environments by supplying fresh, filtered air into a property at a continuous rate throughout, such as the Envirovent Atmos System

Or any other similar performing acoustic ventilators or ventilation system.

To stairwells, no specific acoustic measures would be necessary and standard trickle vents would be appropriate.

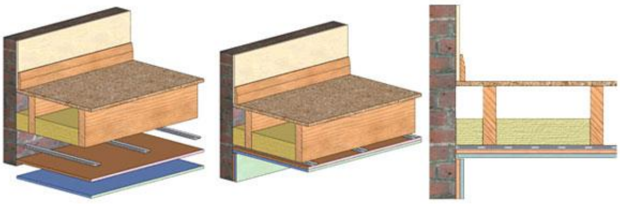
Windows should not be sealed, but openable for times when purge ventilation is required (examples given in Approved Document F including purging of fumes from burnt food when cooking, or removal of fumes when painting).
At no time shall the ventilation system cause the ambient internal noise levels to exceed the criterion set out in BS8233:2014 shown in table 2.4.1. If heat recovery is to be used, then a summer override switch is advisable.

7.0 INTERNAL SOUND INSULATION ASSESSMENT

The floor and wall structure may be subject to pre-completion testing in accordance with requirements of The Building Regulations 2010 Approved Document E (2003 Edition & amendments). It should be expected that the proposed dwelling will exceed the minimum performance standards of the Regulations, as stipulated between dwellings in terms of dB DnT,w +Ctr.

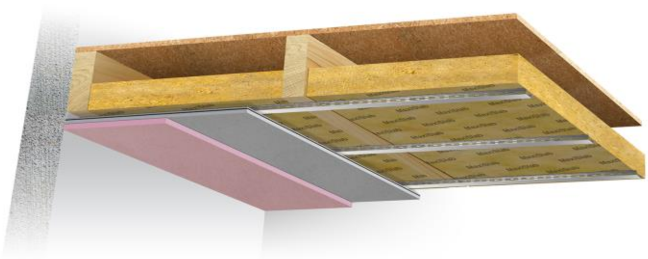
7.1 PROPOSED FLOOR SYSTEM

Between Joists 100mm mineral wool 45kg/m3 rigid slabs to be laid tight.



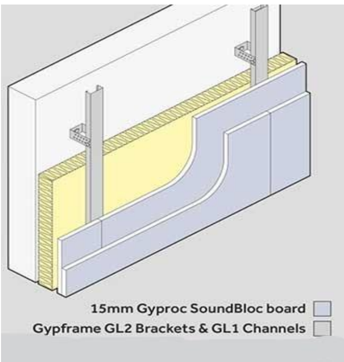
18mm T&G chipboard sub floor or original floorboards to be laid and screwed tight. 28mm T&G Deckfon chipboard or alternatively 10mm carpet underlay with tapped seems and 22mm T&G Chipboard to be laid over, creating a floating floor. A separation gap with a minimum 3mm must be left between walls and floor and then filled with acoustic sealant to prevent flanking noise.

25mm Resilient bars to be installed and fitted with 1x layer of Soundbloc Plasterboard and 1 x layer of Firestop Plasterboard with staggered joins.



7.2 PARTY WALLS

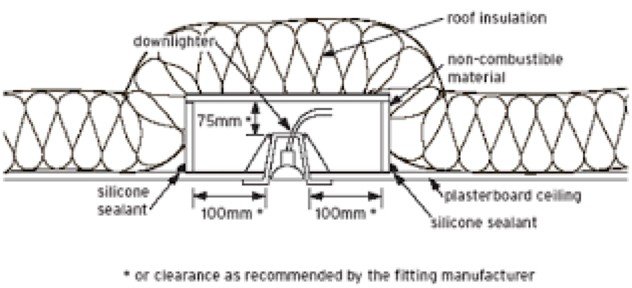
Separating walls are to be built as British Gypsum Quiet Wall, high performance acoustic wall system. Mineral wool infill to be a minimum of 50mm Rw45. (See Detail Below).



