

FLAT 5, 10 CAMBRIDGE GATE, LONDON

PLANNING COMPLIANCE REVIEW

Report 18343.PCR.01

For:

Vama Sandari Investments (P) Ltd

Unit D, 15 Bell Yard Mews

London

SE1 3TY

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1.0 INTRODUCTION

KP Acoustics has been commissioned by Vama Sandari Investments (P) Ltd, Unit D, 15 Bell Yard Mews, London, SE1 3TY, to undertake an environmental noise survey at Flat 5, 10 Cambridge Gate, London, NW1 4JX. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for condenser units installation, 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 installations 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 Outer Circle and Cambridge Gate to the West and residential properties to the remaining elevations. 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

A noise survey was undertaken on site as shown in Figure 2.1 and indicative site plan 18343.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 18:52 on 21st December 2018 and 17:32 on 22th December 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 meter was installed on a window on the Third Floor as shown in 18343.SP1. A correction of 3dB has been applied to account for non-free field conditions</p>
<p>Closest Noise Sensitive Receiver (NR.1)</p>	<p>Nearest Living Room window of the top Flat facing the light well, as shown in 18343.SP1</p>

Table 2.1 Measurement position and description



Figure 2.1 – Site Measurement position (Image Source: Google Maps)

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	Serial no.	Date	Cert no.
Kit 2: Svantek Type 977 Class 1 Sound Level Meter	34104	14/02/2018	1400 8638
Free-field microphone Aco Pacific 7052E	66830		
Preamp Svantek 2v12L	17293		
B&K Type 4231 Class 1 Calibrator	1897774	07/02/2018	03635/1
B&K Type 4231 Class 1 Calibrator	2147411	07/12/2017	03553/1
Rion NC-74 Class 1 Calibrator	34904938	07/12/2017	03673/1
Svantek External windshield	-	-	-

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 18343.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 (07:00-23:00)	45	52
Night-time (23:00-07:00)	42	49

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:

“Noise generated by the new plant at a point 1 metre external to sensitive facades will be at least 5dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment are in operation. Where it is anticipated that any plant/equipment 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) special attention is given to reducing the noise levels from that piece of plant/equipment at any sensitive façade to at least 10dB(A) below the LA90, expressed in dB(A).”

4.3 Noise Emissions Criterion

As the proposed plant unit installation 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})	32 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:

- 2 No. AJY054LCLAH Condenser Units

The closest noise sensitive receiver to the proposed installation location has been identified as being a top Flat Living Room window facing the light well, located approximately 3.5 metres from the proposed plant installation location.

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

Unit	Sound Pressure Level (dB) in each Frequency Band at 1m							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
AJY054LCLAH	65	62	59	54	50	46	43	34

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 noise sensitive window from the condenser 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
Top flat Living Room window facing the light well	32dB(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 condenser unit installation satisfies the emissions criterion of BS4142:2014 and the Local Authority, providing that the mitigation measure described in Section 5.4 is implemented.

5.3 BS8233 Assessment

The highest value of 32dB(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 32dB(A), the residential window itself would need to provide an additional nominal 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)
Top flat Living Room window facing the light well	35dB(A)	17-22dB(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 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.

5.4 Noise Mitigation Proposals

In order to reduce noise emissions from the proposed plant unit to within the criteria specified in Section 4.3, we would recommend that acoustic enclosure with louvres are installed.

The acoustic enclosure with louvres should provide the minimum attenuation characteristics shown in Table 5.4.

Unit	Insertion Loss (dB) in each Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Acoustic louvres	9	11	14	19	26	25	19	13

Table 5.4 Required insertion loss of proposed acoustic louvres

It would be anticipated that the aforementioned insertion loss can be provided by an acoustic enclosure with louvres such as Environ ELV1.1.25AC, or similar.

Providing that the above mitigation measures are installed, noise emissions from the proposed plant unit would be fully compliant with the requirement of the Local Authority.

The above mitigations measures could be provided by companies such as Noico. EEC, Allaway Acoustics, AVK or any other supplier of noise control products.

6.0 CONCLUSION

An environmental noise survey has been undertaken at Flat 5, 10 Cambridge Gate, London, NW1 4JX, by KP Acoustics Ltd between 18:52 on 21st December 2018 and 17:32 on 22th December 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 condenser unit installations would meet the requirements of The London Borough of Camden. 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, providing that the mitigation measure described in Section 5.4 is implemented.

