

NOISE IMPACT ASSESSMENT

REPORT REFERENCE: **NCSL 1248**

POSSABILITIES CIC

HALIFAX ROAD, LITTLEBOROUGH, OL16 2SQ

03/11/2023

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1 INTRODUCTION

Noise Control Solutions Limited (NCSL) have been commissioned by PossAbilities CIC to undertake a noise impact assessment for the proposed development at Halifax Road, Littleborough, OL16 2SQ. The assessment is required in order to accompany the relevant planning application which is to be considered by Rochdale Borough Council. The scope of this application is the development of 17no. residential apartments.

In order to assess the expected noise impact for future residents of the development, an environmental noise impact assessment has been conducted with subsequent recommendations in terms of acoustic specification of glazing and ventilation measures, details of which are shown within this report.

This assessment considers only the acoustics of the development, the specifications in this report have been provided in good faith and assumes a good standard of workmanship. Each and every suggested specification and detail should also be checked with the appropriate consultant in terms of structural integrity, ventilation, overheating, fire etc.

Report prepared by  Andrew Todd BA(HONS) MSc MIOA CEng

2 COMPETENCE

This report has been prepared by Mr Andrew Todd, a corporate member of the Institute of Acoustics, a holder of a MSc in Acoustics and a Chartered Engineer registered with the United Kingdom Engineering Council. Andrew has over 15 years of experience as an acoustic consultant/engineer working in various aspects of acoustics.

3 SUMMARY OF TERMS, DESCRIPTORS & QUANTITIES

Within this report, several acoustic descriptors and quantities are referred to. Due to their specialised nature, the following summary is provided.

DECIBELS (dB): Ten times the logarithm (base 10) of the ratio between a measured quantity and a reference quantity. For sound pressure levels defined within this report, the reference quantity is 20 Micropascals (μPa).

A-WEIGHTING: The filtering of acoustic signals in order to provide a closer approximation to the human hearing response. Measurements with this weighting applied are denoted with “(A)”, for example, “dB(A)”.

NTH PERCENTILE NOISE LEVEL ($L_{AN,T}$): The A-weighted sound pressure level, in decibels, exceeded for N% of the measurement duration (T). This metric is generally used to assess background noise levels (L_{A90}) as it allows for the removal of non-constant noise sources, for example, passing vehicles. The subscript ‘T’ defines the measurement duration.

EQUIVALENT CONTINUOUS NOISE LEVEL ($L_{AEQ,T}$): The logarithmically averaged sound pressure level, in decibels, over the measurement duration (T) with A-weighting applied. The subscript ‘T’ defines the measurement duration.

FAST TIME WEIGHTING: The integration time constant of the measurement. Fast time weighting, denoted by the subscript ‘F’, integrates sound pressure levels over 0.125 seconds.

MAX LEVEL ($L_{AF\ MAX}$): The maximum reported RMS sound pressure level during a measurement period. The level is A-weighted and is calculated with a Fast time weighting.

DAY-TIME AND NIGHT-TIME PERIODS: Following guidance contained within BS4142, the day-time period is defined as 07:00 to 23:00 and the night-time period is defined as 23:00 to 07:00.

NOISE SENSITIVE RECEPTOR (NSR): A premises or area which is sensitive to noise disturbance. This is generally an existing, or future residential premises close to a proposed development.

SOUND POWER LEVEL (L_W): The sound energy radiated per unit time by a sound source, measured in Watts (W) on a decibel scale with a reference value of 10^{-12} W.

4 APPLICABLE LITERATURE

4.1 NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework (NPPF), updated in 2023, outlines the Government's planning policies for England and how they are expected to be applied. In respect of noise, the document states that:

Planning policies and decisions should also ensure that new development is appropriate for its location, taking into account the 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:

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

Additionally, the policy states that:

- *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.*
- *Planning conditions should be kept to a minimum and only imposed where they are necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects. Agreeing conditions early is beneficial to all parties involved in the process and can speed up decision-making. Conditions that are required to be discharged before development commences should be avoided, unless there is a clear justification*

4.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

Published in March 2010 by DEFRA, this document defines the Government's policy on noise. It incorporates the long-term vision of promoting good health and quality of life through the effective management of noise in the context of Government policy on sustainable development. The long-term vision of the NPSE is supported by the following aims:

- *Avoid significant adverse impacts on health and quality of life.*
- *Mitigate and minimise adverse impacts of health and quality of life.*
- *Where possible, contribute to the improvement of health and quality of life.*

This document also defines three categories relating to noise impact:

- **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 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.

4.3 PLANNING PRACTICE GUIDANCE

Further detail is provided within the Planning Practice Guidance (PPG) regarding how the effect levels, set out within NPSE, can be recognised and the associated concern arising from each.

At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behavior, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent

there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behavior and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behavior such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behavior and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

Table 1 summarises the noise exposure hierarchy.

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Noticeable	No Effect	No Observed Effect	No Specific Measures Required

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Adverse Effect Level			
Present & Not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level			
Present & Intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate & Reduce to a Minimum
Significant Observed Adverse Effect Level			
Present & Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Effect Level	Avoid
Present & Very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

TABLE 1 – NOISE EXPOSURE HIERARCHY

4.4 BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings (BS 8233) provides guidance on internal noise levels within dwellings allowing for sufficient resting and sleeping conditions, as shown in Table 2. However, it is also noted that these values may be relaxed by 5dB where a development is considered necessary or desirable with reasonable internal conditions still achieved.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35dB $L_{Aeq,16hour}$	N/A
Dining	Dining room	40dB $L_{Aeq,16hour}$	N/A
Sleeping	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$ 45dB L_{Amax}

TABLE 2 - BS 8233:2014: RECOMMENDATIONS FOR INDOOR NOISE LEVELS

BS8233 also provides guidance as to acceptable external noise levels, as shown in Table 3.

Activity	Location	Desirable Noise Level	Upper Guideline Level
Relaxation	External Amenity Space	50dB $L_{Aeq,T}$	55dB $L_{Aeq,T}$

TABLE 3 - BS 8233:2014: RECOMMENDATIONS FOR EXTERNAL NOISE LEVELS

BS8233, however, does recognise that these external guideline values are not achievable in all circumstances where development may be desirable. The standard also provides guidance on estimated noise reduction levels of commonly used building materials and constructions.

4.5 WORLD HEALTH ORGANISATION – GUIDELINES FOR COMMUNITY NOISE 1999.

The World Health Organisation (WHO) provides guidance on maximum recommended noise levels in outdoor living areas. The noise guideline levels are shown in Table 4.

Specific Environment	Critical Health Effect	dB L _{Aeq}	Time (hr)	dB L _{AMax}
Outdoor living area	Serious annoyance daytime and evening.	55	16	NA
	Moderate annoyance daytime and evening.	50	16	NA
Outside bedroom	Sleep disturbance, window open (outdoor values).	45	8	60

TABLE 4 - WHO RECOMMENDATIONS FOR OUTDOOR NOISE LEVELS

5 LOCATION

5.1 SITE LOCATION

The development in question is located at Halifax Road, Littleborough, OL16 2SQ, (reference 'D1'). This is an area of open grassland located within a residential area. There is a petrol station with an associated amenity building located to the East of the development with a significant public highway (Halifax Road) to the North.

The local area is shown below in Figure 1.

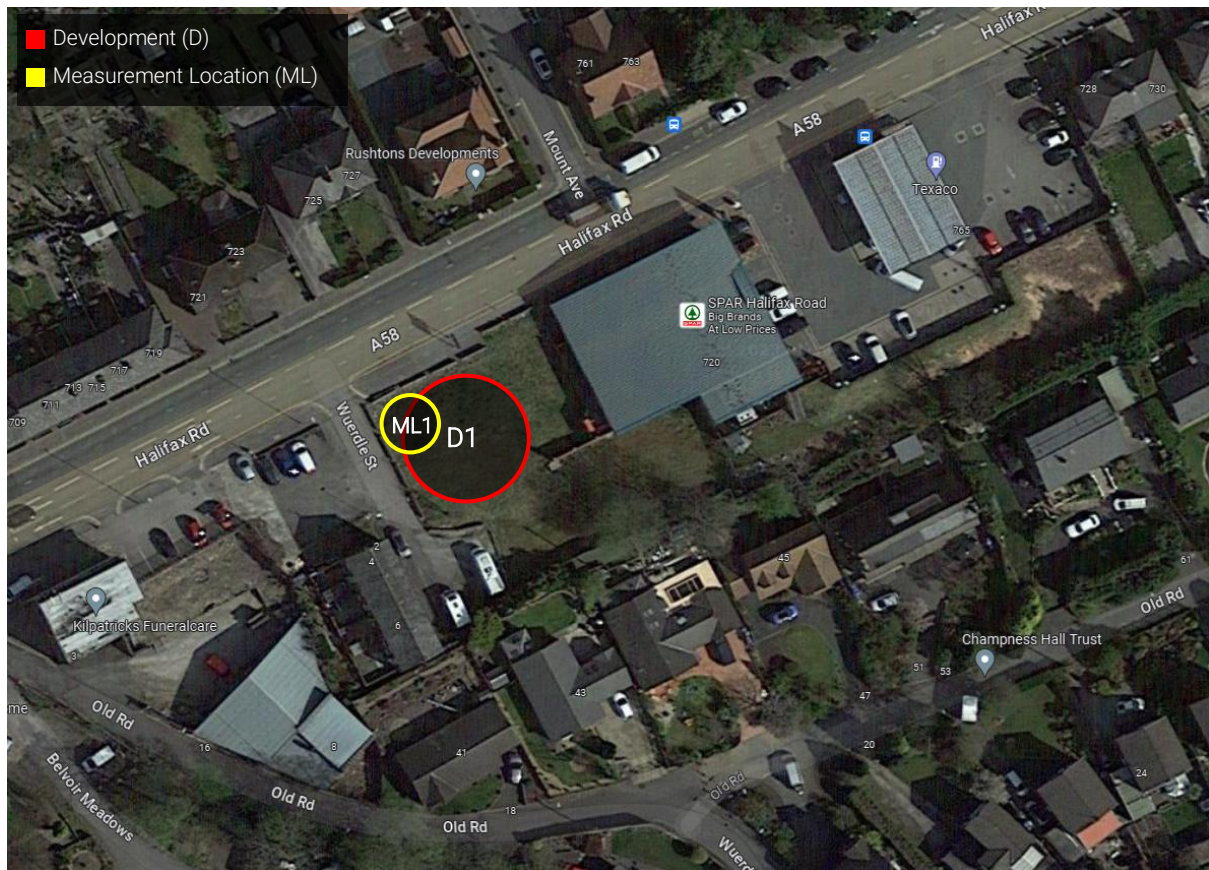


FIGURE 1 - LOCAL AREA MAP

The proposed layout of the new development is shown below in Figure 2.

