

Acoustic Consultancy Report

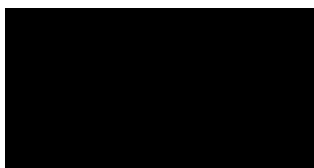
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External Plant Assessment

Report Prepared For

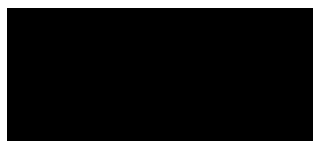
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20 March 2025

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Contents

i) Executive Summary.....	3
ii) Document History	3
1. Introduction.....	4
2. Survey	4
2.1. Site Description.....	4
2.2. Receiver Location	4
2.3. Local Noise Climate	4
2.4. Measurements	4
2.5. Measurement Results	5
3. Evaluation of Design Criteria	5
3.1. Residential Design Criterion	5
3.1.1. BS4142:2014.....	5
3.1.2. World Health Organisation Night Noise Guidelines for Europe (2009)	6
3.1.3. World Health Organisation (WHO) Guidelines for Community Noise (1999)	6
3.1.4. BS8233:2014.....	7
3.1.5. Recommended Residential Design Rating Level	8
3.2. Design Rating Levels.....	8
4. Review of Current Design.....	8
4.1. Current Design	8
4.2. Calculated Results	8
5. Conclusion	10
Appendix A: Site Plan.....	11
Appendix B: Plant Location	12
Appendix C: Measurement Data	13
Appendix D: Plant Data.....	14
Appendix E: Calculations	15
Appendix F: Glossary	17

i) Executive Summary

New mechanical plant is to be installed at 36 Pitts Lane, in Reading.

LCP has been commissioned to carry out an acoustic environment survey and to use the obtained data to assess the potential noise impact of the plant installation on surrounding noise sensitive receptors.

The design criterion is as follows:

Day:	42 dB $L_{Aeq,T}$ at 7m, nearest residential window of no. 38;
Day:	42 dB $L_{Aeq,T}$ at 28m, nearest residential window of no. 32;
Day:	50 dB $L_{Aeq,T}$ at 5m, nearest outdoor living area of no. 38;
Night:	36 dB $L_{Aeq,T}$ at 7m, nearest residential window of no. 38;
Night:	36 dB $L_{Aeq,T}$ at 7m, nearest residential window of no. 32;

The design as proposed and assessed will achieve the required criteria provided the mitigation comprising all units to operate in silent mode detailed in section 5 of this report is implemented; the calculated rating levels are as follows:

Day:	36 dB $L_{Aeq,T}$ at 7m, nearest residential window of no. 38;
Day:	24 dB $L_{Aeq,T}$ at 28m, nearest residential window of no. 32;
Day:	35 dB $L_{Aeq,T}$ at 5m, nearest outdoor living area of no. 38;
Night:	36 dB $L_{Aeq,T}$ at 7m, nearest residential window of no. 38;
Night:	24 dB $L_{Aeq,T}$ at 7m, nearest residential window of no. 32;

This report concludes that the design criteria can be achieved.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	13 th March 2025	Initial Issue	VB	MB
2	20 th March 2025	Amendment following Council comments	VB	MB

1. Introduction

New mechanical plant is to be installed at 36 Pitts Lane, in Reading.

LCP has been commissioned to carry out an acoustic environment survey and to use the obtained data to assess the potential noise impact of the plant installation on surrounding noise sensitive receptors.

The report details recommendations for necessary noise mitigation where necessary.

The guidance in this report is on the basis that the mechanical plant will be consistently operating over a 24-hour period.

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 residential receiver with direct line of sight to the plant is 38 Pitts Lane, approximately 7m to the northern façade of 36 Pitts Lane. This acoustic report also considers the outdoor living area of 36 Pitts Lane, approximately 5m from the plant on the east façade.

The nearest residential receiver with direct line of sight to the plant on the southern façade is 32 Pitts Lane, approximately 28m from the site. This is shown in the site plan in Appendix A.

2.3. Local Noise Climate

The predominant local noise sources were occasional road traffic from local road networks, and to a lesser extent occasional faint aircraft movements. The mechanical plant being assessed is currently installed but was not operational for the ambient and background noise survey undertaken and discussed below.

