hepworth acoustics

ALL BAR ONE, 1 KEW ROAD, RICHMOND

KITCHEN PLANT NOISE ASSESSMENT

On behalf of:

Mitchells & Butlers Leisure Retail Ltd

Report No. P22-347-R01v1
September 2024

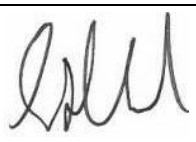
ALL BAR ONE, 1 KEW ROAD, RICHMOND

KITCHEN PLANT NOISE ASSESSMENT

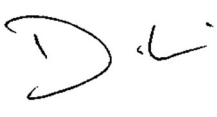
Report prepared by:
Hepworth Acoustics Ltd
The Wheelhouse
Bond's Mill Estate
Stonehouse
Gloucestershire
GL10 3RF

On behalf of:
Mitchells & Butlers Leisure Retail Ltd

Report prepared by:
Graham Bowland BSc MIOA – Technical Director



Report checked by:
Donald Quinn BSc FIOA – Managing Director



CONTENTS

1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd has been commissioned by Mitchells & Butlers Leisure Retail Ltd to carry out a mechanical plant noise assessment in connection with the proposed replacement of kitchen plant at the existing restaurant premises at 1 Kew Road, Richmond. The site has hitherto operated as "One Kew Road" but is due to be rebranded as part of the "All Bar One" chain.

1.2 This assessment has been requested in connection with the planning application for the replacement plant.

1.3 This assessment considers the removal of existing kitchen supply and extract plant, located within an existing plant area on a flat roof towards the centre of the premises, and introduction of replacement plant to perform the same basic functions and to be located in essentially the same locations.

1.4 The existing plant area currently also contains a number of other items of mechanical plant associated with the restaurant, namely condenser units, which are to be retained and hence are not considered as part of proposals for the purpose this assessment.

1.5 The kitchen extract and supply plant comprise externally mounted rooftop fan units, with supply and extract ducting penetrating the flat roof to below. The supply intake from atmosphere is via a horizontal duct termination at roof level, oriented to the north. The extract exhaust to atmosphere is via a vertically ducted flue extending centrally to the rear wall of the front part of the building, to a point of termination about 1m above eaves level. The proposed replacement vertical exhaust duct is to be positioned precisely as per the existing flue, and the kitchen plant generally will be orientated broadly as existing. Of some note, however, it a proposed change from existing circular-section ductwork to rectangular ductwork.

1.6 The proposed plant comprises the following:

- Kitchen Extract Fan: Elta SP-QU82/630-4-3, roof mounted
- Kitchen Supply Fan: Elta SP-QU67/500-4-3, roof mounted

1.7 Atmosphere side and room side attenuators are also proposed for both the kitchen extract and supply systems.

1.8 The plant area is bounded by the rear wall of the front part of the building to the east and by the solid brick wall of the adjacent office building to the north.

1.9 To the west the plant area is bounded by an existing acoustic barrier, extending to about 2.5m above plant deck level, with acoustically absorbent surface treatment facing towards the plant. Beyond this is a further flat roof at slightly higher level, extending to the rear extents of the building, towards Parkshot.

1.10 To the south the plant area is bounded by a similar acoustic barrier, here extending to a slightly lesser height of about 2m, and running along the edge of the building line. Beyond this to the south, across an intervening hardstanding area, are the nearest residential windows to the proposed plant, which are those to the north elevation of Merevale House, a 4-storey apartment block fronting Parkshot and neighbouring the rear part of the 1 Kew Road site.

1.11 The existing kitchen plant, and likewise the proposed replacement plant, operates daily during kitchen hours and hence until about 2200hrs, potentially a little earlier or later depending upon how busy the restaurant is.

1.12 An aerial image of the existing plant area and surroundings is shown in Figure 1. The proposed plant layout is shown in plan and isometric form in Figure 2.

