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4 Montpelier Square
London

Planning Compliance Report
Report 21754.PCR.01

LBMV Architects
72 Haverstock Hill
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Report 21754.PCR.01 Revision History			
First Issue Date: 07/04/2021			
A		D	
B		E	
C		F	

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1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by LBMV Architects, 72 Haverstock Hill, London, NW3 2BE, to undertake a noise impact assessment of a proposed plant unit installation serving the building at 4 Montpelier Square, Knightsbridge, London SW7 1JT.

A 24 hour environmental noise survey has been undertaken on site and the background noise levels measured will be used to determine daytime and night-time noise emission criteria for the intake and discharge exhausts of a mechanical ventilation heat recovery system in agreement with the planning requirements of Westminster City Council.

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

As shown in Figure 2.1, the site is bounded by Montpelier Square to the East and residential properties to all other cardinal directions.

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 11:30 on 30/03/2021 and 11:30 on 31/03/2021.

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 1	The meter was installed on the first-floor balcony of the eastern façade, as shown in Figure 2.2. A correction of 3dB has been applied to account for non-free field conditions
	Noise Measurement Position 2	The meter was installed in the rear garden of the property at ground floor level, as shown in Figure 2.2. A correction of 3dB has been applied to account for non-free field conditions
	Closest Noise Sensitive Receiver 1	Front façade. Ground floor window. Residential house to the north at 3 Montpelier Square
	Closest Noise Sensitive Receiver 2	Rear façade. 1st Floor window. Residential house to the south at 5 Montpelier Square
	Proposed Exhaust 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 (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.

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 2.2.

<table>
<tr><th colspan="2">Measurement instrumentation</th><th>Serial no.</th><th>Date</th><th>Cert no.</th></tr>
<tr><td rowspan="4">Noise Kit 1</td><td>Svantek Type 957 Class 1 Sound Level Meter</td><td>12399</td><td rowspan="3">12/03/2020</td><td rowspan="3">14015015-1</td></tr>
<tr><td>Free-field microphone Aco Pacific 7052E</td><td>55951</td></tr>
<tr><td>Preamp Svantek 2v12L</td><td>33537</td></tr>
<tr><td>Svantek External windshield</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="4">Noise & Vibration Kit 1</td><td>Svantek Type 958A Class 1 Sound Level Meter</td><td>45579</td><td>03/09/2020</td><td>14012949-02</td></tr>
<tr><td>Free-field microphone MTG MK255</td><td>11697</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Preamp Svantek 2v12L</td><td>41535</td></tr>
<tr><td>Svantek External windshield</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="2">B&K Type 4231 Class 1 Calibrator</td><td>2147411</td><td>04/02/2019</td><td>04130/1</td></tr>
</table>

Table 2.2 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 21754.TH1-2.

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

Time Period	Noise Measurement Position 1 - Minimum background noise level L_{A90} dB(A)	Noise Measurement Position 2 - Minimum background noise level L_{A90} dB(A)
Daytime (07:00-23:00)	36	35
Night-time (23:00-07:00)	34	33

Table 3.1 Minimum background noise levels and average ambient noise levels

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Local Authority Guidance

The guidance provided by Westminster City Council, 'Policy ENV7: Controlling Noise from Plant, Machinery, and Internal Activity' is as follows:

Where development is proposed, the City Council will require the applicant to demonstrate that this will be designed and operated so that any noise emitted by plant and machinery and from internal activities, including noise from amplified or unamplified music and human voices, will achieve the following standards in relation to the existing external noise level at the nearest noise sensitive properties, at the quietest time during which the plant operates or when there is internal activity at the development.

1) where the existing external noise level exceeds WHO Guideline levels of $L_{Aeq,12hrs}$ 55dB daytime (07.00- 19.00); $L_{Aeq,4hrs}$ 50dB evening (19.00-23.00); $L_{Aeq,8hrs}$ 45dB night-time (23.00-07.00): either

a) and where noise from the proposed development will not contain tones or be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq15min}$) should not exceed 10dB below the minimum external background noise at the nearest noise sensitive properties. The background noise level should be expressed in terms of $L_{A90,15min}$.

b) or/and where noise emitted from the proposed development will contain tones, or will be intermittent sufficient to attract attention, the maximum emission level (LAeq15min) should not exceed 15dB below the minimum external background noise at the nearest noise sensitive properties. The background noise level should be expressed in terms of $L_{A90,15min}$.