2.4. Measurements

The noise monitoring took place between the 5th March 2025 to the 6th March 2025. The measurement period was considered sufficient to establish the representative background sound levels corresponding to the operational period of the plant. The weather conditions monitored during the survey are shown in the following table.

Table 1: Weather Conditions at Measurement Location

Weather	Value
Average Wind Speed	1m/s
Wind Direction	North
Cloud Cover	20%
Max. Temperature	15°C

Weather	Value
Min. Temperature	3°C
Precipitation	None

2.5. Measurement Results

2.5.1. Ambient Noise Results

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

Table 2: Representative ambient sound levels, dB re 2×10^{-5} Pa

Measurement Position	$L_{Aeq, 16\text{hours}}$ Day*	$L_{A90, 8\text{hours}}$ Night*
MP1	50	48

* Day and Night periods are defined as between 07:00 - 23:00 and 23:00 - 07:00 respectively.

2.5.2. Background Noise Results

The representative background sound level(s) obtained being as follows:

Table 3: Representative background sound levels, dB re 2×10^{-5} Pa

Measurement Position	$L_{A90, 15\text{ mins}}$ Day*	$L_{A90, 15\text{ mins}}$ Night*
MP1	42	36

* Day and Night periods are defined as between 07:00 - 23:00 and 23:00 - 07:00 respectively.

3. Evaluation of Design Criteria

3.1. Residential Design Criterion

3.1.1. BS4142:2014

BS4142:2014 states that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

Table 4: BS4142 assessment based upon rating level

Difference between background noise and rating levels	Assessment
+ 10 dB	Indication of a significant adverse impact
+ 5 dB	Indication of an adverse impact

Difference between background noise and rating levels	Assessment
0 dB	Indication of low impact

Certain acoustic features can increase the significance of impact. The specific sound level should be corrected if a tone, impulse or other acoustic feature is expected to be present.

Table 5: Corrections for acoustic features, subjective method

Acoustic Feature	Correction, dB		
	Just Perceptible	Clearly Perceptible	Highly Perceptible
Tonality	2	4	6
Impulsivity	3	6	9
Other Characteristics	3		
Intermittency	3		

Typically the acoustic feature correction would not be expected to exceed 10dB.

Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty.

3.1.2. 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."

3.1.3. World Health Organisation (WHO) Guidelines for Community Noise (1999)

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

Table 6: 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	-

Specific Environment	$L_{Aeq, T}$ dB	Time Base (hours)	$L_{Amax, fast}$ dB
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

The WHO's 'Guidelines for Community Noise' also gives the following general guidance on the expected sound insulation performance of a façade with a partly open window, it states that:

"At night, sound pressure levels at the outside facades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax} so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB."

3.1.4. BS8233:2014

The criteria offered in BS8233 for residential buildings are largely based on the recommendations made in the Guidelines for Community Noise.

Using the general guidance from above, on the expected sound insulation performance of a façade with a partly open window, the criteria shown in the table below have been adapted from the criteria offered in table 4 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 7: External ambient noise levels for dwellings, based on BS8233, dB re 2×10^{-5} Pa

Activity	Location	Time period	
		07:00 to 23:00	23:00 to 07:00
Resting	Living Room	50 $L_{Aeq, 16 \text{ hour}}$	-
Dining	Dining Room/area	55 $L_{Aeq, 16 \text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	50 $L_{Aeq, 16 \text{ hour}}$	45 $L_{Aeq, 8 \text{ hour}}$

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

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 $L_{Aeq, T}$, with an upper guideline value of 55 dB $L_{Aeq, T}$ which would be acceptable in noisier environments."

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

3.1.5. Recommended Residential Design Rating Level

On the basis of the above the recommended residential design rating level, including a total of 7dB(A) acoustic feature correction to allow for intermittency and clearly perceptible tonality, should therefore be:

Residential Design Rating Level
Representative $L_{A90, 15 \text{ mins}}$ dB

No acoustic feature correction has been included to account for any impulsivity. Impulsivity would be characterised as bangs or clashes which would not be associated with the mechanical plant proposed. LCP have allowed for up to a clearly perceptible tonality as a worst case. Octave band noise data was not available for the SCM60ZS-W unit therefore tonality is a possibility however is extremely unlikely to be to highly perceptible. A tonality check was undertaken and showed no tonality against the manufactures noise levels of the SRC20ZS-W units.

3.2. Design Rating Levels

The design levels to be adopted for this project are set out in table 7.

