

FLAT 5, 32 BRACKNELL GARDENS, LONDON

PLANNING COMPLIANCE REVIEW

Report 17987.PCR.01.Rev.A

For:

Brian Roth
Brentmead House
Britannia Road
London N12 9RU

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Written by:		Checked by:	
Aidan Tolkien AMIOA Acoustic Consultant		Daniel Green MIOA Acoustic Consultant	
Approved by:			
		Kyriakos Papanagiotou MIOA Managing Director	
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1.0 INTRODUCTION

KP Acoustics has been commissioned by Brian Roth, Brentmead House, Britannia Road, London, N12 9RU to undertake an environmental noise survey at Flat 5, 32 Bracknell Gardens, London, NW3 7EH. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for the proposed installation of an external condenser unit, in agreement with the planning requirements of the London Borough of Camden.

This report presents the overall methodology and results from the environmental survey, followed by calculations to demonstrate the feasibility of the plant unit installation to satisfy the emissions criterion at the closest noise-sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE SURVEYS

2.1 Site Description

The site is bounded by Bracknell Gardens to the South-West, and residential dwellings in all other cardinal directions. Entrance to the site is located on Bracknell Gardens. Initial inspection of the site revealed that the background noise profile at the rear monitoring location was typical of a quiet residential environment, with the noise profile comprised of sources from the surrounding residential dwellings.

2.2 Environmental Noise Survey Procedure

A noise survey was undertaken on site as shown in Figure 2.1 and indicative site plan 17987.SP1. The choice of the position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receiver relative to the proposed plant installation.

Continuous automated monitoring was undertaken for the duration of the survey between 11:53 on 02/08/2018 and 14:48 on 03/08/2018.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2007 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Measurement Positions

Measurement positions are as described within Table 2.1 and shown within Figure 2.1.

	Description
<p>Noise Measurement Position 1 (MP.1)</p>	<p>The microphone was installed on a tripod at a minimum distance of 3m above the ground in free-field conditions.</p>

