

MILLER & CARTER, CAVERSHAM

CONDITION 5 NOISE ASSESSMENT

On behalf of:

Mitchells and Butlers Leisure Retail Ltd

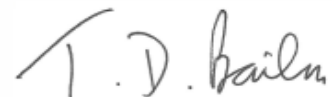
MILLER & CARTER, CAVERSHAM

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd has been commissioned by Mitchells and Butlers Leisure Retail Ltd to carry out a mechanical plant noise assessment to assist with the discharge of Condition 5 of the planning permission regarding approved new kitchen ventilation plant at the existing Miller & Carter restaurant at 109 Kidmore Road, Caversham, Berkshire RG4 7NH.

1.2 The ventilation plant serving the restaurant's kitchen was upgraded during a recent refurbishment. The planning permission for the new plant, with Reading Borough Council reference number 230661, includes Condition 5 relevant to acoustics. This states the following:

"5. Within 6 months of this decision of the hereby approved plant a secondary noise assessment shall be submitted to and approved in writing by the Local Planning Authority. The assessment shall be carried out in accordance with BS4142:2014 A2019 and shall demonstrate that the plant as installed meets the specifications of the Mechanical Plant Noise Assessment produced by Hepworth Acoustics Ltd received on 15 May 2023 and it shall further demonstrate that the specific sound level of the plant/equipment hereby approved, (LAeq,Tr) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, LA90,T when all plant/equipment (or any part of it) is in operation. The rating level, LAr,Tr (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive façade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, LA90,T when all plant/equipment (or any part of it) is in operation. The assessment shall if necessary propose suitable mitigation in order to ensure that the aforementioned criteria is achieved."

1.3 The purpose of this assessment is therefore to determine the noise impact of the new kitchen ventilation plant using the guidance in BS 4142 and to assess this against the noise limits stated in Condition 5. This assessment has included the following:

- A site inspection;
- Direct measurement of background noise levels outside the nearest residence;
- Direct measurement of noise from the new kitchen ventilation plant;
- Assessment of whether the new kitchen ventilation plant meets the noise requirements of Condition 5.

- 1.4 The site is bounded by Kidmore Road to the northeast. To the southeast of the site is Hornbeam Close, with private houses beyond. To the southwest of the site is the restaurant's car park and garden, with the private houses on Lymington Gate beyond. To the northwest are further private residences. The house at 89 Kidmore Road is the nearest residence, at around 31 metres away from the new mechanical plant, based on our survey on site. The site location is shown in Figure 1.
- 1.5 The new mechanical plant has been installed outside on the first-floor flat roof at the rear of the premises, which includes a new kitchen extract fan, new kitchen supply fan, and associated silencers and ductwork.
- 1.6 There are 1.8 metre high acoustic screens proposed for the perimeter of the flat roof, to surround the kitchen ventilation plant and hence screen it from neighbouring residences. This is to reduce the noise impact. The screens have not yet been installed at the time of writing this assessment, and hence their noise attenuation performance by necessity has been predicted, not measured on site.
- 1.7 To summarise, the new mechanical plant is as follows:

Table 1: Kitchen Ventilation Equipment

Equipment	Type	Location
Kitchen Extract Fan	SystemAir MUB T 062 630D4	Rear flat roof
Kitchen Supply Fan	SystemAir MUB T 062 630D4	Rear flat roof

- 1.8 The kitchen ventilation plant runs only when the kitchen is operating, which is typically between 11:00 and 22:30 daily.
- 1.9 We note that there are pre-existing noise-generating mechanical plant items at the site, specifically two condensers: one serving the cellar cooling system, and another serving the fridge/freezer. These are not the subject of the planning application, Condition 5 is not applicable to these units, and therefore these items are excluded from this assessment. All noise measurements referred to in this assessment have been made with the existing condensers switched off. Any investigation of noise from the condensers is outside of the scope of this report. Noise from the condensers, if any, must be ignored when assessing compliance of the kitchen ventilation system with Condition 5.
- 1.10 As requested by the Environmental Health Officer at Reading Borough Council, no modelling has been used in this assessment. Only direct noise measurements and hand calculations have been employed. There has been no noise mapping, ray tracing, or other modelling technique used.

