Eastleigh Borough Council

Fleming Park Leisure Centre

Planning report: Noise

R01-NH

Issue | 26 March 2015

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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 239802-07

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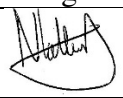
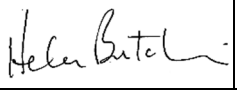
		Signature			
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1 Introduction

This report sets out the noise considerations regarding the planning application for the new leisure centre at Fleming Park, Eastleigh. It is proposed to construct a new building on the current Fleming Park Leisure Centre site, off Passfield Avenue, together with modifications to the sports pitch areas, demolition of the existing building and landscaping works to the car park area.

As part of the planning process, Arup has been in touch with the Environmental Health Department at Eastleigh Borough Council to discuss particular noise sensitivities and to request comment on the noise information submitted as part of the pre-application process. Detailed feedback has not yet been received, but this report aims to provide noise related information that is considered relevant to the Planning Application in the absence of detailed comments.

2 Planning and Noise

2.1 National policy

The National Planning Policy Framework 2012 (NPPF) sets out the governmental requirements for the planning system in England and must be considered in conjunction with local development plans during planning decisions.

In reference to noise, the framework states (Section 123) that planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2 Local policy

In line with the NPPF, the local planning authority has written an adopted local development plan, which takes into account specific local sensitivities and priorities. This is published on-line at http://www.eastleigh.gov.uk/planning--building-control/planning-policy-implementation/local-plan/adopted-local-plan.aspx. Sections 3.6 – 3.15 relate to noise.

The local plan requires that the noise impact of a development on nearby noise sensitive premises will be taken into account and that, where appropriate, a noise

impact assessment will be submitted as part of an application for development. The noise impact assessment should:

- Identify significant sources of noise resulting from the development and potential conflicts between the proposed use and neighbouring uses
- Assess the likely impact both in the short and long term
- Present recommendations for noise protection measures
- Make a statement of how the requirements of the local plan have been met.

2.3 Proposed assessment

On the basis of the noise policy set out above, this report aims to identify significant sources of noise from the new development and proposes a noise limit to control the potential impact of these sources at the nearest noise sensitive receptors.

3 Assessment methodology

3.1 Scope of assessment

The proposed new building is on the same site as the current leisure centre and will be operated similarly, as a community resource with users arriving by car, public transport or on foot. The access to the site will be from Passfield Avenue as it is currently. The car park area will be increased, but the noise emissions from this change will not increase significantly at the nearest houses on Passfield Avenue. A small energy centre building to house district heating equipment is proposed to be built adjacent to the car park to the north.

The use of the wider site will be largely unaffected, with the large grassed sports pitches being retained. Of the 6 hard tennis courts currently on the site, 3 will be retained. The hard sports pitch adjacent to Passfield Avenue will be retained. Although the management of the centre may aim for an increased utilisation as a result of the development, the overall use of the land will remain largely unchanged and significant increase in noise emissions from sports use is not expected. The playing field areas to the north and south are outside the site construction boundary.

The new building will be situated close to the existing building, being constructed directly adjacent to the west side and wrapping around the existing building to the south. The building itself will include heating and mechanical ventilation equipment to serve the internal spaces. Noise from this equipment, and the energy centre is a key consideration in terms of noise impact and is included in the scope of this assessment.

The scope of the noise assessment therefore concentrates on limiting noise from proposed heating and ventilation equipment serving the new building to a suitable level to minimise the noise impact on the nearest noise sensitive receptor. Noise emissions from the external areas, (sports pitches and car parks) remain largely unchanged and are therefore not assessed.

3.2 Methodology

A methodology for the assessment of noise from building services equipment is described in BS4142:2014. This document has recently be revised and the approach has changed in emphasis. The approach uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used residential purposes.

The procedure is summarised as follows:

- Measurement of background noise at the nearest noise sensitive receptors, to establish the prevailing noise climate and a **typical** background noise level (not the lowest noise level as required by the previous version of the standard published in 1997).
- Establish a noise limit from the incoming equipment, relative to the background noise level, based on the following:
    - A noise level of +10dB above the measured background noise level is likely to be an indication of a significant adverse impact
    - A noise level of +5dB is likely to be an indication of an adverse impact,
    - Where the noise level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.
    - Noise levels of -10dB relative to background sound level are normally considered to have no noticeable noise impact.