Table 2.1 Measurement position and description

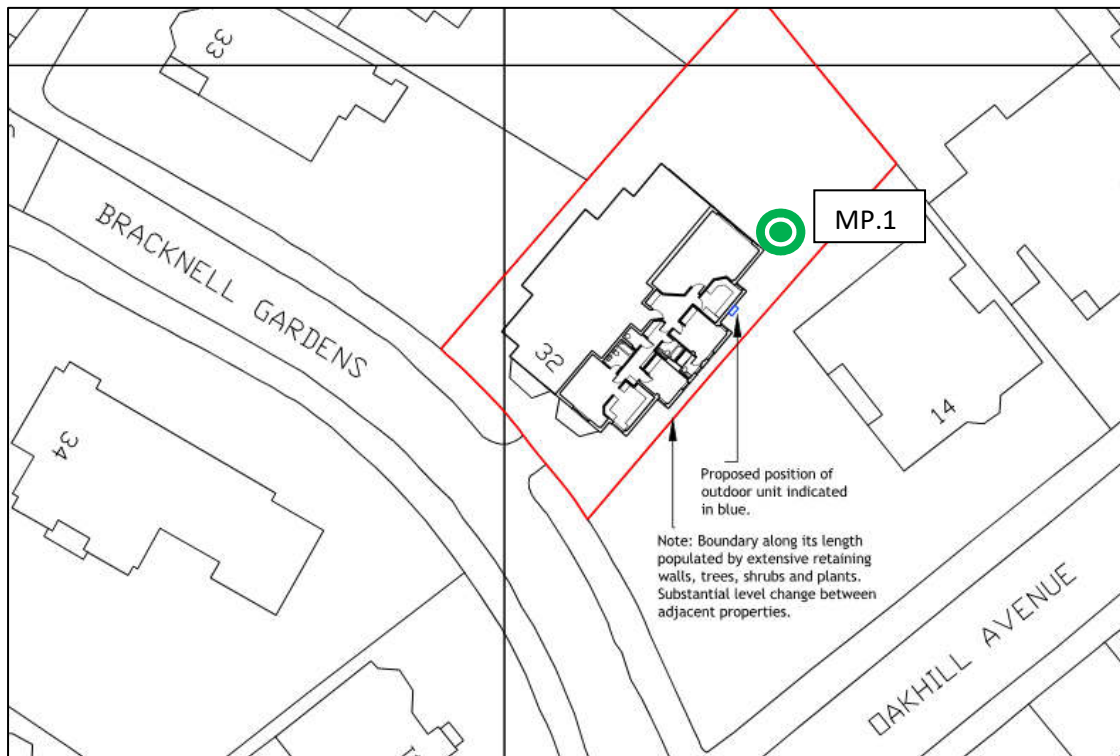


Figure 2.1 – Site Measurement position (Image Source: Counter & King Architects)

2.4 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Measurement instrumentation
1 No. Svantek Type 957 Class 1 Sound Level Meter
1 No. Svantek 2v12L free-field microphone
1 No. Svantek External windshield
1 No. B&K Type 4231 Class 1 Calibrator
1 No. Three-legged tripod

Table 2.2 Measurement instrumentation

3.0 RESULTS

3.1 Noise Survey

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 17987.TH1.

Minimum background noise levels and logarithmically averaged L_{Aeq} levels are shown in Table 3.1 for daytime and night-time.

	Minimum background noise level L_{A90} dB(A)	Average ambient noise level L_{Aeq} dB(A)
Daytime $L_{Aeq,16hour}$	31	45
Night-time $L_{Aeq,8hour}$	28	40

Table 3.1 Minimum background noise levels and average ambient noise levels

4.0 NOISE ASSESSMENT GUIDANCE

4.1 BS4142: 2014 “Methods for rating and assessing industrial and commercial sound”

British Standard BS4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the noise levels in terms of a L_{Aeq} for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) due to the noise source, the “Specific Noise Level”, with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

The resultant background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

4.2 Local Authority Guidance

The criterion of the London Borough of Camden for noise emissions of new plant in this instance is as follows:

“The proposed plant and machinery shall be operated so as to ensure that any noise generated is “not audible” outside the nearest noise sensitive premises. To demonstrate inaudibility, you will need to provide calculations that show that the plant noise level is 10dBA below the lowest background level (LA90 (15minutes)) 1m from the nearest noise sensitive window, over the proposed operating hours.”

4.3 Noise Emissions Criterion

As the proposed external condenser unit could be used at any time of the day or night, the criterion has been set as shown in Table 4.1 in order to comply with the above requirements.

Note that demonstrating compliance with the Local Authority’s guidance would inherently result in a low magnitude of impact with regards to the plant installation negatively affecting the amenity of the closest receiver, as per the guidance contained in BS4142:2014.

	Night-time (23:00 to 07:00)
Noise criterion at nearest residential receiver (10dB below minimum L _{A90})	18 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

5.0 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Installations

It is understood that the proposed plant installation is comprised of the following units:

- 1 No. Daikin 5MXM90N external condenser unit

The proposed installation location for the external unit will be on the south-eastern facing facade, as shown in indicative site plan 17987.SP1

The closest noise sensitive receiver to the proposed installation location has been identified as being a residential window of Flat 3, 32 Bracknell Gardens, located approximately 5 metres away from the external condenser unit.

The sound pressure and power levels at 1 metre as provided by the manufacturer for the units are shown in Table 5.1.

Sound Pressure Levels (dB) in each Frequency Band at 1m								
Unit	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Daikin 5MXM90N	58	56	53	50	48	42	35	26

Table 5.1 Manufacturers Sound Pressure Levels at 1m

5.2 Objective Overview

Taking all acoustic corrections into consideration, the noise level contribution expected at the closest residential window from the external plant installation would be as shown in Table 5.2. Detailed calculations are shown in Appendix B.

Receiver	Criterion	Noise Level at 1m From the Closest Noise Sensitive Window
Ground Floor Window, Flat 3, 32 Bracknell Gardens, London	18dB(A)	18dB(A)

Table 5.2: Predicted noise level and criterion at nearest noise sensitive location

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the plant unit installation satisfies the emissions criterion of BS4142:2014 and the Local Authority, providing that the mitigation measures outlined in Section 5.3 are implemented.