1.13 This assessment has included the following:

- A site inspection
- A survey of the prevailing environmental noise levels at the site
- Assessment of noise from the proposed mechanical plant
- Recommendations of appropriate noise control measures

1.14 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 GUIDANCE

2.1 The *National Planning Policy Framework* (NPPF), December 2023, states at paragraph 180 that "*Planning policies and decisions should contribute to and enhance the natural and local environment by: … e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of … noise pollution …*".

2.2 Further, paragraph 191 states that "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life …*".

2.3 In addition to the above, Policy D14 of the London Plan, dated March 2021, includes the following guidance on noise, which has also been followed in this assessment:

"In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) *avoiding significant adverse noise impacts on health and quality of life*
2) *reflecting the Agent of Change principle*
3) *mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
4) *improving and enhancing the acoustic environment and promoting appropriate soundscapes*
5) *separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
6) *where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
7) *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver."*

2.4 Policy D14 encourages the use of British Standard 4142 is BS 4142: 2014 + A1: 2019 '*Methods for rating and assessing industrial and commercial sound'.* This standard provides methods for rating and assessing sound of an industrial and/or commercial nature.

2.5 The Local Planning Authority, Richmond upon Thames Borough Council document *Supplementary Planning Document (SPD) Development Control for Noise Generating and Noise Sensitive Development* provides interpretation of national planning and noise policy in a local context along with advice on the technical requirements that the Borough regards as relevant to meeting those requirements. With regard to noise generating commercial development, the document also cites British Standard 4142, as well as British Standard BS 8233

BS 4142

2.6 British Standard 4142: 2014 + A1: 2019 '*Methods for rating and assessing industrial and commercial sound*' provides methods for rating and assessing sound of an industrial and/or commercial nature.

2.7 BS 4142 requires the noise 'rating level' for the plant/operation to be compared with the background (L_{A90}) sound level in the absence of the operational noise being assessed, outside the nearest residential location.

2.8 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.

2.9 An initial estimate of the impact of the plant noise at the residential location is determined by subtracting the background sound level from the rating level. BS 4142 states that:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background sound level, the less likely it is that the operation will have an adverse impact or a significant adverse 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.

2.10 Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

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

BS 8233

2.11 British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings,* recommends guidance on acoustic design criteria for acceptable noise levels within residential accommodation. BS 8233 guidelines for the daytime (0700-2300) and night-time (2300-0700) periods are summarised in Table 1.

Table 1: BS 8233 Recommended Acoustic Design Criteria

Activity	Location	Internal Noise Levels	
		Daytime 0700-2300hrs	Night-time 2300-0700hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

2.12 BS 8233 clarifies that the above guidance relates only to noise without 'specific character' (e.g. such as that which has a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) and that where such characteristics are present, lower noise limits might be appropriate.

3.0 NOISE SURVEY

3.1 Environmental noise measurements were carried out at the site to determine the baseline noise climate representative of the nearest residential windows to the proposed replacement kitchen plant.

3.2 The noise measurements were undertaken using a NTi Audio XL2-TA 'Class 1' sound analyser (serial no. A2A-23512-E1), field calibrated using a Bruel & Kjaer Acoustic Calibrator, Type 4231 (serial no. 2389221) with no calibration drift noted.

3.3 The weather conditions throughout the noise survey were dry with sparse cloud cover and with low wind speeds. These were considered suitable conditions for the survey.

3.4 The survey was conducted only a few days after the closure of the previous operation as "One Kew Road". Hence all previously operation plant remained in situ on the roof. This includes the pre-existing kitchen supply and extract systems which are to be removed, and all pre-existing condensers, which are to generally remain. However, all plant was non-operational with the exception of a single cellar cooling condenser, located near to the rear wall of the front part of the building, and freezer cooling unit, located to the rear (west) part of the plant area. Of these units, the cellar unit emitted a steady continuous noise that was clearly noticeable in proximity to the unit, whereas the freezer unit operated only for short intermittent spells and emitted noise that was somewhat less noticeable, even in proximity.

