

Elephant Park H1 Development

# Acoustics Report

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### Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	25/11/2019	Draft Issue for coordination	NC	JE	JE
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## Executive summary.

This Acoustics Report has been prepared by Hoare Lea on behalf of Lendlease (Elephant & Castle) Limited (“Lendlease”) to support an application for full planning permission (“the Application”) for the redevelopment of land comprising Plot H1 (“the Site”) located within the Elephant Park Masterplan, Elephant and Castle, London, SE1 (“the Elephant Park Masterplan”). This standalone development proposal is referred to as “the H1 Development”.

### Design standards.

The acoustic design criteria and recommendations made within this report have been made in line with well-established industry guidance such as the British Council for Offices (BCO) and CIBSE. Consideration has also been to Local Authority policy and guidance,

### Environmental sound survey.

An environmental sound survey has been undertaken at the Site to understand the local sound environment. The survey indicated that the west of the Site, overlooking Walworth Road and Elephant Road are exposed to high sound levels primarily from road traffic and occasional train passes. The East of the Site is a pedestrian area and therefore is exposed to much lower sound levels.

The levels measured during the sound survey will also inform the external façade requirements and plant noise emission limits.

### External noise intrusion.

Preliminary calculations have been undertaken to determine the façade sound reduction requirements in order to meet the internal ambient levels in line with BCO guidance.

The calculations indicate that the sound insulation requirement for the facade overlooking Walworth Road is high. The glazing systems for this façade would need to be either high performance double glazed systems or double glazed systems incorporating an acoustic laminate. The requirements for the other facades should be achievable with standard double glazing systems.

### Building services design.

Noise from building services plant will need to be controlled both internally and externally; in line with BCO guidance and the local authority policy respectively. Criteria for both internal and external noise levels have been set within the report.

A preliminary assessment has been undertaken for the rooftop plant equipment to determine the mitigation measures required to meet the planning requirements. Based on the assessment it is recommended that, low noise equipment is selected, allowance is made induct attenuators for external fans and air handling units and attenuation packs for generators.

A full assessment has not been undertaken on all the basement and mezzanine level plant equipment at this stage as the building services design is yet to be developed. However, it is recommended that allowance is also made for chiller attenuation packs and acoustic louvres to the mezzanine plant area.

## 1. Introduction.

This Acoustics Report has been prepared by Hoare Lea on behalf of Lendlease (Elephant & Castle) Limited ("Lendlease") to support an application for full planning permission ("the Application") for the redevelopment of land comprising Plot H1 ("the Site") located within the Elephant Park Masterplan, Elephant and Castle, London, SE1 ("the Elephant Park Masterplan"). This standalone development proposal is referred to as "the H1 Development".

Plot H1 currently forms Phase MP5b within the Outline Planning Permission ("OPP") granted on 23 March 2013 for the Elephant Park Masterplan (LBS Ref: 12/AP/1092). Outline planning permission was granted under the OPP for development of Plot H1 for a mix of land uses, with matters of scale, appearance and landscaping reserved. The approved development on Plot H1 under the OPP is referred to as "the OPP Plot H1 Parameters".

The Application for Plot H1 seeks full planning permission to develop an office-led building (Class E) on the Site. It is being sought through a standalone planning application because it takes a form which is not capable of being approved in detail through the submission of reserved matters pursuant to the OPP. However, the H1 Development has been designed with the intention that it is to be delivered alongside the adjacent plots that have been and are being delivered under the OPP and will complete the Elephant Park Masterplan. In addition to the Application for the H1 Development, a non-material amendment application will be submitted in parallel to amend the Reserved Matters Application (RMA) approval for Plot H2, alongside a revised RMA for the Park, in order to align the public realm proposals hereby submitted with those approved on the neighbouring plots.

The Elephant and Castle Town Centre has evolved significantly over the past decade and the Application for Plot H1 has been prepared to respond to the emerging context. Additionally, the New Southwark Plan and London Plan set ambitious targets for increasing employment space in the Borough within the Elephant and Castle Opportunity Area. The establishment of a new landmark commercial building in this location will provide new employment and business opportunities for local people and add to the vibrant mix of land uses at Elephant Park and the new Town Centre.

