RYDE Studios

Noise Impact Assessment
T9663 Unit 15 Barton Arcade
11th December 2023

NOISE IMPACT ASSESSMENT

Prepared for:

Kyle Harris

RYDE Studios

16a East Parade
Leeds
LS1 2BH

Email Kyle@rydestudios.com

Rydestudios.com

Prepared by:

Richard Budesha

Senior Consultant

Temple Group Limited
Express Building
9 Great Ancoats Street
M4 5AD

Richard.Budesha@templegroup.co.uk

www.templegroup.co.uk

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Introduction

Temple Group has been appointed by RYDE Studios to undertake a noise impact assessment for a proposed new spin cycle, fitness and yoga studio at Unit 15 of the Barton Arcade, 48 Barton Square, Manchester M3 2BH.

The purpose of this report is to assess the operational noise impact of the proposed development on other businesses within the shopping arcade above. There are no windows in the basement or residential dwellings within the vicinity, and therefore the impact of this has not been assessed.

In the absence of construction details of the separating floor, sound insulation testing has been undertaken between the proposed spin cycle room and the existing retail unit in the arcade above to predict the level of noise transmission during operation. The predicted noise transmission has then been compared against criteria from ProPG GAG and BS 8233.

Details of the assessment methodology used, together with the results of the survey undertaken and the subsequent conclusions and recommendations drawn are presented in this report.

A glossary of acoustic terms and their meanings has been included in **Appendix A.**

Noise Principles and Standards Used

Technical Standards and Guidance

ProPG: Gym Acoustics Guidance (GAG)

The Professional Practice Guidance on Gym Acoustics (ProPG GAG)[1] has been produced to provide practitioners, developers, operators and Local Authorities with guidance on a recommended approach for the standardised methodology for assessing buildings and environments for the location of gymnasiums, fitness and exercise spaces. The Association of Noise Consultants ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH) have worked together, collaborating across industry, to produce this guidance, which has standardised an approach for assessing gym acoustics affecting noise-sensitive adjacencies. The guidance suggests criteria for gym activity noise in different receptor types based on a G Curve value, which is a way to reference sound spectra in a single figure, similar to Noise Rating (NR) curves. ProPG GAG criteria are presented in **Table 1**.

Table 1 ProPG guidance internal sound target criteria for Gym Activity

Receptor Type	Guide Criteria	
	Airborne Sound (e.g music) $L_{eq, T}$ (31.5Hz to 8kHz)	Heavy Impact Sound $L_{max, F}$ (31.5Hz to 8kHz)
Commercial Offices	G25 – G35	G35 – G45
Retail Area	G30 – G45	G35 – G50
Residential Areas	G15 – G25 (day) G10 – G20 (night)	G20 – G25 (day) G15 – G20 (night)

British Standard 8233

British Standard 8233:2014[2] (BS 8233) 'Guidance on Sound Insulation and Noise Reduction for Buildings' provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties. The standard suggests suitable internal noise levels within different types of space with examples for non-domestic buildings when unoccupied shown in **Table 2**.

[1] ANC, IOAN and CIEH. 'ProPG: Gym Acoustics Guidance (GAG)'. (March 2023)
[2] British Standards Institute (BSI), (2014). 'BS 8233 – Guidance on sound insulation and noise reduction for buildings. BSI, London.

Table 2 BS 8233 Typical noise levels in non-domestic buildings

Activity	Location	Design range dB $L_{Aeq, T}$
Speech or telephone communications	Department Store Cafeteria, canteen, kitchen	50-55
	Concourse Corridor, circulation space	45-55
Study and work requiring concentration	Library, gallery, museum	40-50
	Staff/meeting toom, training room	35-45
	Executive office	35-40
Listening	Place of worship, counselling, meditation, relaxation	30-35

ISO 16283-1:2014

ISO 16283-1:2014 'Acoustics – Field measurement of sound insulation in building and of building elements Part1: Airborne sound insulation'[3] describes procedures for field measurements of sound insulation in buildings. The test results can be used to quantify, assess and compare the airborne sound insulation in unfurnished or furnished room where the sound field may or may not approximate to a diffuse field. The measured airborne sound insulation is frequency dependant and can be converted into a single figure number quantity to characterise the acoustic performance using the rating procedures in ISO 717-1.