Alternatively, 75mm CLS stud wall with a 75mm cavity can be erected and secured via the ceiling joist and floor joist but not the party wall directly. The wall must sit on a 15mm strip of Soundbloc Plasterboard (Blue Board) between floor and ceiling to act as a deflection strip and minimise flanking noise. The cavity must be insulated with Rw45/50mm Mineral wool with 45kg/m3 density and left with a clear 25mm airgap. Fitting of one side of the party wall would be sufficient on solid construction.

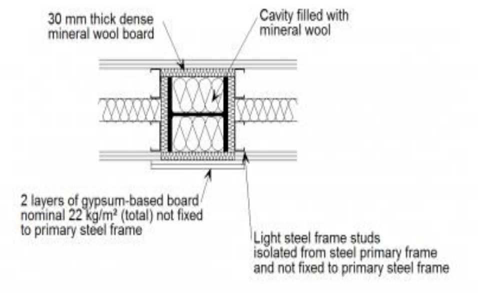
7.3 LIGHTING

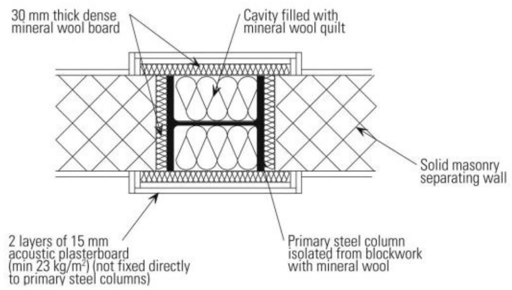
Any down lighting will be boxed with 15mm Sounbloc plasterboard and sealed with acoustic sealant from above. Alternatively, an acoustic downlight unit would be suitable.



7.4 STEEL BEAMS & WASTE PIPES

All steel beams and waste pipes should be boxed and infilled with 100mm 45kg/m3 mineral wool and encased with 15mm soundbloc plaster board, where possible a 20-25mm air gap should be incorporated.



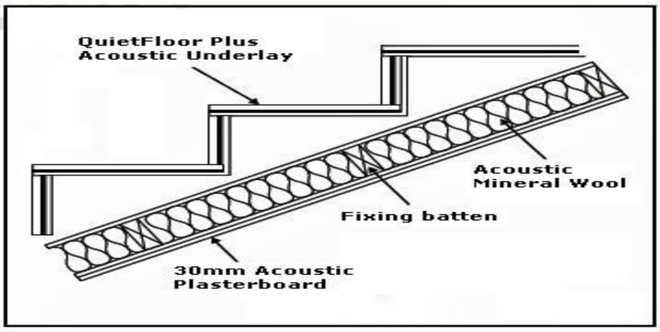


7.5 COMMUNAL AREAS

Soft closers are to be installed to communal and residential main doors to prevent high Reverberation Time (RT60) i.e slamming door.
Acoustic seals and drop seals to be installed to all main residential doors to prevent break in noise.

7.6 PARTY STAIRCASE

Party walls with stairs adjoining will be lined with15mm Soundbloc plasterboard.
The stair treads will have Acoustilay 8 or equivalent glued to each individual tread to prevent impact noise.



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7.7 ENTRANCE DOORS

Entrance doors should have a double acoustic seal to prevent noise break in form communal hallways.

7.8 SOUND INSULATION SCHEME BETWEEN COMMERCIAL AND RESIDENTIAL

The floor between the commercial unit and the residence above should be designed to provide a minimum sound reduction of 55dB Dnt,w+Ctr. to mitigate potential noise from the commercial unit.

The above structure is based on ‘iKoustic’ system: www.iKoustic.com
Commercial Ceiling: 2x 15mm acoustic plasterboard bonded together with a resilient membrane supported with a ‘MuteClip XP’ system from the joists.
100mm 45kg/m3 mineral wool must be tightly fitted between the joists.
Floorboards: must be acoustically sealed around the perimeter and intermediate T&G joints. A resilient membrane must be incorporated under the finished floor system.