2) where the external background noise level does not exceed the above WHO Guideline levels, policy ENV 7(A)(1)(a) and (b) will apply except where the applicant is able to demonstrate *to the City Council that the application of slightly reduced criteria of no more than 5 dB will provide sufficient protection to noise sensitive properties: either*

a) *where noise emitted from the proposed development will not contain tones or be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq15min}$) should not exceed 5dB below the minimum external background noise level at the nearest noise sensitive properties. The background noise levels should be expressed in terms of $L_{A90,\ 15min}$. or*

b) *where noise emitted from the proposed development will contain tones or will be intermittent sufficient to attract attention, the maximum emission level ($L_{Aeq15min}$) should not exceed 10dB below the minimum external background noise level at the nearest noise sensitive properties. The background noise levels should be expressed in terms of $L_{A90,\ 15min}$.*

4.2 Noise Emissions Criterion

As the proposed MVHR system could be used at any time of the day or night, and falls within Section 2 (a) of the guidance above, the criterion has been set as shown in Table 4.1 in order to comply with the above requirements.

Location	Time Period	Noise Criterion at Nearest Residential Receiver
Noise Measurement Position 1 - Front Facade	Night-time (23:00 to 07:00)	29 dB(A)
Noise Measurement Position 2 - Rear Facade		28 dB(A)

Table 4.1 Proposed noise emissions criterion

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. Nuaire XBC+ Mechanical Ventilation Heat Recovery Unit

The proposed installation location for the MVHR system will be within the basement with one induct discharge exhaust discharging from the eastern façade into the front lightwell of the property and one induct intake exhaust discharging from the western façade into the rear garden of the property, as shown in Figure 2.2 and 2.3 above.

The noise emission levels 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	
Nuaire XBC+	Induct Discharge	69	63	61	64	58	55	47	47	75
	Induct Intake	70	64	62	64	59	55	47	46	65

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 induct discharge exhaust has been identified as being a residential window 3 Montpelier Square, located approximately 5 metres from the proposed plant installation location, as shown in Figure 2.2.

The closest noise sensitive receiver to the proposed induct intake exhaust has been identified as being a residential window 5 Montpelier Square, located approximately 5 metres from the proposed plant installation location, as shown in Figure 2.2.

5.3 Calculations

Taking all acoustic corrections into consideration, the noise level contribution expected at the closest residential windows from the MVHR system intake and discharge exhausts 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
Front façade. Ground floor window. Residential house to the north at 3 Montpelier Square	29dB(A)	29dB(A)
Rear façade. 1st Floor window. Residential house to the south at 5 Montpelier Square	28dB(A)	28dB(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 MVHR system exhaust installation satisfies the emissions criterion of Westminster City Council, providing that the mitigation measures outlined in Section 6 are implemented.

5.4 BS8233 Assessment

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 internally within the closest residence, in order to further ensure the amenity of nearby noise sensitive receivers.

The calculated noise emission value of 29dB(A) is to be considered externally at 1m from the receiving window at 3 Montpelier Square. The calculated noise emission value of 28dB(A) is to be considered externally at 1m from the receiving window at 3 Montpelier Square. Windows may be closed or partially closed leading to further attenuation, as follows.

British Standard 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' provides recommendations for acceptable internal noise levels in residential properties, as shown in Table 5.3.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 5.3 BS8233 recommended internal background noise levels

Assuming worst case conditions, of the closest window being for a bedroom, BS8233 recommends 30dB(A) for internal sleeping conditions during night-time hours.

With calculated external levels of 29dB(A) at the front façade and 28dB(A) at the rear facade, the residential windows themselves 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 as shown in Table 5.4.

Receiver	BS8233 Criterion for Night-time	Noise Level Inside Nearest Residential Receiver
Front façade. Ground floor window. Residential house to the north at 3 Montpelier Square	30dB(A)	14-19dB(A)
Rear façade. 1st Floor window. Residential house to the south at 5 Montpelier Square		13-18dB(A)

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 Westminster City Council, the noise emissions from the plant unit installation would be expected to comfortably meet the most stringent recommendations of BS8233.

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 MVHR System Discharge and Intake

In order to control the noise emissions from the MVHR system exhausts, acoustic silencers should be installed within both ducting routes 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
Discharge Ducting	3	5	8	12	14	12	10	10
Intake Ducting	0	0	0	1	2	3	2	1

Table 6.1 Insertion loss figures to be provided by acoustic silencer

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 4 Montpelier Square, Knightsbridge, London SW7 1JT, by KP Acoustics Ltd between 11:30 on 30/03/2021 and 11:30 on 31/03/2021. 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 mechanical ventilation heat recovery unit installation would meet the requirements of Westminster City Council, providing that the mitigation measures outlined in Section 6 are 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.