3.5 Noise measurements were carried out in sequential 15-minute samples over the late evening period of 2115-2300hrs on Tuesday 17 September 2024, thus coinciding with the period slightly before and then comfortably after the normal time of cessation of operation of the proposed plant.

3.6 The measurement microphone was extended via a telescopic pole beyond the south of the plant area towards the residential windows at Merevale House, in essentially 'free-field' condition, as identified in plan in Figure 1.

3.7 Initially the noise measurements were carried out with the measurement microphone mounted above the line of the plant area acoustic barrier, hence with a line-of-sight to the plant deck, including the cellar unit that was still operational. From 2200hrs, to provide additional resolution on variations in representative baseline noise levels at the nearest residential windows, the measurement microphone was lowered well below the line of the acoustic barrier, hence with no line-of-sight to the plant deck.

3.8 The measured noise levels in these two scenarios are hence considered to be representative of the second and first floor areas at Merevale House, which respectively are with and without a line-of-sight to the plant deck.

3.9 The full noise survey results are detailed in Table 2.

Table 2: Measured Baseline Noise Levels

Line-of-Sight to Existing Operational Plant	Representative of Floor Level	Time		dB Noise level		
		Start	End	L_{Aeq}	L_{Amax}	L_{A90}
Yes	2nd	23:15	23:30	51	70	49
		21:30	21:45	50	64	48
		21:45	22:00	51	64	48
No	1st	22:00	22:15	51	62	47
		22:15	22:30	52	66	46
		22:30	22:45	50	63	45
		22:45	23:00	49	66	45

4.0 NOISE ASSESSMENT

4.1 Manufacturer's published in-duct sound power levels for the proposed supply and extract fans have been provided to us, as set out in Table 3.

Table 3: Atmosphere Side In-Duct Fan Sound Power Levels

Plant Item	Component	Sound Power Level dB							
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Kitchen Supply	Inlet	94	97	88	86	88	77	77	77
Kitchen Extract	Exhaust	85	85	80	75	71	71	71	68

4.2 In the absence of specific data, fan casing radiated sound power levels have been derived based the differentials for typical similar plant, which correspond well to the sound reduction indices provided by the sheet steel of the fan casing.

4.3 Proposed kitchen plant noise levels incident at the nearest residential windows have been calculated for first floor and second floor areas at Merevale House, as these floor levels will have varying extents of acoustic screening of the varying elements of the proposed plant. First floor areas will have no line-of-sight to the majority of plant located along the roof deck, however there will be line-of sight to the vertical exhaust flue, which terminates at a higher level. Conversely second floor areas will have a line-of-sight to most parts of the plant area.

4.4 To note, third floor areas at Merevale House are set slightly back from the main building footprint and hence will be no worse affected that second floor areas, such that separate assessment is not necessary. There are no ground floor windows to Merevale House that look towards the plant area.

4.5 The calculations take account of distance attenuation, surface directivity of and end reflection losses at duct terminations. Atmosphere-side attenuators are also taken into account in the calculation of duct termination noise, based on the insertion losses for Systemair LDF65 silencers, as are proposed for use, as given in Table 4.

Table 4: Atmosphere Side Attenuator Insertion Losses

Attenuator	Attenuator Insertion Losses dB							
	63Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
Systemair LDK 65	-	6	7	14	13	9	8	7

4.6 Noting also that rectangular section ducting is proposed, it is anticipated that duct lagging will be required for the vertical exhaust duct of the kitchen extract system. A provision of proprietary duct lagging material, of minimum 5kg/m^2 superficial mass (e.g. Muftilag by Tap Acoustics) has therefore been taken into account, assuming minimum 22g steel sheet ducting, which will need to be implemented.