Installed correctly the overall acoustic performance can achieve 55dB Dnt,w+Ctr.

8.0 OUTDOOR AMENIETY

The balcony balustrade will need to give a least a 15dB sound reduction to meet external amenity noise guidelines. Example balustrade is Lumon Balcony Glazing or Solarlux system with the below Sound Insulation Values.

SOUND INSULATION VALUES (RW) IN DB

The specified values are based on a combination of elements of the SL 25 slide-and-turn system (see table for glass thicknesses) and the SL Plus balustrade with 10 mm LSG.

Variants	SL 25 glass thickness		
	6 mm TSG	8 mm TSG	10 mm TSG
Standard closed	21	23	24
Screen swing panel (6 cm)	17	17	17
Screen swing panel (10 cm)	16	16	16
Swing panel at 90°	9	9	9
Vertical plug-on seal and frame seal	25	27	28

Figure 8.1 – Solarlux Balustrade system.

9.0 SUMMARY AND CONCLUSIONS

A baseline noise survey has been undertaken by DAA Group to establish the prevailing noise climate in the locality of 12, Harpsfield Broadway, Hatfield, AL10 9TF in support of an application for a new residential development.

The measured levels have been assessed against the National Planning Policy Framework and currently available standards and guidance documents including World Health Organisation Guidelines for Community Noise (1999) and BS8233:2014 Guidance on sound Insulation.

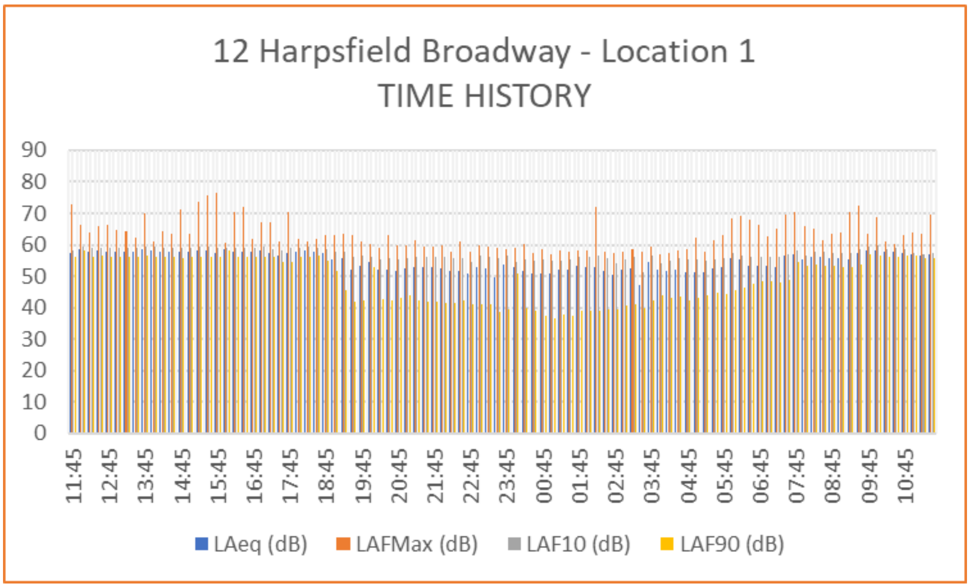
Appropriate external and internal noise criteria have been considered to minimise adverse impacts on health and quality of life as a result of the new development.

