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CLIENT PROJECT REFERENCE:

73-75 North Road, Lancing, West Sussex, BN15 9AS

ENVIRONMENTAL NOISE SURVEY (UPDATED)

PREPARED FOR:

NARCH Design and Build

(On behalf of Mr Bulent Ekinci of 73-75 North Road, Lancing, West Sussex, BN15 9AS)

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1. Summary

A Noise Impact Assessment is carried out at the premises at 73 - 75 North Road, Lancing, West Sussex, BN15 9AS on Thursday 14th July 2022. Ron-berks Acoustics Ltd has been approached by Mrs Umut Gedik Kilic (on behalf of Mr Bulent Ekinci of 73-75 North Road, Lancing, BN15 9AS) to undertake an environmental noise survey at the site in order to determine the impact of the sound sources upon noise sensitive receptors.
The results of the noise survey were considered reasonable given the location of the measurement position and the existing noise sources in the local neighbourhood. Noise calculations of the sound sources have been undertaken using available details and plans provided by the client and obtaining manufacturers' specifications wherever possible. The data and information form the basis of the assessment. A BS4142:2014+A1:2019 noise assessment has been carried out at the site.

In accordance with BS4142:2014+A1:2019 guidance, **the day rating level at nearest receptors** does not exceed the background sound level. It has been shown that the day rating noise levels at nearest receptors are 12 dB(A) below the background level at proposed first floor window of 73-75 North Road, Lancing. ***The operation of the sound sources indicates the specific sound sources having a low adverse impact*** (see section 6.7).

The night rating noise levels at nearest receptors are not expected to exceed day noise level because noise source (garage) will be closed at 5:30pm.

A rigorous calculation method, which is given in BS8233:2014 was used to determine interior noise levels based on measured environmental noise levels. A shortened measurement procedure of CRTN (Calculation of Road Traffic Noise) 1988 was used for a 3-hours $L_{A10,3hrs}$ measurement to be extrapolated into an 18-hours daytime period $L_{A10,18hrs}$ whereby the main source of noise is road traffic (see section 6.8).
In accordance with BS8233:2014 guidance; the *daytime internal noise levels in living/dining area* **18 dBA** $L_{Aeq,16hr}$ *are within the desirable category of 35 dBA. The night-time internal noise levels in sleeping area* **18 dBA** $L_{Aeq,8hr}$ *are in the desirable category of 30 dBA. The maximum individual noise events* **39 dBA** L_{AFmax}, *does not exceed* 45 dBA L_{AFmax} *of the desirable category* (see Appendix B and Appendix C).
Proposed multi-layer ceiling scheme will reduce noise level by 59 dB which is higher than required minimum sound insulation value of 50 dB **(D_{nTw} + C_{tr} dB)** (see section 6.9 and Appendix D).
Noise levels from extractor fans for shower and cooker hood are in the desirable category of 30dBA for sleeping area and below 35 dBA for dining/living/ area (see section 9).

The operation of the sound sources indicates the specific sound sources having a low adverse impact during daytime and night-time. Therefore, the measured noise level of the sound sources is expected to comply with BS4142:2014+A1:2019 guidance and BS8233:2014 guidance, and Adur District Council's policy.

2. Introduction

Acoustic measurements were carried out at No: 73-75 North Road, Lancing, West Sussex, BN15 9AS on Thursday 14th July 2022 (see Figure 1). Environmental Noise Survey was undertaken in accordance with BS4142:2014+A1:2019, on the request of Adur District Council. The site is located on a busy road with moderate background noise level.



Figure 1: Front view of 73-75 North Road, Lancing, West Sussex, BN15 9AS

3. Site Description

73-75 North Road, Lancing, West Sussex, BN15 9AS (shown by yellow line in Figure 2), the site, is seeking planning permission for permitted development for prior approval for change of use from offices at first floor to 2 No. one person one bedroom flats. The building has two floors. The premises is located in a mixed commercial and residential area.



Figure 2: Site location and surrounding land use, Google Earth map. Yellow box shows the site and red box shows Culver Cars Garage.

4. Environmental Noise Survey Methodology

Environmental noise survey was undertaken at two measurement location at the rear and front of 73-75 North Road, Lancing, West Sussex, BN15 9AS on Thursday 14th July 2022 between 9:34am and 19:00 to determine noise levels in accordance with the methodology contained within BS4142:2014 +A1:2019 as shown in Figure 3. Noise survey at given time covers the most sensitive period of the time in which the noise units (Culver cars garage) may be operational.

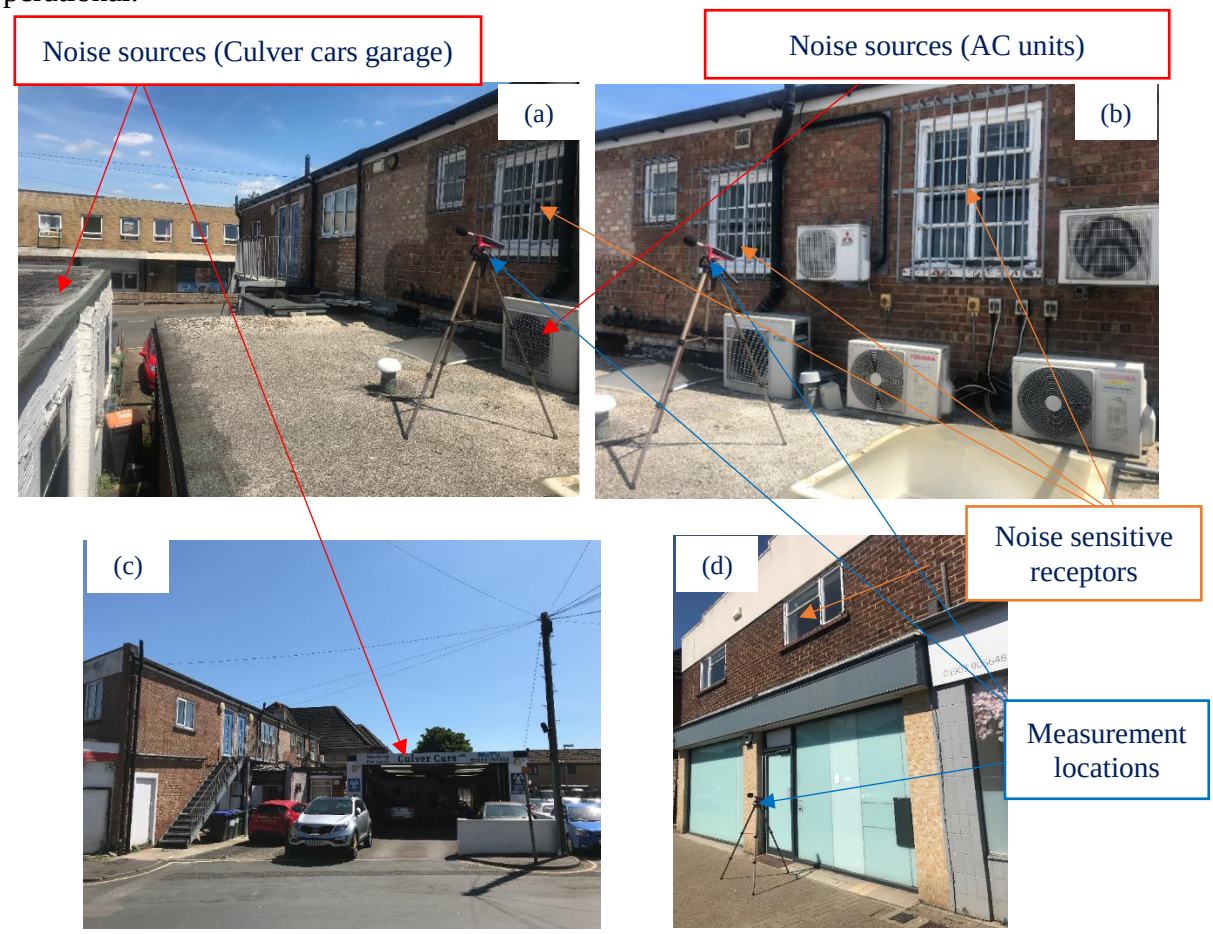


Figure 3: Measurement set-up, noise sensitive receptors and noise sources at the site, a) showing measurements position at the rear terrace of the site, beside Culver Cars Garage; b) showing measurements position at the rear terrace of the site with AC units; c) showing Culver Cars Garage; d) showing measurements position at the front of the site.