Consultation

RYDE studios previously submitted their change of use application to Manchester City Council (MCC) earlier this year, however, the application was not progressed by MCC as it was deemed incomplete as there was a requirement for *"An acoustic report for the use and any associated plant".*

On 02/08/2023, Richard Budesha of Temple contacted Julie Roscoe at MCC via email. The correspondence outlined that no new plant would be installed as part of the proposed development and queried the type of operational acoustic assessment that would be required.

On the 14/08/2023 a response was received from Maximillian Gibson, a planning officer at MCC following a phone call with Richard Budesha. The email summarised what was discussed over the phone:

[3] British Standards Institute (BSI) ISO 16283-1:2014 Acoustics - Field measurement of sound insulation in building and of building elements Part1: Airborne sound insulation. BSI, London

"We need to understand the acoustic impact the proposed use would have on any other businesses in the arcade.

As discussed on the phone, please provide an acoustic assessment to assess the breakout from noise and vibration associated with the proposed gym/fitness use".

The Proposed Development and Surrounding

The proposed development is located in Unit 15 of the Barton Arcade, 48 Barton Square, Manchester M3 2BH. The unit is located at basement level and is accessed via Barton Square Road.

The proposed plan (see **Figure 1** below) shows the unit will be divided into four main areas consisting of the spin studio, a reception/lobby area, yoga studios and changing areas. Significant noise generating uses are expected to be limited to the spin studio, and therefore, this assessment focuses on noise transmission from this space only. Within the spin studio the following loudspeaker equipment is proposed:

- 12 x 8-inch speakers hung on antivibration mounts
- 1 x floor mounted subwoofers

The proposed locations for the speakers is indicated in **Figure 2**.

A full digital sound processor (DSP) is also proposed in the spin studio which can be programmed to act as a noise limiter.

The spin studio will be located at the south end of the unit with an approximate floor space of 96 m^2. The spin studio room will be located below the R Store (retail unit with floor area of approximately 30 m^2) as well as a walkway and a small section of the kitchen storage area of the Pot Kettle Black (restaurant).