5.3 Noise Mitigation Proposals

In order to control noise emissions from the Daikin 5MXM90N unit to meet the noise emissions criterion, an acoustic enclosure should be installed providing minimum insertion loss values as shown in Table 5.3.

Insertion Loss Levels (dB) in each Frequency Band								
Unit	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Daikin 5MXM90N	10	14	22	30	30	30	30	30

Table 5.3 Required insertion loss of acoustic enclosure

We would recommend a company such as Environ Acoustic Enclosures, or similar, as a supplier for the aforementioned enclosure.

5.4 BS8233 Assessment

The highest value of 18dB(A) is to be considered externally at 1m from the receiving window. Windows may be closed or partially closed leading to further attenuation, as follows.

Further calculations have been undertaken to assess whether the noise emissions from the plant unit installation would be expected to meet the recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233:2014 '*Sound insulation and noise reduction for buildings – Code of Practice*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:2014 recommends 30dB(A) for internal resting/sleeping conditions during night-time hours.

With a calculated external level of 18dB(A), the residential window itself would not need to provide any additional attenuation in order for the recommended internal noise conditions to be achieved. According to BS8233:2014, even a partially open window offers 10-15dB attenuation, thus leading to a further reduced interior noise level.

Receiver	Design Range – <i>For resting/sleeping conditions in a bedroom during night-time, in BS8233:2014</i>	Noise Level at Receiver (due to plant installation)
Ground Floor Window, Flat 3, 32 Bracknell Gardens, London	30dB(A)	Non-significant

Table 5.4 Noise levels and criteria inside nearest residential space

Predicted levels are shown in Table 5.4, with detailed calculations shown in Appendix B. It can therefore be stated that, as well as complying with the requirements of the London Borough of Camden, the noise emissions from the plant unit installation would be expected to comfortably meet the most stringent recommendations of BS8233: 2014.

6.0 CONCLUSION

An environmental noise survey has been undertaken at Flat 5, 32 Bracknell Gardens, London, NW3 7EH by KP Acoustics Ltd between 11:26 on 02/08/2018 and 14:48 on 03/08/2018. The results of the survey have enabled criteria to be set for noise emissions.

Using manufacturer noise data, noise levels are predicted at the nearby noise sensitive receivers for compliance with current requirements.

Calculations show that noise emissions from the external plant unit installation would meet the requirements of the London Borough of Camden, providing that the mitigation measures outlined in Section 5.3 are implemented. The proposed plant installation would result in a low magnitude of impact and an indication of low adverse impact on the closest residential receiver, in accordance with BS4142:2014.

Further calculations have been undertaken with regards to the relevant British Standard and it has been ensured that the amenity of nearby residential receivers will be protected.

Flat 5, 32 Bracknell Gardens, London
Environmental Noise Time History
From 02 August 2018 To 03 August 2018

