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27-29 WHITFIELD STREET, LONDON

PLANNING COMPLIANCE REPORT

Report 14907.PCR.01.Rev C

Prepared on 27 October 2017

For:

27-29 Whitfield Street Property Ltd

80-83 Long Lane

London EC1A 9ET

Site Address	Report Date	Revision History
27-29 Whitfield Street London, W1T 2SE	26/10/2016	Rev A – 23/11/2016 Rev B – 10/03/2017 Rev C – 27/10/2017

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1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by 27-29 Whitfield Street Property Ltd, 80-83 Long Lane, London, EC1A 9ET to undertake a noise impact assessment of the proposed plant installations at 27-29 Whitfield Street, London. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for the proposed rooftop plant 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 proposed roof top plant to satisfy the emissions criterion at the closest noise-sensitive receivers and outline mitigation measures as appropriate.

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

Automated noise monitoring was undertaken by KP Acoustics Ltd at the position shown in Site Plan 14907.SP1. This location was chosen in order to collect representative noise data in relation to the nearest noise sensitive receivers relative to the proposed roof top plant. Continuous automated monitoring was undertaken for the duration of the survey between 11:00 on 18th October and 17:00 on 19th October 2016.

Initial inspection of the site revealed that the background noise profile at the monitoring location was dominated by environmental noise.

The weather during the course of the survey was generally dry with wind speeds within acceptable tolerances 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"*.

2.2 Equipment

The equipment calibration was verified before and after the survey and no calibration irregularities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

The results from the continuous noise monitoring are shown as a time history of L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} averaged over 5 minute sample periods shown in Figure 14907.TH2.

Minimum background noise levels are shown in Table 3.1.

	Minimum background noise level $L_{A90: 5min}$ dB(A)
Daytime (07:00-23:00)	44
Night-time (23:00-07:00)	40

Table 3.1: Minimum measured background noise levels

4.0 NOISE CRITERION

We propose to set the noise criteria for the noise emissions of the new plant in this instance, so that the 'A' weighted sound pressure level from the plant, when operating at its noisiest, shall not at any time exceed a value of10dB below the external background noise, at a point 1 metre outside the window of the closest receiver.

We therefore propose to set the noise criteria (at 10dB below minimum background noise) as shown in Table 3.2 in order to comply with the above requirement.

	Daytime (07:00 to 23:00)	**Night-time (07:00 to 23:00)**
Noise criterion at nearest residential receiver (10dB below minimum L_{A90})	34 dB(A)	30 dB(A)

Table 3.2: Proposed Noise Emissions Criteria

As the proposed extraction system could operate at any time of the day, we would suggest adopting the night-time criterion.

5.0 DISCUSSION

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

Rooftop Plant Room

- AVT-X External Duct mounted twin fan
- 4 No. Daikin REYQ14T

The closest noise sensitive receiver to the rooftop plant room will be a residential window located at a minimum distance of 2m.

MVHR Installation

- 2 No. Flaktwoods Eco Premium 6 MVHR Unit serving the Basement and Ground Floors

The MVHR units will be installed internally within Basement and Ground Floors, with an intake and extract located at First Floor level to the rear of the flat roof. The closest noise sensitive receivers to the intake and extract positions are shown in indicative site plan 14907.SP2.

The sound pressure levels provided by the manufacturers for the units are shown in Table 5.1.

	Octave Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Plant units								
Daikin REYQ14T	65	68	64	69	54	50	48	38

Table 5.1 Manufacturer's Sound Pressure Levels

The sound power levels provided by the manufacturers are shown in Table 5.2

	Octave Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Plant units								
AT-X External Duct mounted twin fan	76	71	64	63	63	58	52	50
Flaktwoods Eco Premium 6 MVHR Intake	71	77	77	73	68	67	66	56
Flaktwoods Eco Premium 6 MVHR Exhaust	71	75	77	73	67	66	66	54

Table 5.2 Manufacturer's Sound Power Levels

5.1 Objective overview

Taking all acoustic corrections into consideration, including distance corrections, the noise level expected at the closest residential receiver due to the rooftop plant installation would be as shown in Table 5.3. Detailed calculations are shown in Appendices B1-2.

Receiver - Nearest Noise Sensitive Window	**Criterion dB(A)**	**Noise Level at Receiver dB(A)**
Plant Units		
Roof top plant room	30 dB(A)	30 dB(A)
MVHR Intake	30 dB(A)	30 dB(A)
MVHR Exhaust	30 dB(A)	26 dB(A)

Table 5.3 Predicted noise level and criterion at nearest noise sensitive locations

As shown in Appendices B1-2 and Table 5.3, transmission of noise to the nearest sensitive windows due to the effects of the roof top plant installation would satisfy the emissions criterion set. However, noise control elements should be adopted. These are shown in Section 4.2.