Figure 1 Proposed Floor Plan

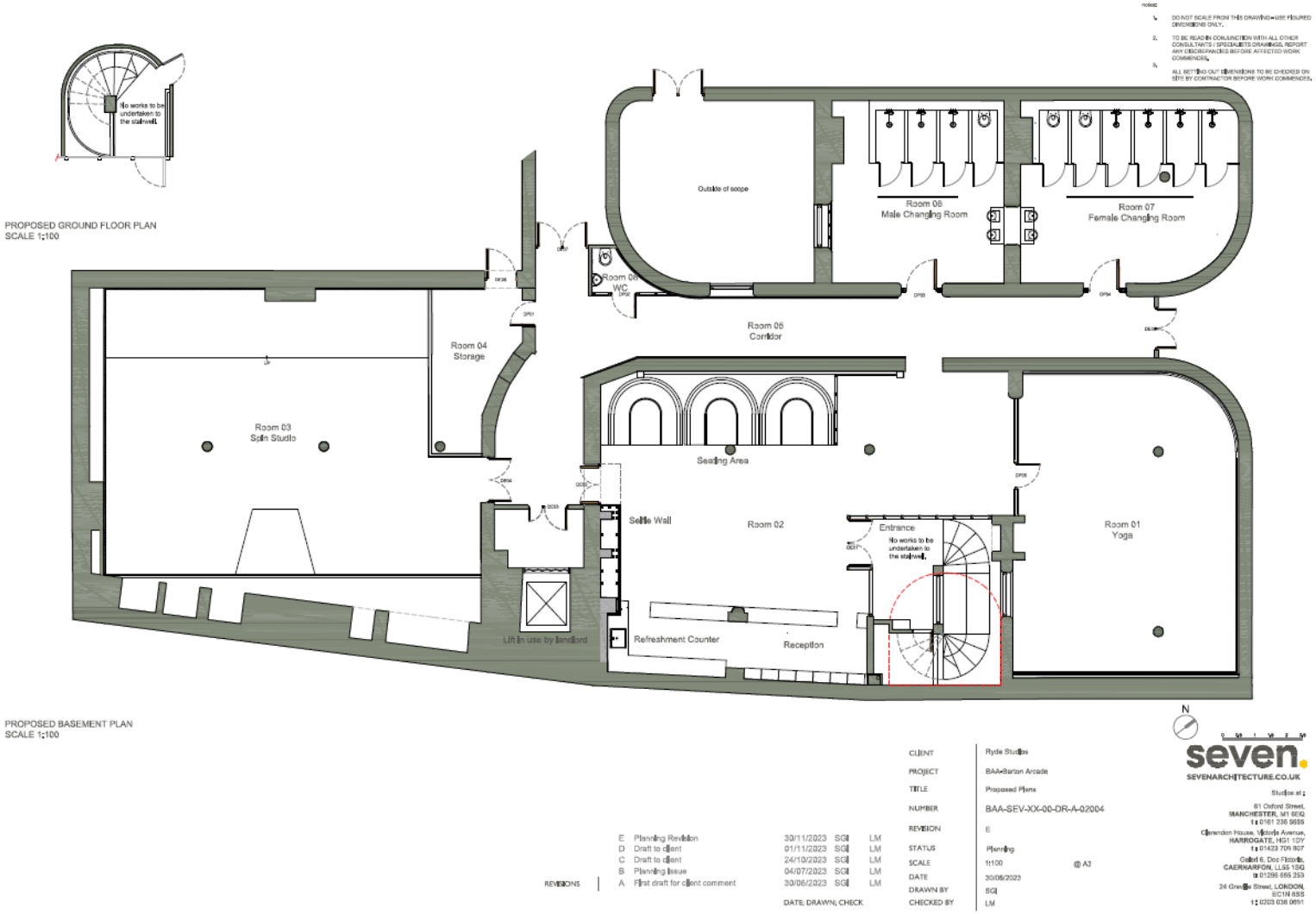
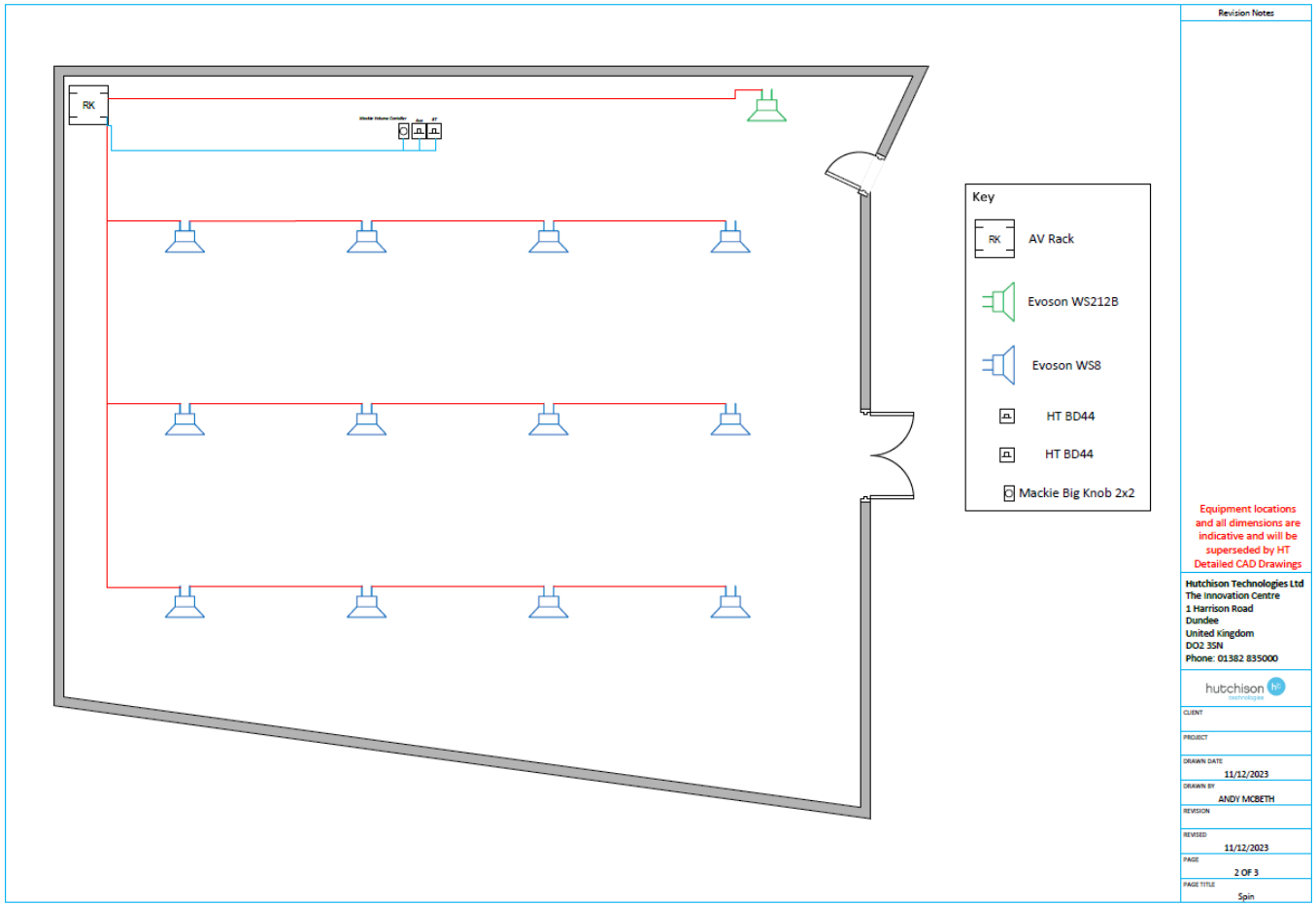


