

KING'S POINT, READING

PLANNING COMPLIANCE REPORT

Report 14120.PCR.01.RevA

For:

CNM Estates Ltd.
Kingstons House
15 Coombe Road
Kingston Upon Thames, London
KT2 7AB

Site Address	Report Date	Revision History
King's Point, Reading RG1 3DA	26/09/2017	Original 13/09/2017 Revision A 26/09/2017

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List of Attachments

14120.PCR.SP1	Indicative Site Plan. Locations
14120.PCR.SP2.RevA	Indicative Site Plan. GroundFloor Plant Room Ground Installation
14120.PCR.SP3	Indicative Site Plan. Plant Roof Installation
14120.TH1	Environmental Noise Time History
Appendix A	Glossary of Acoustic Terminology
Appendix B Rev A	Acoustic Calculations
Appendix C	Anti-vibration mounting specification reference document

1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by CNM Estates Limited, Kingstons House, 15 Coombe Road, Kingston Upon Thames, London, KT2 7AB to undertake an environmental noise survey at King's Point, Reading. The background noise levels measured will be used to determine noise emission criteria for the installation of plant units at Ground Floor and Roof level of the proposed new building in agreement with the planning requirements of the 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 installation to satisfy the emissions criterion at the closest noise-sensitive receiver and outline mitigation measures as appropriate.

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

The automated noise monitoring location is shown in Site Plan 14120.PCR.SP1. The choice of this position was based both on accessibility, security and on collecting representative noise data in relation to the nearest noise sensitive receiver relative to the proposed plant installation. The duration of the survey was between 13:00 on 30/03/2016 and 13:00 on 31/03/2016. Manual noise measurements were also performed outside the North and South facades of the existing building at King's Point, Reading to obtain an impression of the current noise levels at all sides of the building.

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

The weather during the course of the survey was generally dry with wind speeds within acceptable tolerances and therefore suitable for the measurement of environmental noise. The measurement procedure generally complied ISO 1996-2:2007 Acoustics *"Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels"*

2.2 Equipment

The equipment calibration was verified before and after the survey and no calibration irregularities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 958 Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

The results from the continuous noise monitoring are shown as a time history of L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} averaged over 5 minute sample periods in Figure 14120.TH1.

The average L_{90} between 7:00 and 23:00 has been considered as a representative background noise level at the monitoring location during daytime while the average L_{90} between 1:00 and 05:00 was representative of the night-time period background noise level.

Representative background noise levels in the area are shown in Table 3.1

	Measured representative Background noise level L_{90} dB(A) at monitoring location
Daytime (07:00-23:00)	63
Night-time (23:00-07:00)	47

Table 3.1: Representative background noise levels.

4.0 NOISE CRITERIA

The noise emission criterion for new machinery as per the reading Borough Council follows the British Standard BS4142:2014 requirements and procedures. This standard state that if the noise rating level of the plant units at 1m from the receiver's façade is, at least, -10dB below the current representative L_{90} background noise in the area, there would not be adverse effects on the receiver due to the plant units noise emissions.

Based on the above requirement, we would propose the maximum noise emission criterion shown in Table 4.1.

Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
53 dB(A)	37 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

5.0 DISCUSSION

It is understood that there would be three plant rooms at Ground Floor that would contain ventilation systems discharging to the atmosphere and a plant roof installation. The layout of the

Ground Floor level plant rooms layout is shown in 14120.PCR.SP2.RevA while the plant roof installation distribution is shown in site plan 14120.PCR.SP3.

Two residential buildings have been identified as the potentially most affected noise sensitive receivers due to the noise emissions from the plant units installation:

- Receiver 1: First Floor Window, 95 King's Road, Reading located at 55m approximately from the discharge areas on the North façade of the proposed building.
- Receiver 2: First Floor window, Grantley Heights, Kennet Side located at 35m approximately from the discharge areas on the South façade of the proposed building.

Description of plant rooms layout, relevant noise generating machinery and affected receivers are shown in Table 5.1.

Proposed Plant installation	Discharge side	Affected receiver
Car Park Ventilation Fans. • 2 x PVE Extractor Fan with 1DENP silencer.	North Facade	Receiver 1
Plant Room Exhaust Fan. • Nuaire AX45C-23A3+09 with CA45S Silencer	North Facade	Receiver 1
Plant Room Supply Fan. • Nuaire AX45C-23A3+09 with CA45S Silencer	South Facade	Receiver 2
Roof Installation • AHU system air DV30 unit • SYSVRF Unit 335 • Mitsubishi PURY P900YSLM • Mitsubishi PURY P600YSLM.	South & North Facade	Receiver 1 and 2

Table 5.1 Relevant plant installation machinery and affected receivers.