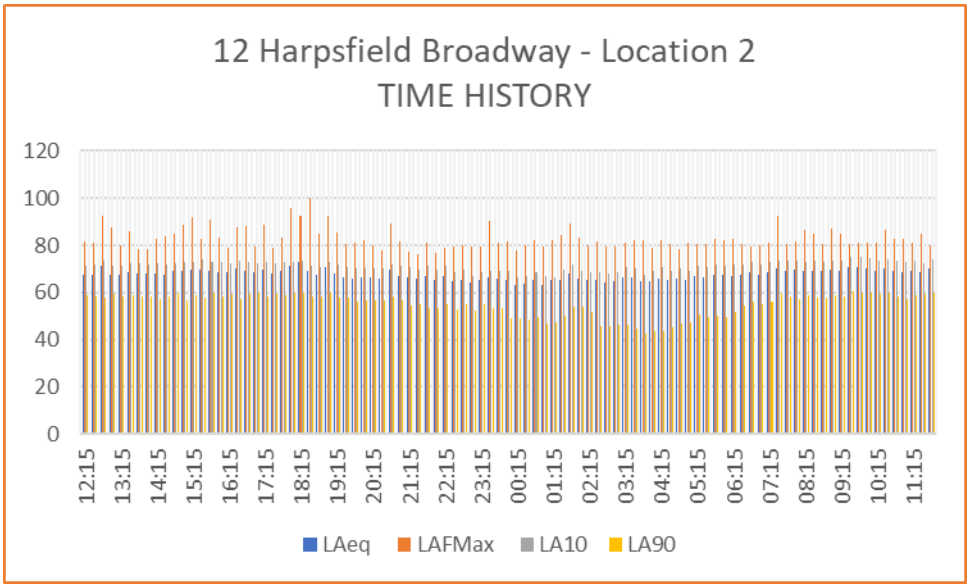
Mitigation measures have been outlined including double-glazing, mechanical ventilation and a sound insulation scheme.

Based on the calculations and assessments made within this report and with implementation of the mitigation measures, the sound levels will be sufficiently attenuated to achieve the recommended internal sound level criteria for new dwellings.

It is concluded that, on noise grounds, the proposed development will not prejudice the amenities of any future occupants provided the above points are taken into consideration.

APPENDIX A – MEASUREMENTS





APPENDIX B - ACOUSTIC TERMINOLOGY

B.1 WEIGHTED DECIBEL, dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. An increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

B.2 EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{Aeq}. This is a notional steady level which would, over a given period, deliver the same sound energy as the actual time-varying sound over the same period.

B.3 MAXIMUM NOISE LEVEL, LAmax

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125 ms in duration.

B.4 NOISE RATING, NR

Noise ratings are used as a single figure criterion for specifying services noise in buildings. Each noise rating value has an associated spectrum of defined values in each third or octave frequency band. To determine the noise rating of a room the measured spectrum is compared to a set of noise rating curves. The highest NR curve that crosses any single frequency band of the measurement determines the noise rating for the room. The single figure noise rating is read at the 1 kHz band.

B.5 SOUND LEVEL DIFFERENCE (D)

The sound insulation required between two spaces may be determined by the sound level difference needed between them. A single figure descriptor which characterises a range of frequencies, the weighted sound level difference, D, is sometimes used (BS EN ISO 717-1). This parameter is not adjusted to reference conditions.

The standardized level difference, Dn, T is a measure of the difference in sound level between two rooms, in each frequency band, where the reverberation time in the receiving room has been normalised to 0.5 s. This parameter measures all transmission paths, including flanking paths.

The weighted standardized level difference, DnTw, is a measure of the difference in sound level between two rooms, which characterises a range of frequencies and is normalised to a reference reverberation time

B.6 SOUND REDUCTION INDEX (R)

The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its attenuation properties. It is a property of the component, unlike the sound level difference which is affected by the common area between the rooms and the acoustic of the receiving room. The weighted sound reduction index, Rw, is a single figure description of sound reduction index characterising a range of frequencies, which is defined in BS EN ISO 717-1: 1997. The Rw is calculated from measurements in an acoustic laboratory

B.7 STATISTICAL NOISE LEVELS (L_{A90}, (T) L_{A1}, (T) L_{A10}, (T) etc.)