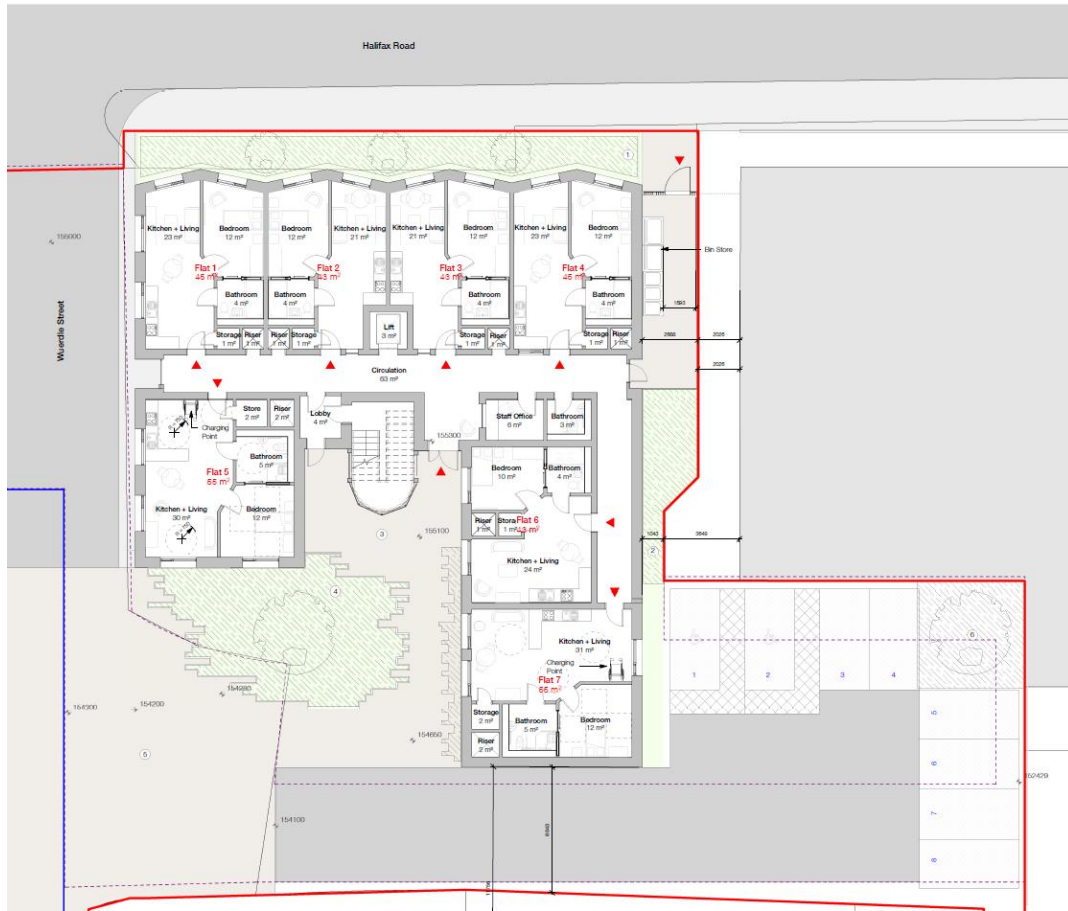


FIGURE 2 - PROPOSED D1 LAYOUT

5.2 NOISE SENSITIVE RECEPTOR LOCATION

In this case, the 17no. proposed residential dwellings are considered to be noise sensitive receptors (NSR(s)) and are detailed in Table 5 below.

NSR Reference	NSR Address	Distance to Development
NSR1	Plots 1-17, Halifax road, Littleborough	NA

TABLE 5 - NOISE SENSITIVE RECEPTOR DETAILS

5.3 MEASUREMENT LOCATIONS

Ambient sound level measurements detailed within this report were taken using an outdoor microphone. Microphone Location 1 (ML1) was located at the approximate position of the proposed front façade of the development. The microphone was located >3.5m from any vertical reflecting planes, at a height of 1.5m from the ground. It is expected that ambient sound levels from this measurement location are representative of the front façade of the proposed new dwellings.

This location gave a clear view of traffic travelling along Halifax Road and is considered to be representative of the proposed dwellings at the site. The measurements at this location will therefore allow for a robust noise assessment.

Location Reference	Location Description	Measured Values
ML1	Proposed D1 Front Façade	Ambient Sound Level

TABLE 6 - MEASUREMENT LOCATIONS

5.4 SUBJECTIVE APPRAISAL OF THE EXISTING ACOUSTIC ENVIRONMENT

During a site visit on Monday 30th October 2023 a subjective assessment of the existing acoustic environment was conducted by NCSL. At the noise sensitive receptor locations, the residual sound is dominated by noise from road traffic travelling along Halifax Road.

6 EXISTING NOISE SOURCES

Two main existing sources of noise have been identified in relation to this development. Further details of both are shown below.

6.1 ROAD TRAFFIC NOISE (S1)

The dominant source of noise at the proposed development site is road traffic along Halifax Road. This is a significant public highway carrying a 30mph speed limit.

Based upon observations made by NCSL during site visits, the road is also frequently used by HGVs and buses.

6.2 VENTILATION SYSTEM NOISE (S2)

The adjacent petrol station is open during daytime hours only (0700hrs to 2300hrs). The associated amenity building also incorporates a small convenience store (Spar) which requires refrigeration systems. External plant which services this ventilation system is located to the rear of the petrol station, approximately 17m from the East façade of the proposed development.

Acoustic measurements have been taken of this noise source, resulting in a level of 51dB(A) at 1m.

It is noted that during site visits by NCSL, no other significant sources of noise from the petrol station were present, and a high level of screening is provided between the forecourt and D1 by the main petrol station building. Furthermore, deliveries to the convenience store are made daily at approximately 1100hrs, therefore noise from at least one delivery is included within the ambient sound level survey detailed within this report.

7 EQUIPMENT & MEASUREMENT CONDITIONS

7.1 EQUIPMENT DETAILS

All measurements detailed within this report relating to the assessment of noise levels were made using a Class 1 NTi Audio XL2 sound level meter (serial number A2A-15792-E0). Field calibration of the meter was conducted using a Class 1 Brüel & Kjær Type 4230 94dB acoustic calibrator (serial number 1275784). Pre and post measurement sensitivity checks were conducted and showed no significant deviation to the nominal sound level meter sensitivity of 41.3mV/Pa or reference signal level. Details of these tests are documented in Table 7.

Test Reference	dB Level	Sensitivity	Comments
Pre-test calibration	93.9dB	41.3 mV/Pa	NA
Post-test check	93.9dB	41.3 mV/Pa	No significant variance

TABLE 7 - FIELD CALIBRATION DETAILS (S/N A2A-15792-E0)

All equipment is calibrated in accordance with IEC 61672-3, IEC 61260 and BS EN 60942:2003 where applicable. Calibration certificates are available upon request.

7.2 GROUND CONDITIONS

The ground was mostly dry throughout the survey period. Light rain was noted for a short period, however this is not expected to alter the findings of this assessment.

7.3 WEATHER CONDITIONS

Weather conditions during survey measurements were overcast with a short period of light rain.

Parameter	Survey Start	Survey End
Barometric Pressure	988 mBar	989 mBar
Temperature	11° Celsius	12° Celsius
Wind Velocity	2.6 ms ⁻¹	2.0 ms ⁻¹
Cloud Cover	100%	100%

TABLE 8 - ENVIRONMENTAL CONDITIONS

8 ACOUSTIC MEASUREMENTS & DEFINED SOUND LEVELS

8.1 AMBIENT SOUND LEVEL

The ambient sound level defines the total sound pressure level in a specific location at a specific time, generally composed of acoustic radiation from several sources. Measurements of ambient sound level take the form of an A-weighted equivalent continuous sound pressure level ($L_{Aeq,T}$). This metric logarithmically averages the observed sound level over the measurement period.

In the case of this noise assessment, the ambient sound level has been measured at ML1, allowing the quantification of the ambient sound level generated as a result of noise from all sources contributing to the acoustic environment at NSRs.

The ambient sound level has been measured as an equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$) logged at 15-minute intervals. These discrete logged values have been logarithmically averaged over a measurement time interval of 24hrs between 1200hrs Monday 30th October 2023 and 1200hrs Tuesday 31st October 2023.

The results of this ambient sound level survey are shown in Figures 3 & 4 and are summarised in Table 9.