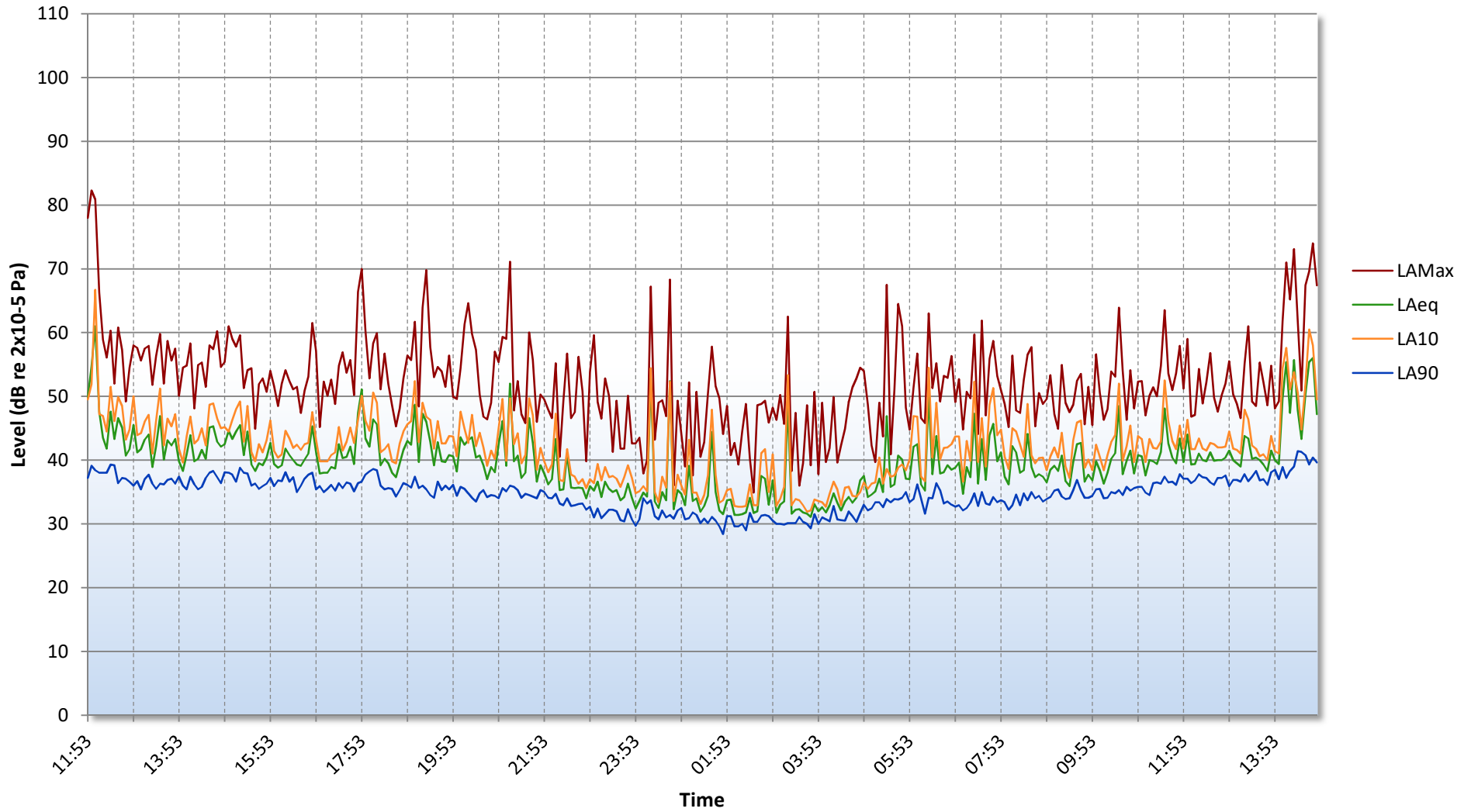
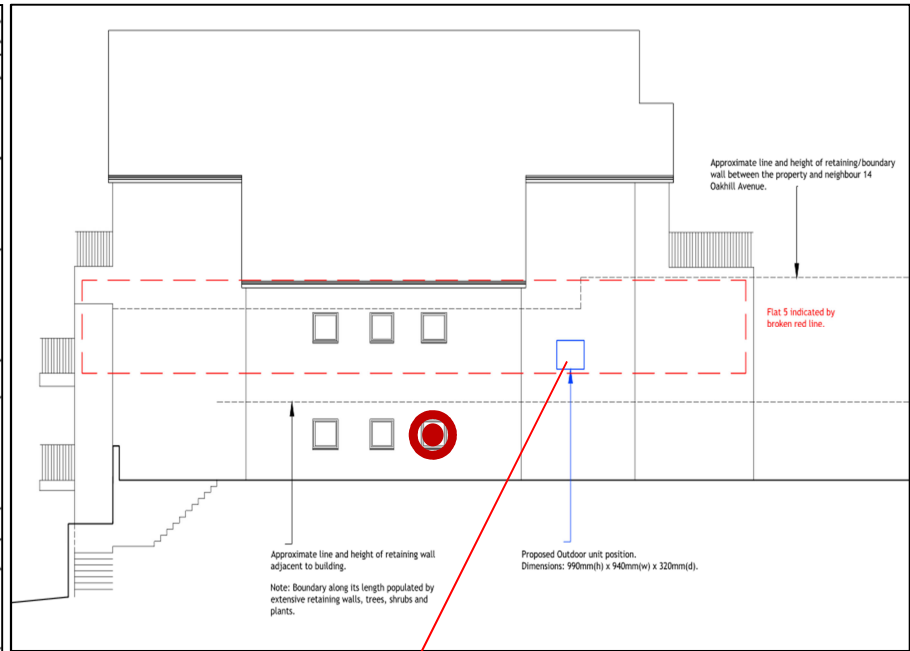
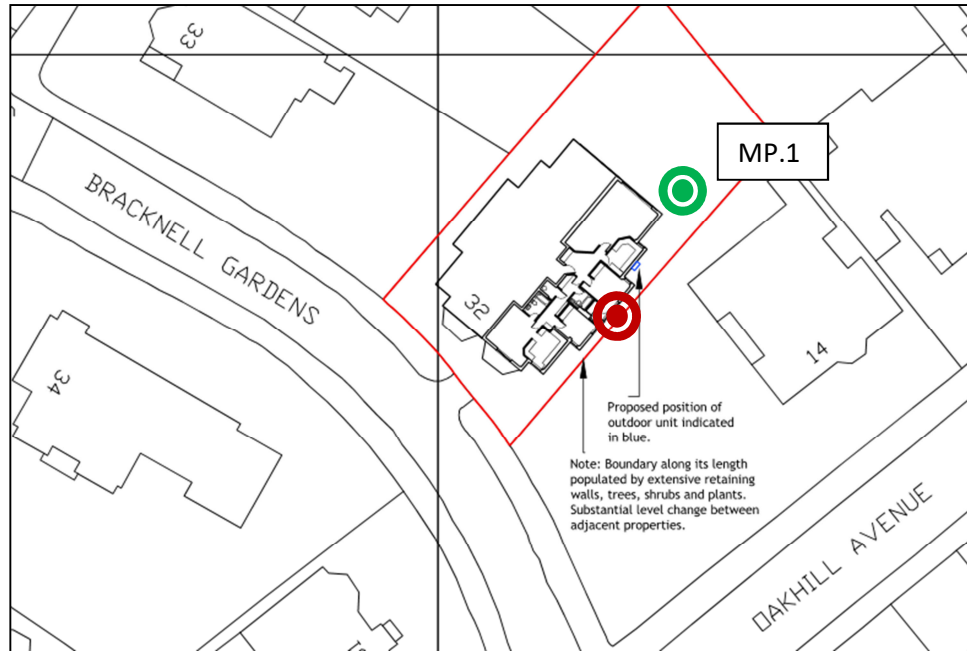