On this basis, a noise level of 10dB below the typical background noise level at the nearest receptor is proposed to be targeted, in order to minimise the noise impact of the development at the closest receptors.

4 Assessment of the proposed leisure centre

4.1 Site description

An aerial photograph showing the current site layout is shown in Figure 1. The proposed site plan is included in Figure 2.

The nearest residential properties are on Passfield Avenue to the east and along Magpie Lane to the southwest.

4.2 Noise levels on the site

A noise report has been commissioned and provided by the Lee Cunningham Partnership (LCP). This is included in Appendix A.

The LCP report presents sampled noise levels measured at residential properties along Passfield Avenue and Magpie Lane during an evening period between 20:10 and 23:25. Measurements were not made during the night-time period.

The report shows a graph of noise levels measured on the site. This has been used to establish that the typical background noise level at each location as shown in the table below. The typical background noise level has been assessed as the lowest measured 15 minute L_{A90} values at each location measured up to 23:00.

Location	**Typical measured background noise level, $dBL_{A90,15mins}$, evening period**
Magpie Lane	44
Passfield Avenue	45

Table 1 Typical measured background noise levels on the site by LCP

Noise levels should be assessed based on noise levels appropriate to the period over which the plant will operate. The current noise measurement information has been gathered over an evening period. It is generally accepted that noise levels during the daytime period are typically higher than during the evening period, and therefore that the evening period is likely to be a limiting case for plant operating 07:00 – 23:00.



Figure 1 Aerial image showing the current site.

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Figure 2 Proposed site layout. Note, item 10 denotes proposed energy centre

4.3 Noise limits

Based on the approach set out in the BS4142:2014, the noise limits at both properties are assessed as given in Table 2.

Noise limit for roof mounted plant equipment	**Magpie Lane**	**Passfield Avenue**
Typical $L_{A90,15min}$, evening period, up to 23:00	44	45
Target noise limit, relative to background	-10	-10
Target noise limit at property, $dBL_{Aeq,15min}$	34	35
Plan distance from roof mounted equipment to receptor, m	250	160
Attenuation with distance from equipment to receptor, based on a point source over a reflecting plane, dB	-56	-52
Noise limit at the boundary of the roof plant area, $dBL_{Aeq,15min,}$ equipment operating up to 23:00	90	88

Table 2 Proposed noise limit for building service equipment mounted on the roof

The noise limit of equipment mounted on the roof of the leisure centre is therefore proposed to be $88dBL_{Aeq,15min}$, when assessed at the boundary of the rooftop plant area. Note that in practice, lower self-imposed noise limits may be used on this equipment to maintain appropriate noise control for the use of the leisure centre.

Similarly, noise levels from the energy centre to the north of the site have been assessed as given in Table 3, on the basis that the noise levels measured on Passfield Avenue are also representative of the noise climate at the Holiday Inn.

Noise limit for energy centre	Holiday Inn
Typical $L_{A90,15min}$, evening period, up to 23:00 (Representative noise measurement made on Passfield Avenue)	45
Target noise limit, relative to background	-10
Target noise limit at receptor, $dBL_{Aeq,15min}$	35
Plan distance from energy centre to receptor, m	100
Attenuation with distance from energy centre to receptor, based on a point source over a reflecting plane, dB	-48
Noise limit at 1m from the façade of the energy centre, $dBL_{Aeq,15min,}$ equipment operating up to 23:00	83

Table 3 Proposed noise limit for building services noise emissions from the energy centre

5 Meeting the noise limit

Building services equipment should be designed not to exceed the noise limits at boundary of the rooftop plant area, where the equipment is to be located. The noise limits apply to the total noise emissions from all equipment that will operate during this period, at their typical operating duty.

The designers should provide noise data and calculations to demonstrate that this limit will be met.

Note that noise levels have not been measured overnight. Environmental noise in the area is expected to be lower during the night-time than during the evening. Building services plant that is expected to operate overnight will include air handling equipment serving the pool area and other small items, together with the energy centre. As stated above, it is likely that the noise limits for equipment on the leisure centre may be lower than the planning limit, to control noise entering the building itself.