As there is not direct line of sight from the discharge areas to the receivers due to the building envelope, a certain degree of acoustic attenuation is expected.

The units could be operating at any time. Therefore, so Table 4.1 worst case scenario being the night-time period would be considered as the limiting noise emission criterion for the proposed plant units.

The relevant noise generating machinery and their noise emission levels as per manufacturer's data are shown in Table 5.1.

Plant Unit	Descriptor	Octave Frequency Band (Hz)								Overall
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
PVE Extractor Fan outlet with 1DENP silencer	Induct SWL	74	75	68	64	61	64	65	62	71
Nuaire AX45C-23A3+09 Extractor Fan outlet	Induct SWL	86	93	86	84	79	74	69	66	85
Nuaire AX45C-23A3+09 Supply Fan inlet	Induct SWL	84	85	82	87	84	79	74	71	88
AHU system air DV30 unit. Discharge	SWL	61	58	60	49	37	29	30	37	53
SYSVRF Unit 335.	SPL at 1m	-	-	-	-	-	-	-	-	60
Mitsubishi PURY P900YSLM.	SPL at 1m	76	73	68	64	59	54	50	44	66
Mitsubishi PURY P600YSLM.	SPL at 1m	77	72	68	65	59	51	46	40	66

Table 5.2 Noise emission Levels as per manufacturer's data

Standby Generator

The installation of one standby diesel generator has been proposed at Ground Floor level, in the same plant room that would contain the car park extract fans. Due to the inherently exceptional use of standby generators, this unit is assessed separately from the rest of the units.

The discharge of the proposed diesel generator would be located next to the car park ventilation discharge on the North façade of the building as shown in 14120.PCR.SP2.RevA.

The exhaust system includes an IVECO N67 TE2A engine with inlet and discharge attenuators. As per manufacturer's specifications, the system is designed to achieve a noise level of 65 dB(A) at 90° off axis one metre from the discharge point in free field non-reverberant conditions.

5.1 Objective overview

Taking all acoustic corrections into consideration, the noise level expected at the identified noise sensitive receivers and according noise criterion are compared in Table 5.3. Detailed calculations are shown in Appendix B Rev A.

Source	Receiver - Nearest Noise Sensitive Window	Criterion	Noise level at 1m from receiver due to plant unit installation
• Car Park Ventilation Fans • Plant Room Exhaust Fan • Roof Installation	Receiver 1	37 dB(A)	27 dB(A)
• Plant Room Supply Fan	Receiver 2	37 dB(A)	37 dB(A)
• Standby Generator	Receiver 1	37 dB(A)	25 dB(A)

Table 5.3 Predicted noise level and criterion at nearest noise sensitive locations

As shown in Appendix B Rev A and Table 5.3, transmission of noise to the nearest sensitive windows due to the effects of the plant installation fully satisfies the proposed criterion provided that the proposed silencer CA45S for the inlet of the plant room supply fan is substituted for a CA45L silencer.

Further calculations have been undertaken to assess whether the noise emissions from the plant unit would be expected to meet the recognised British Standard BS8233:2014 recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

Calculated external levels are to be considered outside of the building. Windows may be closed or partially closed leading to further attenuation. According to BS8233:2014, even a partially open window offers 10-15dB attenuation, thus leading to a further reduced interior noise level.

Source	Receiver Nearest Noise Sensitive Window	Design Criterion – Based on BS8233:2014 internal ambient noise levels recommendations	Noise level inside receiver due to plant unit installation
• Car Park Ventilation Fans • Plant Room Exhaust Fan • Roof Installation	Receiver 1	≤ 30 dB(A) in residential unit bedrooms	17 dB(A)
• Plant Room Supply Fan	Receiver 2		27 dB(A)
• Standby Generator	Receiver 1		15 dB(A)

Table 5.4: Noise levels and criterion inside nearest residential units

Predicted levels are shown in Table 5.4, with detailed calculations shown in Appendix B Rev A. It can therefore be stated that, as well as complying with the set criterion, the emissions from the plant units would be expected to comfortably meet the most stringent recommendations of the relevant British Standard.

6.0 CONCLUSION

An environmental noise survey has been undertaken at King's Point, Reading, RG1 3DA, by KP Acoustics Ltd between 30/03/2016 and 31/03/2016.

