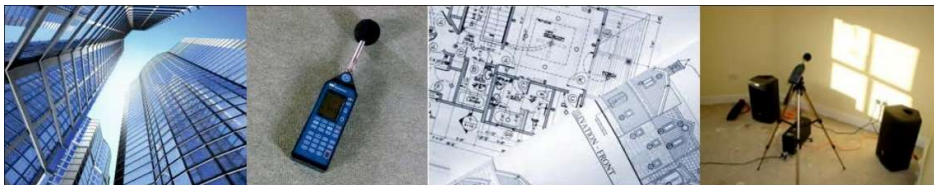


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ST ALBANS CLOSE GRAVESEND GRAVESHAM

ASSESSMENT OF AIR SOURCE HEAT PUMP NOISE

v.1

Client:

HILL PARTNERSHIPS LTD

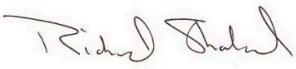
The Powder House
Gunpowder Mill
Powdermill Lane
Waltham Abbey
Essex
EN9 1BN

2nd April 2025

Ref: M5771

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Project Reference	M5771
Issue No.	1
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Date	2nd April 2025

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1. SUMMARY

- 1.1 An assessment of plant noise has been undertaken at St Albans Close, Gravesend, to determine the impact from eight new air source heat pumps. The units are being installed alongside eight new dwellings for the homeless.
- 1.2 A noise survey has been conducted on the site, to determine the typical lowest levels of the background sound level during day time and night time periods.
- 1.3 From this, and with reference to the Environmental Protection team's guidelines, a design target has been derived for the maximum BS4142 Rating level at neighbouring properties.
- 1.4 The new plant comprises a Vaillant AroTHERM Plus heat pump on the west elevation of each property. It is noted that these units should be programmed to operated on the night-mode setting between 2300 and 0700.
- 1.5 Noise modelling has been conducted on the proposed installation and the findings indicate that the resulting conditions would be acceptable at all locations around the development site, as confirmed in Table 1.1:

Receptor	Day 0700 – 2300	Night 2300 - 0700
Target Level	≤26	≤22
45 Taunton Vale	23	18
49 Taunton Vale	26	21
66 St Albans Close	17	14
57 St Albans Close	18	13
70 Winchester Crescent	21	16
72 Winchester Crescent	20	15

Table 1.1 – Predicted Rating Noise Levels, $L_{Ar, tr}$, dB(A)

2. INTRODUCTION

- 2.1 An assessment of plant noise has been undertaken at a new residential development off St Albans Close, Gravesend, to determine the impact of new air source heat pumps
- 2.2 The project, part of the Hill foundation's pledge to provide 200 homes for the homeless, involves the construction of two blocks of four single storey dwellings, on part of an existing amenity space (see Figures 1 & 2).
- 2.3 The houses will be each be served by a small air source heat pump, and concern has been expressed by the GBC Environmental Team that noise might adversely affect neighbouring residents.
- 2.4 In response to this, Ian Sharland Limited has conducted a formal assessment, the objectives of which are summarised as follows:
 - (i) To confirm the existing ambient noise climate in the vicinity of the development site;
 - (ii) To confirm a design target for limiting noise radiation from the new heat pumps;
 - (iii) To predict emissions from St Albans Close, and detail any noise control measures required.
- 2.5 This report details the investigations carried out in respect of each of these objectives and summarises the conclusions which have been reached.

3. SURVEY OF AMBIENT NOISE LEVELS

- 3.1 The first step in the assessment of potential impact is to describe the existing ambient noise levels affecting the site.
- 3.2 As the site was open to the public, it was not possible to conduct a long term survey of background sound levels.
- 3.3 Enquiries to the Environmental Protection department confirmed an acceptable alternative survey form. An attended survey was conducted on the evening of 29th March 2025, to determine the late evening and mid-nighttime conditions.
- 3.4 The weather for the survey was ideal, with clear skies, little wind (<1m/s) and an overnight low of 6°C.
- 3.5 The first visit was conducted between 21.30 and 22.00. 15 minute samples of the following acoustic parameters were recorded using a Norsonic 140 precision grade sound level meter (the calibration of which was checked before and after the survey).

