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28 BELSIZE LANE, LONDON

PLANNING COMPLIANCE REPORT

EXTRACTION UNITS

Report 11377.PCR.02 Rev.C

For:

Vivien Bradley

Rm 2814-15 28/F

Times Sq, Tower 2; No. 1 Matherson Street

Causeway Bay

CH44 7JY

Site Address	Report Date	Revision History
28 Belsize Lane, London	10/03/2017	Rev A – 14/03/2017 Rev.B – 15/03/2017 Rev.C – 02/05/2017

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1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by Vivien Bradley, Rm 2814-15 28/F, Times Sq, Tower 2; No. 1 Matherson Street, Causeway Bay, CH44 7JY, to undertake an environmental noise survey at 28 Belsize Road, London. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for an extract fan installation in agreement with the planning requirements of Camden Borough Council for planning application Ref: 2010/3112/P, planning condition 9.

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 and outline mitigation measures as appropriate.

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

Automated noise monitoring was undertaken at the position shown in Site Plan 11377.SP2 Rev.B. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receiver relative to the operations on site. The duration of the survey was between 20/08/2014 and 21/08/2014.

Initial inspection of the site revealed that the background noise profile at the monitoring location was largely dominated by road traffic noise from the surrounding roads.

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 BS7445:1991 "*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*".

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.

- 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 in Figure 11377.TH1.

Minimum background noise levels are shown in Table 3.1.

	Minimum background noise level $L_{A90,\ 5min}$ dB(A)
Daytime (07:00-23:00)	33
Night-time (23:00-07:00)	29

Table 3.1: Minimum measured background noise levels

4.0 NOISE CRITERIA

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

"Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the LA90, expressed in dB(A)."

It is not expected that the plant units will generate any significant or distinguishable acoustic characteristics other than broadband fan noise. We therefore propose to set the noise criteria as shown in Table 4.1 in order to comply with the above requirement.

	Daytime (07:00 to 23:00)	**Night-time (23:00 to 07:00)**
Noise criterion at nearest residential receiver (5dB below minimum L_{A90})	28 dB(A)	24 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

As the proposed toilet extract units can be used at any time, we would utilise the night-time noise emissions criteria. For kitchen extraction, the daytime noise emissions criteria would be applied.

5.0 DISCUSSION

The units are proposed to be installed in three main groups, as shown in Site plan 11377.SP2 Rev.B. The closest noise sensitive receivers to these locations also marked on 11377.SP2 Rev.B, respective to the proposed installation locations.

Noise emissions data is provided by the *Phoenix Mechanical* document ref: "*28 Belsize Lane, London - Mechanical Plant Noise Break-out – Rev A - 16/12/2016"*

It is understood that the installation for group 1 comprises the following units, with their respective sound pressure level at 1m:

- EF1 – 46 dB(A) @ 1m – Basement laundry
- EF7 – 43 dB(A) @ 1m – First floor en-suite

It is understood that the installation for group 2 comprises the following units, with their respective sound pressure level at 1m:

- EF2 – 43 dB(A) @ 1m – Basement en-suite
- EF5 – 43 dB(A) @ 1m – Ground floor powder room
- EF6 – 43 dB(A) @ 1m – First floor en-suite
- EF10 – 43 dB(A) @ 1m – Second floor bathroom

It is understood that the installation for group 3 comprises the following units, with their respective sound pressure level at 1m:

- EF3 – 43 dB(A) @ 1m – Basement water closet
- EF8 – 43 dB(A) @ 1m – First floor en-suite
- EF9 – 46 dB(A) @ 1m – First floor bathroom
- EF4 – 43 dB(A) @ 1m – Basement changing room

It is understood that in addition a kitchen extract fan will be installed as follows:

- KE – 62 dB(A) @ 1m – Ground floor kitchen

It is understood that in addition a basement heat recovery unit extract fan will be installed as follows:

- HR1 – 35 dB(A) @ 1m – Basement heat recovery

5.1 Objective overview

Taking all acoustic corrections into consideration, including distance, and screening corrections from surrounding walls, the noise levels expected at the closest residential window would be as shown in Table 5.1-5.2, for each of the different installation locations. Detailed calculations are shown in Appendix B1-5.