4.1. Sound sources under investigation

The noise source considered here is Culver Cars Garage on Culver Road. There are five air conditioning units, which are wall and floor mounted at the rear of the site. However, they will not be in operation. The client said they would remove AC units.

4.2. Measurement equipment

A description of the equipment used for the noise survey are given in the Table 1.

Table 1: Description of the Equipment used for measurements

Equipment	Description	Quantity	Serial No
Norsonic SLM	Type 1 sound level meter, NOR140	1	1403870
Norsonic	½ inch microphone	1	1225
Norsonic	Preamplifier	1	1209
Norsonic	Class 1 Calibrator (114 dB)	1	125525649

4.3.Parameters measured

BS4142:2014+A1:2019 gives a method for assessing the impact of specific sounds based upon the amount, in dB, that a specific sound level exceeds the background sound level, taking into account the context of the situation. The standard requires measurement of the **specific sound level**, in $L_{Aeq,T}$ over a period of 1 hour (daytime) and 15 minutes (night time), and the **background sound level**, L_{AF90}, when the specific sound is not in operation, the **residual sound level**, L_{Aeq}, when the specific sound is not in operation, and the background and residual sound should be measured at times which are **representative of and similar to** those at which the specific sound is in operation. Noise parameters were measured using a calibrated system over a period of the time that is representative of the worst-case condition. Ambient, residual, background, and maximum noise levels were measured in 1/3 octave bands throughout the noise survey.

Weather conditions were noted to be 26 degrees Celsius with mostly sunny, clear skies at the beginning of the measurements with a light wind, which was less than 3 m/s, and 25 degrees Celsius at the end of the measurements with a clear sunny sky and a wind, which was less than 4 m/s. These weather conditions were checked against and confirmed using the Meteorology Office mobile application available on smart phone technology.

The noise monitoring equipment was calibrated before and after the measurements. No significant drift was recorded during calibration as shown in Table 2.

Table 2: Calibration details

Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
Day	114.0	114.2	0.20	113.9	-0.1

4.4.Measurements

To undertake a BS4142:2014+A1:2019 assessment it is necessary to measure the noise levels with and without the sound sources in operating. Noise measurements were taken to determine day noise levels with and without sound sources in operation. *Firstly*, noise levels at the front of the site was measured. *Secondly*, ambient noise levels at the rear of the site were measured when Car garage was open. *Finally*, background noise levels were measured at the rear of the site after car garage was closed.

The sound level meter was positioned at 2 metre from nearby walls/fences (1.5 metres from AC units) and 2.53m from the garage wall. The sound level meter was mounted onto a tripod at 1.4 metre above ground level as shown in Figure 4.

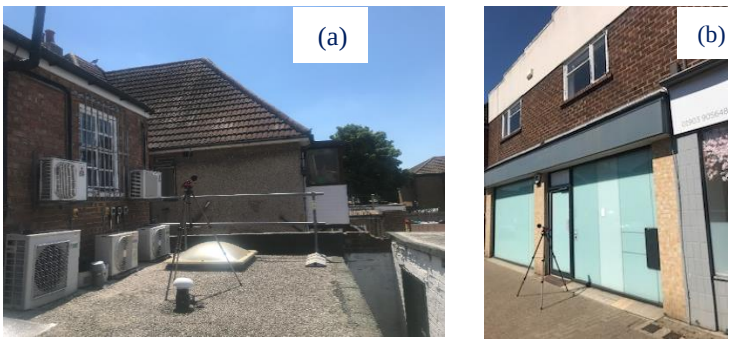


Figure 4: Measurement set-up a) noise measurements at the rear of the site and b) noise measurements at the front of the site.

5. Noise survey results and observations

5.1 Results

A noise survey was carried out at the site. Detailed day and night noise level results are given below.

5.1.1 Day noise levels

At the rear of the site:

Measured ambient ($L_{Aeq,1h}$), residual ($L_{Aeq,1h}$), and background ($L_{AF90,1h}$), levels are 51.5 dB, 51.3 dB and 44.6 dB respectively. Highest L_{AMax}, was 76.7 dB that was observed at 16:52 during measuring background noise levels. A comparison of L_{Aeq}, L_{AMax}, L_{A10} and L_{A90} results with and without sound sources in operation is given in Table 3.

Table 3a: Sound Pressure Levels measured at the rear of the site.

Operator Attended Day Noise Levels					
Measurements of all noise at the assessment location					
Recorded Time	**Noise sources (Garage open)**	**L_{Aeq}**	**L_{AFmax}**	**$L_{AF,10}$**	**$L_{AF,90}$**
13:51	on	52.2	76.1	54.2	43.4
14:51	on	49.2	68.2	51.5	43.2
15:52	on	50.3	72.9	52	44.4
16:52	on	53.2	76.7	52.1	43.7
Average Levels		**$L_{Aeq,1h}$ =51.5dB**	**$L_{AFmax,1h}$ =74.5dB**	**$L_{AF10.1h}$ =52.6dB**	**$L_{AF90,1h}$ =43.7 dB**
Operator Attended Background Noise Levels					
19:00	Off (Garage closed)	51.3	75.2	51.4	44.6
		$L_{Aeq,1h}$ =51.3dB	**$L_{AFmax,1h}$ =75.2dB**	**$L_{AF10.1h}$= 51.4dB**	**$L_{AF90,1h}$ =44.6 dB**

At the front of the site:

Table 3b: Sound Pressure Levels measured at front of the site, 73-75 North Road.

Operator Attended Day Noise Levels at front of the shite					
Measurements of all noise at the front of the site					
Recorded Time	**Noise sources**	**L_{Aeq}**	**L_{AFmax}**	**$L_{AF,10}$**	**$L_{AF,90}$**
10:34	on	59.1	80.2	64.3	56.1
11:34	on	60.1	77.7	63.3	50.9
12:34	on	60	81	63.4	52.8
Average Levels		**$L_{Aeq,1h}$ =59.8dB**	**$L_{AFmax,1h}$ =79.8dB**	**$L_{AF10.1h}$ =63.6dB**	**$L_{AF90,1h}$ =53.8 dB**

5.1.1.1 Objective method to determine noticeable characteristics

Section B.2.1.1 of BS4142:2014+A1:2019 states "Establish whether standing waves/interference patterns are present by considering the nature of the source and the influence of any nearby sound reflecting surfaces. This can be carried out subjectively by listening in several places around the measurement location, or by measuring any change in sound pressure levels with a sound level meter at different locations in the immediate locality when traversing the measurement location".

