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63 - 86 Rowe Court, Grovelands Road Reading

Planning Compliance Report
Report 25747.PCR.01 Rev A

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KP Acoustics Ltd. 2023

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25747.Daytime.LA90	Statistical analysis for representative daytime L_{A90}
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Appendix A	Glossary of Acoustics Terminology
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1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Wimshurst Pelleriti, The Mews, 6 Putney Common, London, SW15 1HL to undertake a noise impact assessment of a proposed plant unit installation serving the building at 63 - 86 Rowe Court, Grovelands Road, Reading.

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 Reading Borough 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 houses on all sides.

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 13:37 on 20/01/2023 and 14:14 on 23/01/2023.

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 Figure 2.2 and 2.3.

Icon	Descriptor	Location Description
	Noise Measurement Position	The microphone was installed on a lamp-post at approximately 2 metre height, as shown in Figure 2.2. The microphone was located within 1.5 metres of the nearest surface and therefore includes local reflections.
	Closest On-Site Noise Sensitive Receiver (1)	2nd Floor window at the façade of the proposed building.
	Closest Off-Site Noise Sensitive Receiver (2)	2nd Floor window at the façade of the existing residential building to the east.
	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 (Image Source: Google Maps)

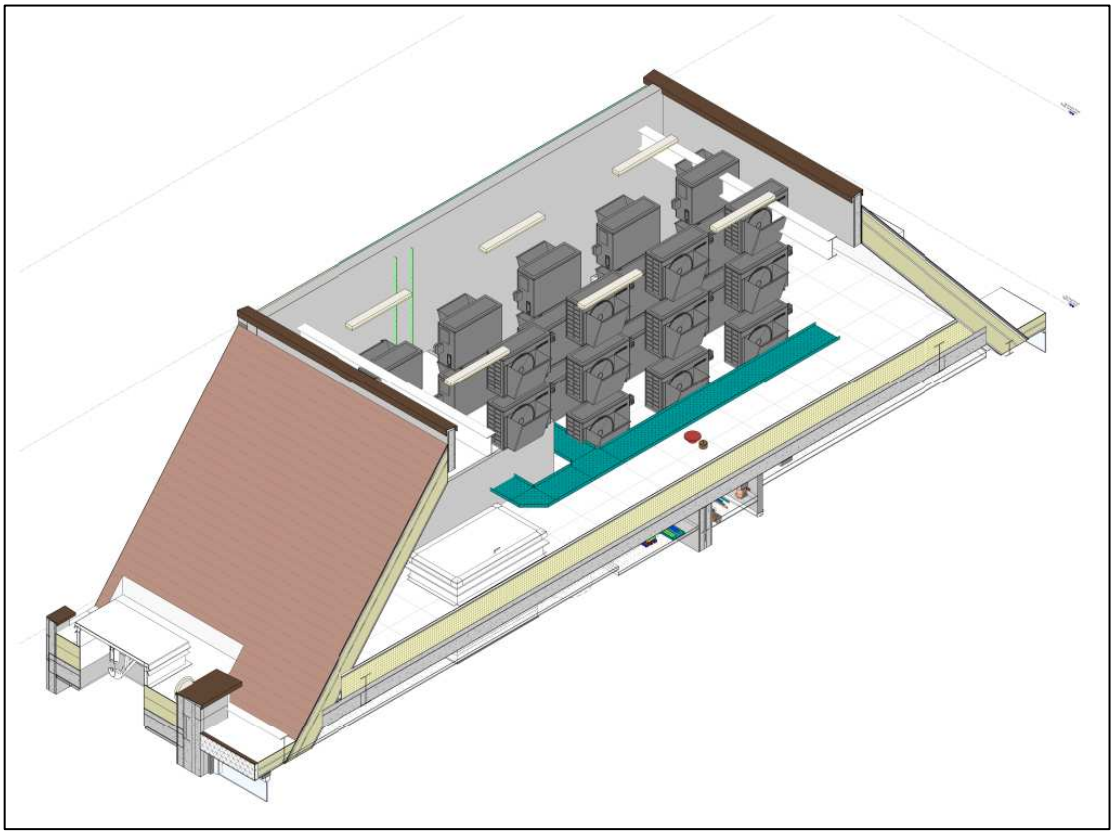

Figure 2.3 Proposed plant unit installation (Image Source: Quinn Ross)

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.