LAeq The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

L_{Amax} The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

LA90 A statistical parameter representing the A-Weighted noise level exceeded for 90% of each sample period. This is commonly used to describe the underlying background noise levels.

- 3.6 Figure 1 indicates the monitoring position.
- 3.7 At this time, noise levels were determined by a combination of very local traffic (St Albans Close), local traffic (from the direction of Valley Road) and distant traffic (from the direction of the A2).
- 3.8 A second survey was conducted between 02.30 and 03.30 on the morning of the 30th March 2025. At this time, the noted noise sources included distant traffic from the A2, and intermittent birdsong.

3.9 Table 3.1 confirms the levels recorded:

Date	Start Time	Duration	LAeq, dB(A)	LAmx, dB(A)	LA90, dB(A)
29/03/2025	21.30	15 mins	40.4	51.7	36.1
	21.45	15 mins	41.2	55.7	36.3
30/03/2025	02.35	15 mins	42.8	59.4	33.2
	02.50	15 mins	44.2	49.4	31.6
	03.05	15 mins	40.4	50.5	32.4
	03.20	15 mins	41.8	54.7	32.1

Table 3.1 – Measured Noise Levels

3.10 For the purposes of the ongoing design assessment, the following levels of the background sound level, LA90, 15 mins will be adopted:

Day time, 0700 – 2300	36 dB(A)
Night time, 2300 – 0700	32 dB(A)

4. DESIGN TARGETS

- 4.1 During the pre-application, the Environmental Protection department noted the absence of an acoustic assessment. They confirmed that they would expect new plant to be designed to a level where there is no increase in the existing background noise levels, when all of the plant is running together.
- 4.2 They also confirmed that, objectively, they would expect the Rating level to be at least 10 dB below the existing L_{A90} values at the nearest noise sensitive receptors, when assessed in accordance with BS4142:2014.
- 4.3 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00 hrs) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1hr sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00 hrs) only the reference time interval is 15 minutes.
- 4.4 Corrections of up to + 9 dB (A) are then made to this "specific sound level" if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".
- 4.5 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level and consider the following.
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

- 4.6 It is therefore confirmed the new plant should be designed to the following levels:

Measure	Day Time 0700 – 2300	Night time 2300 – 0700
Rating Noise Level	26 dB(A) $L_{Ar,tr}$	22 dB(A) $L_{Ar,tr}$

Table 4.1– Proposed Design Limits for St Albans Close Emissions

- 4.7 These values represent the BS4142 Rating level, the sum of the sound pressure level and any character corrections. In this instance, it is confirmed that the noise from these domestic heat pumps will not be perceptibly tonal, nor impulsive. The noise may, however, be intermittent, as the units cycle in and out. A +3dB correction is therefore appropriate.
- 4.8 Consequently, the maximum allowable sound pressure level for the equipment is 3 dB lower than the Rating level given in Table 4.1.

5. ASSESSMENT OF PROPOSED PLANT NOISE

- 5.1 Each of the eight dwellings will be served with a Vaillant AroTHERM Plus air source heat pump. For the floor plots in Block A, the heat pumps will be located next to the southern elevation of the building. For the four heat pumps serving Block B, they will be located on the north elevation of the building.
- 5.2 The manufacturer quotes a sound power level of 55 dB(A) for each unit, with option for a night-mode operation which reduces emissions by 5 dB(A).
- 5.3 Initial modelling has been conducted **in the absence** of any acoustically significant fencing or other screening.
- 5.3 A computer model of the site has been created, using the DGMR iNoise 2024.v3 software. The calculations are based on the 2024 version of the ISO 9613 and the recommendations of the quality standard ISO 17534.
- 5.4 The model includes the two new blocks of dwellings, and the two-storey houses around the perimeter of the site. Particular interest is given to the following properties:



- 5.5 Figures 3 & 4 indicate noise maps for day time and night operation of the heat pumps. The maps show levels at first floor level, these being taken to be the more sensitive and less protected windows of the adjacent houses. Table 5.1 summarises the levels at each of the six receptors:

Receptor	Day 0700 – 2300	Night 2300 - 0700
Target Level	≤23	≤19
45 Taunton Vale	20	15
49 Taunton Vale	23	18
66 St Albans Close	16	11
57 St Albans Close	15	10
70 Winchester Crescent	18	13
72 Winchester Crescent	17	12

Table 5.1 – Predicted Noise Levels, $L_{Aeq, t}$ with No Remediation

- 5.6 The predictions indicate that during the day time and night time periods, noise levels will be compliant at all of the nearest houses.