Section 9.3 of BS 4142:2014+A1:2019 states that if the subjective method is not sufficient for assessing the audibility of tones in sound or the prominence of impulsive sounds, use the one-third octave method in 9.3.2.
Annex C of BS 4142:2014+A1:2019 states that the test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{Zeq,T}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.
The level differences between adjacent one-third-octave bands that identify a tone is:

- ***15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);***
- ***8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and***
- ***5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).***

Firstly, the character correction was determined by using subjective methods listening in several places around the sound sources and at measurement location *in accordance with the methodology contained within section B.2.1.1 of BS 4142:2014+A1:2019.* No acoustic features were observed from the sound sources that are installed at the rear of the site.

Secondly, objective method was used to assess the audibility of tones in sound *in accordance with the methodology contained within section 9.3 and section Annex C of BS4142:2014+A1:2019.*

- *The level differences between adjacent low-frequency one-third-octave bands (25 Hz to 125 Hz) is within 15 dB limit.*
- *The level differences between adjacent middle-frequency one-third-octave bands (160 Hz to 400 Hz) does not exceed the 8 dB limit.*
- *The level differences between adjacent high-frequency one-third-octave bands (500 Hz to 10 000 Hz) does not exceed the 5 dB limit as it is shown in Table 4.*

Hence, there was no tonality found in the sound units' noise. The sound is not tonal according to Annex C in BS4142:2014 + A1:2019.

Table 4: Sound Levels measured for fifteen minutes at the rear of the site with the sound sources in operation.

Frequency (Hz)	**25 Hz**	**31.5 Hz**	**40 Hz**	**50 Hz**	**63 Hz**	**80 Hz**	**100 Hz**	**125 Hz**	**160 Hz**	**200 Hz**	**250 Hz**	**315 Hz**	**400 Hz**	**500 Hz**
$L_{Aeq,15m}$	69.3	70.2	67	70.2	64.7	60.8	58.1	56.9	58.9	57.1	54.9	53.2	53.7	52.3
Frequency (Hz)	**630 Hz**	**800 Hz**	**1.0 kHz**	**1.25 kHz**	**1.6 kHz**	**2.0 kHz**	**2.5 kHz**	**3.15 kHz**	**4.0 kHz**	**5.0 kHz**	**6.3 kHz**	**8 kHz**	**10 kHz**	
$L_{Aeq,15m}$	52	51.4	52	52.4	51.3	48.6	46.8	46.6	42.7	39.8	37.2	37.1	38.4	

The impulsivity of the sound from the sound sources was investigated by checking the onset rate using Annex E of BS4142:2014+A1:2019. The onset rate is less than 10 dB/s. **Therefore, the sound is not impulsive, according to BS4142:2014+A1:2019 Annex E.**

5.2 Observations

Attended noise level measurements were carried out at 73-75 North Road Lancing on Thursday 14th July 2022. Observations and detailed notes were made of the significant noise sources, which contribute to each of the measured levels.

Road Traffic Noise: Road traffic noise from North Road and Culver Road was audible at the monitoring locations.

Site Sound sources: Noise from sound source (Culver Cars Garage) was not audible at measurement locations.

People noise: noise from people walking by the side was audible at measurement locations, but not subjectively loud during the measurement period attended.

5.3 Uncertainty

The levels of uncertainty in the data and calculations are low given the robust measurements undertaken in noise monitoring and the confidence in the data statistical analysis.

6 Noise Impact Assessment

6.1 BS4142:2014+A1:2019

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

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

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

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

Difference between the rating level and the background level	Assessment (All dependant on the context)
Around 10 dBA or more	Indicates a significant adverse impact.
Around 5 dBA	Indicates an adverse impact
Below 5 dBA	Lower the adverse impact
Below 0 dBA	Low adverse impact likely

6.2 BS8233:2014

'BS8233:2014 – Guidance on sound insulation and noise reduction for buildings' is a recognised standard for assessing and mitigating environmental noise levels upon a proposed noise sensitive development. The standard provides a rigorous calculation method for determining interior noise levels based on measured environmental noise levels

6.3 CRTN (Calculation of road traffic noise), 1988

'CRTN (Calculation of road traffic noise), 1988' gives a shortened measurement procedure that

allows a 3-hour, L_{A10} measurement to be extrapolated into an 18-hour daytime period, whereby the main source of noise is road traffic.

6.4Assessment BS4142

6.4.1 Day noise impact

Specific noise level is the logarithmic difference between ambient noise, 51.5 dB(A), and residual noise levels, 51.3 dB(A).

Specific noise level = 10.log ($10^{51.5/10} – 10^{51.3/10}$) = 37.7dB(A)

Specific noise level is 41 dB(A). No tonality and impulsivity were observed at the back-top of the site. The rating level $L_{Aeq\ Tr,1h}$ is equal to the specific noise level.

$L_{Aeq\ Tr,1h}$ = 37.7 = 37.7 dB(A)

Day rating level $L_{Aeq\ Tr,1h}$ = 37.7 dB(A)

6.5 Distance attenuation

The nearest noise sensitive receptors to Culver Cars Garage were noted to be the first floor flats (73-75 North Road) above the site. AC units installed on rear-terrace of the site are not in operation and they will be removed from the site. Therefore, they will not be taken into account. First floor flat windows are at equal distance from the noise source, approximately 4.53-meter distance from the garage. The noise levels at window of the nearest noise sensitive receptors can be predicted using outdoor sound propagation equation;

$$L_{\mathrm{Aeq,Tr}} - L_{\mathrm{Receptor}} = 20\log\left(\frac{r_2}{r_1}\right)$$

Distance attenuation at 4.53 m (*first floor window*) from Culver Cars Garage is 5.1 dB(A) using a 2.53 metre measurement distance from the noise source.

6.6 Façade correction

Section 6.2 of BS4142:2014+A1:2019 states that *where it is necessary to undertake measurements above ground floor level, choose a location, which is approximately 1 m from the façade on the relevant floor of the building if it is not practical to make the measurements at least 3.5 m from the façade at this elevation.*
When measurements for distant sources are made at 1 m from a façade, then the measured level can be adjusted to an equivalent free-field level by ***subtracting a 3 dB correction factor****.*
For sources that are relatively close or not perpendicular to the façade the correction may be 1 dB or 2 dB, in which case the reasons for not using a correction of 3 dB should be explained.
A 3 dB correction factor was applied to specific noise level to determine rating noise level.

6.7 BS 4142 Assessment for nearest noise sensitive receptors

6.7.1 Nearest receptors, first floor flat (73-75 North Road)

Daytime noise assessment:

Culver Cars Garage with a noise output of 37.7 dB(A)@ 2-meter and applying the factors discussed above would predict a noise rating level of 32.6 dB(A) at noise sensitive receptor. The **background noise level** $L_{AF90,1h}$ is 44.6 dB(A). The noise level at the receptor is 12 dB(A) below background noise level as calculated in table below.