5.2 Noise Control Strategy

Acoustic Enclosure

In order to render all noise emissions of the rooftop plant enclosure to within the criterion, mitigation measures have been recommended by means of a high specification plant enclosure following engagement with a concerned neighbour.

We would recommend the installation of an acoustic enclosure with the following spectral attenuation envelope:

	Sound Reduction Index (dB) by Octave frequency band (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Acoustic Louvres	-9	-12	-14	-20	-30	-33	-32	-30

Table 5.3.1 Minimum insertion loss for the proposed acoustic enclosure

The following spectral attenuation envelope could be achieved by enclosures produced by EEC, Noico, Environ or similar.

In-line Silencer

In order to render all noise emissions to within the criterion, we would recommend the installation of an inline silencer directly before and after the intake and extract of the AVT-X Duct mounted fans with the following spectral attenuation envelope:

	Helios GBD 560/4/4 Supply Fan and Helios GBD 560/4/4 – T120 Extraction Fan							
	Required insertion loss							
Mitigation Type	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
In-Line Silencer, 900mm long, 45% free area	-2	-5	-11	-17	-20	-19	-12	-10

Table 5.3: Spectral attenuation required from proposed silencer for extraction system

In order to reduce noise emissions from the MVHR intake and extract, we would recommend the installation of an inline silencer with the following spectral attenuation envelope:

	Flaktwoods MVHR Intake and Extract							
	Required insertion loss							
Mitigation Type	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
In-Line Silencer, 1500mm long, 25% free area	-9	-18	-30	-48	-50	-50	-50	-50

Table 5.4: Spectral attenuation required from proposed silencer for MVHR unit

6.0 CONCLUSION

An environmental noise survey has been undertaken at 27-29 Whitfield Street, London by KP Acoustics Ltd between 11:00 on 18th October and 17:00 on 19th October 2016 in order to assess the current noise levels in the area. The results of the survey have enabled criteria to be set for noise emissions for the proposed plant installation.

Using manufacturer noise data, noise levels have been calculated to the nearest noise sensitive receivers for compliance with current requirements.

Calculations undertaken by KP Acoustics Ltd. show that the noise emissions from the proposed rooftop plant enclosure would meet the criterion of the London Borough of Camden, provided that the noise control measures shown in section 4.2 are adopted.

Report by
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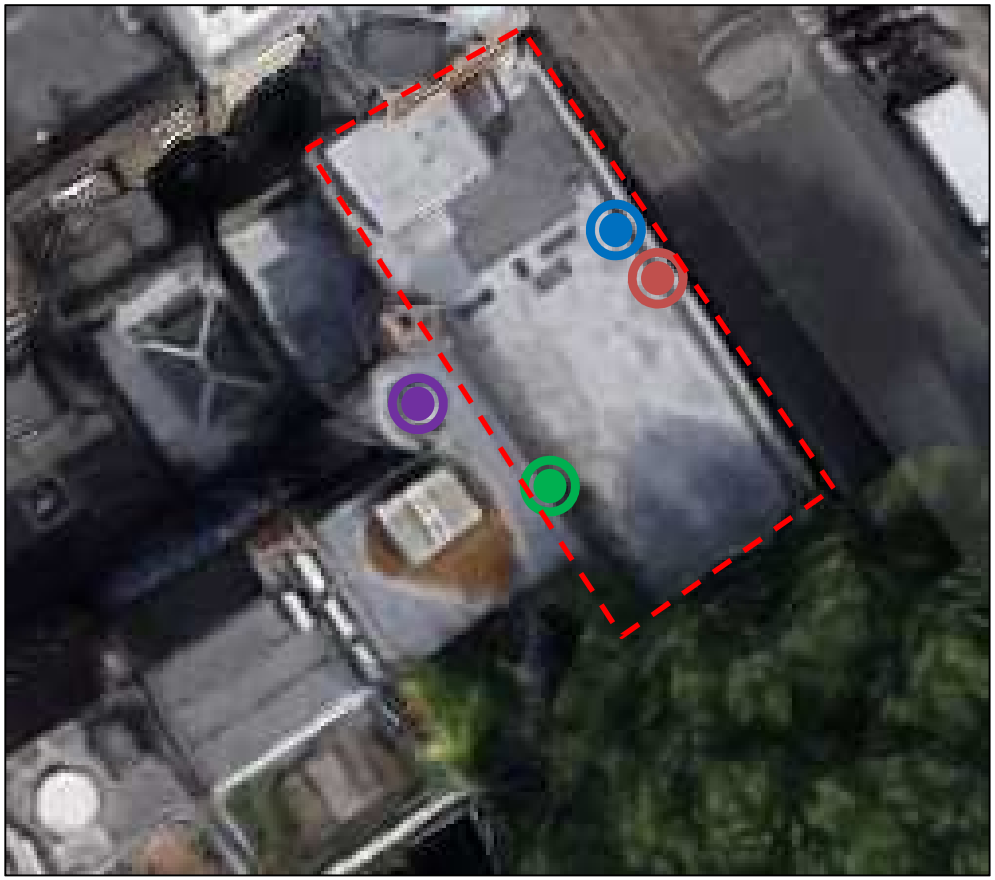