- 1.11 All recommendations in this report are given for acoustics reasons only. Compliance with other requirements (e.g. fire, structural, thermal, etc.) must be checked by others.
- 1.12 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 ACOUSTIC DESIGN CRITERIA

- 2.1 Condition 5 refers to the current version of British Standard 4142, which is BS 4142: 2014 + A1: 2019 *'Methods for rating and assessing industrial and commercial sound'*. The standard will be referred to as BS 4142 for the rest of this report for brevity.
- 2.2 BS 4142 requires the noise 'rating level' for the mechanical plant to be compared with the background (L_{A90}) sound level in the absence of the operational noise being assessed, outside the nearest residential location.
- 2.3 The 'rating level' is derived based on the 'specific sound level' (in L_{Aeq}) attributable to the plant with an *'acoustic feature'* penalty added for any noise sources which give rise to tonal, impulsive, intermittent, or other characteristics that are readily distinctive against the residual acoustic environment, outside the residential location.
- 2.4 The impact of the plant noise at the nearest residential location is determined by subtracting the background sound level from the rating level.
- 2.5 To comply with the noise requirements of Condition 5, the 'specific sound level' outside the nearest residence due to the new kitchen ventilation plant must therefore be at least 10 dB(A) below the dB(A) level shown in Table 2 in the next section of this report, and the 'rating level' must be below the dB(A) level shown in Table 2.
- 2.6 Condition 5 refers to "measurements" of the specific sound level and the rating level, specifically that the report *"shall further demonstrate that the specific sound level of the plant/equipment hereby approved, ($L_{Aeq,Tr}$) (with reference to BS:4142) as **measured [our bold]** at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, $LA_{90,T...}$ ". Condition 5 goes on to state, "The rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as **measured [our bold]** at a point 1 metre external to the nearest noise-sensitive facade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, $LA_{90,T...}$ ".*
- 2.7 We note that it is physically impossible to measure the specific sound level directly when it is at least 10 dB below the background sound level, so Condition 5's use of the word "measured" in this context is inadvisable. This is because the specific sound level is too quiet to measure above the background noise in this scenario. In other words, when the background noise is at least 10 dB above the specific sound level, the background noise will dominate the measurement, meaning only the background

noise is measured directly. To avoid this problem, we have measured the specific sound level at 1 metre from the noise source, where it is sufficiently greater than the background noise level to be measurable with suitable reliability, then we have calculated by hand the resulting specific sound level at a point 1 metre external to the nearest habitable window of a dwelling, taking into account noise attenuation due to distance, and barrier attenuation due to the proposed rooftop screens. This methodology is necessary in order to determine the specific sound level of the kitchen ventilation plant and hence confirm whether it meets the noise limits described in Condition 5.

- 2.8 The same applies to the rating level, which is also impossible to measure directly in this context, partly because it is too quiet, but also because it is impossible to measure the BS 4142 acoustic penalty, as this is added in theory only. In this specific case, the acoustic penalty is zero, but it remains impossible to measure the rating level directly for the same reasons it is impossible to measure the specific sound level directly, as described above. A better wording for Condition 5 would be to use “determined” rather than “measured”, for example.

3.0 NOISE SURVEYS

Background Noise

- 3.1 To determine the pre-existing background noise levels, background noise measurements were made at 22:30 on Thursday 12th January 2023 outside the nearest residence at the location marked on Figure 1. The late-evening measurement time was selected to consider a worst-case scenario, when background noise levels are typically at their lowest point during the plant’s operating hours.
- 3.2 All mechanical plant associated with the site, including fans and condensers, were switched off for the duration of the background noise survey.
- 3.3 The measurement microphone was mounted on a tripod, around 1.5 metres above ground level with the microphone in ‘free-field’ conditions. Measurements were made using the *L*_{A90} metric.
- 3.4 The weather conditions throughout the noise survey were cool, dry, and overcast, with wind speeds below 5 m/s. Wind was from the southwest. These were considered suitable conditions for the survey.
- 3.5 The results of the noise measurements are summarised in Table 2.

Table 2: Measured background noise levels summary (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
All equipment off (background), dB <i>L</i> _{90,5mins}	49	50	45	42	40	32	22	15	44

- 3.6 The background noise levels, in the absence of the equipment noise, were predominantly due to road traffic on Kidmore Road. There was no noise contamination from mechanical plant associated with the site, since this was all switched off at the time.
- 3.7 All noise measurements were carried out using a Brüel & Kjær Type 2250 sound level meter (serial no. 3011626) fitted with a windshield.
- 3.8 The calibration level of the meter was checked before and after the survey with a Brüel & Kjær Type 4231 sound calibrator (serial no. 2412667). No significant calibration deviation was observed.