In accordance with BS4142:2014+A1:2019 guidance and criteria, ***the rating level does not exceed the background sound level. This is an indication of the specific sound source having a low adverse impact (low adverse impact likely).***

BS4142 Assessment- Daytime First floor flat of 73-75 North Road	dB(A)
Specific Sound Level	37.7
Distance attenuation at 4.53m	-5.1
Rating Level at receptor point	32.6
Daytime background level, L_{A90}	44.6
Difference between rating level and background level	-12

Night time assessment:

Culver Cars Garage is closed at 5:30 pm and AC units will be removed from the site. There will not be a specific noise source in operation during night-time. Therefore, night levels are not expected to be higher than day noise levels. In accordance with BS4142:2014+A1:2019 guidance and criteria, ***the rating level will not exceed the background sound level. This is an indication of the specific sound source having a low adverse impact (low adverse impact likely).***

6.8 Assessment for CRTN:1988 and BS8233:2014

The results from the measurement intervals are summarised in the tables below. A 16-hour daytime equivalent noise level (dB $L_{Aeq,16hr}$) is derived in accordance with CRTN:1988 and BS8233:2014:

$$L_{A10,18hr} = L_{A10,3hr} - 1$$
$$L_{Aeq,16hr} = L_{A10,18hr} - 2$$

The daytime broadband noise level is derived from the measurements below:

Table 5: Equivalent Noise Level Derivation (73-75 North Road)

#	Starting Time	Finishing Time	$L_{A10,1hr}$ (dB)	$L_{Aeq,1hr}$ (dB)
1	09:34	10:34	64.3	59.1
2	10:34	11:34	63.3	60.1
3	11:34	12:34	63.4	60
Average	-	-	63.6	59.8
CRTN dB $L_{A10,18hr}$	62.6			-
BS8233 dB $L_{Aeq,16hr}$	60.6			-

The measured spectral data (dB $L_{eq,3hr}$) is to be corrected to give a broadband noise level equal to the derived daytime value, dB $L_{Aeq,16hr}$:

Correction factor = Average dB $L_{Aeq,1hr}$ – BS8233 dB $L_{Aeq,16hr}$ = 59.8 – 60.6

Correction factor = – 0.8 dB

Table 6: Corrected daytime spectra for 73-75 North Road, dB $L_{eq,16hr}$

#	125	250	500	1k	2k
1-3	60	56	55	51	47
Correction	– 0.8				
Corrected	59.2	55.2	54.2	50.2	46.2

A **worst-case scenario** assumption is made. It is assumed that night-time noise levels, dB

$L_{Aeq,8hr}$, are equal to daytime noise levels, dB $L_{Aeq,16hr}$.

A max noise level of 81 dB L_{AFmax} occurring at 12:34 is selected for the assessment of regularly occurring individual noise events recorded during the measurement period.

6.8.1 BS8233: 2014 Noise Assessment Criteria

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

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

6.8.2 Internal noise levels

Internal noise levels have been calculated in order to demonstrate that the proposed development can achieve suitable internal noise levels inside rooms, when the suggested appropriate glazing and ventilation systems are used. In order to describe the likely internal exposure to environmental noise at the site, it is suggested using data from BS8233:2014 on standard construction materials. This will include all elements of the exposed living room/bedroom façades closest to the noise sources.

6.8.3 Daytime internal noise levels

Considering the insulation with the addition of 10/12/6.4mm *double glazing* and *hit and miss trickle ventilation*, daytime environmental noise internally would be reduced from 60.6 dB $L_{Aeq,16hr}$ to interior levels of **18 dB** $L_{Aeq,16hr}$.

The desirable limit of BS8233:2014 suggests a guideline of 35dB $L_{Aeq,16hr}$ for resting conditions, and up to 40dB considered acceptable for necessary developments. *The assumed standard of construction would place the internal levels in living rooms as below 35dB. Therefore, daytime internal levels in living rooms* **18 dB** $L_{Aeq,16hr}$ *are within the desirable category.*

6.8.4 Night time internal noise levels

Considering the insulation with the addition of 10/12/6.4mm *double glazing* and *passive through wall ventilation*, night-time environmental noise in bedrooms would be reduced from 60.6 dB $L_{Aeq,8hr}$ to interior levels of **18 dB** $L_{Aeq,8hr}$ with maximum individual noise events reduced from 81 dB L_{AFmax} to **39 dB** L_{AFmax}.

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

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

6.8.5 External Noise levels

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

There are not any external amenity space at the site. Therefore, the calculations and measurement for external amenity space is not considered in this report.

6.8.6 Effect Level and Exposure Outcomes

A summary of noise levels and their respective BS8233 classifications can be found below:

Table 7: Summary of noise levels for both rear flat (39sqm) and front flat (38.6sqm).

Internal Space	Noise Parameter	Internal Noise Level	Within Desirable Limit (BS8233)
Living/Kitchen Area	Daytime $L_{Aeq,16hr}$	18	**Yes**
Sleeping Area	Night-time $L_{Aeq,8hr}$	18	**Yes**
Sleeping Area	Night-time L_{AFmax}	39	**Yes**
External Space	**Noise Parameter**	**Noise Level**	**BS8233 Classification**
No Amenity	Daytime $L_{Aeq,16hr}$		

6.9 Sound Insulation Scheme

For Ceiling (between office and flat above)

The floor above the office will be used for residential purpose. Sound insulation performance of the proposed ceiling scheme is given in **Appendix D**.

The planning condition states that "**The scheme shall achieve a minimum airborne sound insulation value of 50 dB (D_{nTw} + C_{tr} dB) for all floors. Following approval and implementation of the scheme, a test shall be undertaken to demonstrate that the attenuation measures carried out as part of the approved scheme are effective and achieve the specified criteria. All works, which form part of the approved scheme, shall be completed before the use commences**". $D_{nT,w}$ is the standardised level difference measured on-site.

With the regard to noise emanating from the office to noise sensitive flat above the site, BS 8233:2014 states "*Airborne sound insulation is mainly considered for intermediate floors between spaces containing either noise sources or noise-sensitive occupants. For a ground floor where there is neither an appreciable noise source nor a noise-sensitive occupant below the floor, the floor is only of interest if it could contribute to flanking transmission".*

It is predicted that the highest internal ambient noise level generated inside proposed office will be 65 dB(A) during busiest times of operation. This specific internal ambient noise level is considered for **worst-case noise level in proposed office**. The assessment based on the predictions, using the properties of proposed multi-layer ceiling as showing in Figure 5, has demonstrated that the sound insulation value of multi-layer ceiling scheme is significant. Proposed multi-layer ceiling scheme will reduce noise level by 59 dB which is higher than required minimum sound insulation value of 50 dB. See the details of the prediction method given in **Appendix D**.

To control the transfer of noise from the office to the flat above the site, a multi-layer ceiling build up shown in Figure 5 has been suggested. Existing floor construction to be surveyed and any required remedial works to be undertaken before the floor treatment is provided. If the floor boards are considered unsuitable for upgrade the floor boards are to be replaced with boarding of a minimum thickness of 12mm. Gaps in the timber boarding should be sealed by overlaying with hardboard or filled with sealant. Upgrade the existing ceiling by:

a) Providing 100mm thick mineral wool with a minimum density 10kg/m³ between the joists in the floor cavity of the existing floor and
b) Installing 2 layers of plasterboard minimum total mass per unit area 20kg/m², under existing ceiling laid with staggered joints.