Figure 17987.TH1



External condenser unit

 Noise survey monitoring position
  Closest noise sensitive receiver (Flat 3, 32 Bracknell Gardens, London)

Title:
 Indicative site plan showing noise and vibration monitoring positions
(Image Source: Counter & King Architects)

Date: 14 August 2018

FIGURE 17987.SP1.Rev.A



GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B

Flat 5, 32 Bracknell Gardens, London

PLANT NOISE EMISSIONS CALCULATIONS

	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Source: External Plant units									
Receiver: Closest Noise Sensitive Window (Flat 3, 32 Bracknell Gardens, London)									
Daikin 5MXM90N (Sound Pressure Level @1m)	58	56	53	50	48	42	35	26	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by distance (5m), dB	-14	-14	-14	-14	-14	-14	-14	-14	
Minimum attenuation required by proposed acoustic enclosure, dB	-10	-14	-22	-30	-30	-30	-30	-30	
Total Noise Emission from Daikin 5MXM90N unit, dB	37	31	20	9	7	1	0	0	18
Sound Pressure Level at Receiver due to All Units, dB	37	31	20	9	7	1	0	0	18

Design Criterion	18
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	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
BS8233 Assessment									
Total Sound Pressure Level from all Air Conditioning Units	37	31	20	9	7	1	0	0	
Additional 10-15dB attenuation provided by open window	-10	-10	-10	-10	-10	-10	-10	-10	
Sound Pressure Level inside closest receiver due to All Units, dB	27	21	10	-1	0	0	0	0	10