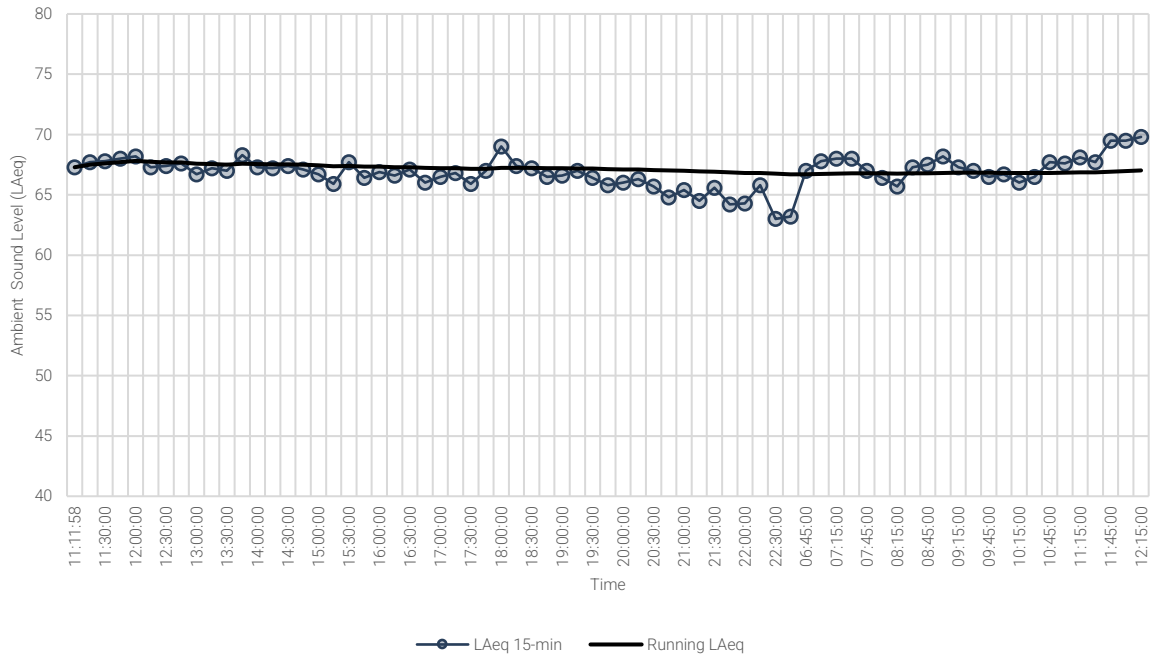


FIGURE 3 – ML1 DAYTIME AMBIENT SOUND LEVEL

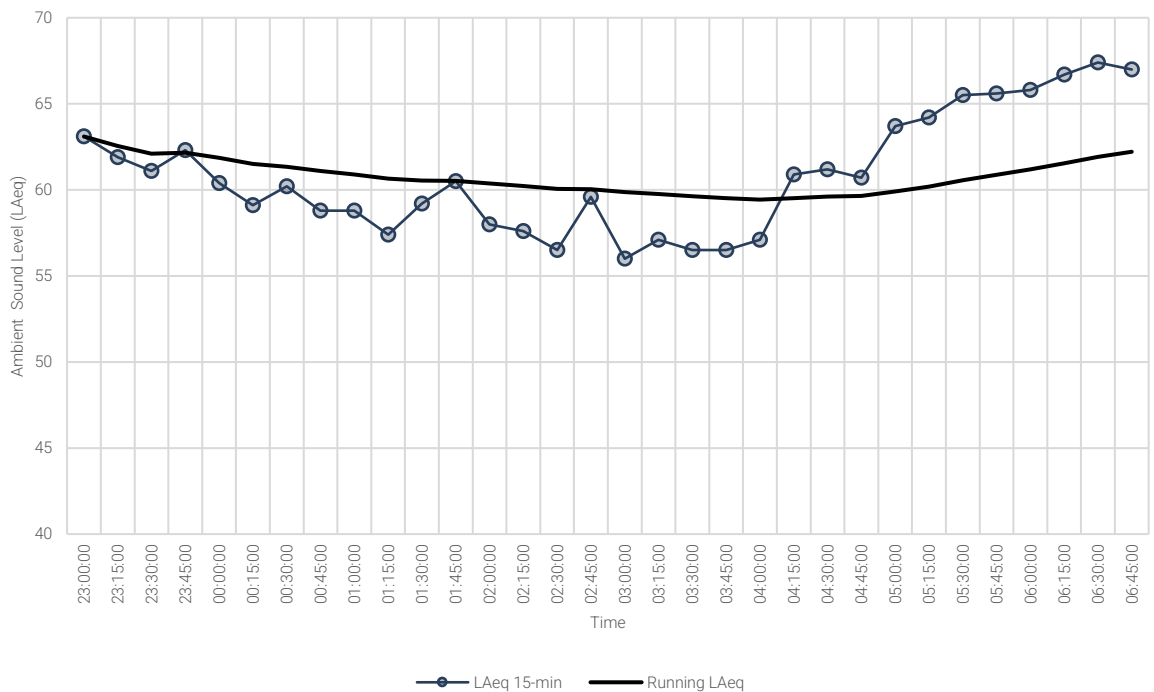


FIGURE 4 – ML1 NIGHT-TIME AMBIENT SOUND LEVEL

Time Period	Measurement Location	Ambient Sound Level (dB, L _{Aeq})
Day-Time	ML1	67dB
Night-Time	ML1	62dB

TABLE 9 - DEFINED SOUND LEVEL SUMMARY

In order to inform the calculation of glazing and ventilation to the proposed dwellings, the octave-band ambient sound level measured at ML1 during the daytime and night-time and night-time L_{AfMax} values are shown below in Table 10.

Location	Time Period	125Hz dB L _{Aeq}	250Hz dB L _{Aeq}	500Hz dB L _{Aeq}	1kHz dB L _{Aeq}	2kHz dB L _{Aeq}	SPL dB L _{Aeq}	L _{Af,Max} (10 th Highest)
ML1	Day	47.1	52.8	57.3	64.3	61.1	67	-
	Night	41	47	52	60	56	62	79

TABLE 10 - ONE-THIRD OCTAVE & LAFMAX AMBIENT SOUND LEVEL

These ambient sound levels are considered to be representative of the ambient sound level at D1 and have been used within this report.

Further details of the measured sound levels are shown in Appendix A attached to this report.

8.2 BACKGROUND SOUND LEVELS

The background sound level characterises the existing acoustic environment at a specific location.

Background sound level measurements have been taken simultaneously with the ambient sound level measurements in order to define the existing background sound level at the noise sensitive receptor location (NSR1).

These measurements were taken at ML1.

The background sound level has been measured as a 90th percentile sound pressure level ($L_{A90,T}$) logged at 15-minute measurement intervals. Following the methodology described in BS4142, the statistical mode of the night-time measurement values has been taken as the night-time background sound level. The statistical mode of the day-time measurement values has been taken as the day-time background sound level.

The results of this acoustic survey are shown in Figures 5 & 6 and the results are summarised in Table 11.

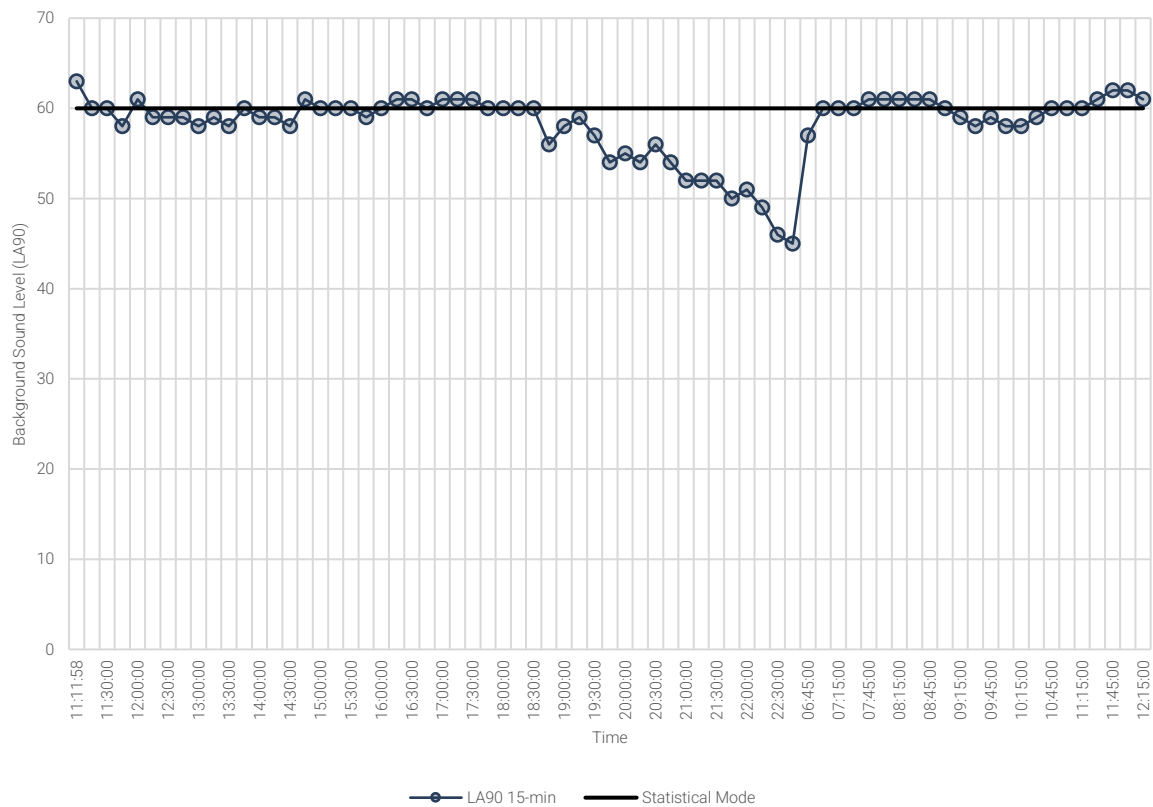


FIGURE 5 – DAY-TIME BACKGROUND SOUND LEVEL VALUES ($L_{A90,15MIN}$)

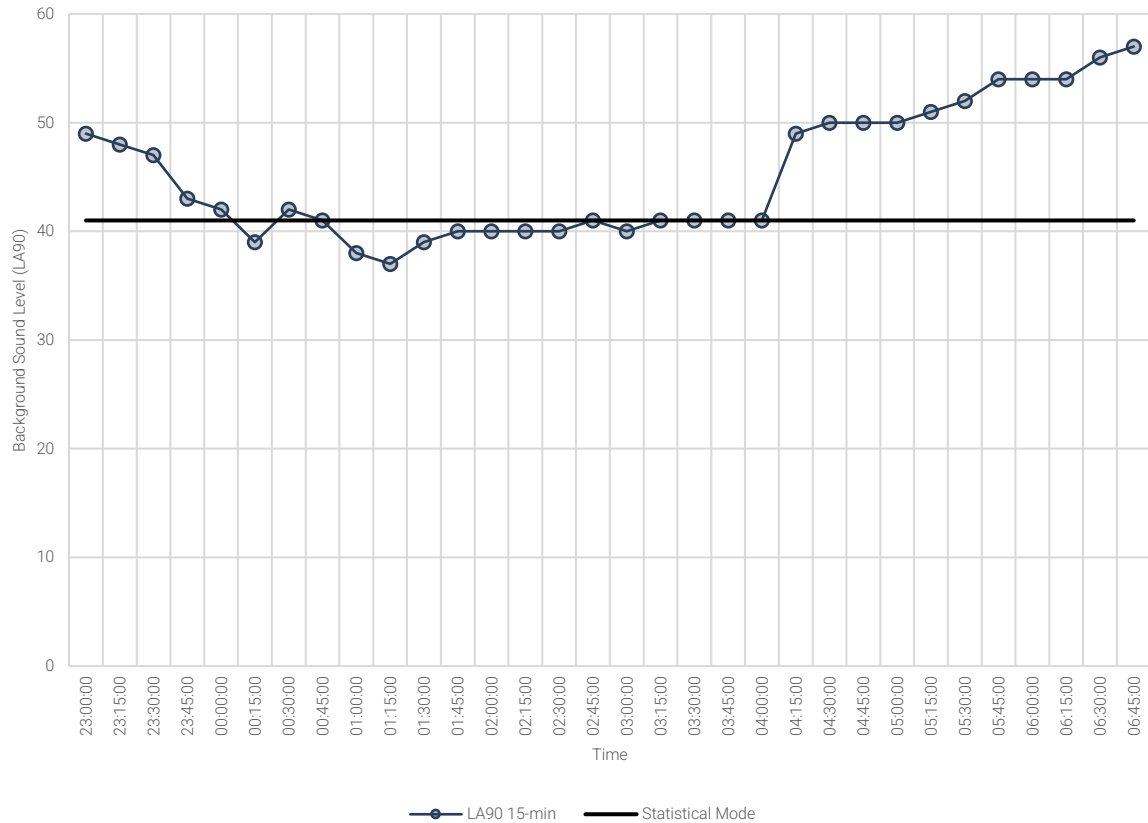


FIGURE 6 - NIGHT-TIME BACKGROUND SOUND LEVEL VALUES (LA90,15MIN)

Time Period	Measurement Location	Representative Receptor	Background Sound Level (dB LA90,T)
Day-Time	ML1	NSR1	60
Night-Time	ML1	NSR1	41

TABLE 11 - BACKGROUND SOUND LEVEL

These background sound levels are considered to be representative of the background sound level at NSR1 and have been used within this report.

Further details of the measured sound levels are shown in Appendix A attached to this report.

9 BS4142 NOISE IMPACT ASSESSMENT

As source reference S2 (ventilation system servicing adjacent petrol station & convenience store) falls within the scope of BS4142, a noise impact assessment to this standard has been undertaken.

As shown in Table 11, the background sound level has been measured to be 60dB L_{A90} during the day-time period and 41dB L_{A90} during the night-time period. It is noted that the specific noise from the HVAC system was inaudible at ML1 and is not expected to influence the measured background sound level.