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{A10} is the level exceeded for ten per cent of the time under consideration, has historically been
adopted in the UK for the assessment of road traffic noise. The LA90 is the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_{A1} the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted LA10, dB LA90, dB. etc. The reference time (T) is normally included, e.g. LA10, (5min), & LA90, (8hr).

B.8 TYPICAL NOISE LEVELS

Typical noise levels are given in the following table.

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-offs at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heaters at 1m
40	Living room
30	Ventilation Noise in Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing.

GUARDIAN GLASS

Acoustic Performance

Glazing Configuration

3mm Float Glass
18mm Cavity
3mm Float Glass

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Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	29	-1	-4	23	28
14	19	25	34	43	21					

Disclaimer: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, Rw, and adaptation terms, C and Ctr, should typically be considered to be accurate within ±2 dB. However, wider deviations can occur. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information please consult Assumptions and Terminology section in Guardian Acoustic Assistant.

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Acoustic Performance

Glazing Configuration

10.38mm (64.1) LamiGlass (PVB)

16mm Cavity

10.38mm (55.1) LamiGlass (PVB)

.

Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	42	-1	-4	37	42
32	38	40	40	46	62					

Disclaimer: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, Rw, and adaptation terms, C and Ctr, should typically be considered to be accurate within ±2 dB. However, wider deviations can occur. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information please consult Assumptions and Terminology section in Guardian Acoustic Assistant.

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APPENDIX D – CALCULATIONS

0	Day-time (07:00 - 23:00)								
1	Room Width		3.7	Area	37	$L_{eq,2}$	32		
2	Room Height		2.5	RT	0.5				
3	Room Depth		4	A	11.9	S	26.46		
4				A_0	10				
5	Mid-Octave Freq (Hz)	63	125	250	500	1k	2k	4k	8k
6	$L_{eq,ff}$	53	53	41	48	44	40	33	33
7	Vent $D_{n,e}$	50	50	50	50	50	50	50	50
8	$(A_0/S)*10(-D_{n,e}/10)$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9			S_{wi}	2.16					
10	WindowR_{wi}	32	32	38	40	40	46	62	62
11	$(S_{wi}/S)*10(-R_{wi}/10)$	0.00005	0.00005	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
12			S_{ew}	9.3					
13	Wall R_{ew}	14	14	19	25	34	43	21	21
14	$(S_{ew}/S)*10(-R_{ew}/10)$	0.01399	0.01399	0.00442	0.00111	0.00014	0.00002	0.00279	0.00279
15			S_{rr}	15					
16	Roof R_w	33	37	42	45	52	54	58	60
17	$(S_{lt}/S)*10(-R_{lt}/10)$	0.00028	0.00011	0.00004	0.00002	0.00000	0.00000	0.00000	0.00000
18	Internal SPL	41	41	24	25	12	1	14	14
19	A-Weighting	-26	-16.1	-8.6	-3.2	0	1	1.2	0
20	A-Weighted levels	15	25	15	22	12	2	15	14
21		31.8	307.3	34.5	152.7	17.3	1.4	32.6	24.7

0	Night-time (23:00 - 07:00)								
1	Room Width		3.7	Area	37	$L_{eq,2}$	30		
2	Room Height		2.5	RT	0.5				
3	Room Depth		4	A	11.9	S	26.46		
4				A_0	10				
5	Mid-Octave Freq (Hz)	63	125	250	500	1k	2k	4k	8k
6	$L_{eq,ff}$	49	49	37	44	40	36	29	29
7	Vent $D_{n,e}$	50	50	50	50	50	50	50	50
8	$(A_0/S)*10(-D_{n,e}/10)$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9			S_{wi}	2.16					
10	WindowR_{wi}	32	32	38	40	40	46	62	62
11	$(S_{wi}/S)*10(-R_{wi}/10)$	0.00005	0.00005	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
12			S_{ew}	9.3					
13	Wall R_{ew}	14	14	19	25	34	43	21	21
14	$(S_{ew}/S)*10(-R_{ew}/10)$	0.01399	0.01399	0.00442	0.00111	0.00014	0.00002	0.00279	0.00279
15			S_{rr}	15					
16	Roof R_w	33	37	42	45	52	54	58	60
17	$(S_{lt}/S)*10(-R_{lt}/10)$	0.00028	0.00011	0.00004	0.00002	0.00000	0.00000	0.00000	0.00000
18	Internal SPL	37	37	20	21	8	-3	10	10
19	A-Weighting	-26	-16.1	-8.6	-3.2	0	1	1.2	0
20	A-Weighted levels	11	21	11	18	8	-2	11	10
21		12.7	122.4	13.7	60.8	6.9	0.6	13.0	9.8