6 Conclusion

This report sets out the noise considerations in support of the planning application for the new leisure centre building at Fleming Park, Eastleigh. A noise limit for incoming roof mounted plant equipment that operates between 07:00 - 23:00 has been established to be 88dBL_{Aeq} measured at the boundary of the rooftop plant area. Noise from the energy centre is also proposed to be limited to 83dBL_{Aeq} over the same period.

In complying with this limit, complaints on the grounds of noise are considered to be unlikely.

Appendix A

Background Noise Survey Report

A1 Background Noise Survey Report

This section of the report includes the report written by the Lee Cunningham Partnership summarising the background noise levels on the site.

Arup has no liability for the content or conclusions of the report. The noise levels have been used in the assessment of a suitable noise criteria for building services, as set out in the noise planning report.

Acoustic Consultancy Report

66478/3/1/2

Background Noise Survey

Report Prepared For

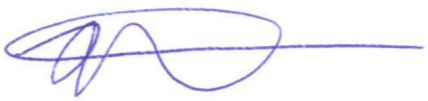
B3 Building Services
Fleming Park Leisure Centre
30 May 2014

Report Author



Robert Martin

Checked By



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i) Executive Summary

Relocation of the leisure centre at Fleming Park, Eastleigh is proposed.

LCP has been commissioned by B3 Building Services to carry out a background noise survey.
The lowest measured background was:

- 42 dB $L_{Aeq, T}$ at Magpie Lane;
- 44 dB $L_{Aeq, T}$ at Passfield Avenue.

The design as proposed and assessed will achieve the required criteria the emissions have been calculated as follows:

- 35dB(A) at Magpie Lane;
- 35dB(A) at Passfield Avenue.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	30/05/2014	Initial Issue	RM	JN

1 Introduction

Relocation of the leisure centre at Fleming Park, Eastleigh is proposed.

LCP has been commissioned by B3 Building Services to carry out a background noise survey.

2 Survey

2.1 Site Description

The site layout together with the measurement position is shown in the drawing contained within Appendix A.

2.2 Receiver Location

The site was surveyed to determine the location of the most affected receiver.

The nearest receivers to the proposed site are Magpie Lane (MP1) and Passfield Avenue (MP2). This is shown in the site plan in Appendix A.

2.3 Local Noise Climate

The predominant local noise source was road traffic.

2.4 Measurements

The noise monitoring took place on the 29/05/2014. The measurement period was considered sufficient to establish the lowest background noise levels.

The weather conditions during the survey were predominantly calm and dry.

2.5 Measurement Results

The measured statistical broad-band sound pressure levels are shown within Appendix B. The lowest representative background noise level(s) obtained being as follows:

Table 1: Lowest measured background noise levels, dB re $2x10^{-5}$ Pa

Measurement Position	$L_{A90,\ 5\ mins}$ Evening*
Magpie Lane	42
Passfield Avenue	44

* Evening periods are defined as between 19.00 - 23.00.

3 Evaluation of Design Criteria

3.1 BS4142:1997

BS4142:1997 states that the 'likelihood of complaints' are to be assessed by subtracting the measured background noise level from the calculated rating level. The following table demonstrates the resultant assessments based upon the calculated rating level.

Table 2: BS4142 assessment based upon rating level

Difference between background noise and rating levels	Assessment
+ 10 dB	Complaints are likely
+ 5 dB	Marginal significance
- 10 dB	Complaints are unlikely

In acoustic terms, a calculated rating level 10 dB below the measured background noise level means that the measured background noise level is not increased.

An explanation of the effects of changes in the difference between the rating level and the background noise level can be found in the glossary in Appendix C. The corresponding subjective change in loudness is described.

A 5 dB correction shall be applied in the case of intermittent or tonal plant noise emissions.

BS4142:1997 also states that background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low. Therefore a rating level of 35 dB is recommended. This will also ensure compliance with BS 8233 and World Health Organisation Guidelines.

3.2 World Health Organisation Night Noise Guidelines for Europe (2009)

The WHO's document 'Night Noise Guidelines for Europe (NNG) states the following:

"…*it is recommended that the population should not be exposed to night noise levels greater than 40 dB of* $L_{night,\ outside}$ *during the part of the night when most people are in bed*."

