

APPENDIX 11.1 - Acoustic Terminology in Brief

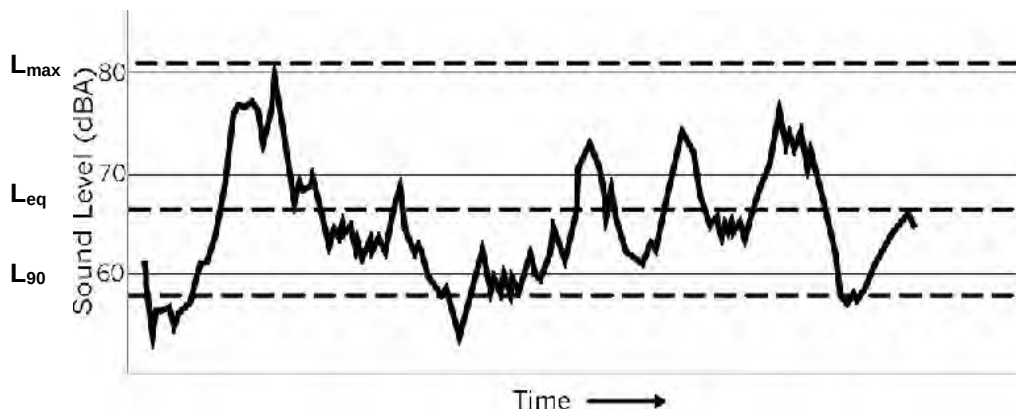
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a *dB* descriptor in the report e.g. $L_{Aeq,T}$ could be written $dB L_{Aeq,T}$.



Example of Sound Level Varying With Time

$L_{Aeq,T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, <i>T</i> . It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the "ambient" noise level.
L_{A1}	The (A-weighted) sound level exceeded for 1% of a measurement period. It is the value generally used to indicate a 'typical' maximum noise level.
$L_{A10,T}$	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
L_{Amax}	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.

Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.

Other Acoustic Units

NRC	Noise Reduction Coefficient – a single figure number sometimes used to describe the performance of sound absorbing materials based on a combination of its absorption coefficient at various frequencies.
NR	Noise Rating – a graphical method for assigning a single number rating to a noise spectrum and is often use to specify noise level limits for mechanical services.
R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
D_w	Single number rating used to describe the on-site airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
D_{nT,w}	Single number rating used to describe the on-site airborne sound insulation performance properties of a material or building element over a range of frequencies, typically 100-3150Hz, which is calculated in terms of a standardized reverberation time of 0.5 seconds.
D_{nT,w}+C_{tr}	As above only the resultant figure is adjusted by a spectrum adaptation term in relation to the low frequency sound insulation performance.
L'_{nT,w}	Single number rating used to describe the on-site impact sound insulation performance properties of a floor over a range of frequencies, typically 100-3150Hz, which is calculated in terms of a standardized reverberation time of 0.5 seconds.
RT	The RT (Reverberation Time) of a space is defined as the time it takes for the sound pressure level to reduce by 60dB. It is not always possible to measure the full 60dB decay, so the first 20dB decay (T ₂₀) or 30dB decay (T ₃₀) is used to approximate the reverberation time (T ₆₀)

APPENDIX 11.2 – Measurement Procedure

Date & Time of Survey:	Day - Friday 2 December 2016 from around 0745h to 1100h. Night - Thursday 8 to Friday 9 December 2016, 2300 to 0120h.
Personnel Present:	Ben Tomlin (AEC).
Equipment Used:	B&K 2260 Real Time Analyser (AEC Kit 1).
Weather Conditions:	Day – Dry, little or no wind, 12°C Night – Dry, little or no wind, 4°C
Measurement Procedure:	Noise levels were measured at 4 locations on the development site, identified as A to D on Figure 1 and described below. A. On Ellesmere St. elevation (Façade measurement), approximately 50m from A57(M). B. Facing the Mancunian Way A57(M), approximately 13m from the edge of the carriageway. C. On northwest elevation, partially screened from A57(M), approximately 50m from A57(M). D. On Arundel St. elevation, partially screened from A57(M), approximately 70m from A57(M).

All locations were selected to measure general ambient, background and maximum noise levels, which were measured in terms of L_{Aeq} , L_{A10} , L_{A90} and L_{Amax} typically over 5-15 minute periods.

All the measurements were taken in free-field, unless stated otherwise, at a height of 1.5m above ground.

The sound level analyser, which conforms to BS EN 61672-12003 '*Electroacoustics – sound level meters - Part 1 Specifications*' for Class 1 Type Z meters, was in calibration and checked calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.

Measured Data:	Full results are given in Tables 11.2A and 11.2B.
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Table 11.2A – Daytime Measured Noise Levels

Position	Period	Measured Noise Level, dB				Notes
		L _{Aeq}	L _{A10}	L _{A90}	L _{Amax}	
A	0746-0801	63.0	65.5	59.6	77.4	Traffic on Ellesmere St and A57(M)
	0901-0917	62.6	64.9	59.4	75.3	
	1005-1020	62.2	64.3	57.9	74.2	
B	0803-0818	72.1	74.1	68.7	84.6	Traffic on A57(M)
	0919-0934	73.8	75.6	70.3	82.9	
	1021-1036	74.2	75.9	71.7	81.2	
C	0821-0836	61.4	62.9	59.3	69.4	Traffic on A57(M)
	0935-0947	63.9	65.5	59.7	79.6	
D	0840-0855	62.6	65.1	58.7	76.5	Traffic on Arundel St and A57(M)
	0949-1004	63.2	65.2	58.5	81.2	
	1038-1052	63.2	65.7	58.8	75.5	

Table 11.2B – Night-time Measured Noise Levels

Position	Period	Measured Noise Level, dB				Notes
		L _{Aeq}	L _{A10}	L _{A90}	L _{Amax}	
A	2336-2341	61.4	63.4	56.2	77.6	Traffic on Ellesmere St and A57(M)
	2341-2346	60.0	62.5	55.6	67.8	
	2346-2351	59.5	61.2	55.8	64.8	
	0045-0050	58.5	60.6	54.3	69.8	
	0050-0055	58.3	60.6	54.1	70.3	
B	2354-2359	72.2	74.2	67.9	84.2	Traffic on A57(M)
	2359-0004	71.9	74.2	68.3	77.5	
	0056-0101	69.7	72.5	65.0	77.0	
	0101-0106	70.1	73.1	64.4	76.5	
C	0012-0017	68.3	65.9	57.1	71.8	Traffic on Arundel St and A57(M)
	0017-0021	63.6	66.1	59.1	69.4	
	0026-0031	63.4	65.6	59.0	68.5	
	0107-0112	61.0	64.0	54.9	72.1	
	0112-0117	60.8	53.2	57.2	66.1	
D	2320-2325	60.3	61.6	57.6	71.1	Traffic on Arundel St and A57(M)
	2325-2330	59.9	61.6	57.2	69.2	
	2330-2335	59.9	62.2	56.2	68.2	
	0034-0039	58.2	60.3	54.4	70.8	
	0039-0044	57.5	59.6	54.2	63.3	