Receiver - Nearest Noise Sensitive Window	**Criterion**	**Noise Level at Receiver 1 (Group 1)**	**Noise Level at Receiver 2 (Group 2)**	**Noise Level at Receiver 3 (Group 3)**	**Noise Level at Receiver 2 (Heat Recovery)**
Operating hours	24 dB(A)	14 dB(A)	14 dB(A)	20 dB(A)	6 dB(A)

Table 5.1: Predicted noise levels and criterion at nearest noise sensitive location

Receiver - Nearest Noise Sensitive Window	**Criterion**	**Noise Level at Receiver 1 (Kitchen Extract)**
Operating hours	28 dB(A)	35 dB(A)

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

As shown in Appendix B1-3 and B5, and Table 5.1, transmission of noise to the nearest sensitive windows due to the effects of the extraction installation from groups 1 – 3, and the basement heat recovery extraction will have no negative impact on the amenity of the nearest noise sensitive receivers in any installation position shown in indicative site plan 11377.SP2 Rev.B.

The kitchen extraction unit would be expected to present the highest noise level received at the nearest noise sensitive receivers. However, it should be noted that the level received would still be relatively low when compared to the noise profile of the area. It should also be noted that all plant units assessed within this report are common domestic systems installed in many new homes, as opposed to large scale units designed for commercial applications. The kitchen extract in this case has multiple operational settings and is operated by a manual switch “on demand” when cooking. It would not be expected that a domestic unit such as this would have any negative impact on neighbouring residential amenity.

As such, it is the professional opinion of KP Acoustics that this level is not going to pose any negative impact on the amenity of nearby residential receivers. Furthermore, the value of 35dB(A) is to be considered outside of the building. 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 proposed 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 Practise*’ 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 30-

35dB(A) as being for internal resting/sleeping conditions during night-time and daytime respectively.

With calculated external levels of 35dB(A), the residential window would not need to provide any additional attenuation, in order for recommended conditions to be achieved. According to BS8233:2014, even a partially open window offers 10-15dB attenuation, thus leading to an acceptable interior noise level that meets the criterion.

Receiver	Design Range – *For resting/sleeping conditions in a bedroom, in BS8233:2014*	Noise Level at Receiver (due to plant installation)
Inside Nearest Residential Space	30-35 dB(A)	20-25 dB(A)

Table 5.3: Noise levels and criteria inside nearest residential space

Predicted levels are shown in Table 5.3, with detailed calculations shown in Appendix B1-5. It can therefore be stated that, as well as generally complying with the requirements of Camden Borough Council, the emissions from the extract unit installations would be expected to comfortably meet the most stringent recommendations of the relevant British Standard, even with neighbouring windows partially open.

6.0 CONCLUSION

An environmental noise impact survey has been undertaken at 28 Belsize Lane, London, by KP Acoustics Ltd between 20/08/2014 and 21/08/2014. 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 proposed extraction installations would generally meet the requirements of Camden Borough Council for planning application Ref: 2010/3112/P, planning condition 9, when utilising the noise emissions criterion of 5dB below the minimum measured background noise level.

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.

