A303 Amesbury to Berwick Down

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Volume 6

6.3 Environmental Statement Appendices

Appendix 9.1 Noise and Vibration Terminology

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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1 Noise Terminology

1.1.1 Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

1.1.2 The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). Table 1-1 below lists the sound pressure level in dB (A) for common situations.

Table 1-1 Sound Pressure Levels for a Range of Situations

Typical Noise Levels dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library Refrigerator humming at 2 m
50	Quiet office, no machinery Boiling kettle at 0.5 m
60	Normal conversation
70	Telephone ringing at 2 m Vacuum cleaner at 3 m
80	General factory noise level
100	Pneumatic drill at 5m
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

1.1.3 The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy road, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night time noise levels will often be smaller and the levels significantly reduced compared to daytime levels.

1.1.4 The equivalent continuous A-weighted sound pressure level, L_{Aeq}, is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period.

1.1.5 The sound power level, L_w is the acoustic energy emitted by a source which produces a sound pressure level at some distance. While the sound power level of a source is fixed, the sound pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located.

1.1.6 With regards to road traffic noise the parameter L_{A10} is prescribed by the relevant guidance and legislation. L_{A10} is the noise level exceeded for 10% of the measurement period. The $L_{A10,18h}$ is defined in the Calculation of Road Traffic Noise as the arithmetic average of the individual 1 hour $L_{A10,1h}$ levels between 06:00 - 00:00.

1.1.7 A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, L_{A90}. This is the noise level exceeded for 90 % of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a one hour period, the L_{A90} will be the noise level exceeded for 54 minutes.

1.1.8 The L_{Amax} noise level is a measure of the maximum noise level during the monitoring period.

1.1.9 Measurements using a sound level meter can be Fast (F), Slow (S), or Impulse (I) time weighted. These weightings date back to when sound level meters had analogue meters and defined the speed at which the meter moved. Fast corresponds to a 125 ms time constant. Slow corresponds to a 1 second time constant. Impulse has a time constant of 35 milliseconds. For the vast majority of environmental noise monitoring situations the standard approach is to use the Fast time weighting.

1.1.10 Human subjects are generally only capable of noticing changes in steady levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. These findings do not necessarily apply to transient or non-steady noise sources.

1.1.11 Most environmental noise measurements and assessments are undertaken for ‘free-field’, away from any existing reflecting surfaces (other than the ground). However, it is sometimes necessary to consider noise levels immediately external to a façade when considering the impact on residents inside properties and this requires the addition of 3 dB(A) to the predicted (or measured) free-field level due to noise reflection from the façade.

2 Vibration Terminology

2.1.1 BS 5228 advises that vibrations, even of very low magnitude can be perceptible to people. It is often assumed that if vibration can be felt then building damage will occur, however much higher levels of vibration are required to damage buildings. Therefore vibration from construction works can cause anxiety as well as annoyance. Some individuals are more sensitive to vibration than others.

2.1.2 Vibration from construction is commonly described in terms of the Peak Particle Velocity (ppv) measured in mm/s. This is a measurement of the maximum ground particle movement speed during a given time interval. If measurements are made in 3-axis then the resultant ppv is the vector sum of the maximum velocity components, i.e. the square root of the summed squares of the maximum velocities, regardless of when in the time history those occur.

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