Table 8: Design rating levels, dB re 2×10^{-5} Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq, 16 \text{ hr}}$	Design Level (Night) $L_{Aeq, 8 \text{ hr}}$
Nearest residential window of no. 38	7	42	36
Nearest outdoor amenity area of no. 38	5	50	-
Nearest residential window of no. 32	29	42	36

4. Review of Current Design

4.1. Current Design

The proposed plant shall comprise of three condenser units, one unit at ground level on the east façade, one unit at first storey level on the south façade, and one unit at first storey level on the north façade. The units on the south and north façade are a Mitsubishi SRC20ZS-W, the unit on the east façade is a Mitsubishi SCM60ZS-W. The proposed plant location is provided in Appendix B.

The guidance in this report is on the basis that the mechanical plant will be consistently operating over a 24-hour period.

4.2. Calculated Results

Calculations of the predicted noise levels have been carried out with the appropriate corrections for geometric attenuation, barrier effect, reflective surfaces and multiple source addition.

The design rating levels to be adopted for this project, together with the predicted noise levels, are set out in the table below.

Table 9: Design and predicted rating levels – normal operation, dB re 2×10^{-5} Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq, 16 \text{ hr}}$	Design Level (Night) $L_{Aeq, 8 \text{ hr}}$	Predicted Level $L_{Aeq, T}$
Nearest residential window of no. 38	7	42	36	44
Nearest outdoor amenity area of no. 38	5	50	-	55
Nearest residential window of no. 32	29	42	36	28

Plant noise level data used in this assessment are contained within Appendix D.

5. Noise Mitigation Option

As the plant installation has been assessed to be over the required criteria at the surrounding noise sensitive receptors, the following option shall be applied in order that noise emissions are reduced to acceptable levels.

Should the plant installation be redesigned after consideration of the mitigation option, the installation shall be re-assessed to ensure compliance to the specification has been achieved.

5.1. Plant Operation Settings

The suggested mitigation measure is for **all three units to operate only in silent mode**.

Additionally, to ensure mechanical plant operates at the manufacturers published noise data, units should be well maintained and retained in the silent mode operation settings indefinitely.

5.2. Mitigated Results

The design rating levels to be adopted for this project, together with the predicted noise levels inclusive of the mitigation detailed in Section 5, are set out in the table below.

Table 10: Design and predicted mitigated rating levels, dB re 2×10^{-5} Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq, 16 \text{ hr}}$	Design Level (Night) $L_{Aeq, 8 \text{ hr}}$	Predicted Level $L_{Aeq, T}$
Nearest residential window of no. 38	7	42	36	36

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq, 16 \text{ hr}}$	Design Level (Night) $L_{Aeq, 8 \text{ hr}}$	Predicted Level $L_{Aeq,T}$
Nearest outdoor amenity area of no. 38	5	50	-	35
Nearest residential window of no. 32	29	42	36	24

Plant noise level data used in this assessment are contained within Appendix D.

Calculations are shown within Appendix E.

6. Conclusion

An environmental noise survey has been undertaken in order to establish the representative background sound levels local to the site generally in accordance with the method contained within BS4142: 2014.

Calculations have been carried out to determine the noise levels at the nearest receiver premises. The calculations show that with the implementation the noise mitigation measures detailed in section 5 of this report the design criteria will be met.

Predicted noise levels within the neighbouring amenity area is 15dB(A) below the existing measured daytime ambient noise levels, which includes a 7dB(A) acoustic feature correction, and therefore will not impact the ambient noise level in the area.

Predicted noise levels at the nearest noise sensitive window is equal the existing measured night-time background noise levels, which includes a 7dB(A) acoustic feature correction, and therefore will be an indication of low impact when assessed against BS4142.