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 25	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21141-E0	21/07/2022	UK-22-069
	Free-field microphone NTI Acoustics MC230A	A23583		
	Preamp NTI Acoustics MA220	10992		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 27	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21174-E0	21/07/2022	UK-22-070
	Free-field microphone NTI Acoustics MC230A	A23539		
	Preamp NTI Acoustics MA220	11025		
	NTI Audio External Weatherproof Shroud	-	-	-
Larson Davis CAL200 Class 1 Calibrator		17148	18/03/2022	UCRT22/1397

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 25747.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 25747.Daytime L90.TH1 and 25747.Daytime L90.TH1 attached.

Time Period	Representative background noise level L_{A90} dB(A)
Daytime (07:00-23:00)	38
Night-time (23:00-07:00)	29

Table 3.1 Representative background noise levels

Please note that measurements are located at a distance less than 1.5 metres from the nearest reflective surface and therefore a 3dB correction has been applied to the results in Table 3.1 to obtain a free-field measurement as per ISO1996 Part 2.

4.0 NOISE ASSESSMENT GUIDANCE

4.1 Local Authority Guidance

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

"Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor."

In an email from Rebecca Moon, Principal Environmental Health Officer at the Environmental Protection & Nuisance Team for Reading Borough Council, Rebecca states:

"…consider the impact of the noise on the new occupants to ensure they are not disturbed, but we would not need our -10 dB noise criteria to be met and would be looking at more of a -5 dB or equal to background."

4.2 Noise Emissions Criterion

As the proposed plant units could be used at any time of the day or night, the local authority criterion would be set as shown in Tables 4.1 and 4.2 in order to comply with the above requirements. Receiver 1 is on-site, therefore set to the criteria set out in the email quoted above, while Receiver 2 is off-site, and conforms to the normal criteria for receivers set out above.

Time Period	Maximum Plant Noise Emissions Criterion at Nearest Residential Receiver
Night-time (23:00 to 07:00)	29 dB(A)

Table 4.1 Proposed noise emissions criterion (Receiver 1)

Time Period	Maximum Plant Noise Emissions Criterion at Nearest Residential Receiver
Night-time (23:00 to 07:00)	19 dB(A)

Table 4.2 Proposed noise emissions criterion (Receiver 2)

5.0 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Installations

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

- 24 No. Samsung AE040RXEDEG/EU Unit

The proposed installation location for the units will be in a lightwell at roof level, 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	
Samsung AE040RXEDEG/EU	SPL@1m (dB)	49	48	45	44	43	36	28	16	46

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

The closest noise sensitive receiver to the proposed installation location has been identified as being a 2nd Floor window at the façade of the proposed building, located approximately 7 metres from the proposed plant installation location, as shown in Figure 2.2.

It should be noted the proposed plant unit would be out of line of site of the receiving window due to screening from the building envelope.

5.2 Calculations

Taking all acoustic corrections into consideration, the noise level contribution expected at the closest residential window from the proposed plant would be as shown in Table 5.2. Detailed calculations are shown in Appendix B1-2.

Receiver	Criterion	Noise Level at 1m From the Closest Noise Sensitive Window
Receiver 1 - 2nd Floor window at the façade of the proposed building at the east of the site.	29dB(A)	28dB(A)
Receiver 2 - 2nd Floor window at the façade of the existing residential building to the east.	19dB(A)	18dB(A)

Table 5.2 Predicted noise level and criterion at nearest noise sensitive locations

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the proposed plant unit installation satisfies the emissions criteria of the Reading Borough Council.