Perimeter of ceiling to be sealed with tape or sealant.
A platform floor to be created by providing a 25mm thick resilient layer of mineral wool with a density of 60 to 100kg/m ³ (e.g. Knauf Acoustic Floor Slabs) over the existing floor and carried up the edges of the room to isolate the floating layer from the wall surface. Over this provide 2 layers of board material: 18mm chipboard spot bonded to 19mm Knauf Drywall Plank, glued together with staggered joints.
Refix the floor deck and fix Floor-foam Easy Edge Strip to the perimeter wall with the integral self-adhesive strip. Install timber battens on resilient strips at the floor perimeter and thresholds. A 5mm gap to be provided between the skirting and floating layer, gap to be filled with flexible sealant. Do not bridge the floating layer and the base or surrounding walls e.g. with services or fixings that penetrate the resilient

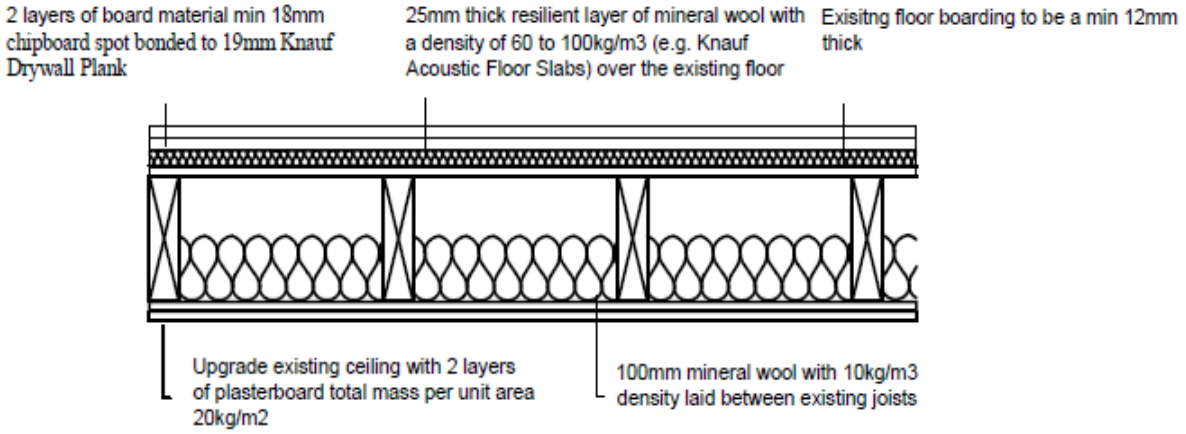


Figure 5: Suggested multi-layer ceiling scheme for sound insulation.

It is determined that by using mitigation as specified above for the building ground floor ceiling, the outcome summarised in the following Table 8 is achieved for the flat above proposed restaurant/café.

Table 8: Noise Assessment Outcome for flats above proposed office

Internal Space	Noise Parameter	Internal Noise Level	Within Desirable Limit (BS8233 and BS4142)
Flats above proposed office	**Daytime $L_{Aeq,16hr}$**	**6**	Yes

For glazing and ventilation:

The following minimum requirements in terms of glazing and ventilation are recommended to ensure desirable internal noise levels are achieved (see Table 9).

Table 9: Façade Specifications

Internal Space	**Glazing**		**Ventilation**	
	Minimum Performance, R_w+C_{tr}	Suggested Specification	Minimum Performance, $D_{ne,w}+C_{tr}$ (open)	Suggested Specification
Living/Dining/ Kitchen/Sleeping Area	34	10/12/6.4mm PVB	45	Hit and miss trickle ventilation, Passive Through Wall Ventilation

See Appendix B and Appendix C for detailed specifications.

7. Vibration

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. Sound sources (garage) at the site is located at the rear of the site. No vibration from the mechanical units was observed. There was not any structural borne noise from the mechanical units.

8. Overheating

Trickle vents in windows will be used to prevent overheating, and condensation build up in kitchen/living/sleeping area by allowing constant circulation of air.

Passive ventilation uses wind and thermal buoyancy to circulate air to and from an indoor space. Passive ventilation will be used to regulate indoor air temperature as well as bringing fresh air into the room and removing stale air from the room (see Table 9, Appendix B and Appendix C for more details).

Solar reflective window films blocks up to 90 % of UV rays without reducing the visible light. Solar reflective window films will be used to prevent overheating from UV rays.

9. Ventilation

There are not any ventilation units except for bathroom extractor fan and cooker hood extractor fan.

The extractor fan for cooker hood

It is recommended to use a wall-mounted Bosch (Series 6 DWB68JQ50B 60 cm) Chimney Cooker Hood with maximum noise level 60 dB at 1m at highest speed, 409 m^3/hour. It is recommended that the extractor fan should be operate at 108 m^3/hour (see **Appendix E**). The extractor fan noise is very strongly dependent on airflow speed. Noise level at 108 m^3/hour could be calculated using the equation below;

$L_{P2} = L_{P1} - 50.\log(V_2/V_1) = 60 - 50.\log(409/108) = 60 - 28.91 = 31.1$ dB.

The fan extractor noise level at 108 m^3/hour at 1 m is 31 dB.

The desirable limit of BS8233:2014 suggests a guideline of 35dB $L_{Aeq,16hr}$ for resting conditions, and up to 40dB considered acceptable for necessary developments. *The assumed standard of the extractor fan would place the internal levels in living/dining/kitchen area as below 35dB. Therefore, daytime internal levels in living/dining/kitchen area* **4 dB** $L_{Aeq,16hr}$ *are within the desirable category.*

Sleeping area is assumed to be around 4 meter away from the extractor fan of cooker hood. Noise level from the extractor fan of cooker hood at 4 meter will be determined using sound propagation equation;

$$L_{\mathrm{Aeq,Tr}} - L_{\mathrm{Receptor}} = 20\log\left(\frac{r_2}{r_1}\right)$$

Distance attenuation at 4 meter is 12 dB(A) using a 1 metre measurement distance from the noise source. Therefore, the noise level at the sleeping area will be 31-12 = 19 dB

BS8233:2014 suggests a desirable guideline of 30dB $L_{Aeq,8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq,8hr}$. *The proposed extractor fan for cooker hood would place the internal continuous levels in sleeping area as below 30dB. Therefore, night-time internal noise level in sleeping area is in the desirable category.*

The extractor fan for shower room (SHW-WC):

Building regulations state "**Provide mechanical extract ventilation to shower room ducted to external air capable of extracting at a rate of not less than 15 litres per second. Vent to be connected to light switch and to have 15 minute over run if no window in the room. Internal doors should be provided with a 10mm gap below the door to aid air circulation**".

Typical sound pressure level for axial bathroom extractor fans is range between 35 dB(A) and 45 dB(A) at 1 meter. Considering worst-case scenario, the sound pressure level from the extractor fan is 45 dB(A) at 1 meter. Sound reduction index of shower room wall with an internal wall and a 100 mm gap below the door is minimum 20 dB. Using airborne sound transmission equation, sound pressure level in the receiving room could be calculated, considering 22 m^2 amount of sound absorption in the room and 10 m^2 surface area between room and shower;

$$L_{Receiver} = L_{Fan} - R + 10\log S - 10\log A$$
$$L_{Receiver} = 45 - 20 + 10\log 10 - 10\log 22$$
$$L_{Receiver} = 45 - 20 + 10\log 10 - 10\log 22$$
$$L_{Receiver} = 21.6\ dB(A)$$

BS8233:2014 suggests a desirable guideline of of 35dB $L_{Aeq,16hr}$ for resting conditions, and up to 40dB considered acceptable for necessary developments and 30dB $L_{Aeq,8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq,8hr}$. *The proposed extractor fan for shower would place the internal continuous levels in sleeping area as below 30dB for night and below 35 dB for day. Therefore, daytime and night-time internal noise level in resting and sleeping area are in the desirable category.*

10. Conclusion

Ron-Berks Acoustics Ltd has undertaken an environmental noise survey at No. 73-75 North Road, Lancing, West Sussex, BN15 9AS on Thursday 14th July 2022 in order to determine prevailing noise levels that are representative of the nearest noise sensitive neighbouring residential receivers. A BS4142:2014+A1:2019 noise assessment has been carried out at the site. All worst-case situations have been considered for the assessment.