Front of 4 Montpelier Square, London
Environmental Noise Time History
From 30 March 2021 To 31 March 2021

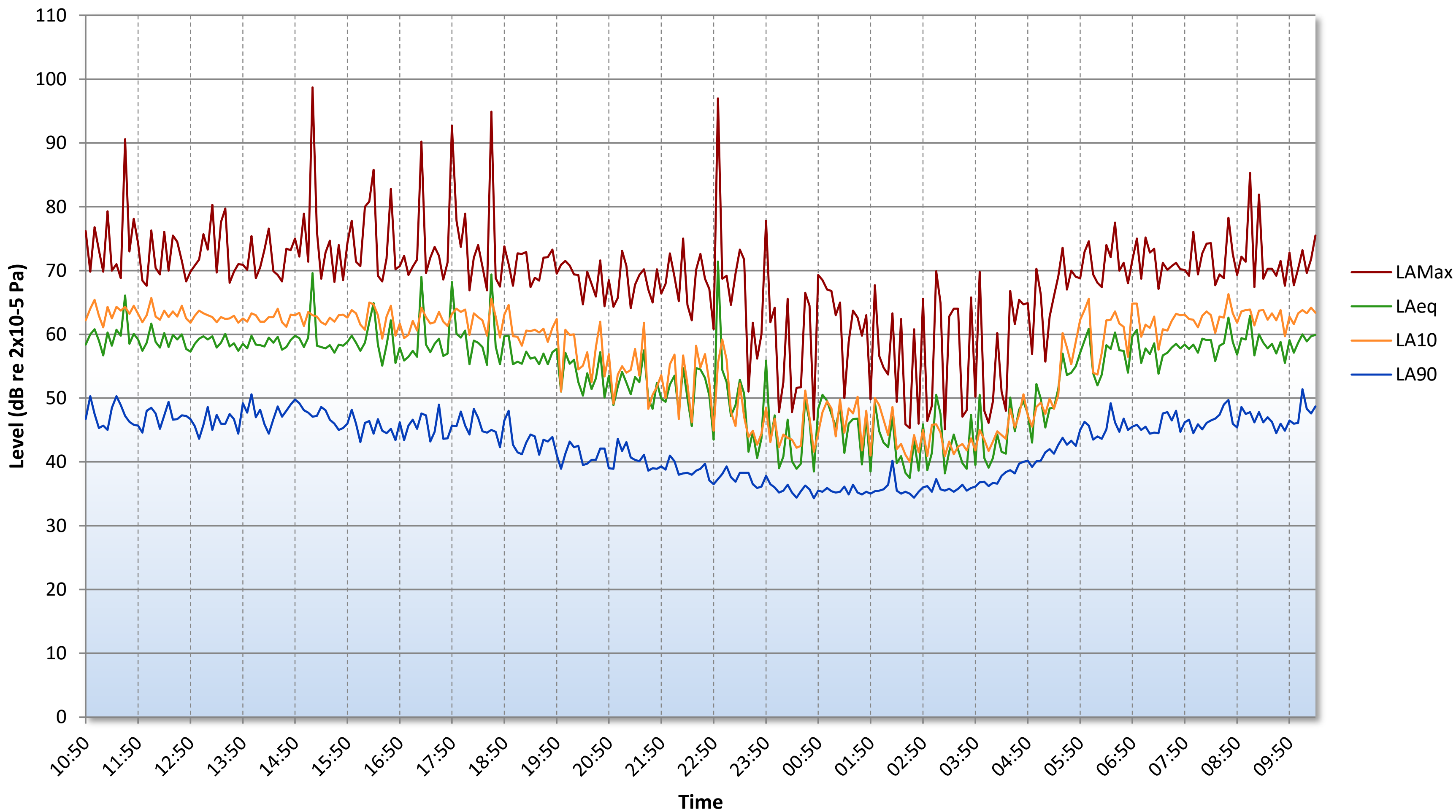

Figure 21754.TH1

Rear f 4 Montpelier Square, London
Environmental Noise Time History
From 30 March 2021 To 31 March 2021