However, to ensure a robust assessment, close-proximity acoustic measurements have been taken of this noise source, resulting in a measured specific sound level of 51dB(A) at 1m. This measurement data has been incorporated within a computer noise model generated within the sound propagation simulation software SoundPLAN 5.1. This allows for the specific sound level of this source to be calculated at the proposed development. Further details of this noise model are shown in Appendix B.

The calculated specific sound level at the East facade of D1 is 36dB(A). It is also noted that noise from this source is not tonal or impulsive, rather it is composed of broadband airflow noise which is well masked by the dominant road traffic noise.

As the acoustic characteristics of S2 are neither tonal nor impulsive, no penalties have been applied following the guidance provided within BS4142.

The defined sound levels are shown below in Table 12

Time Period	Source Reference	NSR	Specific Sound Level (dB, L_{Aeq})	Rating Level (dB)	Background Sound Level (dB, L_{A90})	Difference
Day-Time	S2	NSR1	36dB	36dB	60dB	-24dB
Night-Time	S2	NSR1	36dB	36dB	41dB	-5dB

TABLE 12 – DEFINED SOUND LEVELS

BS4142:2014 provides the following guidance on the expected impact to the local environment based upon rating levels:

- In instances where the rating level exceeds background noise level by +10dB, this is an indication of a significant adverse impact, depending upon the context.
- In instances where the rating level exceeds background noise level by +5dB, this is an indication of an adverse impact, depending upon the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will cause an adverse noise impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The assessment of a noise impact at a receptor should consider the context in which the sound occurs. BS4142:2014 states that the following factors be included in the context assessment.

- The absolute level of sound.
- The character and level of residual sound.
- The sensitivity of the receptor.

In this case, the delta between Rating Level and Background Sound Level is calculated at -24dB during the day-time period and -5dB during the night-time period.

Based upon the guidance from BS4142:2014, noise from S2 is considered to produce no adverse effect at NSR1 depending upon context.

9.1 CONTEXT ASSESSMENT

BS4142:2014 states:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs".

The first requirement of this statement has been determined within the noise impact assessment section above. To determine the context in which the industrial sound will reside, three factors must be considered, these are.

- *The absolute level of sound.*
- *The character and level of the residual sound compared to the character and level of the specific sound; and,*
- *The sensitivity of the receptor.*

9.1.1 ABSOLUTE LEVEL OF SOUND

To determine the first context test in BS4142 it is necessary to determine whether the residual and background sound levels are high or low. Section 11 of BS4142 states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse."

The rating level is calculated at 36 dB(A), and the worst-case (night-time) background sound level is measured at 41 dB(A) L_{A90} . These noise levels are relatively low.

Therefore, this is a positive indication that the noise impact from S2 will be low.

9.1.2 CHARACTER AND LEVEL OF RESIDUAL & SPECIFIC SOUND

The acoustic emission from S2 comprises broadband airflow noise which will be similar in character vehicle pass-by noise. this is a positive indication that the noise impact from S2 will be low.

9.1.3 SENSITIVITY OF RECEPTOR

With regard to pertinent factors to be taken into consideration in the context assessment, Section 11 of BS4142 states:

"The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i) facade insulation treatment.*
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- iii) acoustic screening."*

Based on the measured sound levels of road traffic noise mitigation measures will be required to achieve internal noise guideline levels. These mitigation measures will likely comprise acoustic ventilation and double glazing on the façade. These mitigation measures will also attenuate noise from S2. Therefore, it is expected that noise from this source will be effectively inaudible within the proposed dwelling, even with vents open for the purposes of ventilation.

This is a positive indication that the impact of noise from S2 will be low.

9.2 BS4142 ASSESSMENT SUMMARY

A BS4142 assessment has been undertaken to assess the potential noise impact from existing noise sourced upon the proposed development.

The assessment indicates that the noise associated with S2 will have a **low impact** at noise sensitive receptors.

The potential impacts are considered by NCSL to be no adverse effect at NSR1 and we would suggest that the application is recommended for approval in regards to BS4142.

10 NOISE IMPACT ASSESSMENT – INTERNAL NOISE

10.1 DAYTIME MEASURED NOISE LEVELS

The proposed development comprises 17no. residential dwellings. This assessment has shown that road traffic noise is the dominant source of noise at the development site. The measured noise levels at ML1 have been assessed over a period which includes the complete day-time and night-time periods.

The measured day-time sound levels measured at ML1 have been considered against the internal and external noise guideline levels stated within BS8233, which is the appropriate standard when assessing the potential impact of road traffic noise at proposed noise sensitive receptors.

10.1.2 NOISE IN LIVING ROOMS AND BEDROOMS DURING THE DAYTIME

The development includes living rooms and bedrooms which have windows overlooking Halifax Road at the front façade. The measured daytime ambient noise level at the façades of the building is 67dB $L_{Aeq,16hr}$. The internal noise guideline level for living rooms and bedrooms during the daytime is 35dB $L_{Aeq,16hr}$. The noise level incident upon other facades is expected to be lower.

The windows of the building are considered to be the weakest part of the façade, and a standard double-glazed window can provide between 30dB and 40dB attenuation when closed. However, adequate ventilation must be provided to habitable rooms which could be provided by an open window where an alternative is not provided.

An open window typically provides 13dB attenuation. With an open window for ventilation, the highest internal noise level in rooms overlooking Halifax Road could be up to 54dB(A) which would exceed the internal noise guideline level.

Therefore, mitigation measures to provide adequate glazing, and an alternative to an open window which provides up to 32dB attenuation is required. This will ensure that habitable rooms within the proposed development achieve internal noise guideline levels. Full details are discussed in Section 11 of this report.

10.2 NIGHT-TIME MEASURED NOISE LEVELS

10.2.1 NOISE IN BEDROOMS DURING THE NIGHT-TIME

The development includes living rooms and bedrooms which have windows overlooking Halifax Road at the front façade. The measured night-time ambient noise level at the façades of the building is 62dB $L_{Aeq,8hr}$, and 79dB $L_{Af,Max}$. The internal noise guideline level for bedrooms during the night-time is 30dB L_{Aeq} , and 45dB $L_{Af,Max}$. The noise level incident upon other facades is expected to be lower.

The windows of the building are considered to be the weakest part of the façade, and a standard double-glazed window can provide between 30 and 40dB attenuation when closed. However, adequate ventilation must be provided to habitable rooms which could be provided by an open window where an alternative is not provided.

An open window typically provides 13dB attenuation. With an open window for ventilation, the highest internal noise level in rooms overlooking Halifax Road could be up to 49dB L_{Aeq} , and 66dB $L_{Af,Max}$ which would exceed the internal noise guideline level.

Therefore, mitigation measures to provide adequate glazing, and an alternative to an open window which provides up to 34dB attenuation is required. This will ensure that habitable rooms within the proposed development achieve internal noise guideline levels. Full details are discussed in Section 11 of this report.

10.3 INTERNAL NOISE IMPACT ASSESSMENT SUMMARY

The noise level incident on each façade will vary depending on the floor level and façade facing. Furthermore, the noise level incident at the façade should be considered in octave band levels. A full assessment of the noise level, which is incident on each façade, for each room, is shown in Appendix C, along with the specific mitigation requirements for the development. Proposed mitigation measures are defined within Section 11 of this report.

11 PROPOSED MITIGATION MEASURES

The proposed development comprises 17no. residential dwellings. As the bedrooms incorporate various window and external wall sizes, the amount of noise attenuation provided by the complete façade construction will vary.

Based upon the results of the ambient sound level survey, it is expected that the front (North) façade of the development is subject to higher noise levels relative to the other façades. This is likely due to the proximity to vehicle traffic along Halifax Road. Rooms located on the front façade will therefore require a higher level of sound insulation. The noise incident upon the East, South and West facades has been calculated with the use of a computer noise model generated within SoundPLAN Essentials 5.1, as discussed in Section 9.

The noise mitigation measures are based upon commonly used products and materials and are shown in this report as examples. Alternatives to the recommended products may be used, however, any alternatives must meet with, or exceed the sound attenuation requirements of those used within this assessment. The minimum product performance is shown within the noise break-in calculations contained within Appendix C.

The calculated internal noise levels within each room with the recommended glazing and ventilation measures are shown in Tables 13, 14 & 15. These calculations follow the methodology outlined within BS8233, with the use of octave-band measurement values considered against the sound insulation of the building façade.

Ref.	Plot Reference	Room Reference	Predicted Internal Noise Levels			Mitigation Requirements	
			Daytime L _{Aeq}	Night-Time L _{Aeq}	Night-Time L _{AMax}	Vents	Glazing
1	Flat 1	Living / Kitchen	30	25	39	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
2	Flat 1	Bedroom	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
3	Flat 2	Bedroom	30	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
4	Flat 2	Living / Kitchen	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
5	Flat 3	Living / Kitchen	30	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
6	Flat 3	Bedroom	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
7	Flat 4	Living / Kitchen	30	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
8	Flat 4	Bedroom	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
9	Flat 8	Living / Kitchen	30	25	39	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
10	Flat 8	Bedroom	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
11	Flat 9	Bedroom	30	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
12	Flat 9	Living / Kitchen	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
13	Flat 10	Living / Kitchen	30	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
14	Flat 10	Bedroom	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
15	Flat 11	Living / Kitchen	30	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
16	Flat 11	Bedroom	33	28	42	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
17	Flat 15	Living / Kitchen	29	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
18	Flat 15	Bedroom	34	29	43	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
19	Flat 16	Bedroom	32	27	41	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
20	Flat 16	Living / Kitchen	29	23	37	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
21	Flat 17	Bedroom	34	29	43	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)
22	Flat 17	Living / Kitchen	29	24	38	AT_Greenwood 5000EAW.AC1	AT_Pilkington Optiphon (6/6-20/6.8mm)

TABLE 13 - MITIGATION REQUIREMENTS - FRONT (NW) FACADE

For rooms on the front (North-West) façade, acoustic double glazing (4mm/6-12mm/4mm) is recommended together with an acoustic trickle vent system, enabling windows to be closed in order to meet the required internal noise levels while providing ventilation.

Ref.	Plot Reference	Room Reference	Predicted Internal Noise Levels			Mitigation Requirements	
			Daytime L _{Aeq}	Night-Time L _{Aeq}	Night-Time L _{AMax}	Vents	Glazing
23	Flat 5	Living / Kitchen	30	25	38	AT_Greenwood 5000EAW.AC1	4/6-12/4 (Pilkington)
24	Flat 12	Living / Kitchen	30	25	38	AT_Greenwood 5000EAW.AC1	4/6-12/4 (Pilkington)

TABLE 14 - MITIGATION REQUIREMENTS - SIDE (NE/SW) FACADE

For rooms on the side (North-East / South-West) façades, standard double glazing (4mm/6-12mm/4mm) is recommended with an acoustic trickle vent system, enabling windows to be closed in order to meet the required internal noise levels while providing ventilation.