Title:

Indicative site plan showing noise monitoring positions

(Image Source: Google Maps)

Date: 27 October 2017

Revision: B

FIGURE 14907.SP1

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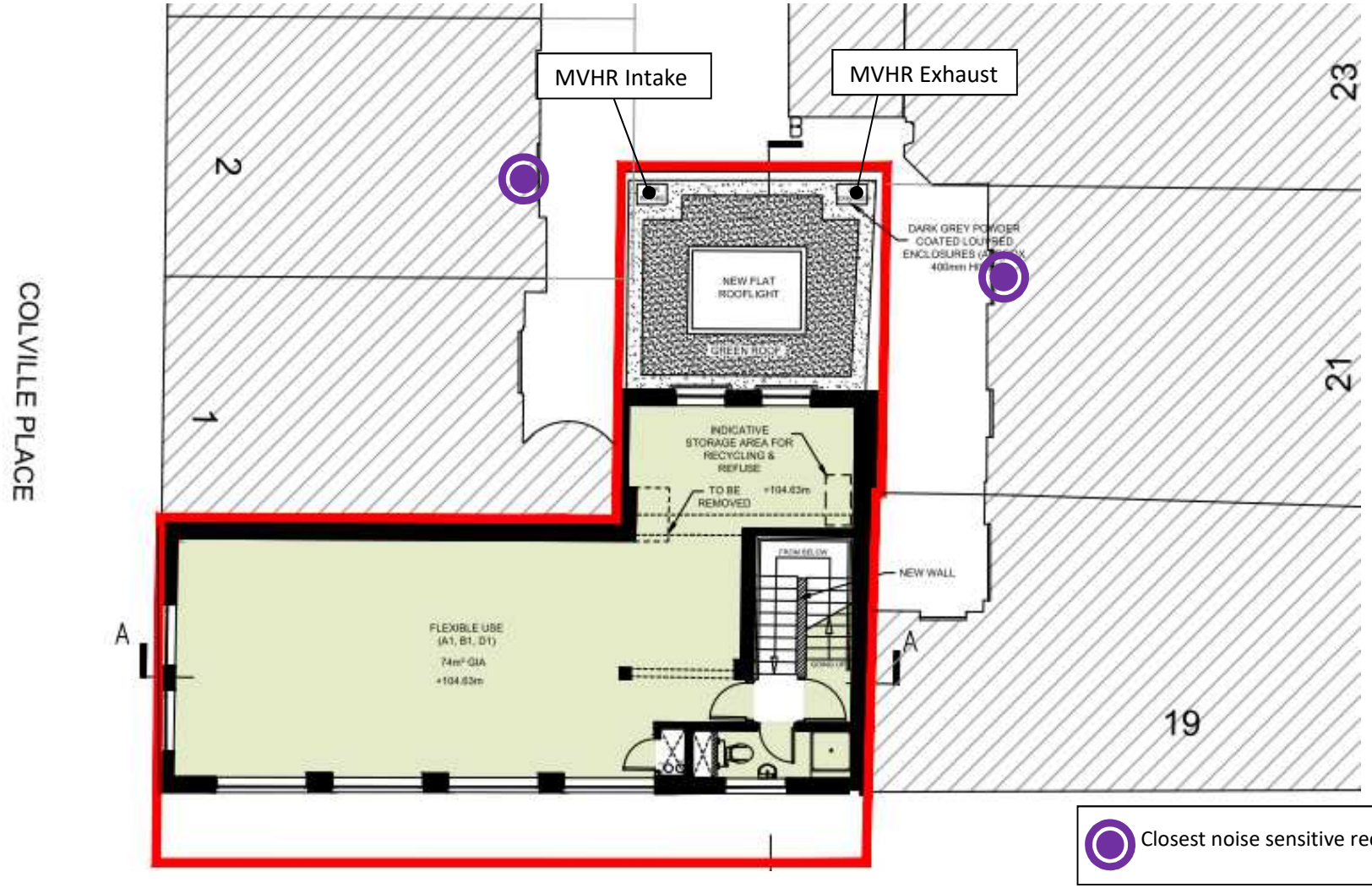