Report by:

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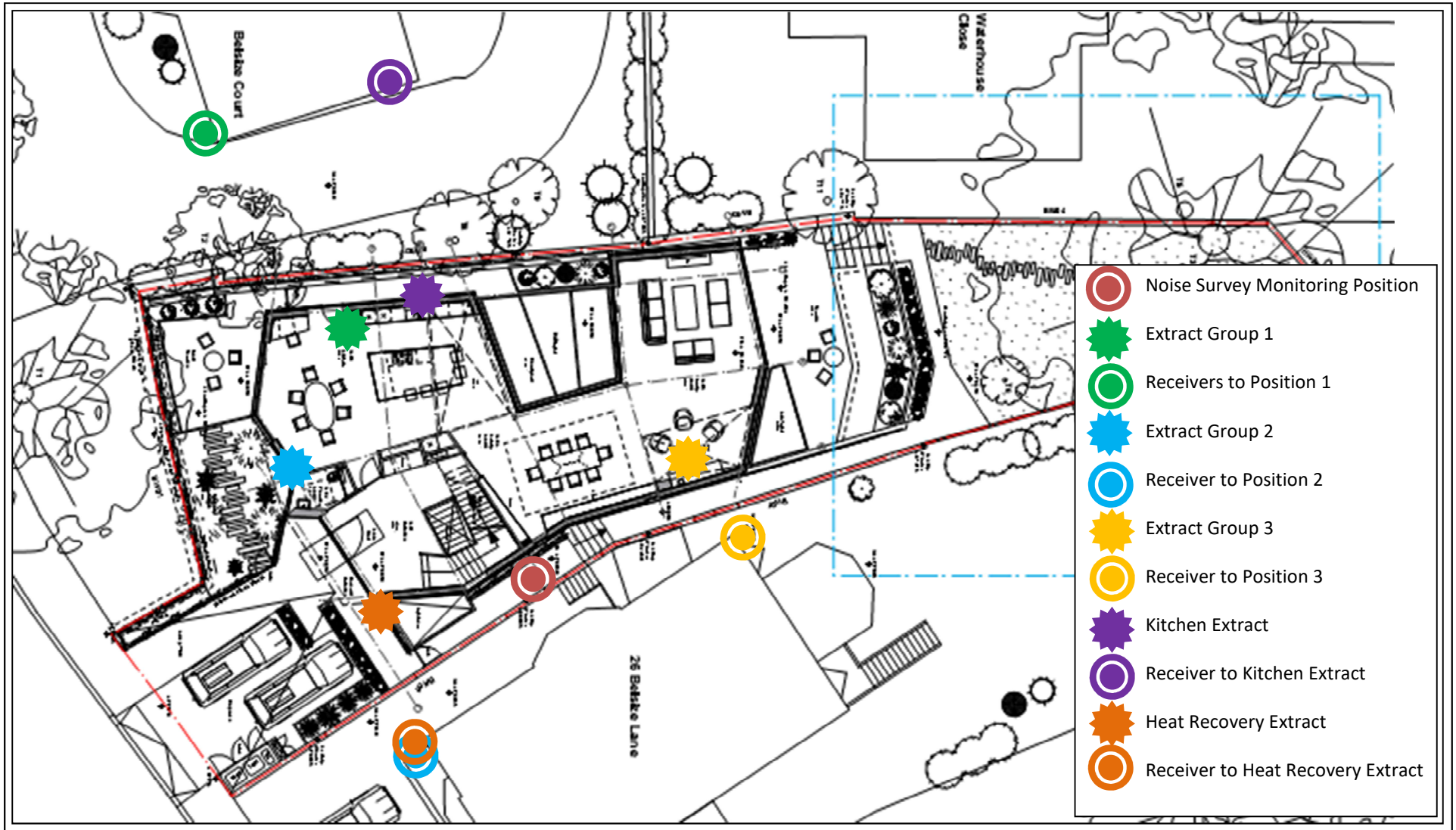

Title:

Indicative site plan showing noise monitoring position and proposed unit locations

