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324 West End Lane London

Planning Compliance Report
Report 23139.PCR.01

324 West End Lane
London
NW6 1LN

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Disclaimer

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1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by 324 West End Lane, London, NW6 1LN, to undertake a noise impact assessment of a proposed plant unit installation serving the building at 324 West End Lane, London, NW6 1LN.

A 24 hour environmental noise survey has been undertaken on site in order to prepare a noise impact assessment in accordance with BS4142:2014 *'Method for rating and assessing industrial and commercial sound'* as part of the planning requirements of Camden London Borough Council.

This report presents the methodology and results from the environmental survey, followed by calculations in accordance with BS4142 to provide an indication as to the likelihood of the noise emissions from the proposed plant unit installation having an adverse impact on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE SURVEYS

2.1 Site Description

As shown in Figure 2.1, the site is bounded by West End Lane to the North, residential properties and Carmel Garage to the West, residential properties to the South and to the East.

Figure 2.1 Site Location Plan (Image Source: Google Maps)

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of an urban cityscape environment, with the dominant source being road traffic noise from the surrounding roads.

2.2 Environmental Noise Survey Procedure

Continuous automated monitoring was undertaken for the duration of the noise survey between 12:37 on 28/07/2021 and 12:37 on 29/07/2021.

The environmental noise measurement position, proposed plant installation locations, and the closest noise sensitive receiver relative to the plant installations are described within Table 2.1 and shown within Figures 2.2 and 2.3.

Icon	Descriptor	Location Description
	Noise Measurement Position	The microphone was installed on the window outside the receiver's bedroom on the first floor of the south façade. A correction of 3dB has been applied to account for non-free field conditions
	Closest Noise Sensitive Receiver	Rear façade. 1st Floor window. Residential house above the restaurant
	Proposed Plant Installation Location	Proposed plant installations are outlined in Section 5.1

Table 2.1 Measurement position and description

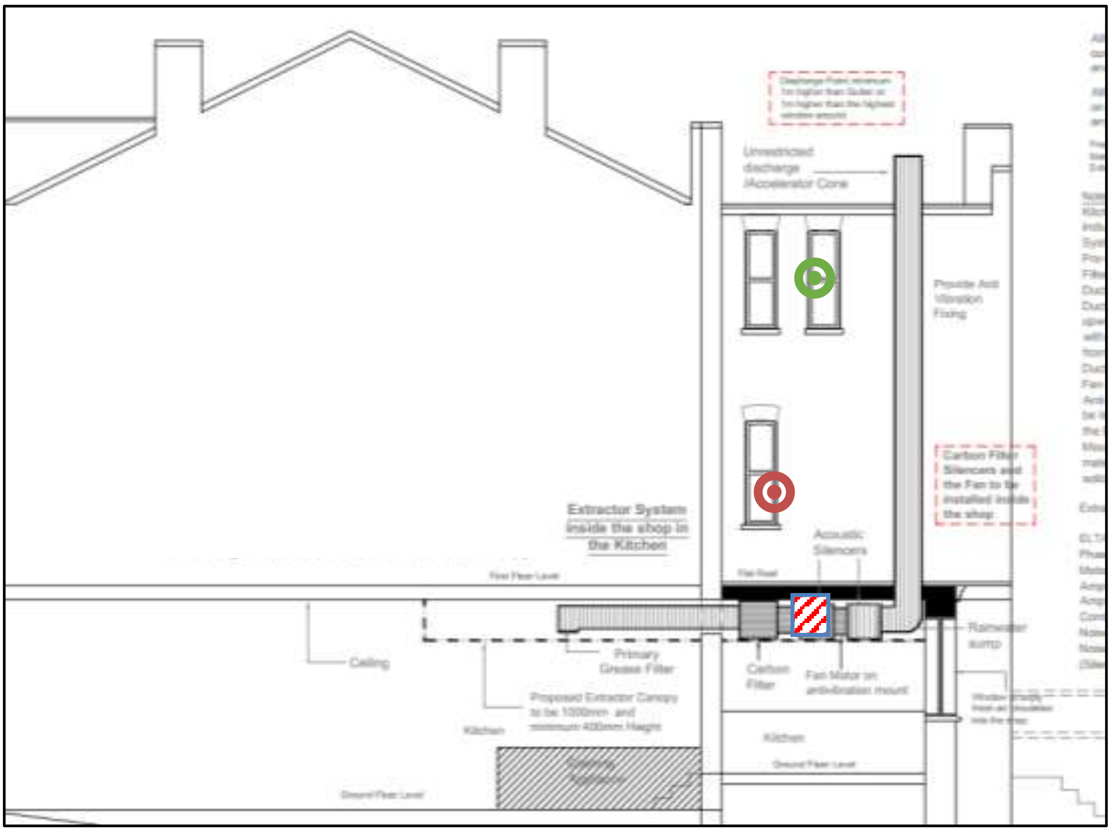

Figure 2.2 Site measurement position, identified receiver and proposed plant unit installation (Drawing provided by the Client ref: 128 -06/MT)

Figure 2.3 Site measurement position (Image Source: Google Maps)

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.