Title:

Indicative site plan showing MVHR intake and exhaust positions in relation to the closest noise sensitive receivers

Date: 27 October 2017

Revision: A

FIGURE 14907.SP2

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27-29 Whitfield Street, London
Environmental Noise Time History
18th October to 19th October 2016

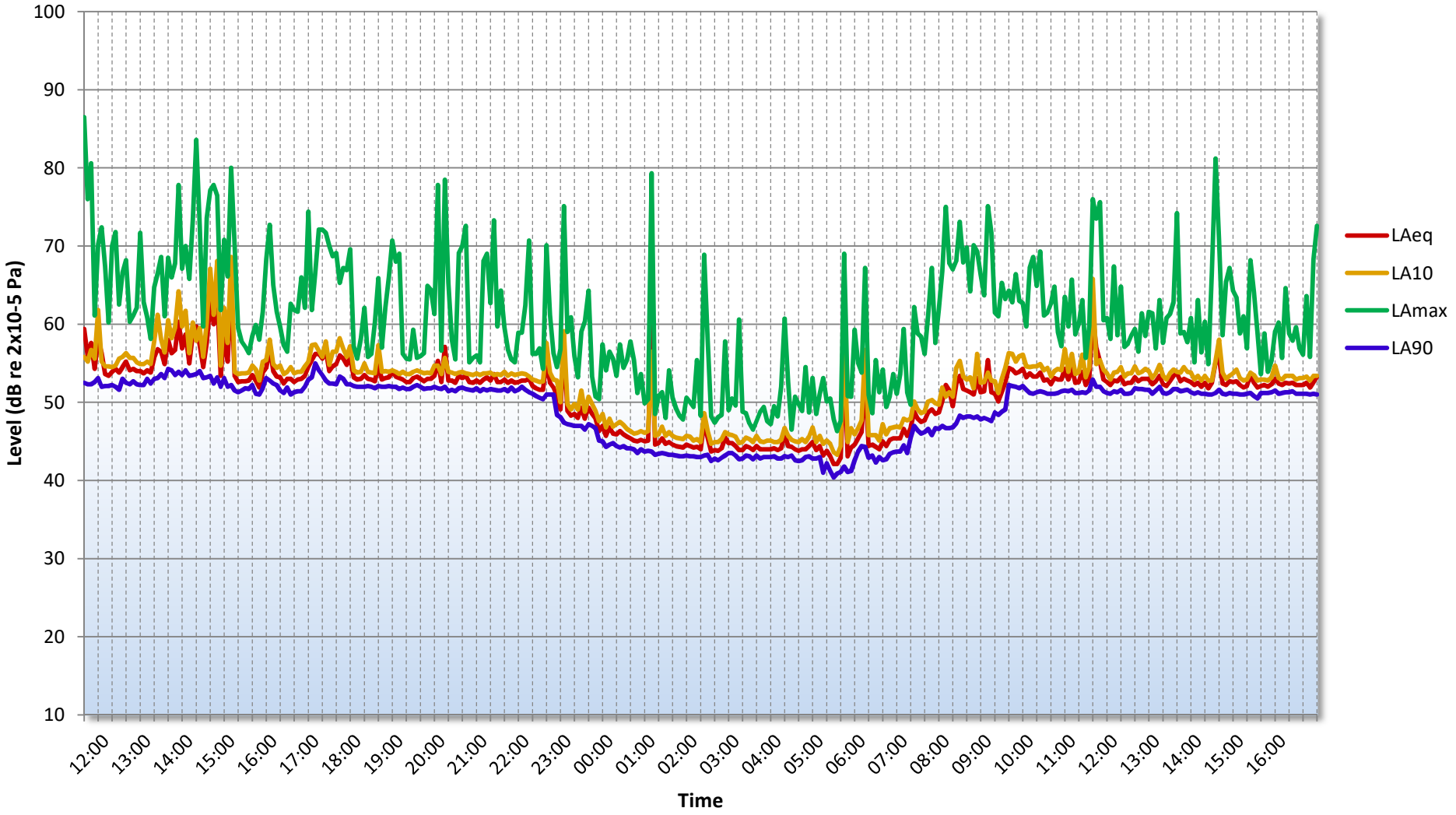

Figure 14907.TH2

APPENDIX 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*.