4.7 The predicted noise levels are set out in Table 5.

Table 5: Predicted Plant Noise Levels

Plant Item	Component	Predicted Noise Level dB	
		1st Floor Residences	2nd Floor Residences
Kitchen Extract	Exhaust	37	41
	Case Radiated	34	39
	Duct Break-Out	37	37
	Sub-Total	**41**	**44**
Kitchen Supply	Inlet	30	32
	Case Radiated	23	23
	Duct Break-Out	15	20
	Sub-Total	**31**	**33**
TOTAL		**41**	**44**

4.8 It is not expected that the equipment to feature tonal or impulsive characteristics readily distinctive against the residual acoustic environment, and the noise will be steady throughout kitchen hours. On this basis, no acoustic feature corrections are warranted in accordance with the guidance in BS 4142. Therefor the plant rating sound level as defined in BS 4142 are 41dB L_{Ar} at first floor windows and 44dB L_{Ar} at second floors windows.

4.9 Based on the background noise levels measured at microphone positions representative of first and second floor residential windows, the initial assessments of impact in line with BS 4142 are set out in Table 6.

Table 6: Initial BS 4142 Assessments

	Noise Level dB	
	1st Floor Residences	2nd Floor Residences
Specific Kitchen Plant Sound Level, L_{Aeq}	41	44
Rating Sound Level, L_{Ar}	41	44
Lowest Measured Background Sound Level, L_{A90}	45	47
Rating minus Background	**-4**	**-4**

4.10 As shown in Table 6, based on the provision of atmosphere side and room side attenuators for both the kitchen extract and supply systems providing insertion losses as per those in Table 6, and provision of duct lagging material of minimum 5kg/m^2 superficial mass to the vertical exhaust duct, the rating level of the proposed kitchen plant will be 4dB below the lowest measured background sound level.

4.11 Based on BS 4142 guidance, this is an indication of a low noise impact, depending on the context. The context in this case is that the plant is to operate with steady and broadband characteristics, as a replacement for similar plant that has been very recently removed. The operation is in daytime hours only within an urban and established mixed residential and commercial environment.

4.12 Further to this, the predicted specific noise levels are no greater than 44dB L_{Aeq}. Therefore, even based on a cautious estimate for the likely noise break-in via a partially open windows, internal noise levels at residences attributable to operation of the proposed plant will be comfortably within the applicable BS 8233 guideline values for daytime periods.

4.13 Also of note is that the residual ambient noise levels in terms of L_{Aeq} are presently at least 6dB above this predicted specific plant level.

4.14 In summary, consideration of contextual factors presents no basis upon which to modify the initial estimate of impact and a low impact is expected, subject to the recommended noise control measures.

4.15 Nonetheless, as an additional measure, it is also recommended that all kitchen fans are connected to a timer to ensure they are switched off overnight.

5.0 CONCLUSIONS

5.1 A noise assessment of the mechanical plant noise assessment in connection with the proposed replacement of kitchen plant at the existing restaurant premises at 1 Kew Road, Richmond has been carried out.