This document provides an overview of the acoustic design standards and guidance on key acoustic design considerations for the H1 Development.

Key considerations discussed within the report can be broadly split into four categories:

- Control of external sound ingress; and
- Building services design and control of external noise emissions.

A glossary of the acoustic terms used within the report is included in Appendix A.

## 2. Acoustic design standards.

Guidance on acoustic design relevant to the H1 Development is available from a variety of references including but not limited to the following:

- British Council for Offices, 2019;
- British Standard 8233, 'Guidance on sound insulation and noise reduction in buildings', 2014;
- BREEAM, 2018;
- CIBSE, Guide A, 2015
- The WELL building standard, 2015.

### 2.1 Southwark Council Policy.

The Local Authority, the London Borough of Southwark ('the Council'), outlines its noise and vibration standards for the locality within their supplementary planning guidance titled, 'Technical Guidance for Noise', 2017.

Within this document, they outline their policies regarding building services noise emissions, noise emissions from potential leisure or entertainment facilities as well as any deliveries associated with the H1 Development.

#### 2.1.1 Noise from building services plant.

The Council imposes the following requirements for any proposed building services equipment associated with the H1 Development:

'In order for planning permission to be recommended it is required that the assessment Rating sound level does not exceed the typical minimum  $L_{A90}$  (15 minute) background sound level at any time. Furthermore, in order to prevent gradually creeping background levels over time, it is required that the unrated 'Specific' sound level does not exceed 10dB below the typical minimum  $L_{A90}$  (15 minute) background sound level at any time. The 'Specific', 'Rating' and 'Background' sound levels shall be calculated fully in accordance with the methodology of BS4142:2014. (sic)'

### 3. Existing sound environment.

Environmental sound surveys have been undertaken by Hoare Lea to establish the existing sound environment. The intent of the survey is to inform the external façade sound insulation requirements and to set plant emission limits for the building services proposals.

The Site is exposed to road traffic noise from the adjacent Walworth Road and Elephant Road located to the west of the Site. There are also elevated railway lines to the West of the Site, which contribute to the overall noise environment. The east of the Site is pedestrianised, and therefore there are no major sources of noise other than occasional noise from commercial properties and passing pedestrians.

The Site, its surrounding and the sound levels measured as part of the survey are indicated in Figure 1; the nearby noise sensitive receivers are indicated in purple.