5.3 BS8233:2014 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 28dB(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.

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 5.4.

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 5.4 BS8233 recommended internal background noise levels

Assuming worst case conditions, of the closest window being for a bedroom, BS8233 recommends 35dB(A)/30dB(A) for internal resting/sleeping conditions during daytime/night-time hours.

With a calculated external level of 28dB(A), the residential window itself 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 5.5.

Receiver	BS8233 Criterion for Night-time	Noise Level Inside Nearest Residential Receiver
2nd Floor window at the façade of the proposed building.	30dB(A)	13-18dB(A)

Table 5.5 Noise levels and criteria inside nearest residential space

Predicted levels are shown in Table 5.5, with detailed calculations shown in Appendix B. It can therefore be stated that, as well as complying with the requirements of BS4142, 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

6.1 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.

In the case of this plant installation it is recommended that the units are mounted on freestanding springs with 25 mm of static deflection, and a steel beam base, based on guidance in Table 4.56 of CIBSE B4 2016. 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 63 - 86 Rowe Court, Grovelands Road, Reading by KP Acoustics Ltd between 13:37 on 20/01/2023 and 14:14 on 23/01/2023. 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 plant unit installation would meet the requirements of Reading Borough Council. 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.

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.

63 - 86 Rowe Court, Grovelands Road, Reading, RG30 2HZ
Environmental Noise Time History
From 20 January 2023 To 23 January 2023