It then goes on to say:

"*An interim target (IT) if 55 dB* $L_{night,\ outside}$ *is recommended in the situations where the achievement of NNG is not feasible in the short run for various reasons*."

As the above guideline values consider the combined level of noise external to a façade (i.e. vehicular traffic, air traffic, building services noise etc, it is recommended that a criterion of 10 dB below these given levels is applied, depending on the particulars of the site in question.

3.3 World Health Organisation (WHO) Guidelines for Community Noise (1999)

The WHO's 'Guidelines for Community Noise' gives the following relevant noise criteria:

Table 3: Guideline values for community noise, from Guidelines for Community Noise (WHO, 1999)

Specific Environment	$L_{Aeq, T}$ dB	Time Base (hours)	L_{Amax}, fast dB
Outdoor living area (serious annoyance, daytime and evening)	55	16	-
Outdoor living area (moderate annoyance, daytime and evening)	50	16	-
Dwelling, indoors	35	16	-
Inside bedrooms	30	8	45
Outside bedrooms	45	8	60
Outdoors in parkland and conservation areas*	-	-	-

* Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low

3.4 BS8233:1999

The criteria offered in BS8233 for residential buildings are largely based on the recommendations made in the Guidelines for Community Noise. BS8233 gives internal criteria for bedrooms and living rooms for both 'reasonable' and 'good' resting/sleeping conditions.

BS8233 also gives general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states that:

"…*if windows are intended to be opened to provide rapid ventilation and summer cooling, the insulation will reduce to about 10 dB or 15 dB*…"

This infers that should windows on a noise affected façade be openable, a sound insulation value of 10-15 dB should be applied to the whole façade to an internal room being assessed. On this basis, the criteria shown in the table below have been adapted from the criteria offered in table 5 of BS8233 in order to obtain acceptable external noise levels.

The noise levels shown should be treated as overall noise levels, i.e., the combination of all existing noise levels at the site, and noise levels from any proposed plant or activity.

Table 4: BS8233 criteria, dB re $2x10^{-5}$ Pa

External Facade	Design Range $L_{Aeq, T}$		L_{Amax}*
	Good	Reasonable	
Living Rooms	40	50	n/a
Bedrooms	40	45	55

* Fast time weighting

In addition to the above criteria, BS8233 goes on to say:

"*In gardens and balconies etc it is desirable that the steady noise level does not exceed 50 $L_{Aeq,\ T}$ dB and 55 dB $L_{Aeq,\ T}$ dB should be regarded as the upper limit*."

The above criteria are in line with the recommendations made in WHO's 'Guidelines for Community Noise'.

3.5 Design Rating Level

On the basis of the above the recommended design rating level at any residential premises should be:

Design Rating Level
35dB(A)