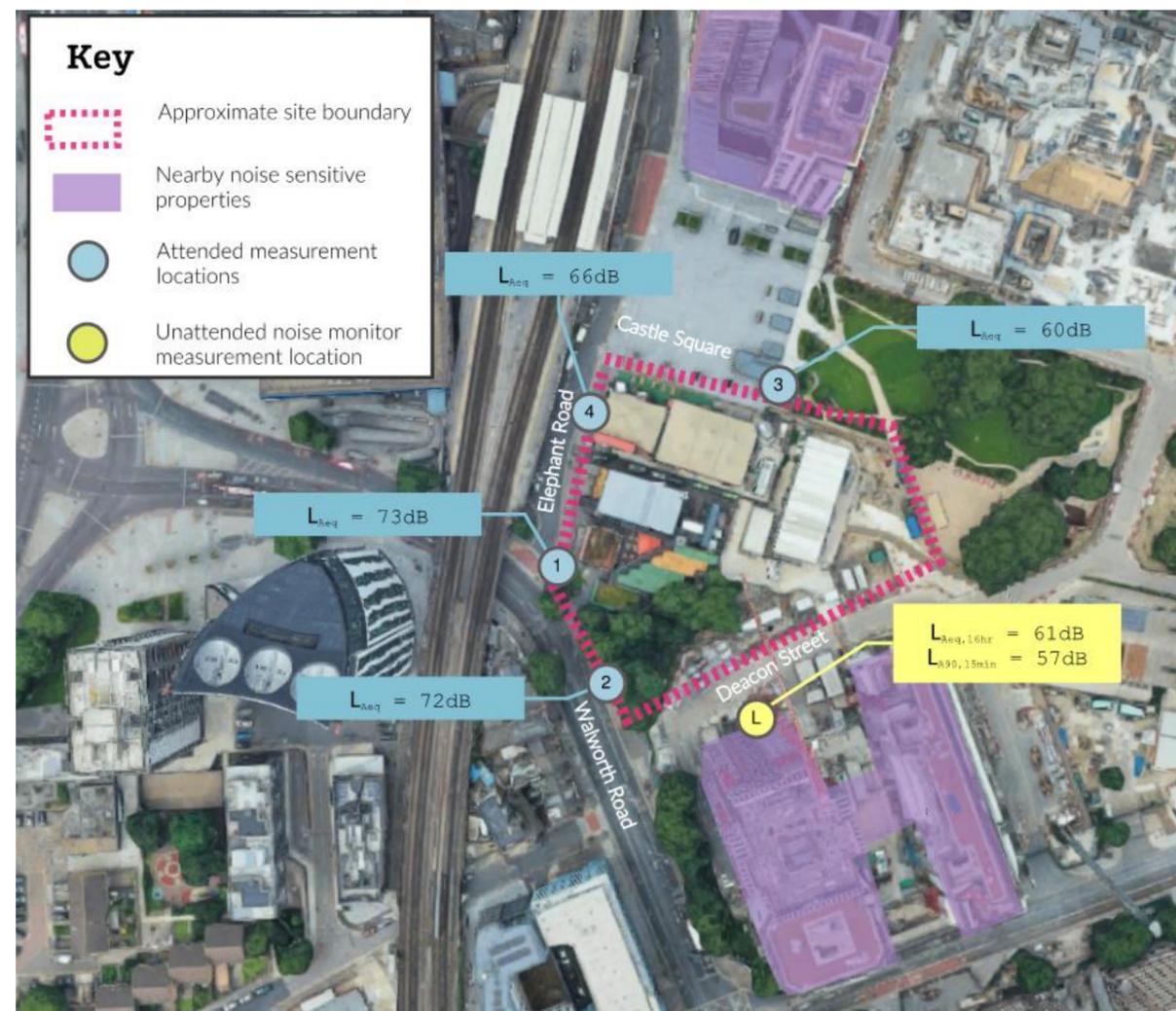


Figure 1: Summary of the environmental sound survey at the Site; Image source: Google

During the Site visit, it was observed that Walworth Road was a particularly busy road. A regular flow of busses and vans was also observed on this road. Attended measurements were therefore undertaken at two locations near the road to capture the noise levels affecting the Site.

### 4. External sound intrusion.

#### 4.1 Internal sound level criteria.

Internal ambient sound levels within offices are advised not to exceed those set out in Table 1. These are based on guidance provided in BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and the British Council for Offices *Guide to specification* (BCO, 2019). It should be noted that BCO refers to the target levels in terms of a noise rating (NR), which essentially fall within the BS 8233 range.

Table 1: Internal ambient noise level criteria

Location	BS 8233 recommended internal ambient sound levels	BCO recommended Noise Rating
Open plan offices	45-50 dB L <sub>Aeq,T</sub>	NR 40
Speculative offices	45-50 dB L <sub>Aeq,T</sub>	NR 38
Cellular offices/meeting room	35-45 dB L <sub>Aeq,T</sub>	NR 35
Retail spaces	45-55 dB L <sub>Aeq,T</sub>	NR 40

In addition to this, BCO recommends a limit of 55 dB(A) L<sub>A01,1hr</sub> and 50 dB(A) L<sub>A01,1hr</sub> within open-plan and cellular offices, respectively for noisier events occurring over short periods of time.

It is also noted that BCO allows for a +5 dB relaxation in the case of naturally ventilated buildings or where the occupants have the option of opening windows for occasional periods.

#### 4.2 Façade sound reduction performance for offices.

The external façade will be comprised of a glazed curtain walling system. It is recommended that the façade sound insulation is designed to achieve cellular office standards as set out in Section 4.1, so as to provide a degree of flexibility to the future tenant fit-outs.