0	Night-time (23:00 - 07:00)		LAMAX						
1	Room Width		3.7	Area	37	$L_{eq,2}$	40		
2	Room Height		2.5	RT	0.5				
3	Room Depth		4	A	11.9	S	26.46		
4				A_0	10				
5	Mid-Octave Freq (Hz)	63	125	250	500	1k	2k	4k	8k
6	$L_{eq,ff}$	57	57	55	52	48	44	39	39
7	Vent $D_{n,e}$	50	50	50	50	50	50	50	50
8	$(A_0/S)*10(-D_{n,e}/10)$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9			S_{wi}	2.16					
10	WindowR_{wi}	32	32	38	40	40	46	62	62
11	$(S_{wi}/S)*10(-R_{wi}/10)$	0.00005	0.00005	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
12			S_{ew}	9.3					
13	Wall R_{ew}	14	14	19	25	34	43	21	21
14	$(S_{ew}/S)*10(-R_{ew}/10)$	0.01399	0.01399	0.00442	0.00111	0.00014	0.00002	0.00279	0.00279
15			S_{rr}	15					
16	Roof R_w	33	37	42	45	52	54	58	60
17	$(S_{lt}/S)*10(-R_{lt}/10)$	0.00028	0.00011	0.00004	0.00002	0.00000	0.00000	0.00000	0.00000
18	Internal SPL	45	45	38	29	16	5	20	20
19	A-Weighting	-26	-16.1	-8.6	-3.2	0	1	1.2	0
20	A-Weighted levels	19	29	29	26	16	6	21	20
21		80.0	772.0	866.1	383.7	43.5	3.6	129.8	98.4

0	Day-time (07:00 - 23:00)								
1	Room Width		3.7	**Area**	**37**	**$L_{eq,2}$**	**31**		
2	Room Height		2.5	**RT**	**0.5**				
3	Room Depth		4	**A**	**11.9**	**S**	**26.46**		
4				**A_0**	**10**				
5	Mid-Octave Freq (Hz)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
6	**$L_{eq,ff}$**	**68**	**68**	**65**	**62**	**58**	**54**	**49**	**49**
7	**Vent $D_{n,e}$**	**50**	50	50	50	50	50	50	50
8	$(A_0/S)*10(-D_{n,e}/10)$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9			S_{wi}	**2.16**					
10	**WindowR_{wi}**	32	32	38	40	40	46	62	62
11	$(S_{wi}/S)*10(-R_{wi}/10)$	0.00005	0.00005	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
12			S_{ew}	**9.3**					
13	**Wall R_{ew}**	**34**	**41**	**43**	**48**	**50**	**55**	**60**	**62**
14	$(S_{ew}/S)*10(-R_{ew}/10)$	0.00014	0.00003	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000
15			**S_{rr}**	**15**					
16	**Roof R_w**	**33**	**37**	**42**	**45**	**52**	**54**	**58**	**60**
17	$(S_{it}/S)*10(-R_{it}/10)$	0.00028	0.00011	0.00004	0.00002	0.00000	0.00000	0.00000	0.00000
18	**Internal SPL**	**41**	**37**	**30**	**24**	**17**	**10**	**3**	**2**
19	A-Weighting	-26	-16.1	-8.6	-3.2	0	1	1.2	0
20	**A-Weighted levels**	**15**	**21**	**21**	**21**	**17**	**11**	**4**	**2**
21		33.7	134.7	135.6	119.1	53.2	12.9	2.4	1.6