Ref.	Plot Reference	Room Reference	Predicted Internal Noise Levels			Mitigation Requirements	
			Daytime L _{Aeq}	Night-Time L _{Aeq}	Night-Time L _{AMax}	Vents	Glazing
25	Flat 5	Bedroom	27	22	39	No Vent	Open window
26	Flat 6	Bedroom	26	21	37	No Vent	Open window
27	Flat 6	Living / Kitchen	24	19	35	No Vent	Open window
28	Flat 7	Living / Kitchen	24	20	36	No Vent	Open window
29	Flat 12	Bedroom	27	22	39	No Vent	Open window
30	Flat 13	Bedroom	26	21	37	No Vent	Open window
31	Flat 13	Living / Kitchen	24	19	35	No Vent	Open window
32	Flat 14	Living / Kitchen	24	20	36	No Vent	Open window

TABLE 15 - MITIGATION REQUIREMENTS – REAR (SE) FACADE

For rooms on the Rear (South-East) façade, standard double glazing (4mm/6-12mm/4mm) is recommended with ventilation provided by open windows.

This assessment has shown that the internal noise levels defined within BS8233 are likely to be met with the installation of the glazing and ventilation specifications set out in Tables 13, 14 and 15 and/or the minimum product performance detailed within Appendix C.

12 CONCLUSIONS

Noise Control Solutions Limited (NCSL) have been commissioned by PossAbilities CIC to undertake a noise impact assessment for the proposed development at Halifax Road, Littleborough, OL16 2SQ. The assessment is required in order to accompany the relevant planning application which is to be considered by Rochdale Borough Council. The scope of this application is the development of 17no. residential apartments.

In order to assess the expected noise impact for future residents of the development, an environmental noise impact assessment has been conducted with subsequent recommendations in terms of acoustic specification of glazing and ventilation measures, details of which are shown within this report.

The assessment of noise at the development site relies upon measured noise levels taken between Monday 30th October 2023 and Tuesday 31st October 2023. The noise assessment shows that road traffic is the main sources of noise at the development site, especially at the front (North-East) façade. The measured on-site noise levels have been assessed and calculated in accordance with BS8233.

For rooms on the front façade, acoustic glazing is recommended together with an acoustic trickle vent system, enabling windows to be closed in order to meet the required internal noise levels while providing ventilation. Additional ventilation may be required to mitigate the possibility of overheating – however this should be assessed by a suitable ventilation consultant.

For rooms on the side façades, standard 4/12/4 glazing is recommended, together with an acoustic trickle vent system, enabling windows to be closed in order to meet the required internal noise levels while providing ventilation. Additional ventilation may be required to mitigate the possibility of overheating – however this should be assessed by a suitable ventilation consultant.

For rooms on the rear façade, standard 4/12/4 glazing is recommended, and it is expected that adequate noise levels can be met with the use of open windows to provide ventilation. However, should the client wish to further improve the acoustic comfort of future residents, acoustic trickle ventilation could also be used.

These mitigation measures are expected to allow the internal noise guideline levels to be met during the daytime and night-time in habitable rooms.

The suggested methodologies have been provided in terms of acoustics only, and in good faith. All suggested construction principles must be checked in terms of fire separation, structural integrity, ventilation, overheating, etc.

Where the recommendations stated in this report are followed, the internal acoustic environment, in terms of the internal noise level, is expected to meet with the requirements of BS8233.

In addition, the adjacent petrol station ventilation system is served by external plant (S2). As this falls within the scope of BS4142, a noise impact assessment to this standard has also been conducted. This results in a delta between background sound level and rating level of -24dB during the daytime and -5dB during the night-time period.

The findings of this assessment demonstrate that S2 is unlikely to cause any adverse acoustic effect at NSR1 based upon a difference between background sound level and rating level of -24dB during the day-time period and -5dB during the night-time period when calculated in accordance with BS4142.

Based upon the findings of this assessment, it is the recommendation of NCSL that the planning application is approved regarding noise impact.

13 UNCERTAINTY

All measurements within this report have been taken under repeatable conditions and therefore any uncertainty in the result will be low.

To reduce measurement uncertainty, the following steps have been taken.

- The results of each measurement period were reported to the nearest 0.1dB.
- Noise measurements were made using one Class 1, integrating sound level meter.

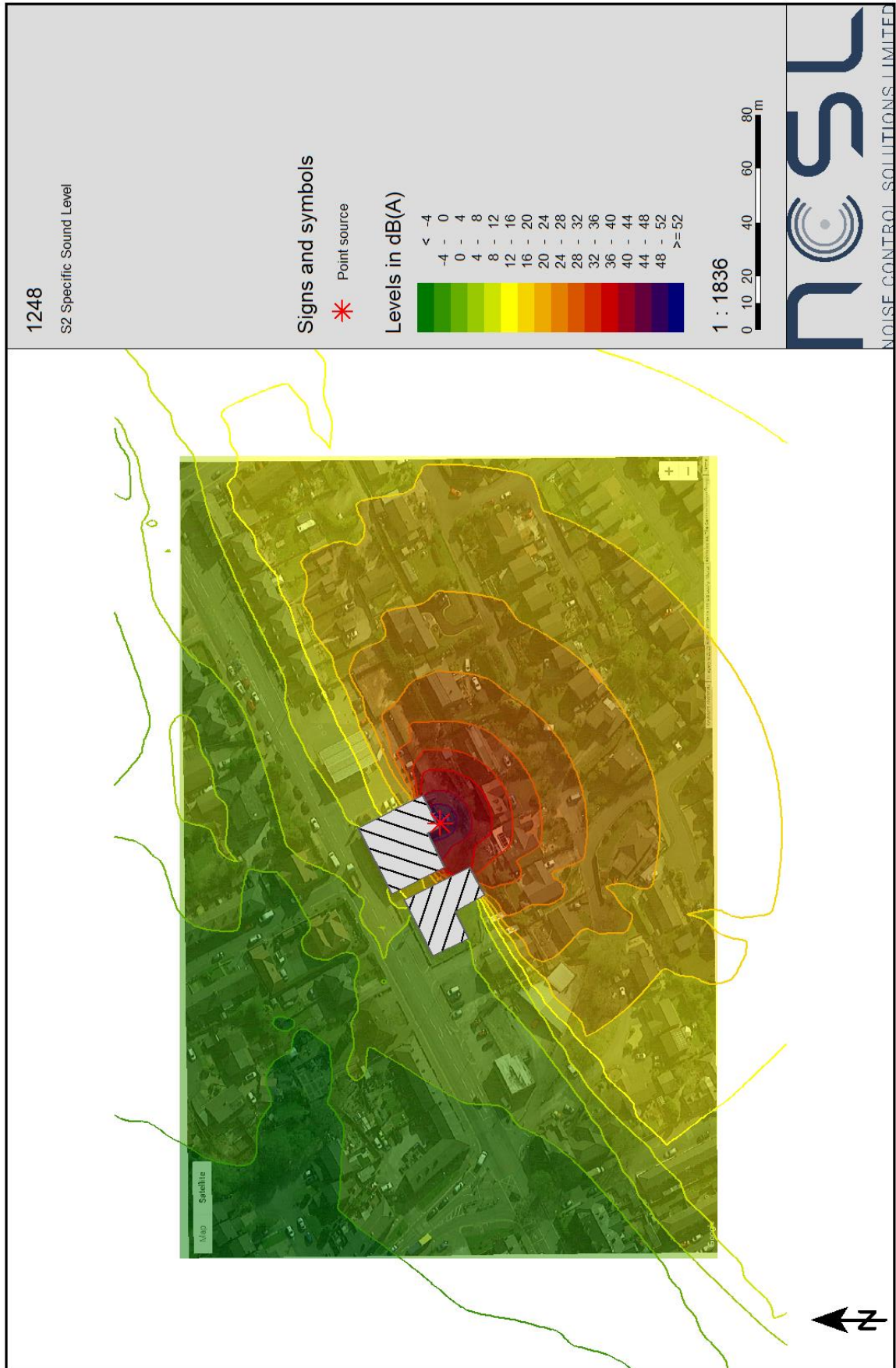
All noise impact assessments and similar acoustic assessments inherently rely upon estimations and assumptions. This report should therefore be considered within this context.

APPENDIX A: ACOUSTIC SURVEY DATA

Time	LAeq	LAF90.0%	LAF10.0%	LAFmax	LAFmin	LZeq	LCeq
11:15:00	67.3	63.2	69.9	76.1	59	81.9	74.8
11:30:00	67.7	60.4	70.8	86.5	49.2	85.4	75.6
11:45:00	67.8	59.8	70.9	78.3	51.8	80.8	73.5
12:00:00	68	57.9	71.6	77.6	50.2	79.4	73.6
12:15:00	68.2	60.8	71	76.3	50.9	82.2	73.8
12:30:00	67.3	58.7	70.7	78.8	52.3	83	74.2
12:45:00	67.4	59.2	70.5	77	51.2	80.4	73.2
13:00:00	67.6	59.4	70.5	80.1	51.3	79.7	73.6
13:15:00	66.7	58.1	69.9	74.8	47.1	81.4	73.8
13:30:00	67.2	58.8	70.6	77.7	50.3	81.7	73.7
13:45:00	67	58.1	70.3	78.3	50.6	79.5	73.1
14:00:00	68.3	60.1	71.3	80.1	48.7	78.5	73.3
14:15:00	67.3	58.8	70.3	76.8	53	80.4	73.7
14:30:00	67.2	58.5	70.5	75	50.8	81.5	74
14:45:00	67.4	57.8	70.4	85.6	49.6	80.4	74.2
15:00:00	67.1	60.8	70	76.6	54.9	81.7	74.5
15:15:00	66.7	60	69.8	74.2	50.4	80.5	73.4
15:30:00	65.9	60.4	68.5	77.9	51.8	80.6	74.6
15:45:00	67.7	60.3	69.1	90.5	53.1	81.4	74.5
16:00:00	66.4	59.2	69	79.8	49.3	79.6	73.4
16:15:00	66.9	60.4	69.8	77.4	50.7	79.1	73
16:30:00	66.6	60.5	69.1	76.3	50	81.4	74.2
16:45:00	67.1	60.6	69.9	82.9	50.8	85.2	75.5
17:00:00	66	60	68.7	75.8	54	84.1	74.6
17:15:00	66.5	60.5	69.3	82.1	52.6	79	74.2
17:30:00	66.8	61.4	69.6	74.3	49	82.9	74.5
17:45:00	65.9	60.7	68.4	74.3	53.7	83.5	74.4
18:00:00	67	60.1	70	73.9	51.4	81.1	74.4
18:15:00	69	60	70.8	85.9	51.6	81	73.5
18:30:00	67.4	60.1	70.2	82.2	49.5	84	74.3
18:45:00	67.2	59.5	70.4	76.2	51	81.4	73.5
19:00:00	66.5	56.1	70.1	74.2	50.1	80.5	72.2
19:15:00	66.6	58.3	70.1	75.3	47.5	77.6	72.6
19:30:00	67	58.7	70	82	50	80.2	73.1
19:45:00	66.4	57.4	69.8	76.9	49.6	79.7	71.8
20:00:00	65.8	54	69.3	80.7	45.2	82.3	72.7
20:15:00	66	55.1	69.8	75.8	49.5	81.4	72.3
20:30:00	66.3	53.7	70	75.8	48	77.5	72.1
20:45:00	65.7	55.5	69.1	73.7	49.2	77	70.9
21:00:00	64.8	53.5	68.7	74.9	47	79.6	70.4