In accordance with BS4142:2014+A1:2019 guidance, **the day rating level at nearest receptors** does not exceed the background sound level. It has been shown that the day rating noise levels at nearest receptors are 12 dB(A) below the background level at proposed first floor window of 73-75 North Road, Lancing. ***The operation of the sound sources indicates the specific sound sources having a low adverse impact.***

The night rating noise levels at nearest receptors are not expected to exceed day noise level because noise source (garage) will be closed at 5:30pm.

The summary of the difference between rating level and background noise level of all noise sensitive receptors are given in table below.

Noise sensitive receptor	**Difference between rating level and background level**	
	Day	**Night**
First floor flats of 73-75 North Road, Lancing, West Sussex, BN15 9AS	-12 dB(A)	-12 dB(A)

A rigorous calculation method, which is given in BS8233:2014 was used to determine interior noise levels based on measured environmental noise levels. A shortened measurement procedure of CRTN (Calculation of Road Traffic Noise) 1988 was used for a 3-hours $L_{A10,3hrs}$ measurement to be extrapolated into an 18-hours daytime period $L_{A10,18hrs}$ whereby the main source of noise is road traffic.
In accordance with BS8233:2014 guidance; the *daytime internal noise levels in living/dining area* **18 dBA** $L_{Aeq,16hr}$ *are within the desirable category of 35 dBA. The night-time internal noise levels in sleeping area* **18 dBA** $L_{Aeq,8hr}$ *are in the desirable category of 30 dBA. The maximum individual noise events* **39 dBA** L_{AFmax}, *does not exceed* 45 dBA L_{AFmax} *of the desirable category.*
Proposed multi-layer ceiling scheme will reduce noise level by 59 dB which is higher than required minimum sound insulation value of 50 dB **(D_{nTw} + C_{tr} dB)**.
Noise levels from extractor fans for shower and cooker hood are in the desirable category of 30dBA for sleeping area and below 35 dBA for dining/living/ area.

The operation of the sound sources indicates the specific sound sources having a low adverse impact during daytime and night-time. Therefore, the measured noise level of the sound sources is expected to comply with BS4142:2014+A1:2019 guidance and BS8233:2014 guidance, and Adur District Council's policy.

11. References

1 BS4142:2014+A1:2019 "*Methods for rating and assessing industrial and commercial sound*".
2 BS8233:2014 "*Guidance on sound insulation and noise reduction for buildings*".
3 CRTN 1988, "*Calculation of road traffic noise*", Department of Transport.

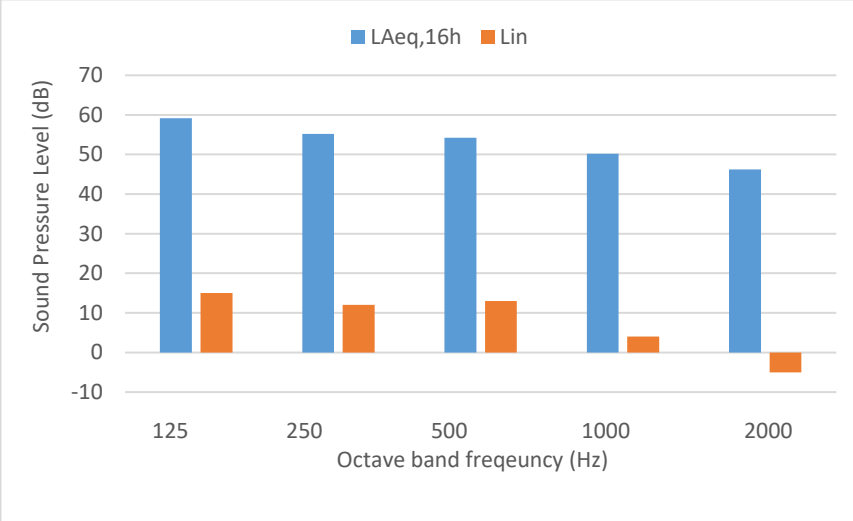
12. APPENDIX A: Acoustics Terminology

Parameter	Description
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing ($20x10^{-6}$ Pascals).
Ambient noise level	The totally encompassing sound in a given $L_{Aeq,T}$ situation at a given time, usually composed of sound from many sources near and far.
Background noise level	The A-weighted sound pressure level of the $L_{A90,T}$ residual noise at the assessment position exceeded for 90% of a given time interval T, measured using the fast response and reported to the nearest whole dB.
Rating level $L_{Ar,T}$	The specific noise level plus any adjustment for the characteristic features of the noise.
Residual noise level	The ambient noise level at the assessment $L_{Aeq,T}$ position in the absence of the noise source under investigation.
Specific noise level	The equivalent continuous A-weighted noise $L_{Aeq,T}$ level produced by the source over a given reference time interval.
$L_{Aeq,T}$	The A-weighted equivalent continuous noise level over the time period T (typically T= 16 hours for daytime periods, T = 8 hours for night-time periods). This is the sound level that is equivalent to the average energy of noise recorded over a given period.
$L_{n,T}$	The noise level exceeded for n% of the time over a given period T. e.g., L90, the noise level exceeded for 90% of the time (background noise) level.
L_{Max}	The maximum noise level measured.
$L_{eq,ff}$	The equivalent continuous sound pressure level outside the room elements under consideration
A_0	A reference absorption area of 10 m^2 and is independent of frequency;
S_f	The total facade area in square metres (m^2) of the room in question;
S_{wi}	The area in square metres (m^2) of the windows of the room;
S_{ew}	The area in square metres (m^2) of the external wall of the room;
S_{rr}	The area in square metres (m^2) of the ceiling of the room
S	The total area in square metres (m^2) of elements through which sound enters the room, i.e. $S_f + S_{rr}$;
$D_{n,e}$	The insulation of the trickle ventilator measured according to BS EN ISO 10140;
R_{wi}	The sound reduction index (octave band value) of the window (see Annex C BS EN ISO 10140)
R_{ew}	The sound reduction index (octave band value) of the external wall (see Annex C BS EN ISO 10140);
R_{rr}	The sound reduction index (octave band values) of the roof/ceiling (see Annex C BS EN ISO 10140);
A	The equivalent absorption area of the receiving room being considered (see Annex C BS EN ISO 10140);
3	A correction factor

13. APPENDIX B – BS8233:2014 Specification Calculations / Construction Details

BS8233: 2014 Specification Calculation Summary
Day/Night, Front-Flat Above Office (38.6sqm) Kitchen/Living/Sleeping Area