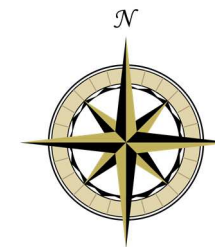
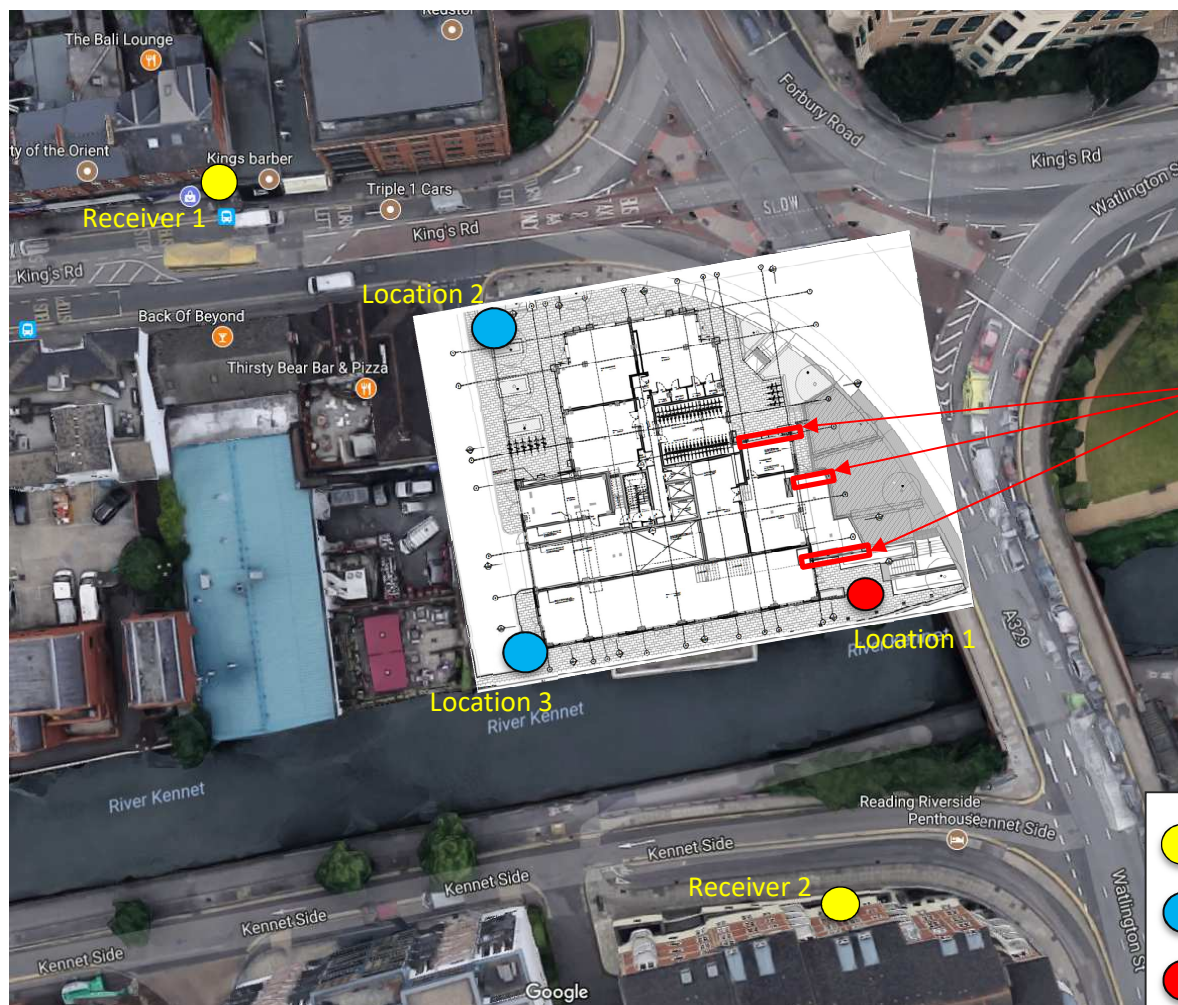
The results of the survey have enabled criteria to be set for noise emissions. Using manufacturer noise data, noise levels are predicted at the nearby noise sensitive receivers for compliance with current requirements.

Calculations show that noise emissions from the proposed plant unit installation would meet the Reading Borough Council noise requirements provided that the proposed silencer CA45S for the inlet of the plant room supply fan is substituted for a CA45L silencer.