Following a conversation with the Client, it was understood that the proposed extraction fan will in operation on Monday to Thursday between 15:00 to 23:00 and Friday to Sunday between 12:00 to 23:00.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.3.

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 3	Svantek Type 977 Class 1 Sound Level Meter	34104	12/03/2020	14015015-2
	Free-field microphone Aco Pacific 7052E	66830		
	Preamp Svantek 2v12L	17293		
	Svantek External windshield	-	-	-
Larson Davis CAL200 Class 1 Calibrator		17148	27/04/2021	05223/1

Table 2.3 Measurement instrumentation

3.0 RESULTS

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 23139.TH1.

Representative background noise levels are shown in Table 3.1 for daytime and night-time.

It should be noted that the representative background noise level has been derived from the most commonly occurring $L_{A90,5\ min}$ levels measured during the environmental noise survey undertaken on site, as shown in 23139.Daytime.LA90 and 23139.Night-time.LA90 attached.

Time Period	Representative background noise level L_{A90} dB(A)
Daytime (07:00-23:00)	44
Night-time (23:00-07:00)	36

Table 3.1 Representative background 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 Rating Level due to the noise source/s under assessment 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) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question ($L_{Aeq,\ Tr}$), including any relevant acoustic feature corrections, as follows:

- **Tonality** – '*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible*'
- **Impulsivity** – '*A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible*'
- **Intermittency** – '*If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'

- **Other sound characteristics** – '*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- 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 or significant 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

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

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 guidance provided by The London Borough of Camden for noise emissions of new plant in this instance is as follows:

The noise criteria, as per the Local Plan 2017 of London Borough of Camden, British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' should be considered as the main reference document for the assessment. The resultant 'Rating Level' would be considered as follows:

Period	Assessment Location	Rating Level Acceptability Range		
		Green: noise is considered to be at an acceptable level	**Amber:** noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development	**Red:** noise is observed to have a significant adverse effect.
Daytime (7:00-23:00)	Garden used for main amenity (free field) and Outside living or dining or Bedroom window (façade)	10dB below background	9 dB below and 5dB above background	5dB above background
Night-time (23:00-7:00)	Outside bedroom window (façade)	10dB below background and no events exceeding 57dB L_{Amax}	9db below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	5dB above background and/or events exceeding 88dB L_{Amax}

Table 4.1 Camden noise criteria for plant and machinery

5.0 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Installations

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

- 1 No. Axial Fan TCBBx2/4 450

The proposed installation location for the Extraction Fan will be along the existing side elevation at the rear of the property, as shown in Figure 2.2 and 2.3 above.

The noise emission level as provided by the manufacturer for the units are shown in Table 5.1.

Unit	Descriptor	Octave Frequency Band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
Axial Fan TCBBx2/4 450	SWL (dB)	58	70	80	80	83	79	71	64	87

Table 5.1 Plant Units Noise Emission Levels as provided by the manufacturer

5.2 Closest Noise Sensitive Receiver

The closest noise sensitive receiver to the proposed installation location has been identified as being a residential window at the rear elevation of the building, located approximately 2.1 metres from the proposed plant installation location, as shown in Figure 2.2.

5.3 Calculations

The 'Rating Level' of each plant unit installation has been calculated at 1m from the closest receiver using the noise levels shown in Table 5.1, and corrected due to different acoustic propagation features such as distance, reflective surfaces, screening elements, etc.

Detailed calculations for each plant unit installation are shown in Appendix B.

Receiver	Criterion	Noise Level at 1m From the Closest Noise Sensitive Window
Residential window at the rear elevation of the building	34dB(A)	32dB(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 Extraction Fan unit installation satisfies the emissions criterion of The London Borough of Camden, providing that the mitigation measures outlined in Section 6 are implemented.

6.0 NOISE CONTROL MEASURES

In order to achieve the specific sound level and subsequent rating level shown in the assessment above, the following noise control strategy should be adopted.