21:15:00	65.4	52.1	69.2	79.3	42.9	77	70.4
21:30:00	64.5	51.5	68.3	80.1	43	78.6	70.5
21:45:00	65.6	51.5	69.4	77.3	46.2	80.3	71
22:00:00	64.2	50.4	68.2	75.5	44.3	77.6	68.9
22:15:00	64.3	50.5	68.3	75.9	45.9	77.2	69
22:30:00	65.8	49	69.6	81.4	43	79.1	71.4
22:45:00	63	45.9	67.7	77.8	40	79.9	69.6
23:00:00	63.2	45.1	67.7	75.7	38.1	80.3	69.4
23:15:00	63.1	49.4	67.5	77.1	46.5	81.5	70.7
23:30:00	61.9	47.8	66.4	77.2	45.3	80.6	69.8
23:45:00	61.1	46.7	65.8	76.5	42.4	80.4	69.2
00:00:00	62.3	42.7	66.8	77.1	36.6	82.9	70.4
00:15:00	60.4	42.4	64.5	79.7	37.2	80.7	68.5
00:30:00	59.1	39	63.8	74.3	35.3	81.4	69.6
00:45:00	60.2	41.5	64.2	78.5	37.2	81	68.3
01:00:00	58.8	40.5	62.4	77.8	37.2	82.9	69.8
01:15:00	58.8	37.7	62.9	76.2	35.1	82.1	69.4
01:30:00	57.4	37.3	62.4	71.5	34.4	80.8	67.7
01:45:00	59.2	38.9	63.3	76.7	36.1	77.4	65.7
02:00:00	60.5	39.5	59.4	83.2	36.7	84	71
02:15:00	58	39.7	62.7	72.3	36.8	83.6	70.1
02:30:00	57.6	40	60.3	73	37.5	85.3	71.6
02:45:00	56.5	39.9	57	72.5	38.1	82.5	69
03:00:00	59.6	40.9	54.8	82.6	38.1	82.7	69.5
03:15:00	56	39.8	55.6	73.4	37.8	81.4	68.1
03:30:00	57.1	41.1	57.7	74.1	39.3	79.5	66.8
03:45:00	56.5	40.8	58.2	72.2	39	82	68.8
04:00:00	56.5	40.9	57	74.3	39.5	82	68.6
04:15:00	57.1	41.4	59.2	73.2	38.8	80.7	67.8
04:30:00	60.9	49.2	64.5	78.3	47.1	82.1	69.6
04:45:00	61.2	50.4	65.5	74.5	48.1	83.8	71.4
05:00:00	60.7	49.7	65.1	74.9	47.9	82.7	70.2
05:15:00	63.7	49.7	67.7	79.6	47	82.8	71
05:30:00	64.2	51.3	68.6	77	47.7	82.8	71.6
05:45:00	65.5	52.2	69.5	79	45.4	85.3	73.4
06:00:00	65.6	53.9	69.4	77.5	48.2	82	71.5
06:15:00	65.8	53.5	69.6	79.1	47.1	81.8	71.7
06:30:00	66.7	53.7	70.8	77.7	49.1	82.3	72.8
06:45:00	67.4	55.7	70.9	78.2	49	80.9	72.5
07:00:00	67	56.8	70.4	76.9	49.6	80.4	72.7
07:15:00	67.8	59.8	71.1	75.8	51.7	77.4	73.7
07:30:00	68	60.4	71	76.1	52.3	79.9	74.9
07:45:00	68	59.7	70.8	75.6	52	76.8	73.8
08:00:00	67	60.5	69.9	79.7	55.3	76.2	73.9
08:15:00	66.4	61.3	68.4	87.9	54.8	78.8	75

08:30:00	65.7	60.7	68.5	78.3	57.1	80.2	75.6
08:45:00	67.3	61.3	69.8	87.3	55.2	78.4	74.8
09:00:00	67.5	60.9	70.6	76.8	52.6	78.6	74
09:15:00	68.2	59.9	70.1	84.3	55.3	80	76
09:30:00	67.3	59.3	70.3	77	52.2	77.4	73.4
09:45:00	67	57.5	70.4	78.1	49.6	75.1	72.6
10:00:00	66.5	59.3	69.5	81.9	51.9	78.8	73.2
10:15:00	66.7	57.9	70	83.8	50.2	76.3	72.8
10:30:00	66	57.5	69.2	76.9	50.9	77.5	71.8
10:45:00	66.5	59.1	69.5	79.5	52.5	76.3	72.9
11:00:00	67.7	60.3	71	81.3	48.1	77.4	73.4
11:15:00	67.6	59.5	70.8	76.1	51.8	77.6	73
11:30:00	68.1	60.2	70.9	86	51	77.7	73.6
11:45:00	67.7	61.1	70.8	77.9	56.5	76.9	73.6
12:00:00	69.5	61.7	72.6	79.7	53.9	78	73.8
12:15:00	69.5	61.9	72.7	78.4	52.8	76.9	73.6
12:26:47	69.8	60.5	73.3	81.7	49.9	77.3	74.2



APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 1
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	30.75
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,fr} Daytime							
External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime							
External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,fr} Night-time							
External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time							
External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e}							
Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A(-D_{n,e})/10}	B	0.00004	0.00004	0.00025	0.00001	0.00001	-
R_{wi}							
Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A(-R_{wi})/10}	C	0.00054	0.00043	0.00004	0.00001	0.00001	-
R_{ew}							
Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A(-R_{ew})/10}	D	0.00018	0.00006	0.00001	0.00000	0.00000	-
R_{rr}							
Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A(-R_{rr})/10}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-31.2	-32.8	-35.2	-47.0	-46.9	-
A							
Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	1.1	1.1	1.1	1.1	1.1	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
Rw							
Sound reduction of complete partition	H	-	-	-	-	-	43
L_{Aeq} Daytime	A_n+F+G+3+A_{weight}	20.0	24.1	26.1	21.4	18.3	30
L_{AMax} Daytime	A_n+F+G+3+A_{weight}	-27.1	-28.7	-31.2	-42.9	-42.8	-24
L_{Aeq} Night-time	A_n+F+G+3+A_{weight}	14.1	18.2	21.0	16.8	13.5	25
L_{AMax} Night-time	A_n+F+G+3+A_{weight}	24.5	30.2	33.7	33.2	31.5	39

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 1
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n-D_{n,e}/10}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n-R_{wi}/10}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n-R_{ew}/10}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n-R_{rr}/10}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	-1.6	-1.6	-1.6	-1.6	-1.6	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	26.9	29.2	24.4	21.3	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-25.9	-28.1	-39.9	-39.8	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	21.0	24.1	19.8	16.5	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	33.0	36.8	36.2	34.5	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 2
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	-4.8	-4.8	-4.8	-4.8	-4.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	19.0	23.7	26.1	21.2	18.2	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-28.1	-29.1	-31.2	-43.1	-42.9	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.1	17.8	21.0	16.6	13.4	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	23.5	29.8	33.7	33.0	31.4	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 2
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	-1.6	-1.6	-1.6	-1.6	-1.6	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	26.9	29.2	24.4	21.3	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-25.9	-28.1	-39.9	-39.8	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	21.0	24.1	19.8	16.5	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	33.0	36.8	36.2	34.5	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 3
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	-4.8	-4.8	-4.8	-4.8	-4.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	19.0	23.7	26.1	21.2	18.2	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-28.1	-29.1	-31.2	-43.1	-42.9	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.1	17.8	21.0	16.6	13.4	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	23.5	29.8	33.7	33.0	31.4	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 3
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	-1.6	-1.6	-1.6	-1.6	-1.6	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	26.9	29.2	24.4	21.3	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-25.9	-28.1	-39.9	-39.8	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	21.0	24.1	19.8	16.5	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	33.0	36.8	36.2	34.5	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 4
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	-4.8	-4.8	-4.8	-4.8	-4.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	19.0	23.7	26.1	21.2	18.2	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-28.1	-29.1	-31.2	-43.1	-42.9	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.1	17.8	21.0	16.6	13.4	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	23.5	29.8	33.7	33.0	31.4	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 4
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	18.75
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00006	0.00006	0.00039	0.00002	0.00002	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00084	0.00066	0.00007	0.00001	0.00001	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00017	0.00005	0.00001	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-29.8	-31.1	-33.4	-45.2	-45.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	2.4	2.4	2.4	2.4	2.4	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.7	27.1	29.3	24.5	21.4	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.4	-25.7	-28.0	-39.8	-39.7	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.8	21.2	24.2	19.9	16.6	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	27.2	33.2	36.9	36.3	34.6	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 8
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	30.75
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00004	0.00004	0.00025	0.00001	0.00001	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00054	0.00043	0.00004	0.00001	0.00001	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00018	0.00006	0.00001	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-31.2	-32.8	-35.2	-47.0	-46.9	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	1.1	1.1	1.1	1.1	1.1	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	20.0	24.1	26.1	21.4	18.3	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-27.1	-28.7	-31.2	-42.9	-42.8	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	14.1	18.2	21.0	16.8	13.5	25
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	24.5	30.2	33.7	33.2	31.5	39

APPENDIX C

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 8
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	-1.6	-1.6	-1.6	-1.6	-1.6	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	26.9	29.2	24.4	21.3	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-25.9	-28.1	-39.9	-39.8	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	21.0	24.1	19.8	16.5	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	33.0	36.8	36.2	34.5	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 9
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	-4.8	-4.8	-4.8	-4.8	-4.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	19.0	23.7	26.1	21.2	18.2	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-28.1	-29.1	-31.2	-43.1	-42.9	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.1	17.8	21.0	16.6	13.4	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	23.5	29.8	33.7	33.0	31.4	38

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 9
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	-1.6	-1.6	-1.6	-1.6	-1.6	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	26.9	29.2	24.4	21.3	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-25.9	-28.1	-39.9	-39.8	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	21.0	24.1	19.8	16.5	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	33.0	36.8	36.2	34.5	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 10
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	-4.8	-4.8	-4.8	-4.8	-4.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	19.0	23.7	26.1	21.2	18.2	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-28.1	-29.1	-31.2	-43.1	-42.9	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.1	17.8	21.0	16.6	13.4	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	23.5	29.8	33.7	33.0	31.4	38

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 10
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	-1.6	-1.6	-1.6	-1.6	-1.6	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	26.9	29.2	24.4	21.3	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-25.9	-28.1	-39.9	-39.8	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	21.0	24.1	19.8	16.5	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	33.0	36.8	36.2	34.5	42

APPENDIX C

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 11
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	3.5
Width (m)	8
Height (m)	3
Surface Area (m ²)	125
Volume (m ³)	84
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5.25
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00014	0.00016	0.00097	0.00005	0.00006	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00209	0.00166	0.00017	0.00003	0.00002	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00012	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.3	-27.3	-29.4	-41.3	-41.1	-
A Room Absorption (m ²)	-	27.0	27.0	27.0	27.0	27.0	-
10*log(S/A)	G	-4.8	-4.8	-4.8	-4.8	-4.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	19.0	23.7	26.1	21.2	18.2	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-28.1	-29.1	-31.2	-43.1	-42.9	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.1	17.8	21.0	16.6	13.4	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	23.5	29.8	33.7	33.0	31.4	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 11
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	18.75
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	3.75
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00006	0.00006	0.00039	0.00002	0.00002	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00084	0.00066	0.00007	0.00001	0.00001	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00017	0.00005	0.00001	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-29.8	-31.1	-33.4	-45.2	-45.1	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	2.4	2.4	2.4	2.4	2.4	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.7	27.1	29.3	24.5	21.4	33
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.4	-25.7	-28.0	-39.8	-39.7	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.8	21.2	24.2	19.9	16.6	28
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	27.2	33.2	36.9	36.3	34.6	42