0	Night-time (23:00 - 07:00)								
1	Room Width		3.7	**Area**	**37**	**$L_{eq,2}$**	**27**		
2	Room Height		2.5	**RT**	**0.5**				
3	Room Depth		4	**A**	**11.9**	**S**	**26.46**		
4				**A_0**	**10**				
5	Mid-Octave Freq (Hz)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
6	**$L_{eq,ff}$**	**63**	**63**	**61**	**58**	**54**	**50**	**45**	**45**
7	**Vent $D_{n,e}$**	**50**	50	50	50	50	50	50	50
8	$(A_0/S)*10(-D_{n,e}/10)$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9			S_{wi}	**2.16**					
10	**WindowR_{wi}**	32	32	38	40	40	46	62	62
11	$(S_{wi}/S)*10(-R_{wi}/10)$	0.00005	0.00005	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
12			S_{ew}	**9.3**					
13	**Wall R_{ew}**	**34**	**41**	**43**	**48**	**50**	**55**	**60**	**62**
14	$(S_{ew}/S)*10(-R_{ew}/10)$	0.00014	0.00003	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000
15			**S_{rr}**	**15**					
16	**Roof R_w**	**33**	**37**	**42**	**45**	**52**	**54**	**58**	**60**
17	$(S_{it}/S)*10(-R_{it}/10)$	0.00028	0.00011	0.00004	0.00002	0.00000	0.00000	0.00000	0.00000
18	**Internal SPL**	**36**	**32**	**26**	**20**	**13**	**6**	**-1**	**-2**
19	A-Weighting	-26	-16.1	-8.6	-3.2	0	1	1.2	0
20	**A-Weighted levels**	**10**	**16**	**17**	**17**	**13**	**7**	**0**	**-2**
21		10.6	42.6	54.0	47.4	21.2	5.1	0.9	0.6

0	Night-time (23:00 - 07:00)		LAMAX						
1	Room Width		3.7	**Area**	**37**	**$L_{eq,2}$**	**42**		
2	Room Height		2.5	**RT**	**0.5**				
3	Room Depth		4	**A**	**11.9**	**S**	**26.46**		
4				**A_0**	**10**				
5	Mid-Octave Freq (Hz)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
6	**$L_{eq,ff}$**	**78**	**78**	**76**	**73**	**69**	**65**	**60**	**60**
7	**Vent $D_{n,e}$**	**50**	50	50	50	50	50	50	50
8	$(A_0/S)*10(-D_{n,e}/10)$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9			S_{wi}	**2.16**					
10	**WindowR_{wi}**	32	32	38	40	40	46	62	62
11	$(S_{wi}/S)*10(-R_{wi}/10)$	0.00005	0.00005	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
12			S_{ew}	**9.3**					
13	**Wall R_{ew}**	**34**	**41**	**43**	**48**	**50**	**55**	**60**	**62**
14	$(S_{ew}/S)*10(-R_{ew}/10)$	0.00014	0.00003	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000
15			**S_{rr}**	**15**					
16	**Roof R_w**	**33**	**37**	**42**	**45**	**52**	**54**	**58**	**60**
17	$(S_{it}/S)*10(-R_{it}/10)$	0.00028	0.00011	0.00004	0.00002	0.00000	0.00000	0.00000	0.00000
18	**Internal SPL**	**51**	**47**	**41**	**35**	**28**	**21**	**14**	**13**
19	A-Weighting	-26	-16.1	-8.6	-3.2	0	1	1.2	0
20	**A-Weighted levels**	**25**	**31**	**32**	**32**	**28**	**22**	**15**	**13**
21		336.6	1347.4	1707.1	1499.8	670.0	162.3	29.7	20.5