Calculations have at present been undertaken to meet the more onerous standard for the cellular offices, and these requirements are illustrated in Figure 2.

The requirements stated for facades overlooking Walworth Road are high and would require high-performance double-glazed systems or glazing systems incorporating an acoustic laminate layer. The requirements for façades overlooking Elephant Road, Castle Square and Deacon Street should be achievable with standard double-glazing systems.

If cellular office standards are not required on certain or all facades, then these requirements could be reduced by 4-5 dB.

#### 4.3 Flanking sound transmission.

In addition to providing adequate levels of sound reduction from outside to inside, it is important that the cladding mullions provide sufficient flanking sound insulation to enable a good level of sound reduction performance of the partitions as part of future tenant fit-out.

##### 4.3.1 Horizontal flanking.

BCO recommends that horizontal flanking constructions be capable of achieving a minimum sound insulation performance of D<sub>nf,w</sub> 45 dB. BCO also states that flanking construction should be capable of being upgraded to a minimum sound insulation performance of D<sub>nf,w</sub> 53 dB to accommodate high-performance partitions required areas with higher sound insulation requirements such as meeting rooms.

Facade sound insulation requirements	
	35 dB $R_w + C_{tr}$
	32 dB $R_w + C_{tr}$
	29 dB $R_w + C_{tr}$

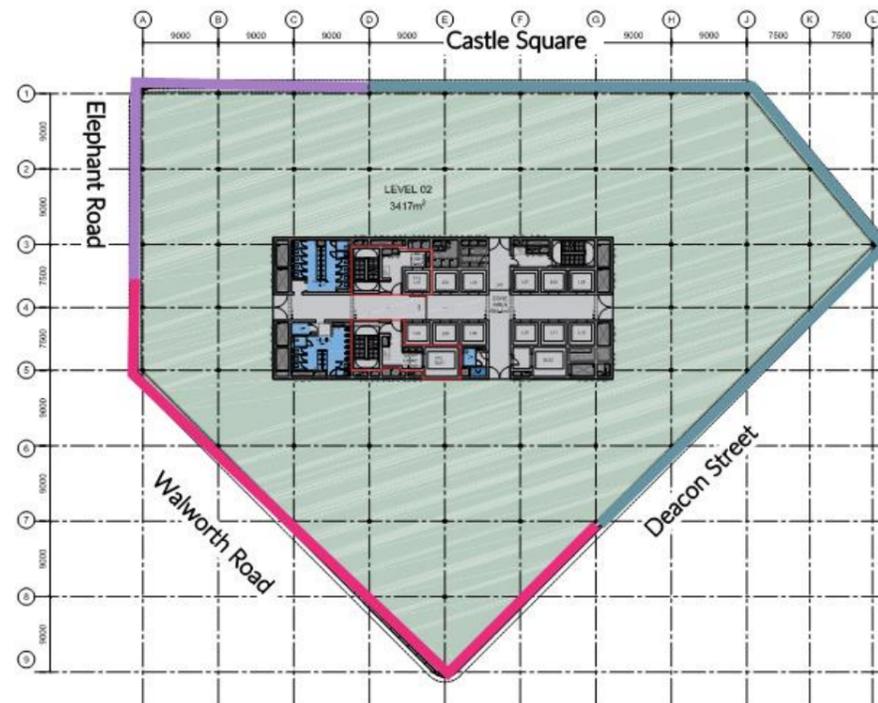


Figure 2: Facade sound insulation requirements

## 5. Building services noise.

Building services noise and vibration will need to be controlled to suitable levels; both internally and externally.

### 5.1 Internal building services noise criteria.

The following sets out the recommended noise rating (NR) design levels for the building services to be achieved as a spatial average throughout each area. The requirements have been set out in line with the guidance provided within BCO 2019.