Figure 2 Proposed spin studio speaker locations



Measurement Methodology

Sound Insulation Testing

A sound insulation test was undertaken between the basement and ground floor following guidance from ISO 16283-1. The source room was the proposed spin studio room and the receiving room used was the retail unit located above (the R store).

Measurements were undertaken in at least 5 positions in both the source and receiving rooms for two noise source positions. During the measurements, the source room was unoccupied apart from the surveyor, and only one other person was present in the receiving room (store owner).

The equipment used is detailed in **Table 3** below. A class 1 sound level meter was used, and field checked for calibration before and after the measurements, no significant variation in level was observed. The RION equipment is subject to manufacturer's certificates of periodic verification within one year for the field calibrator and two years for sound level meter. Copies of these certificates are available upon request.

Table 3 Survey equipment

Manufacturer	Item	Type	Serial Number	Calibration Date
RION	Sound Level Meter	NA-28	00881067	28/01/2022
RION	Microphone	NH-23	81104	28/01/2022
RION	Calibrator	NC-74	34936354	06/09/2022
HH	Loudspeaker	Tessen-x 1201	n/a	n/a
HH	Loudspeaker	Tessen-SUB	n/a	n/a

Noise Survey Results

Level Difference

Based on the results of the survey, the octave band level difference (D) between the basement and ground floor has been calculated, this is presented in **Table 4**.

Table 4 Measured sound level difference between basement and ground floor

Level difference (D) (dB) at Octave band centre frequency (Hz)						
63	125	250	500	1000	2000	4000
32	47	60	48*	47*	48*	52*

*During the background noise level measurement within the R Store, there was some high frequency noise contamination from people within Barton Arcade hallways as the door had to be left open at the owner's request. The source noise measurements at these frequencies were therefore < 6 dB above the background and a 1.3 dB correction has been made in line with ISO 16283-1. In practice, it is expected that the level difference at these octave bands would be similar to, if not greater than that at the 250 Hz band. The calculated performance is therefore considered worst case.

Background Noise Levels (in the R Store)

In accordance with the ISO 16283-1 procedure, some short duration background noise measurements ($L_{eq,\ 10s}$) were taken within the R Store (receiving room). It should be noted that amplified music is played within the R Store and that this was switched off for the measurements, they were also undertaken in the absence of any customers in the shop and therefore are considered to be lower than the typical levels. **Table 5** below presents the background measurements at various locations around the shop.