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 15
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	4
Width (m)	8
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	34.5
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	1.5
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	32

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00002	0.00002	0.00013	0.00001	0.00001	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00011	0.00009	0.00001	0.00000	0.00000	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00010	0.00003	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00037	0.00002	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-32.2	-37.8	-38.4	-50.3	-50.0	-
A Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	3.4	3.4	3.4	3.4	3.4	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	21.3	21.4	25.3	20.4	17.5	29
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-25.8	-31.4	-32.0	-43.9	-43.6	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	15.4	15.5	20.2	15.8	12.7	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	25.8	27.5	32.9	32.2	30.7	38

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 15
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	4
Width (m)	2
Height (m)	3
Surface Area (m ²)	52
Volume (m ³)	24
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	6.5
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	1
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	8

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00008	0.00009	0.00056	0.00003	0.00003	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00032	0.00026	0.00003	0.00000	0.00000	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00008	0.00003	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00041	0.00003	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-30.5	-34.0	-32.3	-44.8	-44.3	-
A Room Absorption (m ²)	-	7.7	7.7	7.7	7.7	7.7	-
10*log(S/A)	G	3.0	3.0	3.0	3.0	3.0	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.7	24.9	31.1	25.5	22.8	34
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.4	-27.9	-26.2	-38.8	-38.3	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.8	19.0	26.0	20.9	18.0	29
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	27.2	31.0	38.7	37.3	36.0	43

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 16
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	3
Width (m)	4.5
Height (m)	3
Surface Area (m ²)	72
Volume (m ³)	40.5
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	7.5
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	1.5
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	13.5

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00006	0.00006	0.00039	0.00002	0.00002	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00033	0.00027	0.00003	0.00000	0.00000	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00007	0.00002	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00048	0.00003	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-30.3	-34.2	-33.7	-46.0	-45.6	-
A Room Absorption (m ²)	-	13.0	13.0	13.0	13.0	13.0	-
10*log(S/A)	G	2.4	2.4	2.4	2.4	2.4	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.2	24.0	28.9	23.6	20.8	32
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.9	-28.8	-28.4	-40.7	-40.3	-22
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.3	18.1	23.8	19.0	16.0	27
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	26.7	30.1	36.5	35.4	34.0	41

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 16
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	4
Width (m)	8
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	7.5
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	1.5
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	32

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00003	0.00004	0.00021	0.00001	0.00001	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00018	0.00015	0.00001	0.00000	0.00000	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00004	0.00001	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00062	0.00004	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-30.6	-36.4	-36.3	-48.3	-47.9	-
A Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	1.2	1.2	1.2	1.2	1.2	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	20.7	20.7	25.3	20.2	17.4	29
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-26.4	-32.1	-32.0	-44.1	-43.7	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	14.8	14.8	20.2	15.6	12.6	23
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	25.2	26.8	32.9	32.0	30.6	37

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 17
Room Reference:	Bedroom
Façade Reference:	N

Room Details	
Length (m)	4
Width (m)	2
Height (m)	3
Surface Area (m ²)	52
Volume (m ³)	24
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	6.5
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	1
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	8

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00008	0.00009	0.00056	0.00003	0.00003	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00032	0.00026	0.00003	0.00000	0.00000	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00008	0.00003	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00041	0.00003	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-30.5	-34.0	-32.3	-44.8	-44.3	-
A Room Absorption (m ²)	-	7.7	7.7	7.7	7.7	7.7	-
10*log(S/A)	G	3.0	3.0	3.0	3.0	3.0	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	22.7	24.9	31.1	25.5	22.8	34
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-24.4	-27.9	-26.2	-38.8	-38.3	-21
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.8	19.0	26.0	20.9	18.0	29
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	27.2	31.0	38.7	37.3	36.0	43

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FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 17
Room Reference:	Living / Kitchen
Façade Reference:	N

Room Details	
Length (m)	4
Width (m)	8
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	34.5
Glazing Specification:	AT_Pilkington Optiphon (6/6-20/6.8mm)	Area:	1.5
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	32

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	63.2	61.4	60.5	64.3	59.9	69.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	57.3	55.5	55.4	59.7	55.1	64.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	67.7	67.5	68.1	76.1	73.1	79.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00002	0.00002	0.00013	0.00001	0.00001	-
R_{wi} Sound reduction of window	-	23	24	34	42	43	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00011	0.00009	0.00001	0.00000	0.00000	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00010	0.00003	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00037	0.00002	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-32.2	-37.8	-38.4	-50.3	-50.0	-
A Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	3.4	3.4	3.4	3.4	3.4	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	21.3	21.4	25.3	20.4	17.5	29
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-25.8	-31.4	-32.0	-43.9	-43.6	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	15.4	15.5	20.2	15.8	12.7	24
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	25.8	27.5	32.9	32.2	30.7	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 5
Room Reference:	Living / Kitchen
Façade Reference:	W

Room Details	
Length (m)	8
Width (m)	4
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	18
Glazing Specification:	4/6-12/4 (Pilkington)	Area:	6
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,fr} Daytime							
External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	58.2	56.4	55.5	59.3	54.9	64.2
L_{Max,ff} Daytime							
External noise level (free-field), dB(Z)	A_{day,Max,Ext}	11.1	3.6	-1.8	-5.0	-6.2	12.1
L_{eq,fr} Night-time							
External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	52.3	50.5	50.4	54.7	50.1	59.0
L_{Max,ff} Night-time							
External noise level (free-field), dB(Z)	A_{night,Max,Ext}	62.7	62.5	63.1	71.1	68.1	74.0
D_{n,e}							
Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A(-D_{n,e})/10}	B	0.00005	0.00006	0.00036	0.00002	0.00002	-
R_{wi}							
Sound reduction of window	-	21	17	25	35	37	-
(S_{wi}/S_f) 10^{A(-R_{wi})/10}	C	0.00199	0.00499	0.00079	0.00008	0.00005	-
R_{ew}							
Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A(-R_{ew})/10}	D	0.00015	0.00005	0.00000	0.00000	0.00000	-
R_{rr}							
Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A(-R_{rr})/10}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.6	-22.9	-29.4	-40.1	-41.5	-
A							
Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	-1.1	-1.1	-1.1	-1.1	-1.1	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
Rw							
Sound reduction of complete partition	H	-	-	-	-	-	37
L_{Aeq} Daytime	A_n+F+G+3+A_{weight}	17.4	26.8	24.8	21.1	16.5	30
L_{AMax} Daytime	A_n+F+G+3+A_{weight}	-29.7	-26.0	-32.5	-43.2	-44.6	-24
L_{Aeq} Night-time	A_n+F+G+3+A_{weight}	11.5	20.9	19.7	16.5	11.7	25
L_{AMax} Night-time	A_n+F+G+3+A_{weight}	21.9	32.9	32.4	32.9	29.7	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 12
Room Reference:	Living / Kitchen
Façade Reference:	W

Room Details	
Length (m)	8
Width (m)	4
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	AT_Greenwood 5000EAW.AC1	No:	1
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	18
Glazing Specification:	4/6-12/4 (Pilkington)	Area:	6
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	58.2	56.4	55.5	59.3	54.9	64.2
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	11.1	3.6	-1.8	-5.0	-6.2	12.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	52.3	50.5	50.4	54.7	50.1	59.0
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	62.7	62.5	63.1	71.1	68.1	74.0
D_{n,e} Sound reduction of vent	-	39	38	31	44	43	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00005	0.00006	0.00036	0.00002	0.00002	-
R_{wi} Sound reduction of window	-	21	17	25	35	37	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00199	0.00499	0.00079	0.00008	0.00005	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00015	0.00005	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-26.6	-22.9	-29.4	-40.1	-41.5	-
A Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	-1.1	-1.1	-1.1	-1.1	-1.1	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	17.4	26.8	24.8	21.1	16.5	30
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-29.7	-26.0	-32.5	-43.2	-44.6	-24
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	11.5	20.9	19.7	16.5	11.7	25
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	21.9	32.9	32.4	32.9	29.7	38

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 5
Room Reference:	Bedroom
Façade Reference:	S

Room Details	
Length (m)	3.5
Width (m)	3.5
Height (m)	3
Surface Area (m ²)	66.5
Volume (m ³)	36.75
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity, rigid wall ties	Area:	15
Glazing Specification:	Open window	Area:	6
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,fr} Daytime							
External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime							
External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,fr} Night-time							
External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time							
External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e}							
Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi}							
Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A(-R_{wi}/10)}	C	0.01432	0.01432	0.01432	0.01432	0.01432	-
R_{ew}							
Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A(-R_{ew}/10)}	D	0.00014	0.00005	0.00000	0.00000	0.00000	-
R_{rr}							
Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-18.4	-18.4	-18.4	-18.4	-18.4	-
A							
Room Absorption (m ²)	-	11.8	11.8	11.8	11.8	11.8	-
10*log(S/A)	G	2.5	2.5	2.5	2.5	2.5	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
R_w							
Sound reduction of complete partition	H	-	-	-	-	-	23
L_{Aeq} Daytime	A_n+F+G+3+A_{weight}	14.3	17.3	19.5	24.5	20.0	27
L_{AMax} Daytime	A_n+F+G+3+A_{weight}	-12.9	-12.9	-12.9	-12.9	-12.9	-6
L_{Aeq} Night-time	A_n+F+G+3+A_{weight}	8.4	11.4	14.4	19.9	15.2	22
L_{AMax} Night-time	A_n+F+G+3+A_{weight}	18.8	23.4	27.1	36.3	33.2	39

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 6
Room Reference:	Bedroom
Façade Reference:	S

Room Details	
Length (m)	3
Width (m)	3.5
Height (m)	3
Surface Area (m ²)	60
Volume (m ³)	31.5
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5
Glazing Specification:	Open window	Area:	4
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.02227	0.02227	0.02227	0.02227	0.02227	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00011	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-16.5	-16.5	-16.5	-16.5	-16.5	-
A Room Absorption (m ²)	-	10.1	10.1	10.1	10.1	10.1	-
10*log(S/A)	G	-0.5	-0.5	-0.5	-0.5	-0.5	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.2	16.2	18.4	23.4	18.9	26
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-14.0	-14.0	-14.0	-14.0	-14.0	-7
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	7.3	10.3	13.3	18.8	14.1	21
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	17.7	22.3	26.0	35.2	32.1	37

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 6
Room Reference:	Living / Kitchen
Façade Reference:	S