4 Conclusion

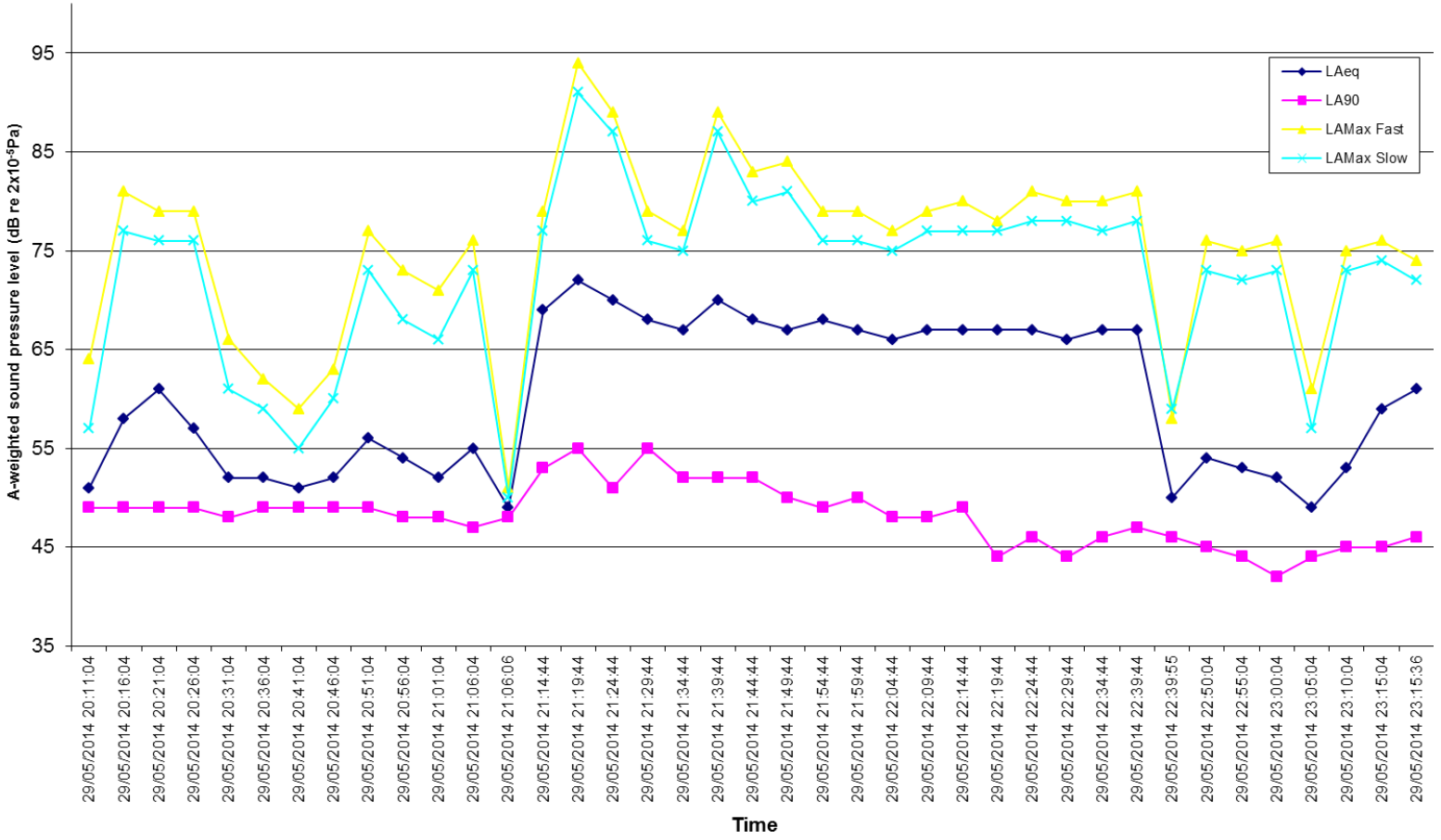
An environmental noise survey has been undertaken in order to establish the existing background noise levels local to the site generally in accordance with the method contained within BS4142: 1997.

Appendix A: Site Plan





Appendix B: Measurement Data



Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11259
- Svantek pre-amplifier SV12L S/N: 11484 with GRAS microphone capsule 40AE S/N: 82239

Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10893 complying with Class 1 specification of BS EN 60942:2003, calibration level 94.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Appendix C: Glossary

The list below details the major acoustical terms and descriptors, with brief definitions:

'A' Weighting
Weighting applied to the level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The letter 'A' will follow a descriptor, indicating the value has been 'A' weighted. An 'A' weighted noise level may also be written as dB(A).
Airborne Noise
Noise transmitted through air.
Ambient Noise
The total noise level including all 'normally experienced' noise sources.
dB or Decibel
Literally meaning 'a tenth of a bel', the bel being a unit devised by the Bell Laboratory and named after Alexander Graham Bell. A logarithmically based descriptor to compare a level to a reference level. Decibel arithmetic is not linear, due to the logarithmic base. For example:

30 dB + 30 dB ≠ 60 dB	30 dB + 30 dB = 33 dB

$D_{nTw}+C_{tr}$	
The weighted, normalised difference in airborne noise levels measured in a source room (L1) and a receive room (L2) due to a separating partition.	
D	Is simply L1 – L2.
D_{nT}	Is the normalisation of the measured level difference to the expected (in comparison to the measured) reverberation time in the receiving room.
D_{nTw}	Is the weighted and normalised level difference. This value is the result of applying a known octave band weighting curve to the measured result.