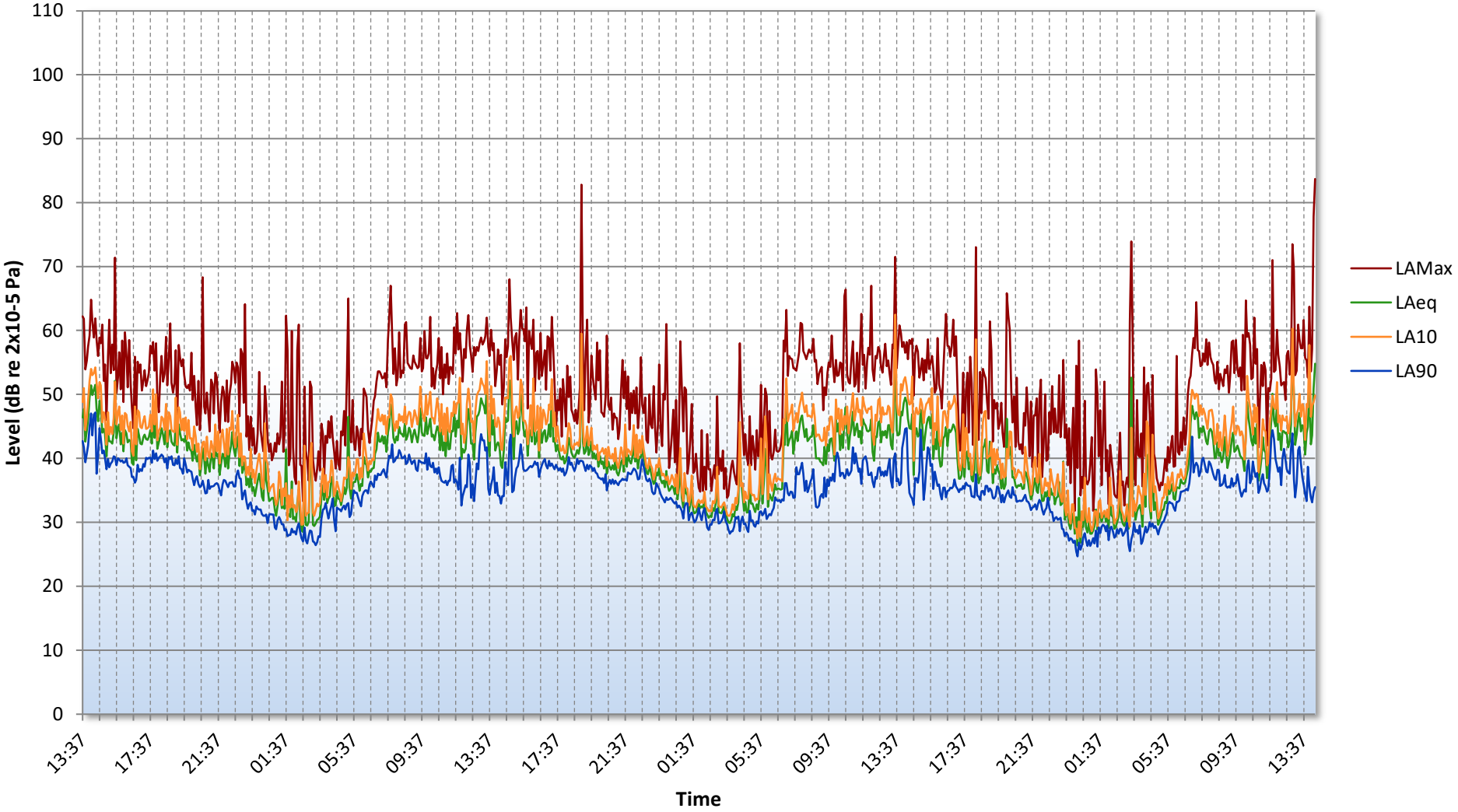

Figure 25747.TH1

63 - 86 Rowe Court, Grovelands Road, Reading, RG30 2HZ
Representative Daytime Background Noise Level
From 20 January 2023 To 23 January 2023