Kitchen Ventilation Plant Noise

- 3.9 To determine the noise emissions of the new kitchen ventilation plant, noise measurements were made at 22:30 on Thursday 29th February 2024 at 1 metre from the new kitchen ventilation plant at the location marked on Figure 1. The measurements were made with a) the new kitchen ventilation

plant running at normal speed and b) with all equipment switched off. The late-evening measurement time was selected to reduce interference from extraneous noise such as road traffic. Other mechanical plant items associated with the site, including the two condensers, were switched off for the duration of the measurements.

- 3.10 The measurement microphone was mounted on a tripod, around 1.5 metres above first-floor roof level with the microphone in 'free-field' conditions. Each of measurements a) and b) described above were taken for five-minute sample durations. Measurements were made using the L_{A90} metric. For constant noise sources, including fixed plant such as this, L_{A90} can be considered equivalent to L_{Aeq} for assessment purposes, but with the advantage of excluding intermittent noise from external environmental sources that would otherwise interfere with the source noise measurements.
- 3.11 The weather conditions throughout the noise survey were cool, dry, and overcast, with wind speeds below 5 m/s. Wind was from the southwest. These were considered suitable conditions for the survey.
- 3.12 The results of the noise measurements are summarised in Table 3.

Table 3: Measured noise levels summary (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
New plant on at normal speed @ 1 m, dB $L_{90,5mins}$	64	68	63	58	55	48	39	30	61
All equipment off (residual), dB $L_{90,5mins}$	50	51	46	43	40	32	24	19	45

- 3.13 The residual noise levels, in the absence of the equipment noise, were predominantly due to road traffic on Kidmore Road. As the residual noise levels at the time were at least 10 dB below the measured plant noise levels, no correction for residual noise is necessary.
- 3.14 The mechanical plant source noise was neither tonal, intermittent, nor impulsive, therefore no BS 4142 acoustic feature penalty is required.
- 3.15 All noise measurements were carried out using a Brüel & Kjær Type 2250 sound level meter (serial no. 3011626) fitted with a windshield.
- 3.16 The calibration level of the meter was checked before and after the survey with a Brüel & Kjær Type 4231 sound calibrator (serial no. 2412667). No significant calibration deviation was observed.

4.0 ASSESSMENT

- 4.1 There will be distance attenuation of sound over the 31 metres to the nearest habitable room window, giving 30 dB(A) reduction. The following standard equation has been used for calculating the sound pressure level (in L_{Aeq}) at a point of interest away from a source of noise that has a known sound pressure level at a specified distance:

$$L_2 = L_1 - 20 \log r_2/r_1$$

Where:

L_1 = sound pressure level (in dB) close to source at distance r_1 (in metres)

L_2 = sound pressure level (in dB) at point of interest at distance r_2 (in metres)

- 4.2 There is a 1.8 metre high acoustic screen proposed for the perimeter of the flat roof, which will block line-of-sight between the kitchen ventilation plant and the neighbouring residences. The screen must be solid, imperforate, with no gaps or openings, sealed at the base, with a minimum surface mass of 10 kg/m².
- 4.3 We understand that the specified screen material is the Soundshield product by Configured Platforms Ltd. According to the manufacturer's data, this has a surface mass of 15 kg/m² so this complies with the surface mass requirement stated above.
- 4.4 The acoustic screen supplier's design drawings (Configured Platforms Ltd drawing reference DR1340, Revision B, dated 21st May 2025) show the screen as solid, imperforate, with no gaps or openings, and sealed at the base, which is also compliant with the acoustic requirements stated above.
- 4.5 Using the guidance in British Standard 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – noise*, we calculate that the proposed screen will reduce noise levels at the nearest residence by at least 7 dB(A). This performance matches our previous experience measuring the noise attenuation performance of similar screens at other sites. The noise barrier calculation is shown in Appendix II.
- 4.6 The noise level from the new kitchen ventilation plant determined at a point 1 metre external to the nearest habitable room window is summarised in Table 4. Ground attenuation is taken as negligible for a conservative approach.