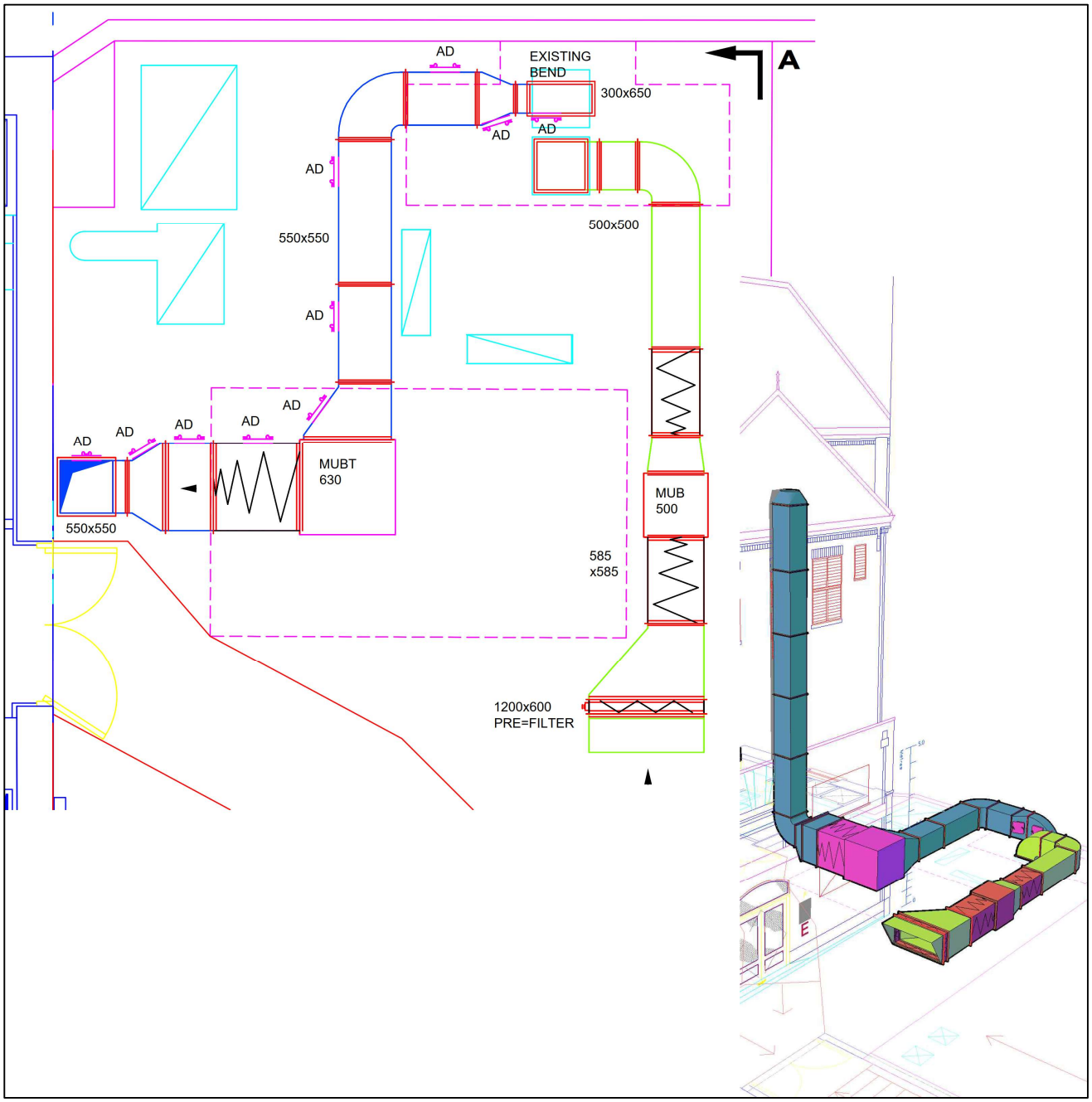
5.2 This assessment has involved carrying out a baseline noise monitoring survey to establish the existing noise climate outside the nearest residential windows.

5.3 Using the manufacturer's noise output data for the proposed equipment, the likely levels of plant noise has been calculated outside the nearest noise-sensitive premises and assessed using the guidance in BS 4142. Suitable noise mitigation measures have been recommended.

5.4 By following the recommendations in this report, we predict that the noise impact of the mechanical plant associated with the proposed development will not result in any significant harm of amenity to the nearby residents.

Figure 1: Aerial View of Site

Figure 2: Proposed Kitchen Plant



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_{wA} This is the A-weighted 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.

L_{pA} This is the A-weighted 'Sound Pressure Level', which is the Sound Pressure Level (L_p) adjusted to account for the average human hearing response at difference frequencies for a given sound pressure range.