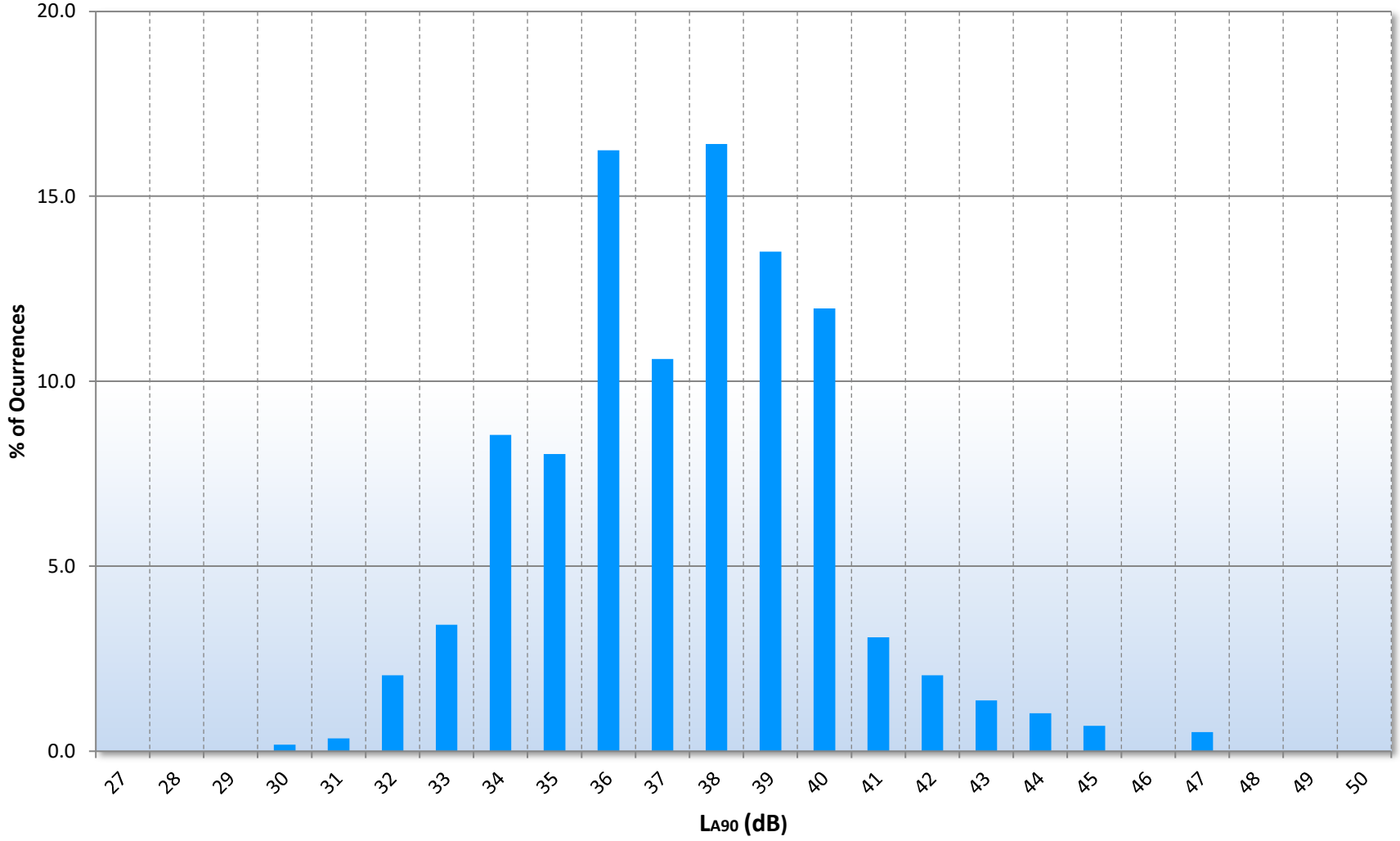

Figure 25747.L90

63 - 86 Rowe Court, Grovelands Road, Reading, RG30 2HZ
Representative Night-time Background Noise Level
From 20 January 2023 To 23 January 2023