APPENDIX A

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 B1 Rev B

27-29 Whitfield Street, London

Rooftop Plant Room

Source: Rooftop Plant Room	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound Pressure Levels as provided by manufacturer									
AVT-X Extract Duct mounted twin fan (Sound Power Level) (Intake)	76	71	64	63	63	58	52	50	
Correction to Sound Pressure level	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for reflections	3	3	3	3	3	3	3	3	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
Attenuation provided by directivity	-1	-1	-2	-4	-9	-8	-8	-8	
Attenuation provided by in-line silencer (45% free area/900mm)	-2	-5	-11	-17	-20	-19	-12	-10	
Distance correction to receiver, dB (minimum of 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Sound Pressure level from AT Extract Duct (Intake)	50	39	23	8	-10	-16	-14	-12	27
AVT-X Extract Duct mounted twin fan (Sound Power Level) (Extract)	76	71	64	63	63	58	52	50	
Correction to Sound Pressure level	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for reflections	3	3	3	3	3	3	3	3	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
Attenuation provided by directivity	-1	-1	-2	-4	-9	-8	-8	-8	
Attenuation provided by in-line silencer (45% free area/900mm)	-2	-5	-11	-17	-20	-19	-12	-10	
Distance correction to receiver, dB (minimum of 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Sound Pressure level from AT Extract Duct (Extract)	50	39	23	8	0	0	0	0	27
AVT-X Extract Duct mounted twin fan (Sound Power Level) (Case breakout)	65	56	47	36	28	23	24	18	
Correction to Sound Pressure level	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for reflections	3	3	3	3	3	3	3	3	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
Attenuation provided by directivity	-1	-1	-2	-4	-9	-8	-8	-8	
Distance correction to receiver, dB (minimum of 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Sound Pressure level from AT Extract Duct (Case breakout)	41	29	17	0	0	0	0	0	18
Daikin REYQ14T Heat recovery unit	67	60	55	55	50	45	42	38	
Correction for number of units (4)	6	6	6	6	6	6	6	6	
Correction for reflections	3	3	3	3	3	3	3	3	
Removal of reflections with weatherproof mineral wool	-3	-3	-3	-3	-3	-3	-3	-3	
Attenuation provided by directivity	-1	-1	-2	-4	-9	-8	-8	-8	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
Attenuation provided by building envelope	-11	-11	-11	-11	-11	-11	-11	-11	
Distance correction to receiver, dB (minimum of 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Sound Pressure Level from Daikin REYG14T	47	37	29	20	0	0	0	0	26
Total Sound Pressure level from Kitchen Extraction System and Air Conditioning Heat Pumps									**30**

Design Criterion **30**

APPENDIX B1 Rev B

27-29 Whitfield Street, London

Rooftop Plant Room

Source: Rooftop Plant Room	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound Pressure Levels as provided by manufacturer									
AVT-X Extract Duct mounted twin fan (Sound Power Level) (Intake)	76	71	64	63	63	58	52	50	
Correction to Sound Pressure level	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for reflections	3	3	3	3	3	3	3	3	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
Attenuation provided by directivity	-1	-1	-2	-4	-9	-8	-8	-8	
Attenuation provided by in-line silencer (45% free area/900mm)	-2	-5	-11	-17	-20	-19	-12	-10	
Distance correction to receiver, dB (minimum of 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
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Correction to Sound Pressure level	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for reflections	3	3	3	3	3	3	3	3	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
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Correction for reflections	3	3	3	3	3	3	3	3	
Removal of reflections with weatherproof mineral wool	-3	-3	-3	-3	-3	-3	-3	-3	
Attenuation provided by directivity	-1	-1	-2	-4	-9	-8	-8	-8	
Attenuation provided by Acoustic enclosure	-9	-12	-14	-20	-30	-33	-32	-30	
Attenuation provided by building envelope	-11	-11	-11	-11	-11	-11	-11	-11	
Distance correction to receiver, dB (minimum of 2m)	-6	-6	-6	-6	-6	-6	-6	-6	
Sound Pressure Level from Daikin REYG14T	47	37	29	20	0	0	0	0	26
Total Sound Pressure level from Kitchen Extraction System and Air Conditioning Heat Pumps									**30**

Design Criterion **30**