Table 4: Kitchen ventilation system noise outside nearest residence

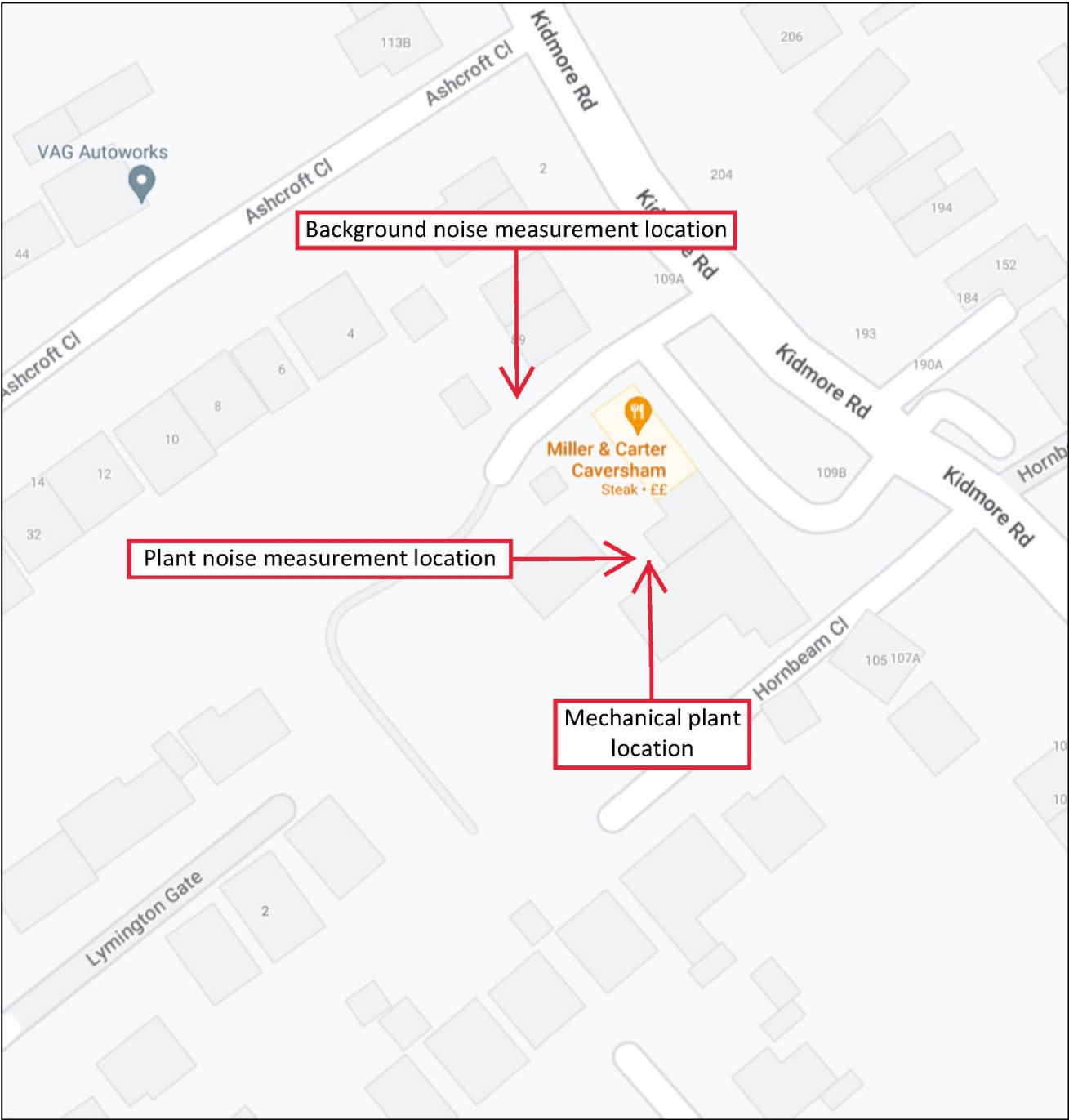
Description	dB(A)
Measured kitchen ventilation plant sound pressure level @ 1 metre (dB L_p)	61
Distance attenuation (31 metres, hemispherical propagation)	-30
Barrier attenuation	-7
Façade reflection (from section 3.1.10 in BS 8233: 2014)	+2
Resultant specific sound level at 1 metre external to nearest habitable room window (dB $L_{Aeq,Tr}$)	26
Acoustic feature correction	0
Rating level (dB $L_{Ar,Tr}$)	26
Background noise level (dB $L_{A90,15mins}$)	44
Comparison (Rating level – Background level)	-18

- 4.7 As can be seen from the results in Table 4, the kitchen ventilation system specific sound level and the noise rating level are both calculated to be 18 dB(A) below the background noise levels at a point 1 metre external to the nearest habitable room window.
- 4.8 This therefore meets the noise requirements of Condition 5. No further noise mitigation measures are required, beyond those already specified as described in this report.
- 4.9 Please note that compliance with Condition 5 does **not** mean that noise from the kitchen ventilation system will be inaudible outside the nearest residence. It is likely still to be audible during quiet times, for example, in lulls between traffic. Audibility of the kitchen ventilation system outside the nearest residence must not be taken as evidence of non-compliance with Condition 5.
- 4.10 As previously mentioned, this assessment excludes noise from the existing condensers at the site, as these have no relevance to the discharge of Condition 5.
- 4.11 For general good practice, we recommend that the equipment is inspected periodically to confirm whether maintenance is needed. This should include checks that all equipment is running smoothly, without any unusual noise or excessive vibration, with the necessary maintenance carried out as needed. The fan speed should also be checked to ensure it has not been altered to run faster than the design speeds noted in the Statement of Design Intent for Kitchen Ventilation System prepared by Building Management Technology Ltd.