6.1 Kitchen Extraction System

In order to control the noise emissions from the kitchen extraction system duct termination point, two acoustic silencers should be installed after the proposed fan position (exhaust duct), providing the minimum insertion loss values outlined in Table 6.1 below.

Unit	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Silencer (1260-1600 mm length)	-6	-8	-13	-22	-22	-13	-12	-9

Table 6.1 Insertion loss figures to be provided by acoustic silencer

We would recommend the following suppliers of the aforementioned silencer:

- Environmental Equipment Corporation
- Noico Ltd
- Waterloo Acoustics
- Allaway Acoustics
- Wakefield Acoustics
- Caice

6.2 Anti-Vibration Mounting Strategy

In the case of all plant units, appropriate anti-vibration mounts should be installed in order to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines detailed advice in order to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 324 West End Lane, London, NW6 1LN, by KP Acoustics Ltd between 12:37 on 28/07/2021 and 12:37 on 29/07/2021. The results of the survey have enabled a representative background noise level to be set.

Manufacturer's noise data of proposed plant units has been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receiver in accordance with British Standard BS4142:2014 for compliance with Camden London Borough Council requirements.

The rating level was compared with the representative background noise level to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of BS4142:2014.

It has been concluded that noise emissions from the proposed plant units would not have an adverse impact on the nearest residential receivers provided that the noise control strategy presented in Section 6 is followed.