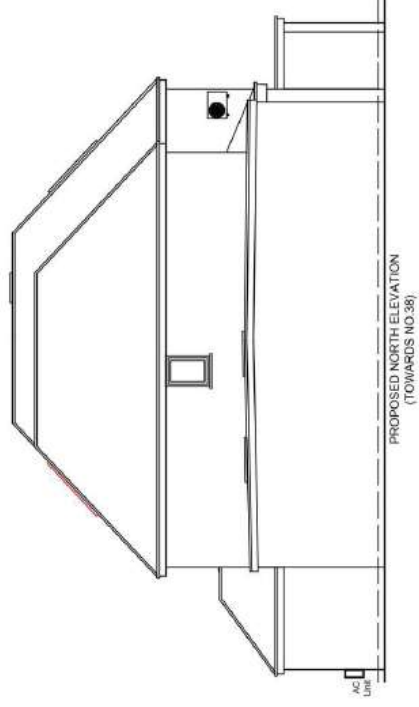
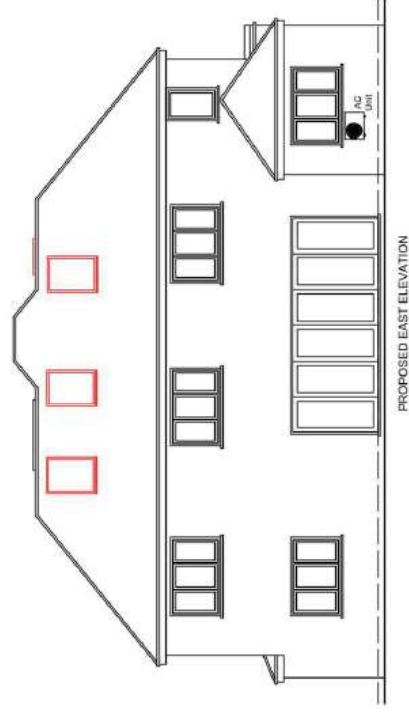
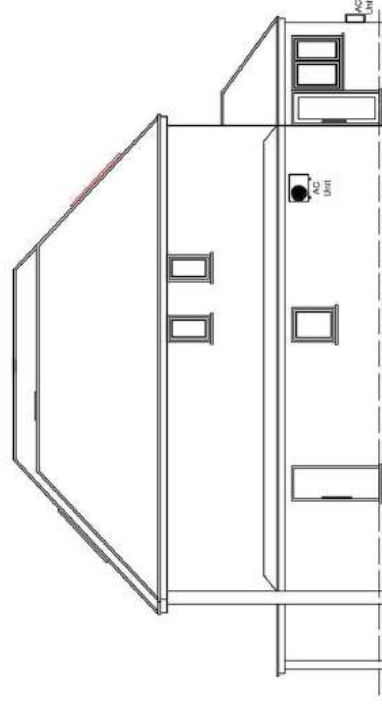
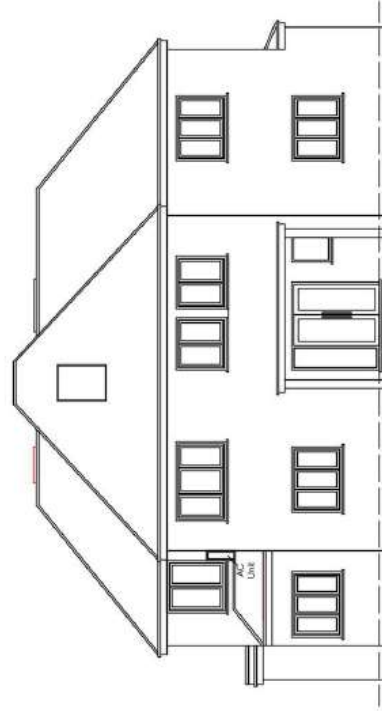
Appendix A: Site Plan