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, 10 Cambridge Gate, London, NW1 4JX
Environmental Noise Time History
From 21 November 2018 To 22 November 2018

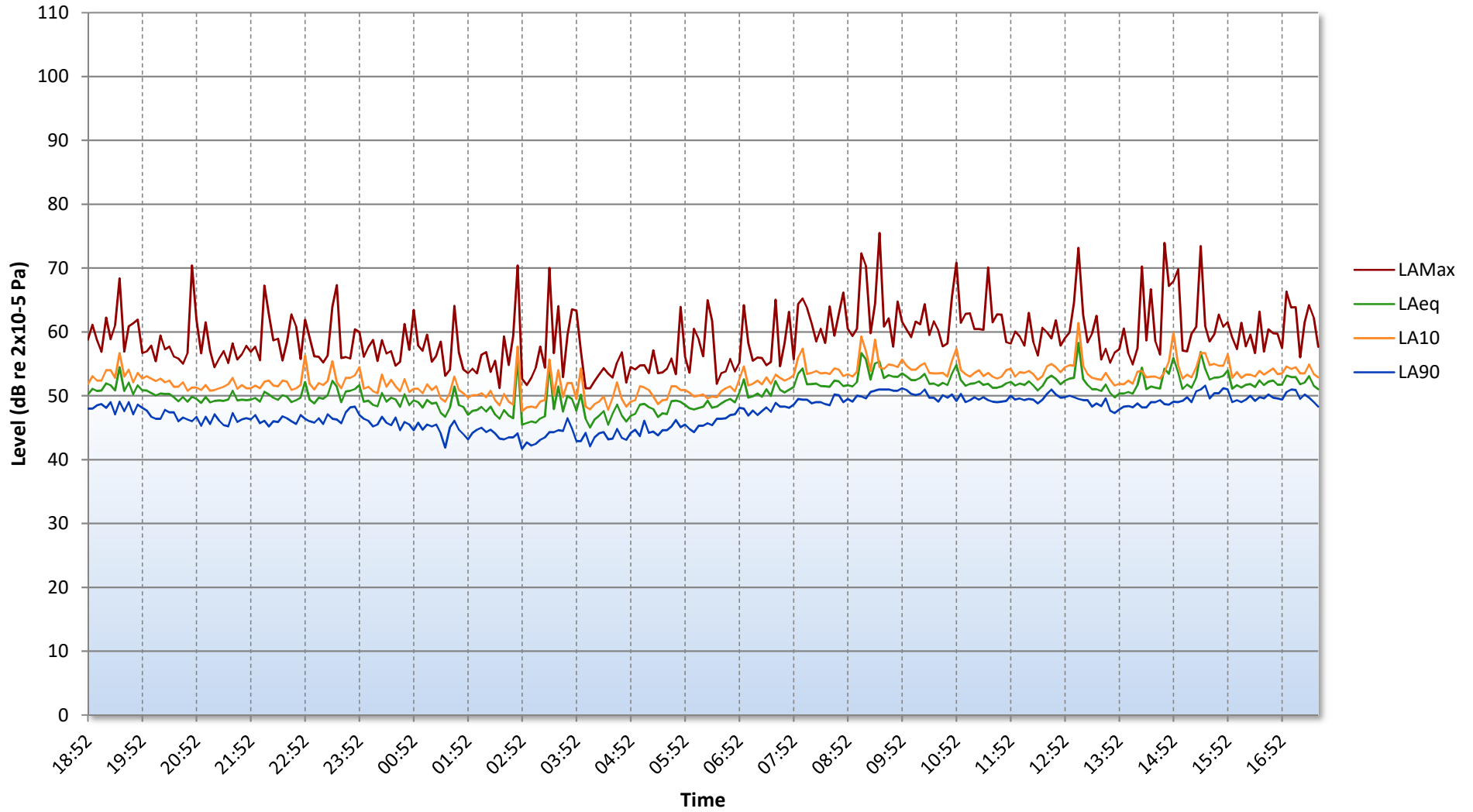
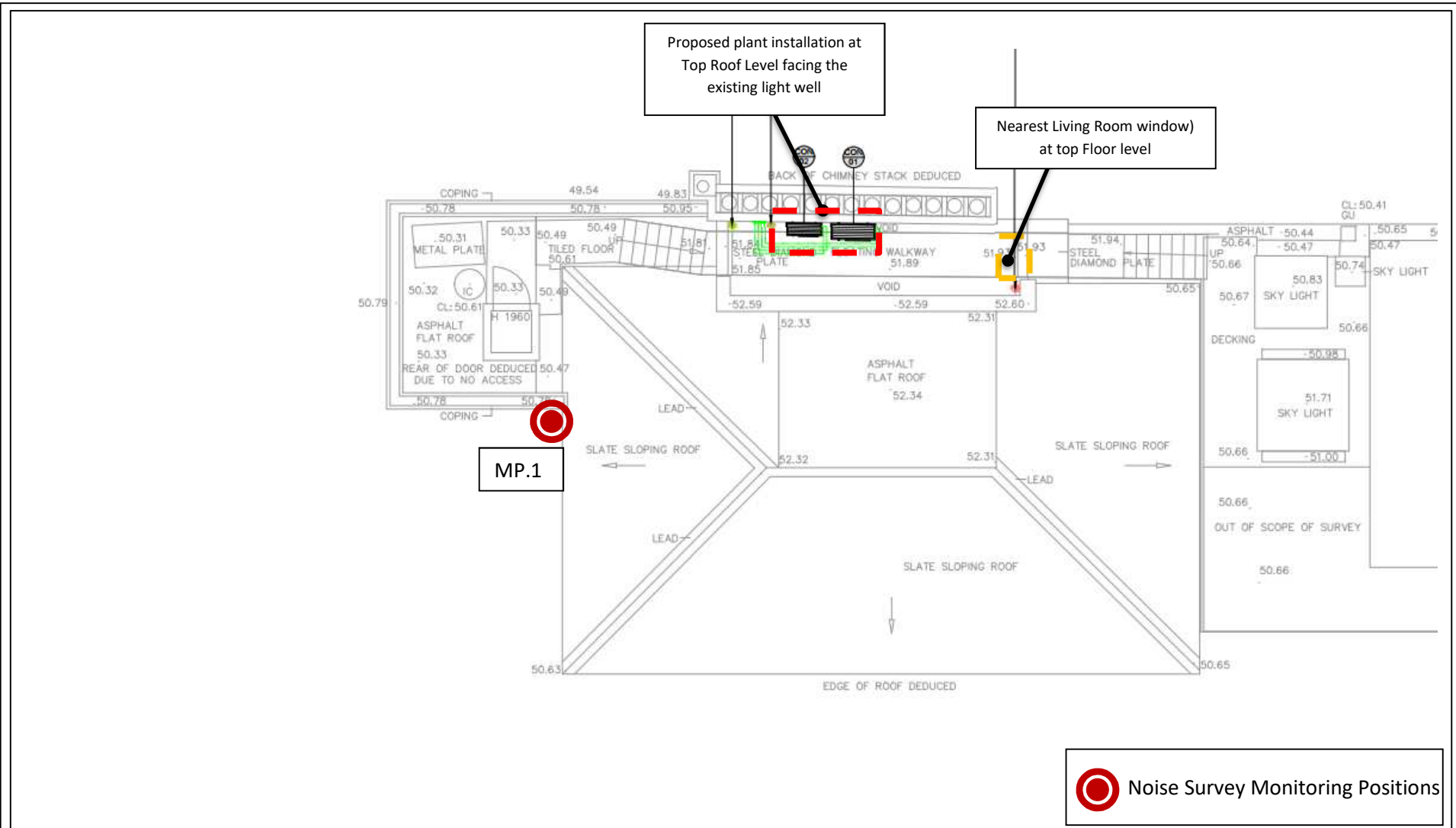


Figure 18343.TH1



Title: Indicative site plan showing noise monitoring and plant unit location.
(Image Source: Google maps)

Date: 14 December 2018

FIGURE 18343.SP1



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, 10 Cambridge Gate, London, NW1 4JX

PLANT NOISE EMISSIONS CALCULATIONS

Source: Proposed Plant Installation at Roof level
 Receiver: Nearest Living Room window of the top Flat facing the light well , as shown in SP1

	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturers Sound Pressure Levels									
2No. AJY054LCLAH(Sound Pressure Level @1m)	65	62	59	54	50	46	43	34	
Correction due to units number (2), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by distance (3.5m), dB	-11	-11	-11	-11	-11	-11	-11	-11	
Attenuation provided by acoustic enclosure with louvres	-9	-11	-14	-19	-26	-25	-19	-13	
Sound Pressure Level at Receiver, dB	48	43	37	27	16	13	16	13	32

Design Criterion	32
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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/m³) 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.