FIGURE 1 – SITE LOCATION



FIGURE 2 – LOCATION PLAN

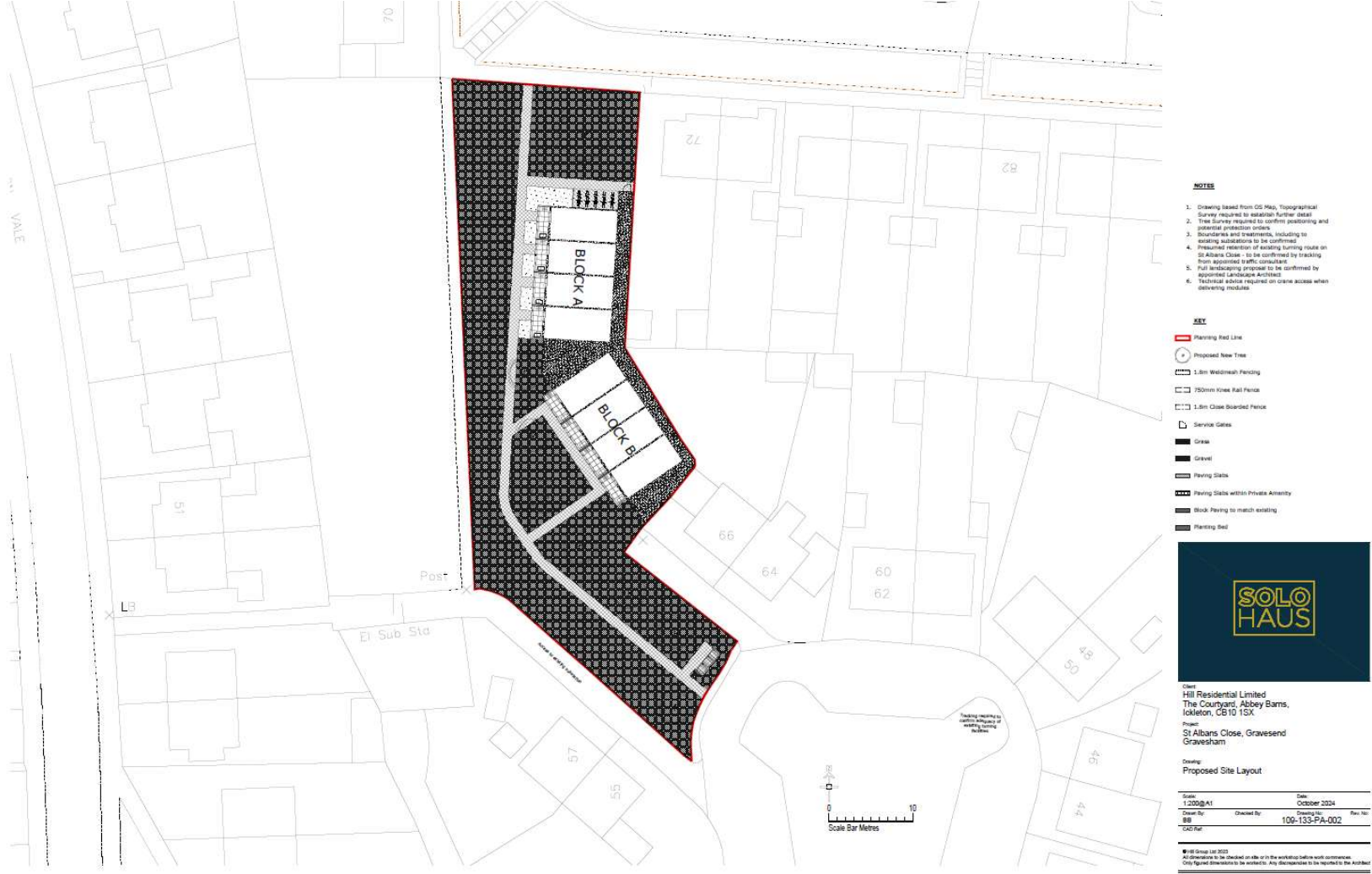


FIGURE 3 – NOISE MAP, DAY TIME, WITH NO REMEDIATION

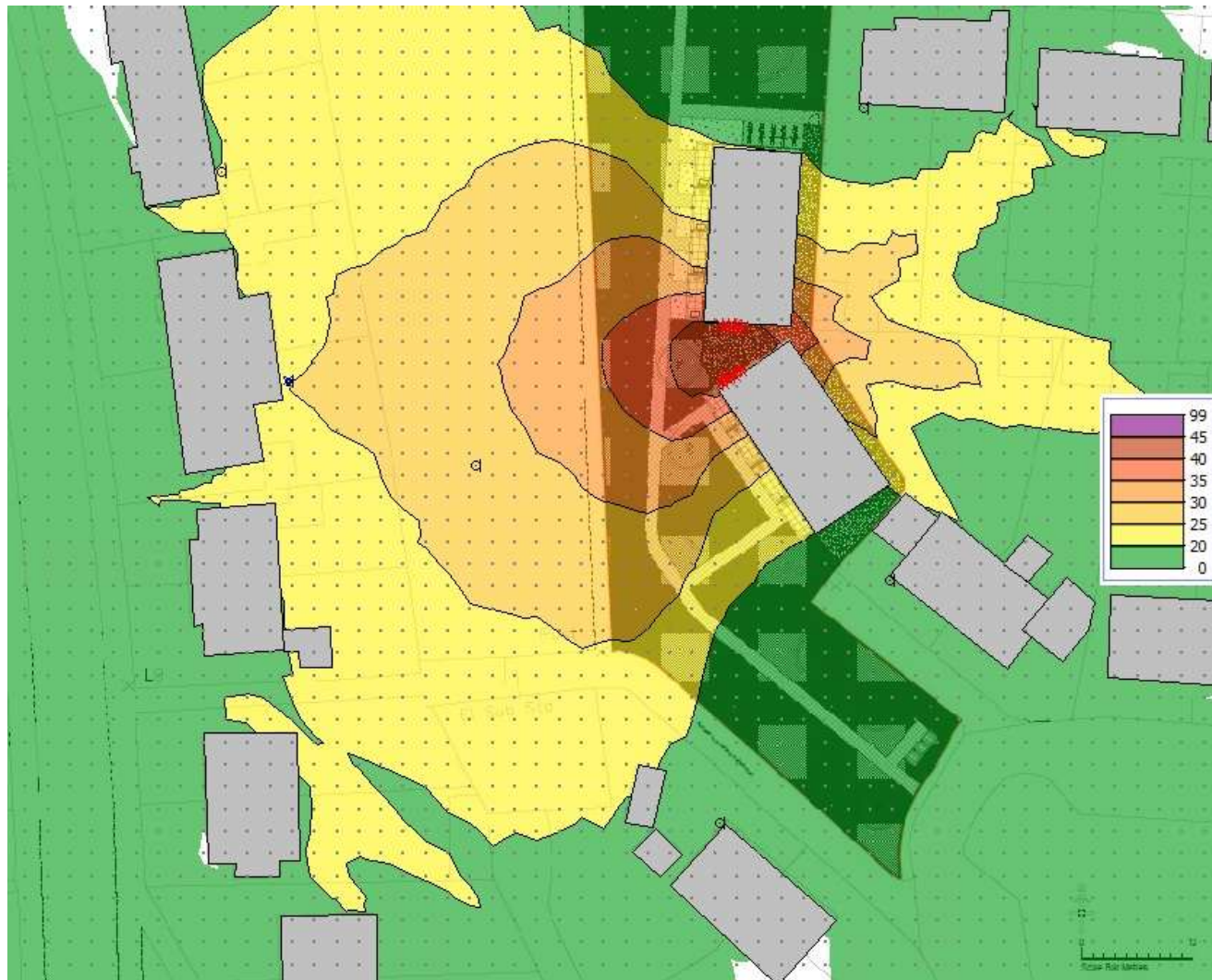
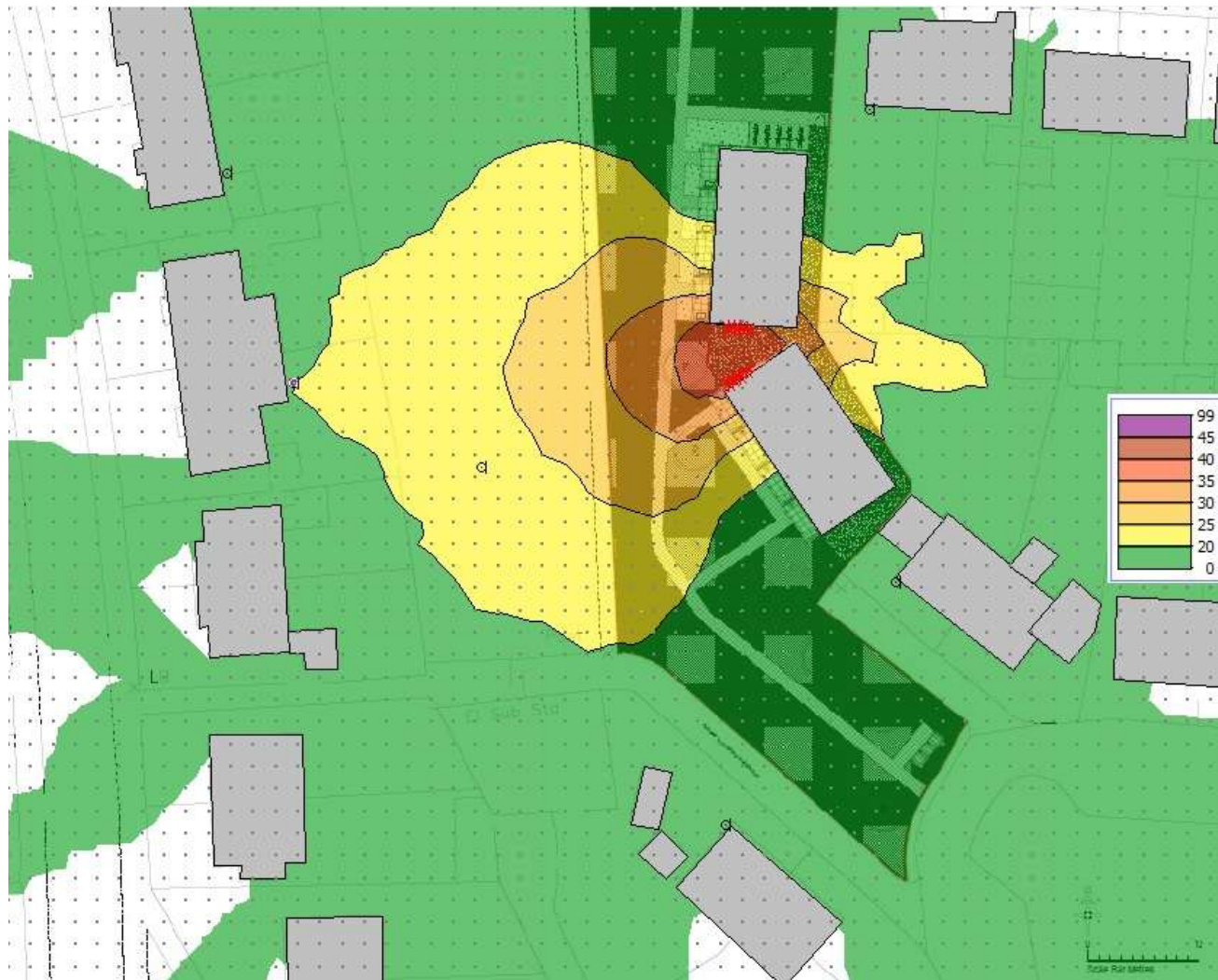


FIGURE 4 – NOISE MAP, NIGHT TIME, WITH NO REMEDIATION



APPENDIX 1 - TERMINOLOGY RELATING TO NOISE

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
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 20µPa.
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.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Leq,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.
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade Noise Level	At a distance of 1m in front of a large sound reflecting object such as a façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	Range of frequencies whose upper limit is twice the lower limit.
DnT,w	The single number quantity that characterises airborne sound insulation between rooms over a range of frequencies.
Rw	Single number quantity that characterises the airborne sound insulating properties of a material or building element over a range of frequencies.