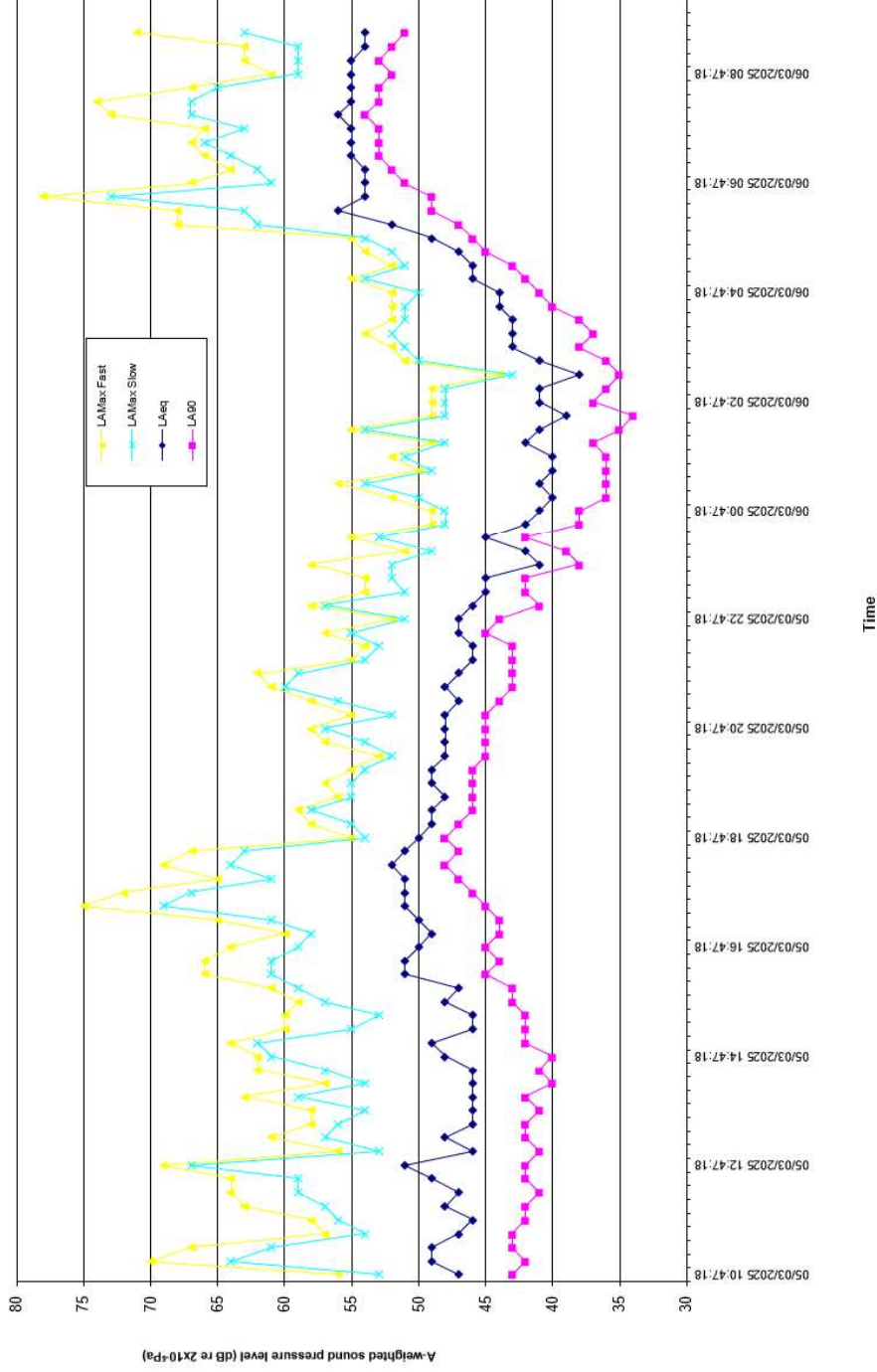
Approximate measurement position (Latitude & Longitude) 51°27'19.54"N, 0°55'24.63"W.



Appendix B: Plant Location



Appendix C: 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: 11207 (next cal due 27/07/2025) Start gain +2.17 End gain +1.97
 - Svantek pre-amplifier SV12L S/N: 49860 with GRAS microphone capsule 40AE S/N: 215511
- Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10890 (next cal due 04/02/2026) complying with Class 1 specification of BS EN 60942:2003, calibration level 114.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Appendix D: Plant Data

Plant noise data used in the preceding assessment follow.

Table 11: Manufacturer's plant sound power data, dB re 10^{-12} W

Plant	Octave Band Centre Frequency (Hz)								L _{WA}
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi SCM60ZS-W*	77	72	67	62	57	52	47	47	64
Mitsubishi SCM60ZS-W (silent mode)*	56	51	46	41	36	31	26	26	43

* The sound power spectrum for this unit has been estimated based upon the manufacturer's single figure broadband value.

Table 12: Manufacturer's plant sound pressure data, dB re 2×10^{-5} Pa

Plant	Distance (m)	Octave Band Centre Frequency (Hz)								L _{PA}
		63	125	250	500	1k	2k	4k	8k	
Mitsubishi SRC20ZS-W	1	58	46	44	43	42	33	28	24	45
Mitsubishi SRC20ZS-W (silent mode)	1	52	44	44	41	39	31	27	22	43



Nearest residential window of no. 32:

[illegible]

Appendix F: 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 $\neq$ 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 2×10^{-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.