5.0 CONCLUSIONS

- 5.1 A noise assessment of the new kitchen ventilation plant associated with the Miller & Carter restaurant at 109 Kidmore Road, Caversham, Berkshire RG4 7NH has been carried out with regards to Condition 5 of the planning permission.
- 5.2 A noise survey has been undertaken at the site to determine the pre-existing background noise levels in the absence of noise from the mechanical plant associated with the site.
- 5.3 In addition to the background noise survey, noise from the kitchen ventilation system has been measured directly on a separate occasion. Using the results of the direct noise measurements, the specific sound level and the rating level for the kitchen ventilation system outside the nearest residence have been determined using the guidance in British Standard 4142.
- 5.4 New acoustic screening has been proposed for the flat roof to shield neighbouring residences from the kitchen ventilation system.
- 5.5 Based on our assessment, the specific sound level and the noise rating level from the new kitchen ventilation system will be more than 10 dB(A) below the background noise levels previously measured on site by Hepworth Acoustics in February 2023. This is when determined at a point 1 metre external to the nearest habitable room window.
- 5.6 This therefore means that the noise from the new kitchen ventilation plant complies with the noise limits of Condition 5 of the planning permission. On this basis, we recommend that Condition 5 may be discharged.
- 5.7 Please note that compliance with Condition 5 does **not** mean that noise from the kitchen ventilation system will be inaudible outside the nearest residence. It is likely still to be audible during quiet times, for example, in lulls between traffic.
- 5.8 As requested by the Environmental Health Officer, no modelling has been used in this assessment. Only direct noise measurements have been used, along with hand calculations where necessary. Hand calculations are necessary partly to account for the proposed acoustic screen, but also because it is not physically possible to measure directly specific sound levels that are more than 10 dB below background noise levels. This report therefore complies with the requirements of Condition 5, as far as practical.
- 5.9 For general good practice, we recommend that the kitchen ventilation equipment is inspected periodically and maintained as needed to ensure noise levels are not raised.

Figure 1 – Site Location



Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

- $L_{Aeq,T}$ This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period, T. It is increasingly being used as the preferred parameter for all forms of environmental noise.
- $L_{Amax,f}$ This is the maximum A-weighted noise level that was recorded during a sample duration, with the sound level meter on the 'fast' setting.
- $L_{A90,T}$ This is the A-weighted noise level exceeded for 90% of the time period, T. L_{A90} is used as a measure of background noise.
- $L_{Ar,T}$ This is the BS 4142 rating level for the time period, T.
- L_W This is the sound power level of a sound source, in decibels, which is 10 times the logarithm to the base 10 of the ratio of sound power radiated by the source to a reference power. The reference power is 1 picowatt (1×10^{-12} watt). The sound power level is the fundamental measure of the total sound energy radiated by a source per unit time.

Barrier Attenuation	h (Source)	h(Receiver)	h(Barrier)	d(S-B)	d(B-R)	d(S-B-R)	d(SBR)	d(SR)
	4.5	4.5	4.8	1.0	29.0	30.0	30.05	30.00

a	b	c	Path Diff	Log
1.04	29.00	30.00	0.045582	#####

Frequency (Hz)	500	h(S)-H(R)	h(S)-H(R)/SBR	Theta	h(min shadow)	Zone
Speed (c)	344	0	0	0	4.5	Shadow

	Freq Hz	Barrier Correction dB
	At Frequency (Hz)	
Fresnel		-7.5
Octave Band	63	-5.2
	125	-5.6
	250	-6.4
	500	-7.5
	1000	-9.2
	2000	-11.3
	4000	-13.8
	8000	-16.6

Diagram illustrating the geometry of sound diffraction over a barrier. The diagram shows the Effective source position (S), the Diffracting edge, and the Reception point (R). The paths are labeled a, b, and c. The illuminated zone is shown above the barrier, and the shadow zone is shown below it. The path difference is given by the formula: $\delta = a + b - c$.

Minimum mass kg/m ²	10.0
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	BS5228								
	63	125	250	500	1k	2k	4k	8k	A
Fresnel/BS5228	-5	-6	-6	-8	-9	-11	-14	-17	-7