Table 5 Background noise measurements within the R Store ($L_{eq,\ 10s}$)

Measurement Number	Background noise level (Leq, 10s) (dB) within the R store at Octave band centre frequency (Hz)						
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**
1	17	24	31	34	36	33	30
2	18	27	30	36	35	33	28
3	16	26	31	37	35	34	30
4	17	29	37	42	40	37	32
5	21	28	33	42	42	40	34
6	19	26	31	36	34	31	26
7	19	27	28	33	32	32	26
Log Average	**19**	**27**	**32**	**38**	**37**	**35**	**30**

Based on the above data, the average A weighted background sound level measured in the R Store (without music playing and customers) is **42 dB $L_{Aeq, 10s}$**.

Assessment

Spin Cycle Room Noise Transmission

Criteria

The ProPG GAG recommends airborne sound criteria from gym activities in retail units is G30 - G45. A G37.5 criteria would meet the middle of this range, however, as the assessment is considered worst case for several reasons, a criteria of G40 is proposed.

Noise Transmission

Based on the proposed floorplan drawing and on-site observations, it is expected that noise transmission into the R Store will be greater than any other businesses located in the arcade. As a result, the assessment has been based on the noise transmission between these two spaces only as it is considered worst case.

It is understood that music noise levels are limited to 85 dBA in existing RYDE spin studios, this level has been used in the noise transmission calculations. Music played from the proposed speaker system is likely to be more prominent in the lower "bass" frequencies, the assessment has therefore considered the expected internal level of 85 dBA as an octave band spectrum based on Noise Rating (NR) curve 78 as well as measured data within a "bass heavy" nightclub. The two noise source levels assessed are presented in **Table 6**.

Table 6 Anticipated spin studio internal noise levels

Spectrum source	**Noise level $L_{eq,T}$ (dB) at Octave band centre frequency (Hz)**							**Total (dBA)**
	63	125	250	500	1000	2000	4000	
NR 78	97	90	85	81	78	76	74	85
"Bass heavy" nightclub	105	93	86	80	75	75	66	85

Allowing for the level differences presented in **Table 4**, the predicted resulting noise levels within the R Store and their exceedance over the criteria are presented in **Table 7**.

Table 7 Predicted noise transmission from spin studio to R Store

Spectrum Description	Predicted noise level in the R Store $L_{eq,T}$ dB at Octave band centre frequency (Hz) and exceedance over Criteria							Total (dBA)
	63	125	250	500	1000	2000	4000	
A – Predicted Noise Level in R Store based on NR 78 spectrum	65	43	25	34	31	28	22	41
B – Predicted Noise Level in R Store based on "bass heavy" nightclub	73	46	26	33	28	27	14	47
C – G40 Curve	66	55	48	43	40	37	35	n/a
A-C	-1	-12	-23	-9	-9	-9	-13	n/a
B-C	7	-9	-22	-10	-12	-10	-21	n/a

The worst-case assessment of noise transmission from the proposed spin studio into the R Store indicates that G40 criteria can be achieved with a 7 dB reduction to the 63 Hz band by limiting noise levels at this frequency to 98 dB inside the spin studio. The predictions show that all other frequency bands can achieve G40 criteria without any limiting. To achieve G45 criteria (upper end of guide criteria range), only a 3 dB reduction to the 63 Hz band is required, resulting in an internal limit of 102 dB for this octave band.

It should be noted that the octave band levels presented in **Table 6** and **Table 7** are unweighted, for reference the G40 Curve criteria that is targeted inside the R Store has also been presented as A weighted (dBA) values in **Table 8**.

Table 8 G40 Curve A Weighted octave band values

Spectrum Description	A weighted Sound Level $L_{Aeq,T}$ dB at Octave band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
C – G40 Curve	40	39	39	40	40	38	36

In terms of dBA level, noise levels within the R Store are predicted to range between 41 dB $L_{Aeq,T}$ (based on the NR 78 spectrum) and 47 dB $L_{Aeq,T}$ (based on the "bass heavy" nightclub measurements) when the spin studio is in use. Assuming that the 63 Hz music noise level is reduced by 3 or 7 dB in the spin studio for the "bass heavy" nightclub spectrum, this would lead to predicted levels of 44 and 41 dB $L_{Aeq,T}$ respectively in the R Store.