Room Properties		Sound Insulation Properties					
Room Width (m)	8.6	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.49	Wall, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Room Height (m)	2.5	Roof, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Glazed Area (m^2)	1.5	Glazing, $R_{w,Ctr}$ (dB)	27	29	36	41	52
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	42	43	43	49	64



External Level	60.6 dB L_{Aeq}
Internal Level	18 dB L_{Aeq}
Insertion Loss	42.6 dB L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			Suitable Systems
Glazing	**34**	dB $R_{w+}C_{tr}$	Double Glazing 10/12/6.4 PVB
Ventilation	**45**	dB $D_{new+}C_{tr}$	Hit and miss trickle ventilation, Passive thru-wall vent Passivent Fresh 80dB

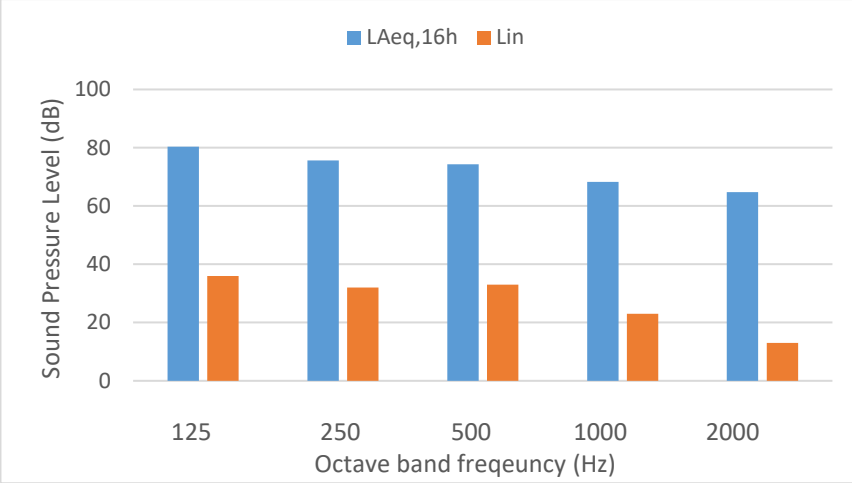
	Transmission coefficients				
Frequency, Hz	125	250	500	1k	2k
Vents	5.25798E-06	4.177E-06	4.177E-06	1.049E-06	3.318E-08
Glazing	0.000249408	0.0001574	3.14E-05	9.929E-06	7.887E-07
Wall	6.95037E-05	2.767E-05	2.767E-05	3.483E-06	1.387E-06
Roof	6.95037E-05	2.767E-05	2.767E-05	3.483E-06	1.387E-06
Internal Level (dB)	31	21	16	4	-6
A-Weighted Internal Level (dB)A	15	12	13	4	-5

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

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

BS8233: 2014 Specification Calculation Summary
Maximum Level, Front-Flat Above Office (38.6sqm) Kitchen/Living/Sleeping Area

Room Properties		Sound Insulation Properties					
Room Width (m)	8.6	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.49	Wall, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Room Height (m)	2.5	Roof, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Glazed Area (m^2)	1.5	Glazing, $R_{w,Ctr}$ (dB)	27	29	36	41	52
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	42	43	43	49	64



External Level	81 dB L_{Aeq}
Internal Level	39 dB L_{Aeq}
Insertion Loss	42 dB L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			Suitable Systems
Glazing	**34**	dB $R_{w+}C_{tr}$	Double Glazing 10/12/6.4 PVB
Ventilation	**45**	dB $D_{new+}C_{tr}$	Hit and miss trickle ventilation, Passive thru-wall vent Passivent Fresh 80dB

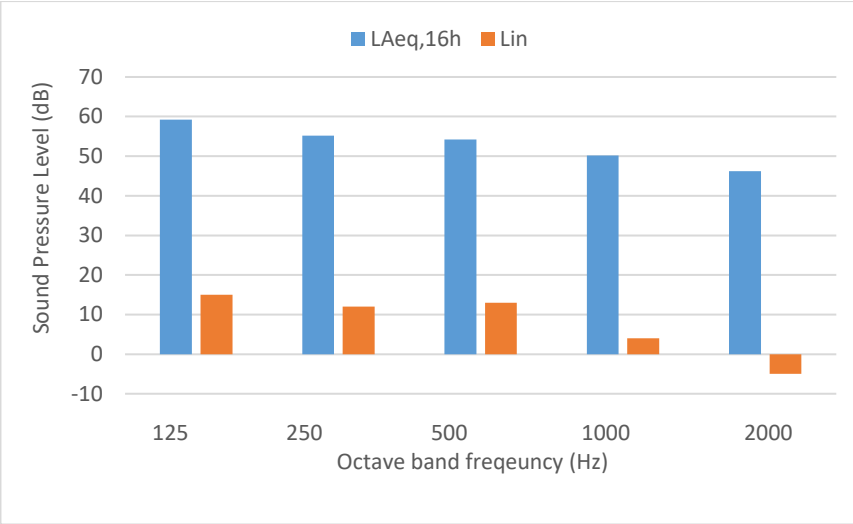
	Transmission coefficients				
Frequency, Hz	125	250	500	1k	2k
Vents	5.25798E-06	4.17656E-06	4.17656E-06	1.0491E-06	3.32E-08
Glazing	0.000249408	0.000157366	3.13986E-05	9.9291E-06	7.89E-07
Wall	6.95037E-05	2.76699E-05	2.76699E-05	3.48344E-06	1.39E-06
Roof	6.95037E-05	2.76699E-05	2.76699E-05	3.48344E-06	1.39E-06
Internal Level (dB)	52	41	36	23	12
A-Weighted Internal Level (dB)A	36	32	33	23	13

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

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

14. APPENDIX C : BS8233: 2014 Specification Calculation/Construction Summary Day/Night, Rear-Flat Above Office (39sqm), Kitchen/Living/Sleeping Area

Room Properties		Sound Insulation Properties					
Room Width (m)	8.6	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.55	Wall, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Room Height (m)	2.5	Roof, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Glazed Area (m^2)	1.5	Glazing, $R_{w,Ctr}$ (dB)	27	29	36	41	52
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	42	43	43	49	64



External Level	60.6 dB L_{Aeq}
Internal Level	18 dB L_{Aeq}
Insertion Loss	42.6 dB L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			Suitable Systems
Glazing	**34**	dB $R_{w+}C_{tr}$	Double Glazing 10/12/6.4 PVB
Ventilation	**45**	dB $D_{new+}C_{tr}$	Hit and miss trickle ventilation, Passive thru-wall vent Passivent Fresh 80dB

	Transmission coefficients				
Frequency, Hz	125	250	500	1k	2k
Vents	5.25798E-06	4.177E-06	4.177E-06	1.049E-06	3.318E-08
Glazing	0.000249408	0.0001574	3.14E-05	9.929E-06	7.887E-07
Wall	6.95037E-05	2.767E-05	2.767E-05	3.483E-06	1.387E-06
Roof	6.95037E-05	2.767E-05	2.767E-05	3.483E-06	1.387E-06
Internal Level (dB)	31	21	16	4	-6
A-Weighted Internal Level (dB)A	15	12	13	4	-5