Room Details	
Length (m)	3.5
Width (m)	5
Height (m)	3
Surface Area (m ²)	86
Volume (m ³)	52.5
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	5
Glazing Specification:	Open window	Area:	4
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.02227	0.02227	0.02227	0.02227	0.02227	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00011	0.00004	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-16.5	-16.5	-16.5	-16.5	-16.5	-
A Room Absorption (m ²)	-	16.9	16.9	16.9	16.9	16.9	-
10*log(S/A)	G	-2.7	-2.7	-2.7	-2.7	-2.7	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	11.0	13.9	16.1	21.1	16.6	24
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-16.2	-16.3	-16.3	-16.3	-16.3	-9
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	5.1	8.0	11.0	16.5	11.8	19
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	15.5	20.0	23.7	32.9	29.8	35

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 7
Room Reference:	Living / Kitchen
Façade Reference:	S

Room Details	
Length (m)	8
Width (m)	4
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	4
Glazing Specification:	Open window	Area:	8
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	0

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.03341	0.03341	0.03341	0.03341	0.03341	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00007	0.00002	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00000	0.00000	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-14.8	-14.8	-14.8	-14.8	-14.8	-
A Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	-4.1	-4.1	-4.1	-4.1	-4.1	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	11.3	14.3	16.5	21.5	17.0	24
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-15.9	-15.9	-15.9	-15.9	-15.9	-9
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	5.4	8.4	11.4	16.9	12.2	20
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	15.8	20.4	24.1	33.3	30.2	36

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 12
Room Reference:	Bedroom
Façade Reference:	S

Room Details	
Length (m)	3.5
Width (m)	3.5
Height (m)	3
Surface Area (m ²)	66.5
Volume (m ³)	36.75
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties	Area:	15
Glazing Specification:	Open window	Area:	6
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	12.25

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00904	0.00904	0.00904	0.00904	0.00904	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00009	0.00003	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00029	0.00002	0.00000	0.00000	0.00000	-
10*log(B+C+D+E)	F	-20.3	-20.4	-20.4	-20.4	-20.4	-
A Room Absorption (m ²)	-	11.8	11.8	11.8	11.8	11.8	-
10*log(S/A)	G	4.5	4.5	4.5	4.5	4.5	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	14.4	17.3	19.5	24.5	20.0	27
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-12.8	-12.9	-12.9	-12.9	-12.9	-6
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	8.5	11.4	14.4	19.9	15.2	22
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	18.9	23.4	27.1	36.3	33.2	39

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 13
Room Reference:	Bedroom
Façade Reference:	S

Room Details	
Length (m)	3
Width (m)	3.5
Height (m)	3
Surface Area (m ²)	60
Volume (m ³)	31.5
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity, rigid wall ties	Area:	5
Glazing Specification:	Open window	Area:	4
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	10.5

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.01028	0.01028	0.01028	0.01028	0.01028	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00005	0.00002	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00043	0.00003	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-19.7	-19.9	-19.9	-19.9	-19.9	-
A Room Absorption (m ²)	-	10.1	10.1	10.1	10.1	10.1	-
10*log(S/A)	G	2.8	2.8	2.8	2.8	2.8	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	13.4	16.2	18.4	23.4	18.9	26
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-13.8	-14.0	-14.0	-14.0	-14.0	-7
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	7.5	10.3	13.3	18.8	14.1	21
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	17.9	22.3	26.0	35.2	32.1	37

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 13
Room Reference:	Living / Kitchen
Façade Reference:	S

Room Details	
Length (m)	3.5
Width (m)	5
Height (m)	3
Surface Area (m ²)	86
Volume (m ³)	52.5
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity, rigid wall ties	Area:	5
Glazing Specification:	Open window	Area:	4
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	17.5

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00757	0.00757	0.00757	0.00757	0.00757	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00004	0.00001	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00052	0.00003	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-20.9	-21.2	-21.2	-21.2	-21.2	-
A Room Absorption (m ²)	-	16.9	16.9	16.9	16.9	16.9	-
10*log(S/A)	G	2.0	2.0	2.0	2.0	2.0	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	11.3	14.0	16.1	21.1	16.6	24
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-15.9	-16.2	-16.3	-16.3	-16.3	-9
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	5.4	8.1	11.0	16.5	11.8	19
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	15.8	20.1	23.7	32.9	29.8	35

APPENDIX C

BS8233:2014 INTERNAL NOISE CALCULATION

FORM VERSION: 2.3



Project Details	
NCSL Project Reference:	1248
Plot Reference:	Flat 14
Room Reference:	Living / Kitchen
Façade Reference:	S

Room Details	
Length (m)	8
Width (m)	4
Height (m)	3
Surface Area (m ²)	136
Volume (m ³)	96
Reverberation Time (s)	0.5

Vent Specification:	No Vent	No:	0
Wall Specification:	Two leaves of 102.5mm brickwork, 50mm cavity, rigid wall ties	Area:	4
Glazing Specification:	Open window	Area:	8
Ceiling / Roof Specification:	AT_Tiles + 2no PB Ceiling	Area:	32

	REF	125	250	500	1000	2000	Sum
L_{eq,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Leq,Ext}	43.3	38.8	35.6	37.4	31.7	46.0
L_{Max,ff} Daytime External noise level (free-field), dB(Z)	A_{day,Max,Ext}	16.1	8.6	3.2	0.0	-1.2	17.1
L_{eq,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Leq,Ext}	37.4	32.9	30.5	32.8	26.9	40.4
L_{Max,ff} Night-time External noise level (free-field), dB(Z)	A_{night,Max,Ext}	47.8	44.9	43.2	49.2	44.9	53.5
D_{n,e} Sound reduction of vent	-	100	100	100	100	100	-
(A₀/S) 10^{A_n(-D_{n,e}/10)}	B	0.00000	0.00000	0.00000	0.00000	0.00000	-
R_{wi} Sound reduction of window	-	13	13	13	13	13	-
(S_{wi}/S_f) 10^{A_n(-R_{wi}/10)}	C	0.00911	0.00911	0.00911	0.00911	0.00911	-
R_{ew} Sound reduction of external wall	-	37	42	52	60	63	-
(S_{ew}/S_f) 10^{A_n(-R_{ew}/10)}	D	0.00002	0.00001	0.00000	0.00000	0.00000	-
R_{rr} Sound reduction of roof	-	31	43	50	56	56	-
(S_{rr}/S_f) 10^{A_n(-R_{rr}/10)}	E	0.00058	0.00004	0.00001	0.00000	0.00000	-
10*log(B+C+D+E)	F	-20.1	-20.4	-20.4	-20.4	-20.4	-
A Room Absorption (m ²)	-	30.9	30.9	30.9	30.9	30.9	-
10*log(S/A)	G	1.5	1.5	1.5	1.5	1.5	-
A-weighting	A_{weight}	-16.1	-8.6	-3.2	0.0	1.2	-
L_{Aeq} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	11.6	14.3	16.5	21.5	17.0	24
L_{AMax} Daytime Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	-15.6	-15.9	-15.9	-15.9	-15.9	-9
L_{Aeq} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	5.7	8.4	11.4	16.9	12.2	20
L_{AMax} Night-time Internal noise level, dB(A)	A_n+F+G+3+A_{weight}	16.1	20.4	24.1	33.3	30.2	36

TERMS AND CONDITIONS OF BUSINESS

1. GENERAL

Work done or services undertaken are subject to the terms and conditions detailed below and all other conditions, warranties and representations, expressed or implied are hereby excluded.

2. PRICES

Prices are based on current costs, exchange rates, duty and freight and are subject to change without notice. The quoted price does not cover the cost of attending meetings, telephone calls or email exchanges. This is charged separately at a pro rata hourly rate of £75 per hour.

3. TIMING ESTIMATES

Timing estimates are made in good faith and date from receipt of a written order and full information to enable us to proceed. While NCSL makes every effort to fulfil them, such estimates are subject to unforeseen events and if not maintained, cannot give rise to any claim.

4. CANCELLATION AND RETURNS

Cancellation of orders for services, training or consultancy is only acceptable by prior agreement of NCSL and a charge will normally be made. NCSL reserve the right to cancel any work at any time.

5. CLAIMS

Claims for errors etc should be notified within 10 days of date of receipt.

6. PAYMENT TERMS

Full payment is required before any work is undertaken by NCSL. Failure to comply with the terms of payment may result in delayed delivery of services and a review of the Customer's credit account (if applicable). Should the customer become subject to an administration order, or becomes bankrupt or goes into liquidation, NCSL has a right to cancel any contract and discontinue any work.

7. RETENTION OF TITLE

All reports & data remain the property of NCSL. Under no circumstances will a customer's purchase order override our Retention of Title clause. In the case of software and data, the ownership remains with NCSL. Payment of invoices in full will entitle the customer to use reports or other services under licence until (a) a set expiry date is passed (b) they cease trading. In both instances, the licence shall then revert to NCSL. All measurement data and reports are the sole property of NCSL and shall not be reproduced or distributed without written consent from NCSL.

8. TEST REPORTS

NCSL shall not be liable for any subsequent loss or damage incurred by the client as a result of information supplied in a test report. Any specifications or targets supplied by NCSL are to be considered as guidance only. No guarantee is offered by NCSL that the meeting of any supplied targets or specifications will solve the relevant issue or prevent future issues.

9. RESPONSIBILITY

Every effort is made to ensure accuracy in description, drawings and other information in correspondence etc but no warranty is given in this respect and NCSL shall not be liable for any error therein. NCSL carries out all tests and/or advises only on the basis that the same are carried out, made or given without any responsibility whether for negligence or otherwise. NCSL and its servants or agents will not be liable for any damage or loss direct or indirect of whatsoever kind, whether or not the same results directly or indirectly from negligence on the part of NCSL or its servants or agents.

10. CONFIDENTIALITY

Unless specifically excluded in the terms of an individual contract between NCSL and its Customer, the following shall apply to all reports, advice, drawings, photographs, specifications or data:

- i. The above shall not be disclosed to third parties or used in litigation without the consent of NCSL.
- ii. Where NCSL has given consent to disclosure, the Customer shall draw the attention of the third party to these terms of business and the basis on which NCSL undertakes test, reporting and advising. The Customer shall indemnify NCSL for any failure to do so.
- iii. The above items are submitted to the Customer as confidential documents. Confidentiality shall continue to apply after completion of the business but shall cease to apply to information or knowledge which may come into the public domain.

11. CONSTRUCTION AND ARBITRATION

The laws of England shall govern all contracts and the parties submit to exclusive jurisdiction of the courts of England, unless otherwise agreed.

12. JOB SPECIFIC TERMS

NCSL will not be held responsible for any adverse impact arising from the introduction of proposed palliative measures. Furthermore, no guarantee is given regarding the effectiveness of any proposed palliative and/or mitigation measures. The client is responsible for any palliative measures, including, but not limited to, the sourcing of suppliers, the quality of installation, the cost of all materials / installation, maintenance and safety. All advice given should be taken as guidance only. It is the responsibility of the client to ensure the safe operation of any mitigation measures, including but not limited to, adequate fire safety and ventilation requirements. NCSL provide no guarantee that adherence to provided specifications will result in no further noise and/or vibration complaints and/or the elimination of noise and/or vibration issues. NCSL do not supply, procure, install or maintain any materials. We reserve the right to publicise the work conducted by NCSL, including, where appropriate, client logos etc. On occasion, work may be conducted by sub-contract partners.