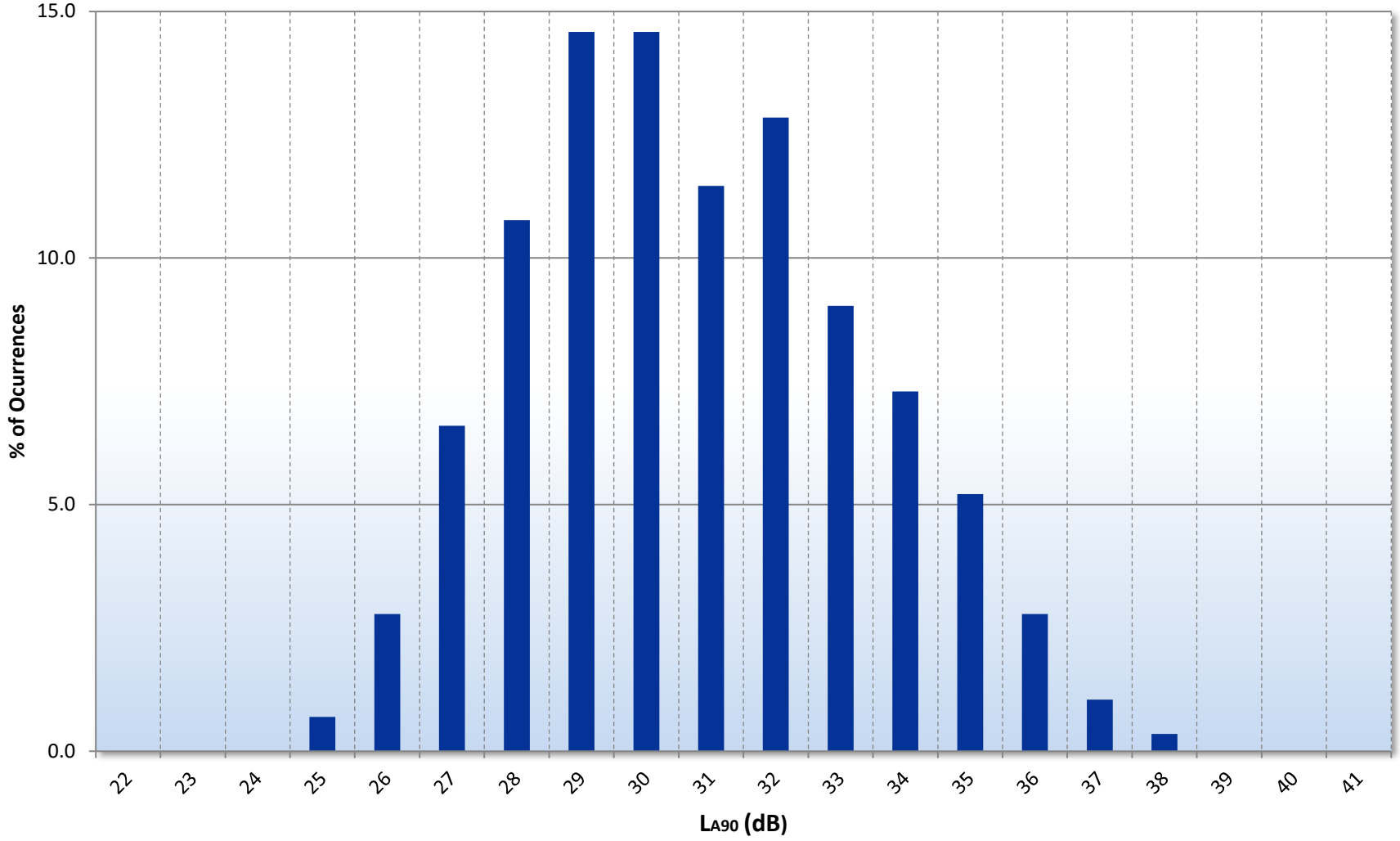

Figure 25747.L90

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

63 - 86 Rowe Court, Grovelands Road, Reading, RG30 2HZ

PLANT NOISE EMISSIONS CALCULATIONS

Source: Roof level plant at 63-86 Rowe Court **Receiver 1: 2nd Floor window at the façade of proposed building**	*Frequency, Hz*								*dB(A)*
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	
Samsung AE040RXEDEG/EU (Sound Pressure Level)	49	48	45	44	43	36	28	16	46
Correction due to number of units (24), dB	14	14	14	14	14	14	14	14	
Correction due to surface reflections (2), dB	6	6	6	6	6	6	6	6	
Minimum attenuation provided by the building envelope, dB	-12	-15	-18	-21	-24	-27	-30	-30	
Minimum attenuation provided by distance (7m), dB	-17	-17	-17	-17	-17	-17	-17	-17	
Sound Pressure Level at Receiver due to All Units, dB	**40**	**36**	**30**	**26**	**22**	**12**	**1**	**-11**	**28**

Design Criterion	**29**

APPENDIX B2

63 - 86 Rowe Court, Grovelands Road, Reading, RG30 2HZ

PLANT NOISE EMISSIONS CALCULATIONS

Source: Roof level plant at 63-86 Rowe Court **Receiver 2: 2nd Floor window at the façade of the existing building to the east of the site.**	***Frequency, Hz***								***dB(A)***
	63	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	
Samsung AE040RXEDEG/EU (Sound Pressure Level)	49	48	45	44	43	36	28	16	46
Correction due to number of units (24), dB	14	14	14	14	14	14	14	14	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-11	-14	-16	-19	-22	-25	-30	-30	
Minimum attenuation provided by distance (19m), dB	-26	-26	-26	-26	-26	-26	-26	-26	
Sound Pressure Level at Receiver due to All Units, dB	**29**	**26**	**20**	**16**	**12**	**2**	**-11**	**-23**	**18**

Design Criterion	**19**

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.