Date: 02 May 2017

FIGURE 11377.SP2 Rev.B

KP acoustics

28 Belsize Lane, London
Environmental Noise Time History
20th August to 21st August 2014

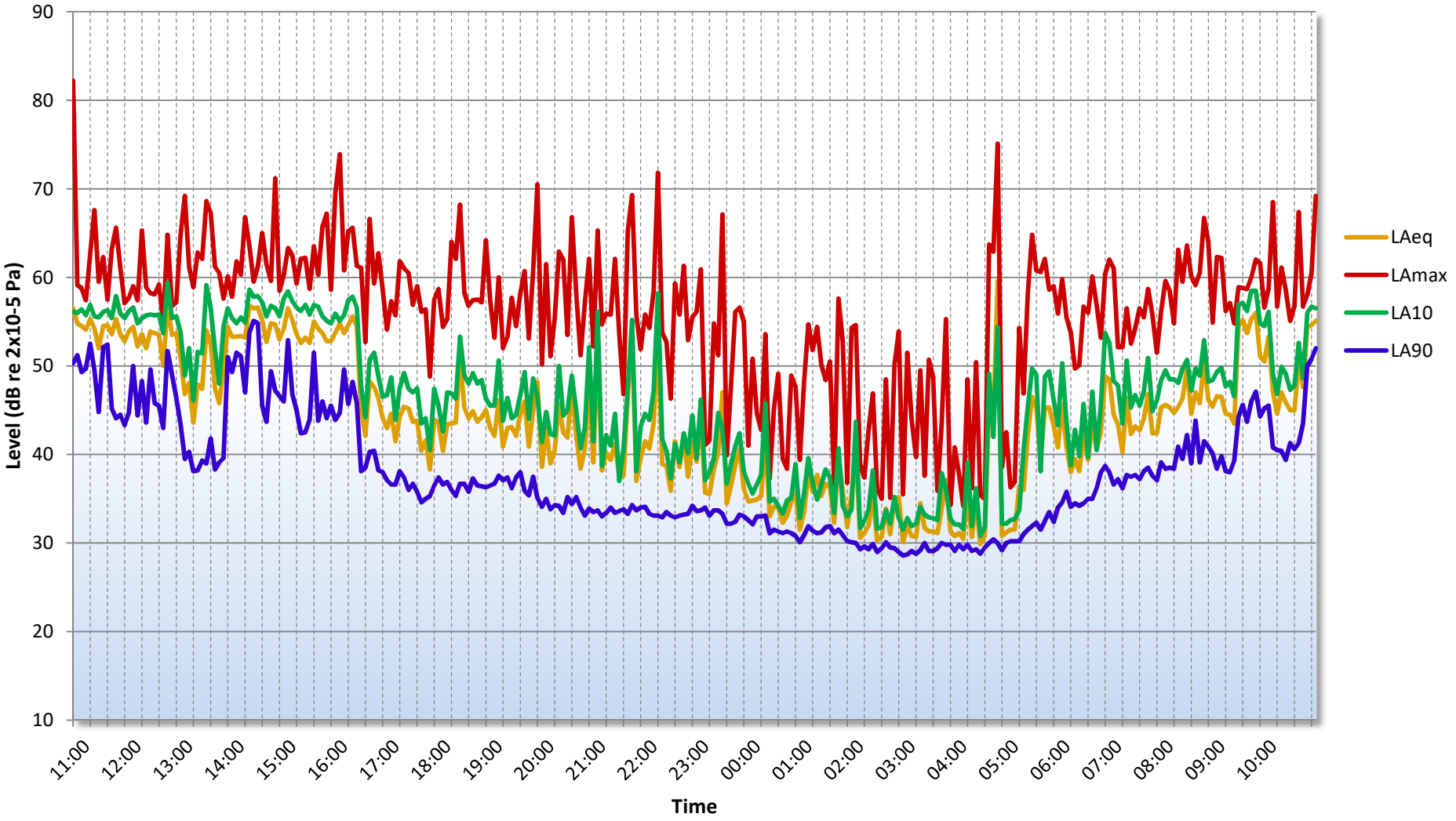

Figure 11377.TH1

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 - Group 1

28 Belsize Lane, London

EXTRACT UNIT EMISSIONS CALCULATIONS

Source: Extract Unit Installation	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturers Sound Pressure Level at 1m									
EF1 - Sound pressure level at 1m					46				46
Attenuation provided by distance to receiver (min 10m)					-20				-20
Attenuation provided by directivity (overall, narrow duct, 90˚)					-6				-6
Attenuation provided by 12m duct length (basement to termination)					-3				-3
Attenuation provided by duct bends (assumed 2 no. 90˚)					-6				-6
EF7 - Sound pressure level at 1m					43				43
Attenuation provided by distance to receiver (min 10m)					-20				-20
Attenuation provided by directivity (overall, narrow duct, 90˚)					-6				-6
Attenuation provided by 6m duct length first floor to termination)					-1				-1
Attenuation provided by duct bends (assumed 2 no. 90˚)					-6				-6
Sound pressure level 1m from nearest residential receiver									**14**

Design Criterion	**24**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Extract Unit Installation	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									14
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**4**

APPENDIX B2 - Group 2

28 Belsize Lane, London

EXTRACT UNIT EMISSIONS CALCULATIONS

Source: Extract Unit Installation	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturers Sound Pressure Level at 1m									
EF2 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 11.5m)				-21					-21
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 12m duct length (basement to termination)				-3					-3
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
EF5 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 11.5m)				-21					-21
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 9m duct length (ground floor to termination)				-2					-2
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
EF6 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 11.5m)				-21					-21
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 6m duct length (first floor to termination)				-1					-1
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
EF10 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 11.5m)				-21					-21
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 3m duct length second floor to termination)				-1					-1
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
Sound pressure level 1m from nearest residential receiver									**14**
								Design Criterion	**24**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Extract Unit Installation	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									14
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**4**

APPENDIX B3 - Group 3

28 Belsize Lane, London

EXTRACT UNIT EMISSIONS CALCULATIONS