C_{tr}	Is a correction factor applied to the D_{nTw} to account for the known effects of particular types of noise, such as loud stereo music or traffic noise.

Frequency (Hz)

Measured in Hertz (after Heinrich Hertz), and represents the number of cycles per second of a sound or tone.

Insertion Loss, dB

The amount of sound reduction offered by an attenuator or louvre once placed in the path of a noise level.

$L_{A90, T}$

The ‘A’ weighted noise level exceeded for 90% of the time period T, described or measured. The ‘90’ can be substituted for any value between 1 and 99 to indicate the noise level exceeded for the corresponding percentage of time described or measured.

$L_{Aeq, T}$

The ‘A’ weighted ‘equivalent’ noise level, or the average noise level over the time period T, described or measured.

L_{Amax}

The ‘A’ weighted maximum measured noise level. Can be measured with a ‘slow’ (1 sec) or ‘fast’ (0.125 sec) time weighting.

L_{Amin}

The ‘A’ weighted minimum measured noise level.

NR

Noise Rating (NR) level. A frequency dependent system of noise level curves developed by the International Organisation for Standardisation (ISO). NR is used to categorise and determine the acceptable indoor environment in terms of hearing preservation, speech communication and annoyance in any given application as a single figure level. The US predominantly uses the Noise Criterion (NC) system.

Octave

The interval between a frequency in Hz (f) and either half or double that frequency (0.5f or 2f).

Pa

Pascals, the SI unit to describe pressure, after physicist Blaise Pascal.

Reverberation Time, T_{mf}, RT60, RT30 or RT20

The time taken in seconds for a sound to diminish within a room by 1,000 times its original level, corresponding to a drop in sound pressure of 60 dB. When taking field measurements and where background noise levels are high, the units RT20 or RT30 are used (measuring drops of 20 or 30 dB respectively). Sometimes given as a mid-frequency reverberation time, T_{mf} which is the average of reverberation time values at 500Hz, 1kHz and 2kHz.

R_w

The sound reduction value(s) of a constructional element such as a door, as measured in a laboratory, with a known octave band weighting curve applied to the result.

Sound Power Level

A noise level obtained by calculation from measurement data, given at the face of an item of plant or machinery. Referenced to 10^{-12} W or 1pW.

Sound Pressure Level

A noise level measured or given at a distance from a source or a number of sources. Referenced to $2x10^{-5}$ Pa.

Subjective Effect of Changes in Sound Pressure Level

The table below details the subjective effects of variations in sound pressures (adapted from Bies and Hansen).

Difference between background noise and rating levels	Increase in ambient noise level in 'real terms'	Change in apparent loudness
+ 10 dB	+ 10 dB	Twice as loud
+ 5 dB	+ 6 dB	Clearly noticeable
0 dB	+ 3 dB	Just perceptible
-10 dB	0 dB	No change

W

Watts, the SI unit to describe power, after engineer James Watt.

Appendix B

Noise related terminology

Decibel (dB)

The ratio of sound pressures which we can hear is a ratio of 10^6:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq} for the 'A' weighted equivalent continuous noise level.

Equivalent continuous sound level

An index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. 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

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, eg 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 in some cases, narrow frequency bands.

Maximum noise level

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.

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

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Sound power level

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.

Sound pressure level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level (L_p) is ten times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10^{-5}Pa (the threshold of hearing).

Thus L_p (dB) = 10 log $(P1/P_{ref})^2$ where P_{ref}, the lowest pressure detectable by the ear, is 0.00002 pascals (ie 2x10^{-5} Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dBL_A and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

Statistical noise levels

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. The L_{10}, 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_{Aeq} is used in BS 8233 for assessing traffic noise). The L_{90}, the level exceeded for 90% of the time, has been adopted to represent the background noise level. The L_1, the level exceeded for 1% of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, e.g. dB$L_{A10, 5min}$ or dB$L_{A90, 8hr}$.

Structureborne noise

This is the transmission of noise energy as vibration of building elements. The energy may then be re-radiated as airborne noise. Structureborne noise is controlled by structural discontinuities, i.e. expansion joints and floating floors.

Typical levels

Some typical dB(A) noise levels are given below:

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

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Noise Level, dB(A)	Example
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
10	Sound insulated test chamber

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