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6.4 Environmental Statement
Appendix 11.1 Glossary of Acoustic Terminology

Planning Act 2008

APFP Regulation 5(2)(a)
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6.4 Environmental Statement
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1 Glossary of acoustic terminology

Sound pressure level

1.1.1 The sound power emitted by a source results in tiny pressure fluctuations in the air, which are heard as sound. These pressure fluctuations are measured in Pascals. Audible sound pressures range from approximately 2 x 10^{-5} Pascals up to 20 Pascals. This represents a large range of sound pressures over which we can hear.

1.1.2 This large range of values is most conveniently handled mathematically by using a logarithmic measurement scale, to produce much more convenient ways of expressing sound pressures. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is called the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply to any summation of sound pressure levels. For most purposes, the following rules will suffice:

dB Addition

If the levels to be added differ by:	the total is equal to the larger level plus:	example:
0 or 1dB	3dB	45dB+45dB = 48dB
2 or 3	2dB	68dB+70dB = 72dB
4 to 9	1dB	21dB+13dB = 22dB
10 and over	0dB	59dB+70dB = 70dB

dB Subtraction

If the levels to be subtracted differ by:	The total is equal to the larger level minus:	example:
10dB or more	0dB	70dB-58dB = 70dB
6 to 9	1	43dB-36dB = 42dB
5 or 4	2	94dB-90dB = 92dB
3	3	94dB-91dB = 91dB
2	(5)*	94dB-92dB = 89dB
1	(7)*	17dB-16dB = 10dB

* approximately

dB(A)

1.1.3 The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. Similar to the non-linear response of the human ear to noise levels, the ear also has a non-linear response to the frequency content of sound. The frequency response of the human ear is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz. The 'A' weighting filter is therefore used, which mimics the ear's frequency-dependant characteristics.

1.1.4 In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{pA10}, L_{pA90}, and L_{pAeq} for the 'A' weighted equivalent continuous noise level.

Equivalent continuous sound level

1.1.5 An index for the assessment of overall noise exposure is the equivalent continuous sound level, L_{pAeq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Frequency

1.1.6 Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000Hz is often denoted as 1kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or narrow frequency bands.

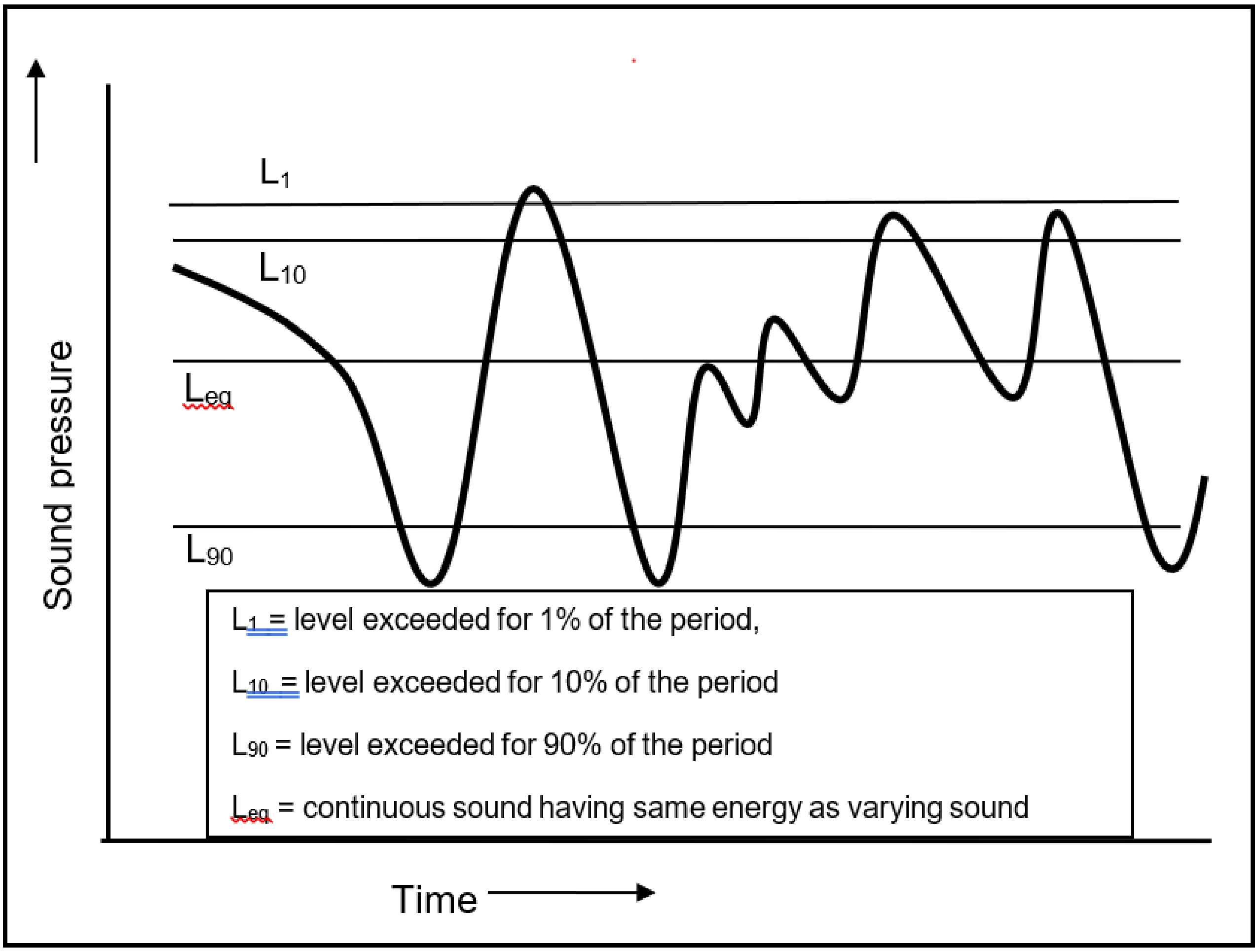
Maximum noise level

1.1.7 The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear’s response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

1.1.8 The maximum level measured with fast time weighting is denoted as $L_{pAmax, F}$. The maximum level measured with slow time weighting is denoted $L_{pAmax, S}$.

Fluctuating sound levels and statistical noise percentiles

1.1.9 For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. For instance, the L_{pA10}, the level exceeded for 10% of the time period under consideration and can be used for the assessment of road traffic noise (note that L_{pAeq} is used for assessing traffic noise). As further examples of percentiles, although not generally used for traffic noise assessment, the L_{pA90}, the level exceeded for 90% of the time, is often used to represent the background noise level. The L_{pA1}, the level exceeded for 1% of the time, is representative of the maximum levels recorded during the sample period. The figure below illustrates the comparisons between each percentile.



1.1.10 A weighted statistical noise level is denoted L_{pA10}, dBL_{pA90} etc. The reference time period (T) is normally included, e.g. $dBL_{pA10,\ 5min}$ or $dBL_{pA90,\ 8hr}$.

Table 1-1 Typical noise levels

Noise Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night