Source: Extract Unit Installation	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturers Sound Pressure Level at 1m									
EF3 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 8m)				-18					-18
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 12m duct length (basement to termination)				-3					-3
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
EF8 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 7m)				-17					-17
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 6m duct length (first floor to termination)				-1					-1
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
EF9 - Sound pressure level at 1m				46					46
Attenuation provided by distance to receiver (min 7m)				-17					-17
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 6m duct length (first floor to termination)				-1					-1
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
EF4 - Sound pressure level at 1m				43					43
Attenuation provided by distance to receiver (min 4m)				-12					-12
Attenuation provided by directivity (overall, narrow duct, 90˚)				-6					-6
Attenuation provided by 12m duct length (basement to termination)				-3					-3
Attenuation provided by duct bends (assumed 2 no. 90˚)				-6					-6
Sound pressure level 1m from nearest residential receiver									**20**
							Design Criterion		**24**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Extract Unit Installation	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									20
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**10**

APPENDIX B4 - Kitchen Extract

28 Belsize Lane, London

KITCHEN EXTRACT UNIT EMISSIONS CALCULATIONS

Source: Extract Unit Installation	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturers Sound Pressure Level at 1m									
Kitchen Extract - Sound pressure level at 1m from duct					62				62
Attenuation provided by distance to receiver (min 8.5m)					-19				-19
Attenuation provided by brick wall barrier					-8				-8
Sound pressure level 1m from nearest residential receiver									**35**

Design Criterion	**28**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Extract Unit Installation	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									35
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**25**

APPENDIX B5 - Basement Heat Recovery Extract

28 Belsize Lane, London

HEAT RECOVERY EXTRACT UNIT EMISSIONS CALCULATIONS

Source: Heat Recovery Extract Unit Installation	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturers Sound Pressure Level at 1m									
Basement Heat Recovery Extract - Sound pressure level at 1m from duct					35				35
Attenuation provided by distance to receiver (min 11.5m)					-21				-21
Attenuation provided by brick wall barrier					-8				-8
Sound pressure level 1m from nearest residential receiver									**6**

Design Criterion	**24**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Extract Unit Installation	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									6
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest residential window									**0**