DECARBONISATION

ENVIRONMENTAL STATEMENT: 6.3 APPENDIX 6-1: NOISE AND VIBRATION TERMINOLOGY

Cory Decarbonisation Project

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations (2009) - Regulation 5(2)(a)

1. APPENDIX 6-1: NOISE AND VIBRATION TERMINOLOGY

1.1. NOISE

1.1.1. Noise is defined as unwanted sound. Human hearing is able to respond to sound in the frequency range 20 Hz (low frequency/deep bass) to 20,000 Hz (high frequency/high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used, which reduces the importance of lower and higher frequencies in a similar manner to human hearing.

1.1.2. The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale, as stated in BS 8233:2014. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc. according to the parameter being measured.

1.1.3. The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

1.1.4. The subjective response to a noise is dependent not only upon the sound pressure level and its frequency, but also its intermittency. Various indices have been developed to try and correlate annoyances with the noise level and its fluctuations.

- Sound Pressure: Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
- Sound Pressure Level (Sound Level): The sound level is the sound pressure relative to a standard reference pressure of 20 Pa ($20x10^{-6}$ Pascals) on a decibel scale.
- Sound Power: The sound energy radiated per unit time by a sound source. Measured in Watts (W).
- Sound Power Level, L_W: Sound power measured on a decibel scale, relative to a reference value of 10^{-12} W.
- Decibel (dB): A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa.

- A-weighting, dB(A): The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
- $L_{eq,T}$: A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
- $L_{max,T}$: A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
- $L_{90,T}$: A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
- $L_{10,T}$: A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
- L_{AE} A noise level index. Equivalent to the $L_{Aeq,T}$ condensed into a one second period. Typically used when dealing with noise events where the activity duration is not necessary the same as under the conditions the source data was obtained.
- Free-Field: Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres away.
- Façade: At a distance of 1 metre in front of a large sound reflecting object such as a building façade.
- Slow and Fast Time Weightings: Averaging times used in sound level meters.

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