Table 2: Internal building service noise rating criteria

Type of Space	Noise Rating, NR
Speculative Office	NR 38
Open plan office	NR 35
Entrance lobbies/reception/circulation	NR 40
Lift lobbies	NR 40
Toilets	NR 45
Retail Units	NR 40
Loading Bay	NR 55
Plant rooms	NR 65

It should be noted that in the case of office spaces, the building services will provide an underlying level of 'masking sound' which is useful in providing acoustic privacy. If the level of the masking sound is too low, then the acoustic privacy across the floor plate will be reduced. Consequently, the criteria set out within Table 2 should be considered design targets, rather than merely a 'maximum' number for compliance.

### 5.2 Acoustic considerations to develop internal building services design.

The following should be allowed for within the design to enable the internal sound levels to be achieved:

- Make allowance for room-side sound attenuators to the ductwork of the new ventilation plant.
- Consideration will also need to be given to regenerated noise; this is particularly important for a tall building. Consideration will include attenuators to CAV and VAV regulators within the ductwork design.
- Adequate vibration isolation will be required for all systems such that there is no perceivable vibration or associated re-radiated airborne noise in any occupied parts of the H1 Development.

### 5.3 Vibration from building services plant.

Adequate vibration isolation will need to be provided to all systems such that there is no perceivable vibration from building services throughout the H1 Development. BCO states that vibration should not exceed a peak acceleration of  $0.01 \text{ ms}^{-1}$ .

This corresponds to a threshold of perception for 25% of the generation populations, i.e. 75% of people will not be able to perceive it.

### 5.4 Lift noise and vibration.

BCO provides guidance and limits for noise and vibration from lifts which are outlined below:

Noise:

- In lift car 55 dB  $L_{A_{fmax}}$
- In lift lobby 55 dB  $L_{A_{fmax}}$
- Into offices without lift lobbies 50 dB  $L_{A_{fmax}}$
- Into offices through shaft walls 35 dB  $L_{A_{fmax}}$

Vibration:

- Horizontal vibration  $0.12 \text{ ms}^{-2}$
- Vertical vibration  $0.15 \text{ ms}^{-2}$
- Maximum acceleration  $1.2 \text{ ms}^{-2}$
- 8-hour VDV on the floor slab  $0.36 \text{ ms}^{-1.75}$

### 5.5 External plant noise emissions.

Noise from building services plant will need to be controlled to achieve the external plant noise emission limits in line with the local authority criteria.

#### 5.5.1 Landlord plant.

The environmental sound survey undertaken at the Site has been used to derive plant noise emission limits, which have been presented in Table 3. These limits apply 1 metre from the nearest adjacent noise-sensitive property window, which is the Plot H2 development located to the south of the Site.

Table 3: Plant noise emission limits

Time of day	Typical minimum background level, dB $L_{A90,15min}$	Specific noise level (dB) for new plant (in accordance with BS 4142)	Rating noise level (dB $L_{Ar,Tr}$ ) for new plant (in accordance with BS 4142)
Day (07:00 – 23:00)	51	41	51

Building service plant that is tonal or has other strong characteristics such as a distinguishable hiss or hum or operates intermittently will require a rating penalty derived in line with BS 4142 guidance as required by the local authority.

Please note that night-time limits have not been provided for the landlord building services as these are not expected to run at night.

### 5.6 Tenant plant.

It is expected that the majority of the tenant plant would be located at the basement level with the tenant life safety generator located at the rooftop level.

Any tenant plant will be required to meet a plant emission limit 10 dB below the limit landlord plant emission limits to ensure the local authority noise emission criteria is met 1 m from the nearest noise sensitive receiver.

Table 4: Plant emission limits for tenant plant

Time of day	Specific noise level (dB) (in accordance with BS 4142) for Landlord plant	Specific noise level (dB) for tenant plant (in accordance with BS 4142)	Rating noise level (dB L <sub>A,r,Tr</sub> ) for tenant plant (in accordance with BS 4142)
Day (07:00 – 23:00)	41	31	41
Night (23:00-07:00)	45	35	45

#### 5.6.1 Emergency plant.

Any mechanical or electrical plant for emergency use shall be designed (for testing purposes only) to achieve 10 dB above the normally existing background. This is specified on the basis that plant will be tested during the day, between 09:00-17:00 and for short periods of time. The rating level for the emergency plant at 1m from the sensitive receptors is shown in Table 5.