Spin Bike Noise

Manufacturer data from Stages Cycling sates that noise levels from the spin bikes during typical operation range between 50 and 55 dB. As no further information was provided, for the purpose of this assessment, a worst-case assumption has been made that this is an A weighted sound pressure level at 1m.

Using the upper end of this range (55 dBA), the total noise level from 51 bikes operating simultaneously would be 72 dBA at 1m. This level is more than 10 dB below the adjusted music noise level inside the spin studio and therefore will not increase the total noise level.

Vibration

It is not expected that there will be any significant vibration transfer from the studios as spin cycling and yoga activities are not likely to cause vibration. It is also assumed that the anti-vibration mounts for the cabinet speakers will be designed to reduce vibration to a negligible level. On this basis, vibration is not considered to be an issue in this case.

Conclusion

Temple Group has been appointed by RYDE Studios to undertake a noise impact assessment for a proposed new spin cycle studio, fitness and yoga studio at Unit 15 of the Barton Arcade, 48 Barton Square, Manchester M3 2BH.

Sound insulation testing has been undertaken to determine the sound insulation between the proposed new spin cycle studio in the basement to retail space on the ground floor. Based on the survey results and operational noise levels within existing RYDE spin studios, noise levels within the R Store (worst affected unit located above) have been predicted.

Noise levels within the R Store are predicted to be in the range 41- 47 dB $L_{Aeq, T}$ when the spin studio is in use. The assessment of noise transmission from the proposed spin studio into the R Store indicates that the G45 and G40 ProPG GAG criteria can be achieved with minor reductions in the 63 Hz octave band by limiting internal noise levels to 102 dB and 98 dB respectively.

The assessment is considered worst case as the 'bass heavy' nightclub spectrum is based on measurements of a much larger nightclub sound system. As a result, it is expected that noise break out from the spin studio is not likely to reach 44 dB $L_{Aeq, T}$ within the R Store.

The dominant noise source inside of the spin studios will be music/microphone playback. Noise from all bikes operating simultaneously is likely to be 10 dB below and therefore will not increase the overall level inside of the spin studio.

It is not expected that there will be any significant vibration transfer from the studios as spin cycling and yoga activities are not likely to cause vibration. It is also assumed that the anti-vibration mounts for the cabinet speakers will be designed to reduce vibration to a negligible level.

Appendix A Acoustic Glossary

Decibel (dB)

This is the unit sound pressure levels are presented in. They are a logarithmic ratio between the sound pressure and a reference sound pressure (20 µPa). A 3dB increase is a doubling of sound energy but is generally a just noticeable increase; a 10dB increase is a 10 fold increase in sound energy and is generally perceived as being twice as loud.

dB(A)

This indicates that the overall dB noise level has been 'A-weighted'; this is a weighting applied to instrument-measured sound levels to account for the relative loudness perceived by the human ear.

L_{Aeq}

This represents the A-weighted 'ambient noise level' also known as the equivalent continuous sound level. As almost all sounds vary or fluctuate with time it is helpful to have an average of the total acoustic energy experienced over its duration. The LAeq,16hr for example, describes the equivalent continuous sound level over the 16-hour period between 7am and 11pm.

L_n

Another method of describing, with a single value, a noise level which varies over a given time period is to consider the length of time for which a particular noise level is exceeded. If a level of X dB(A) is exceeded for say 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the L_{A10} = X dB.

The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise.

L_{AFmax}

The maximum RMS A-weighted sound pressure level, using the Fast time weighting.

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CREATING SUSTAINABLE FUTURES

Manchester
Express Building
9 Great Ancoats Street
M4 5AD

+44 (0)161 817 5039
enquiries@templegroup.co.uk
templegroup.co.uk

Haywards Heath Lewes Lichfield London Norwich Wakefield