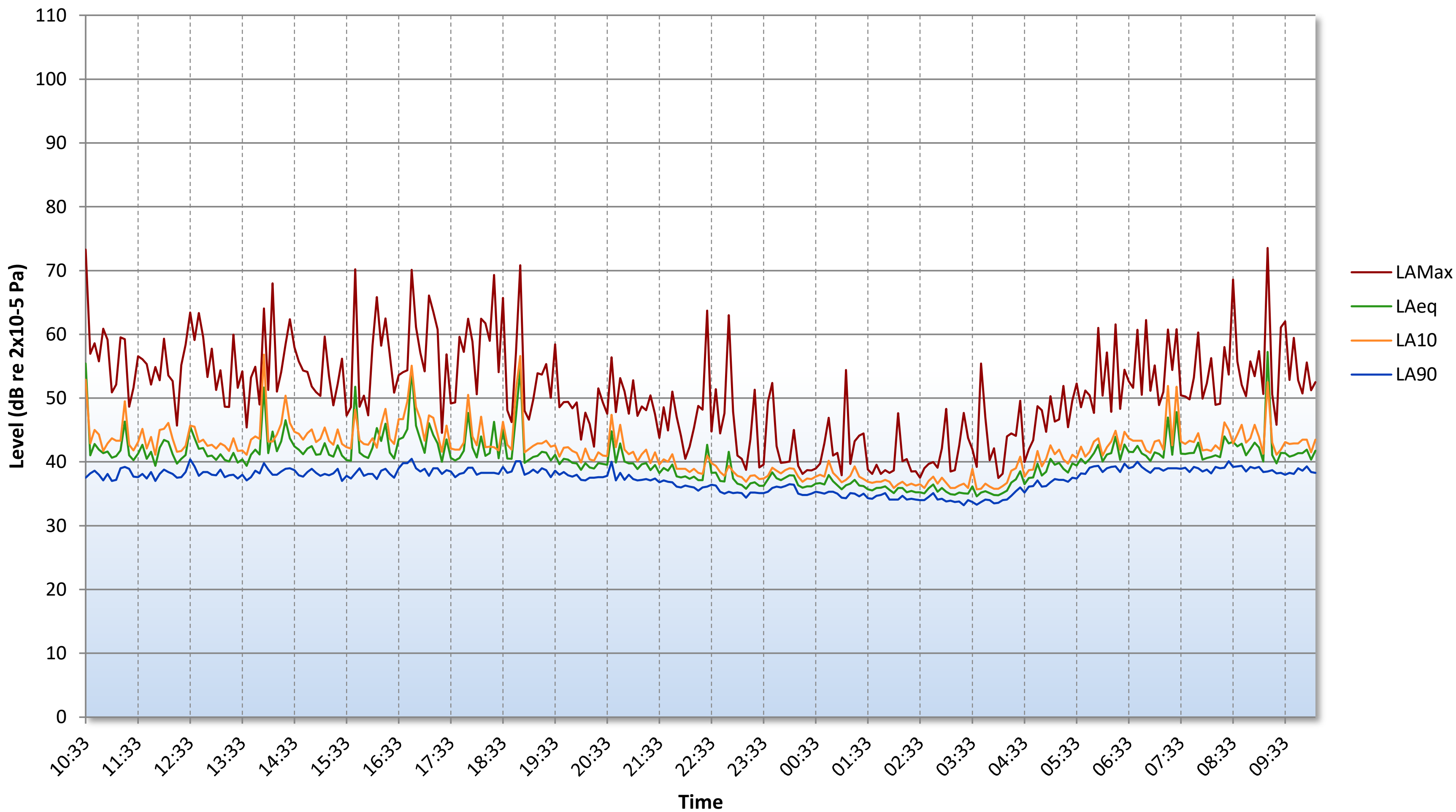

Figure 21754.TH2

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 B

4 Montpelier Square, London

PLANT NOISE EMISSIONS CALCULATIONS

Source: Discharge exhaust installed on front façade of 4 Montpelier Square Receiver: Residential window of 3 Montpelier Square	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Nuaire XBC+ Discharge Exhaust (Sound Power Level)	76	77	71	75	65	65	61	63	75
Attenuation due to duct length (16.5m), dB	-8	-11	-8	-5	-4	-4	-4	0	
Attenuation due to duct bends (4), dB	0	0	0	-4	-8	-12	-12	-12	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
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 from proposed silencer, dB	-3	-5	-8	-12	-14	-12	-10	-10	
Sound Pressure Level at Receiver due to Extract Exhaust, dB	**31**	**31**	**29**	**31**	**17**	**15**	**13**	**19**	**29**

Design Criterion	**29**

Source: Intake exhaust installed on front façade of 4 Montpelier Square Receiver: Residential window of 5 Montpelier Square	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Nuaire XBC+ Intake Exhaust (Sound Power Level)	70	64	62	64	59	55	47	46	65
Attenuation due to duct length (20m), dB	-10	-13	-10	-7	-5	-5	-5	0	
Attenuation due to duct bends (4), dB	0	0	0	-4	-8	-12	-12	-12	
Correction due to duct end reflection, dB	-12	-8	-4	-1	0	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
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 from proposed silencer, dB	0	0	0	-1	-2	-3	-2	-1	
Sound Pressure Level at Receiver due to Extract Exhaust, dB	**26**	**21**	**26**	**29**	**22**	**13**	**6**	**11**	**28**

Design Criterion	**28**

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.