Table 5: Plant noise emission limit for emergency plant

Time of day	Typical minimum background level, dB L <sub>A90,15min</sub>	Plant noise emission limit (dB L <sub>Aeq</sub> ) for emergency plant
Day (07:00 – 23:00)	51	61

### 5.7 Plant noise control measures.

A preliminary noise assessment has been undertaken for the Landlord's rooftop plant equipment to facilitate the stage 2 design. As the noise data for all the plant proposals are not available, sample noise levels and frequency spectrum to account for the different units on the roof.

Based on the assessment, the following mitigation measures will be required for the plant proposals:

- Selection of low noise equipment wherever possible;
- Induct Attenuators for the fresh air inlet and exhaust outlets for the Air Handling Units;
- Induct Attenuators to the Extract Fans;
- Air Handling Unit and fan breakout may need to be controlled further through the use of enhanced casing to the unit or an acoustic mass barrier layer;
- Acoustic mass barrier layers to the ductwork of minimum mass 5 kg/m<sup>2</sup>;
- Enclosures to control breakout noise from the generator and attenuators for the discharge outlet. The data provided by the MEP engineer states a level of 65 dB(A) at 1m. This is a fairly low noise level for a generator and probably already accounts for mitigation measures such as an enclosure system and attenuators to the discharge.

In addition to the above, the plant will need to be supplied with appropriate antivibration mounts to control vibration transmission to the building.

It is important to note that the overall plant noise emission is dominated by the noise from the proposed cooling towers. Based on the sound power level data provided 82 dB(A), and the available distances between the source and receiver, no specific mitigation measures have been specified for the unit. Should a noisier selection be chosen in the next design stage, this can have an impact on the overall size of the unit and particularly its height.

As the selections have not been developed for the plant items at the mezzanine and within the basement level, no assessment has been undertaken at this stage. However, allowance should be made for attenuators to the proposed Air Handling Units, acoustic louvres to mezzanine plant rooms and attenuation packages for chillers and back-up generators.

## Appendix A – Glossary of terms.

### Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also the sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

### Octave and Third Octave Bands

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of the noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third-octave bands provide a fine resolution by dividing each octave band into three bands.

### A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third-octave band frequencies. An 'A' weighted value would be written as dB(A).

### $L_{Amax}$

The highest A-weighted noise level recorded during a measurement period.

### $L_{eq}$

The  $L_{eq}$  is a parameter defined as the equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. The  $L_{eq,T}$  can be seen to be an "average" sound pressure level over a given time period (although it is not an arithmetic average). Typically the  $L_{eq,T}$  will be an 'A' weighted noise level in dB(A). It is commonly used to describe all types of environmental noise sources.

### $L_{90}$

The  $L_{90,T}$  is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and cannot be directly combined with other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

### Sound Reduction Index, 'R'

The difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 Hz - 3150 Hz). R varies with frequency and is measured in a laboratory in one-third octave bands.

### Level Difference, D

This is defined as the differences in decibels between the average sound pressure level in a source room on one side of a dividing structure and the average sound pressure level in a receiving room on the other side (both rooms being enclosed spaces). The level difference is an absolute measure of the sound insulation of a dividing structure and is commonly used to quantify 'on-site' performance. It is measured in decibels.

### Airborne Single Number Quantity Weighting

This is a weighting procedure defined in BS EN ISO 717, Part 1 for converting third-octave band R, R', D and  $D_{nT}$  values to a single number quantity denoted as  $R_w$ ,  $R'_w$ ,  $D_w$  or  $D_{nT,w}$ . It is a decibel value.

### Reverberation Time, T (or RT)

The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds.

Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

### Noise rating level

The Noise Rating (NR) level is typically used to describe the level of noise from building services plant. It takes into account the sound pressure level in each octave band and compares against a reference curve. The NR level is typically 5-6 dB lower than  $L_{Aeq}$  for typical building services noise sources.

### Rating Level

The specific noise level of the source plus any adjustment for characteristic features of the noise