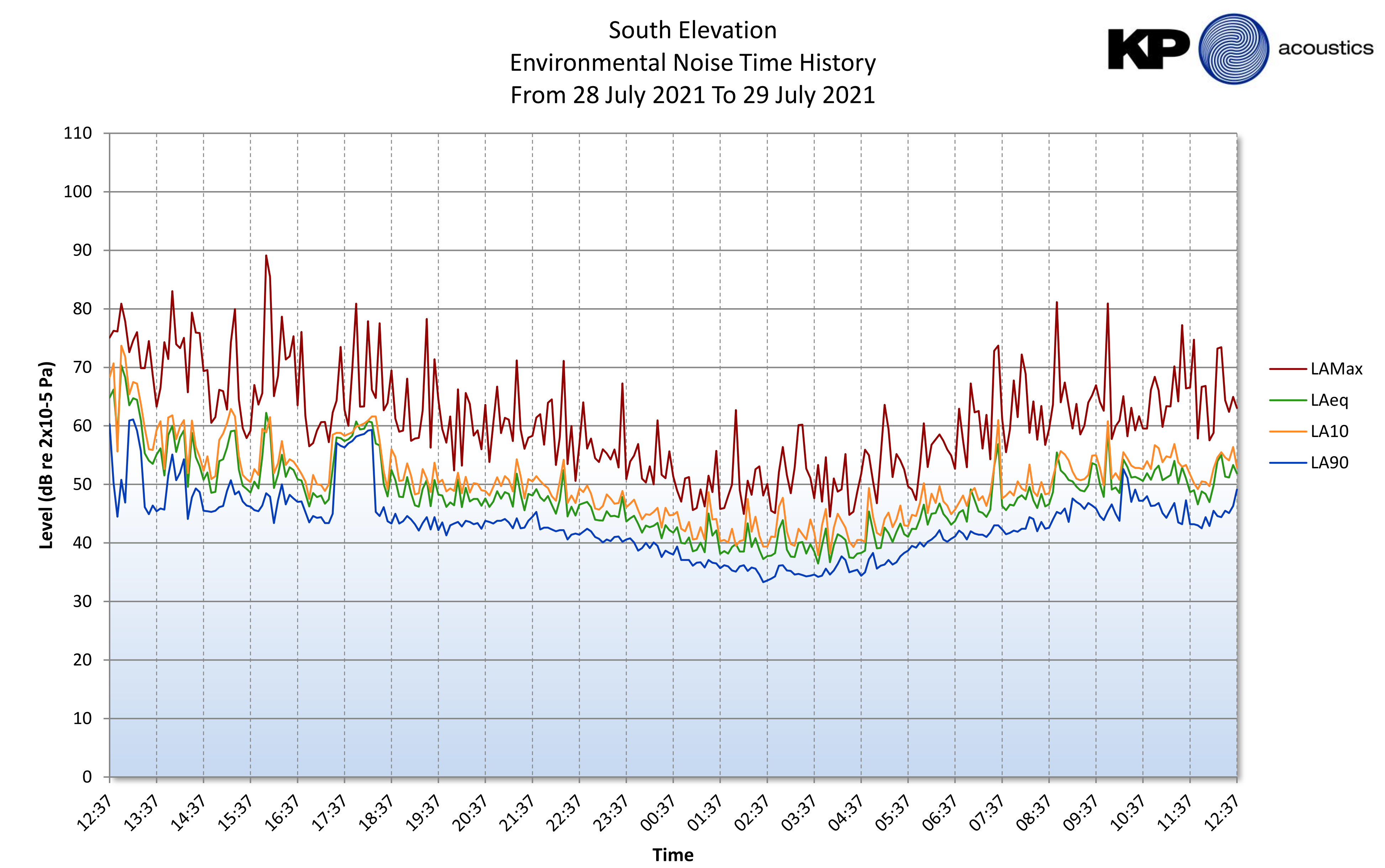

Figure 23139.TH1

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 B

324 West End Lane, London

KITCHEN EXTRACTION SYSTEM EMISSIONS CALCULATIONS

Source: Kitchen Extraction System	*Frequency, Hz*								
Receiver: Residential Window at the Rear Elevation	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Duct Termination									
Fan Outlet. Sound Power level.	58	70	80	80	83	79	71	64	
A Weighting Correction	26	16	9	3	0	-1	-1	1	
Extract Fan Outlet. Sound Power level	84	86	89	83	83	78	70	65	
Correction for duct length	-0.4	-0.6	-0.6	-0.9	-1.3	-1.3	-1.3	-1.3	
Correction for bends	0.0	0.0	0.0	-1.0	-2.0	-3.0	-3.0	-3.0	
Correction for end reflections	-12	-7	-3	-1	0	0	0	0	
Correction for Sound Pressure level at 1m from termination	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for directivity	-1	-2	-3	-6	-8	-14	-17	-26	
Correction for distance	-8	-8	-8	-8	-8	-8	-8	-8	
Attenaution due to silencer 1	-6	-8	-13	-22	-22	-13	-12	-9	
Attenaution due to silencer 2	-6	-8	-13	-22	-22	-13	-12	-9	
Total SPL at receiver due to duct termination noise emissions	40	41	37	11	9	15	6	0	31
Duct Break Out									
Fan Outlet. Sound Power level.	58	70	80	80	83	79	71	64	
A Weighting Correction	26	16	9	3	0	-1	-1	1	
Correction for duct length	-0.4	-0.6	-0.6	-0.9	-1.3	-1.3	-1.3	-1.3	
Correction for bends	0.0	0.0	0.0	-1.0	-2.0	-3.0	-3.0	-3.0	
Correction for duct wall	-43	-53	-55	-33	-34	-35	-25	-25	
Correction due to radiating surface	10	10	10	10	10	10	10	10	
Correction for convertion from SWL to SPL	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for close surfaces	3	3	3	3	3	3	3	3	
Attenaution due to silencer 1	-6	-8	-13	-22	-22	-13	-12	-9	
Attenaution due to silencer 2	-6	-8	-13	-22	-22	-13	-12	-9	
Total SPL at receiver due to duct break out noise emissions	31	19	10	7	4	15	19	20	24
Total Sound pressure level at 1m from receiver due to all sources	**40**	**42**	**38**	**12**	**10**	**18**	**19**	**20**	**32**
					Design Criterion				**34**

APPENDIX C

ANTI-VIBRATION MOUNTING SPECIFICATION REFERENCE DOCUMENT

1.0 General

1.1 All mountings shall provide the static deflection, under the equipment weight, shown in the schedules. Mounting selection should allow for any eccentric load distribution or torque reaction, so that the design deflection is achieved on all mountings under the equipment, under operating conditions.

1.2 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.

1.3 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.

Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Service Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.1 Type A Mounting (Caged Spring Type)

2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principle isolation elements, and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.

2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height, and be selected to have at least 50% overload capacity before becoming coil-bound.

2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.

2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment as a result of vibration or accidental or unauthorised tampering.

2.2 Type B Mounting (Open Spring Type)

2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements, and shall incorporate a built-in levelling device.

2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.

2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.3 Type C Mounting (Rubber/Neoprene Type)

Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device, and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

3.0 Plant Bases

3.1 **Type A Bases (A.V. Rails)**

An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary should be checked by the Structural Engineer.

3.2 **Type B Bases (Steel Plant Bases)**

Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment, and fitted with isolator height saving brackets. The frame depth shall be approximately 1/10 of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 **Type C Bases (Concrete Inertia Base: for use with steel springs)**

These shall consist of an all-welded steel pouring frame-work with height saving brackets, and a frame depth of approximately 1/12 of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m^3) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.