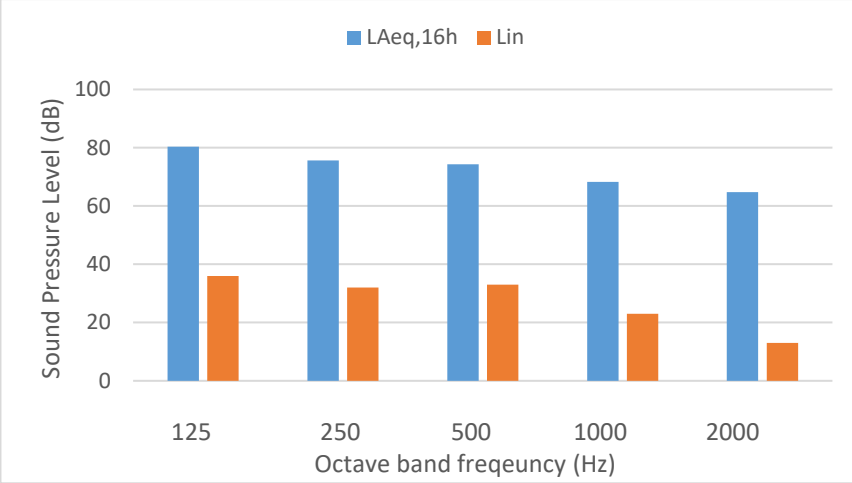
Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

Ron-Berks Acoustics Ltd. Acoustic Consultancy

BS8233: 2014 Specification Calculation / Construction Details Summary
Maximum Level, Rear-Flat Above Office (39sqm) Kitchen/Living/Sleeping Area

Room Properties		Sound Insulation Properties					
Room Width (m)	8.6	Frequency, Hz	125	250	500	1k	2k
Room Depth (m)	4.55	Wall, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Room Height (m)	2.5	Roof, $R_{w,Ctr}$ (dB)	41	45	45	54	58
Glazed Area (m^2)	1.5	Glazing, $R_{w,Ctr}$ (dB)	27	29	36	41	52
Is dwelling on top floor?	Yes	Vents, $D_{new,Ctr}$ (dB)	42	43	43	49	64



External Level	81 dB L_{Aeq}
Internal Level	39 dB L_{Aeq}
Insertion Loss	42 dB L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			Suitable Systems
Glazing	**34**	dB $R_{w+}C_{tr}$	Double Glazing 10/12/6.4 PVB
Ventilation	**45**	dB $D_{new+}C_{tr}$	Hit and miss trickle ventilation, Passive thru-wall vent Passivent Fresh 80dB

	Transmission coefficients				
Frequency, Hz	125	250	500	1k	2k
Vents	5.25798E-06	4.17656E-06	4.17656E-06	1.0491E-06	3.32E-08
Glazing	0.000249408	0.000157366	3.13986E-05	9.9291E-06	7.89E-07
Wall	6.95037E-05	2.76699E-05	2.76699E-05	3.48344E-06	1.39E-06
Roof	6.95037E-05	2.76699E-05	2.76699E-05	3.48344E-06	1.39E-06
Internal Level (dB)	52	41	36	23	12
A-Weighted Internal Level (dB)A	36	32	33	23	13

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

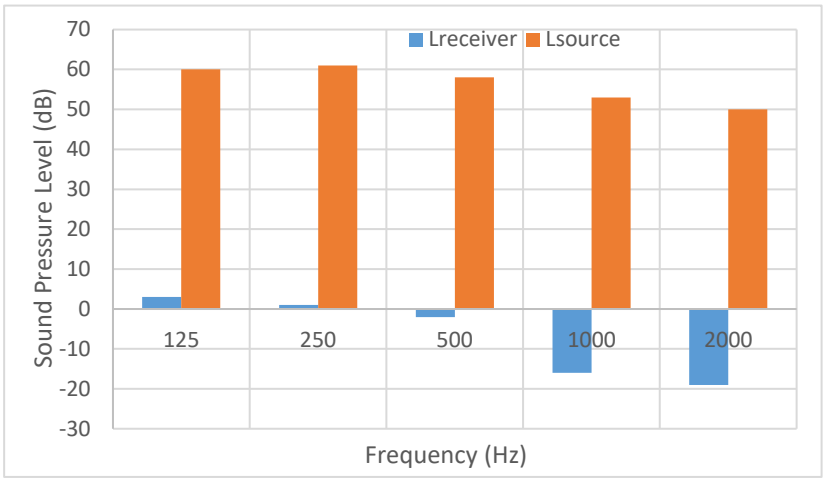
$$L_{eq,2}=L_{eq,ff}+10\log\left(\frac{A_0}{S}10^{\frac{-D}{10}}+\frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}}+\frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}}+\frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right)+10\log\left(\frac{S}{A}\right)+3$$

15. APPENDIX D: BS8233:2014 Specification Calculations / Construction Details

BS8233: 2014 Specification Calculation Summary

Flat (39sqm) and (38.6sqm) above the proposed office, CEILING

		Sound Insulation Properties					
Room Width (m)	8.6	**Frequency, Hz**	**125**	**250**	**500**	**1k**	**2k**
Room Depth (m)	4.55	Wall, R_w,C_{tr} (dB)	40	44	45	51	56
Room Height (m)	2.5	Ceiling, R_w,C_{tr} (dB)	**48**	**53**	**53**	**62**	**62**
Glazed Area (m^2)	1.5	Glazing, R_w,C_{tr} (dB)	27	29	36	41	52
Is dwelling on top Floor?	yes	Vents, D_{new},C_{tr} (dB)	37	36	35	36	34



Receiver Level (flat above the office)	6dB L_{Aeq}
Source Level (Office)	65 dB L_{Aeq}
Insertion Loss	59 dB L_{Aeq}

Sound Insulation Requirement			
Minimum Sound Insulation Requirement			Suitable Systems
Ceiling	**50**	dB (D_{nTw} + C_{tr})	**See Section 6.9 sound insulation scheme**

	Transmission coefficients				
Frequency, Hz	**125**	**250**	**500**	**1k**	**2k**
Vents	0	0	0	0	0
Glazing	0	0	0	0	0
Wall	0	0	0	0	0
Ceiling	1.58489E-05	5.01187E-06	5.01187E-06	6.30957E-07	6.30957E-07
Source (restaurant/cafe), L_{Aeq} (dB) A	60	61	58	53	49
Receiver (inside flat), L_{Aeq} (dB)A,	3	1	-2	-15	-19

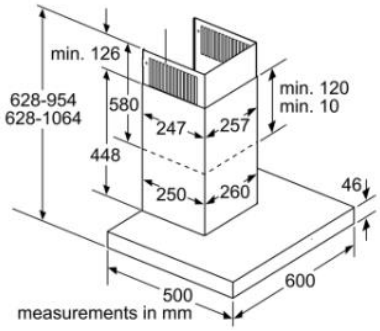
Calculations are conducted in accordance with BS8233: 2014 rigorous calculation method:

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

16. APPENDIX E

Bosch Series 6 DWB68JQ50B 60 cm Chimney Cooker Hood - Stainless Steel







Product Specification

Highlights

Dimensions (cm)
(H)62.8 x (W)59.8 x (D)50.0

Control Type
Touch Control

Energy Rating
A

Lighting Type
LED

Maximum Noise Level
60 dB

Number of Speeds
5

Venting Type
Ducted/Recirculating

Boost Mode
Yes

Brand
Bosch

Colour
Stainless Steel

Category
Chimney Cooker Hoods

SKU
DWB68JQ50B SS

Hood Type
Chimney

Manufacturer Warranty
2 Year