Further calculations have been undertaken with regards to the relevant British Standard and it has been ensured that the amenity of nearby noise sensitive receivers will be protected.

Report by
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Checked by
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Plant Room air discharge and intake areas which would represent a new noise source in the environment.

There would be plant units on the roof above the 16th floor

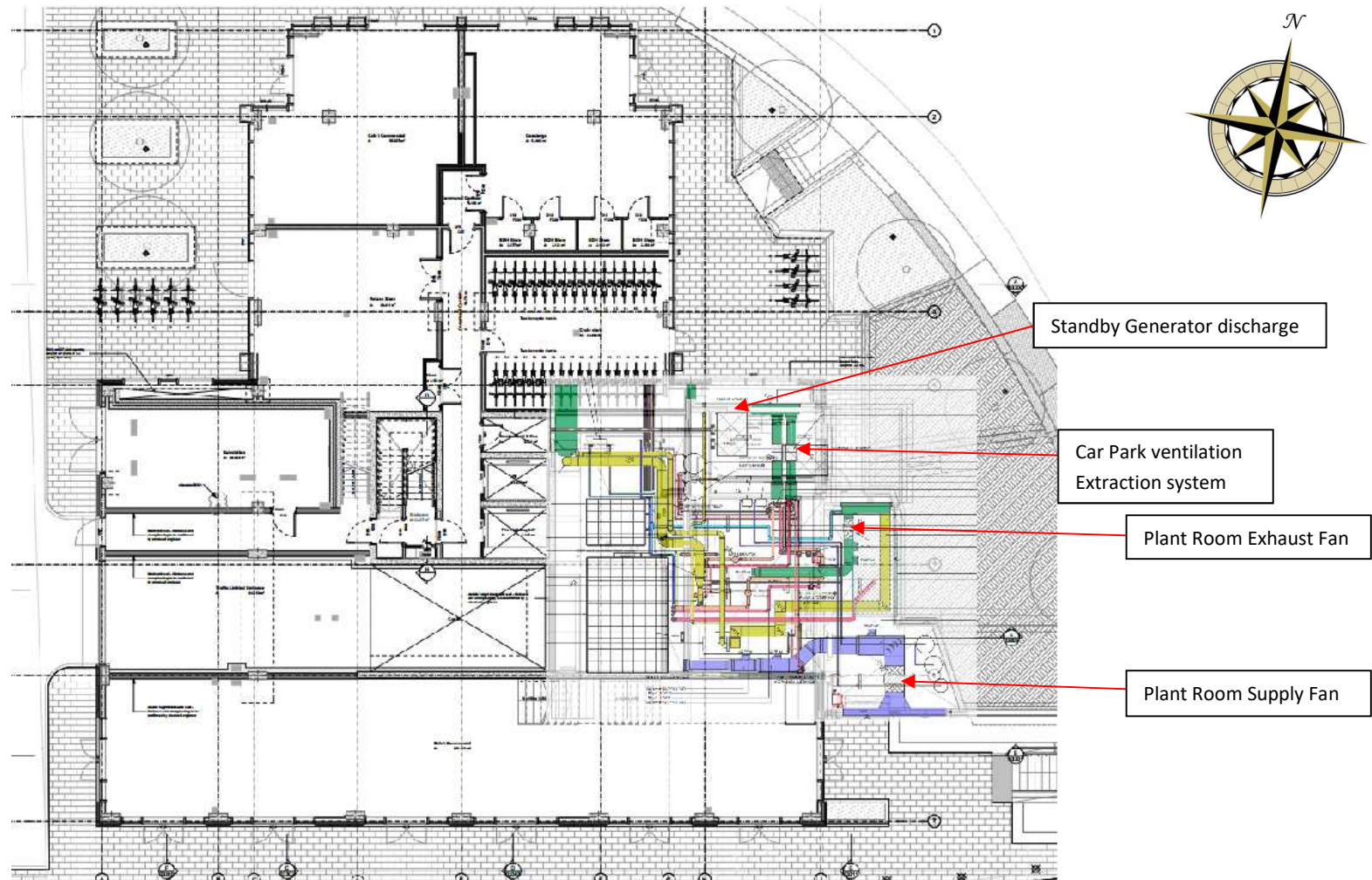
- Closest Noise sensitive receiver
- Noise Manual Measurements
- 24h Noise monitoring position

Title: Indicative site picture showing manual noise measurements, unattended monitoring location and closest noise sensitive receiver. Source: Google maps & Gerathy Taylor architectural drawing

Date: 13 September 2017

FIGURE 14120.PCR.SP1





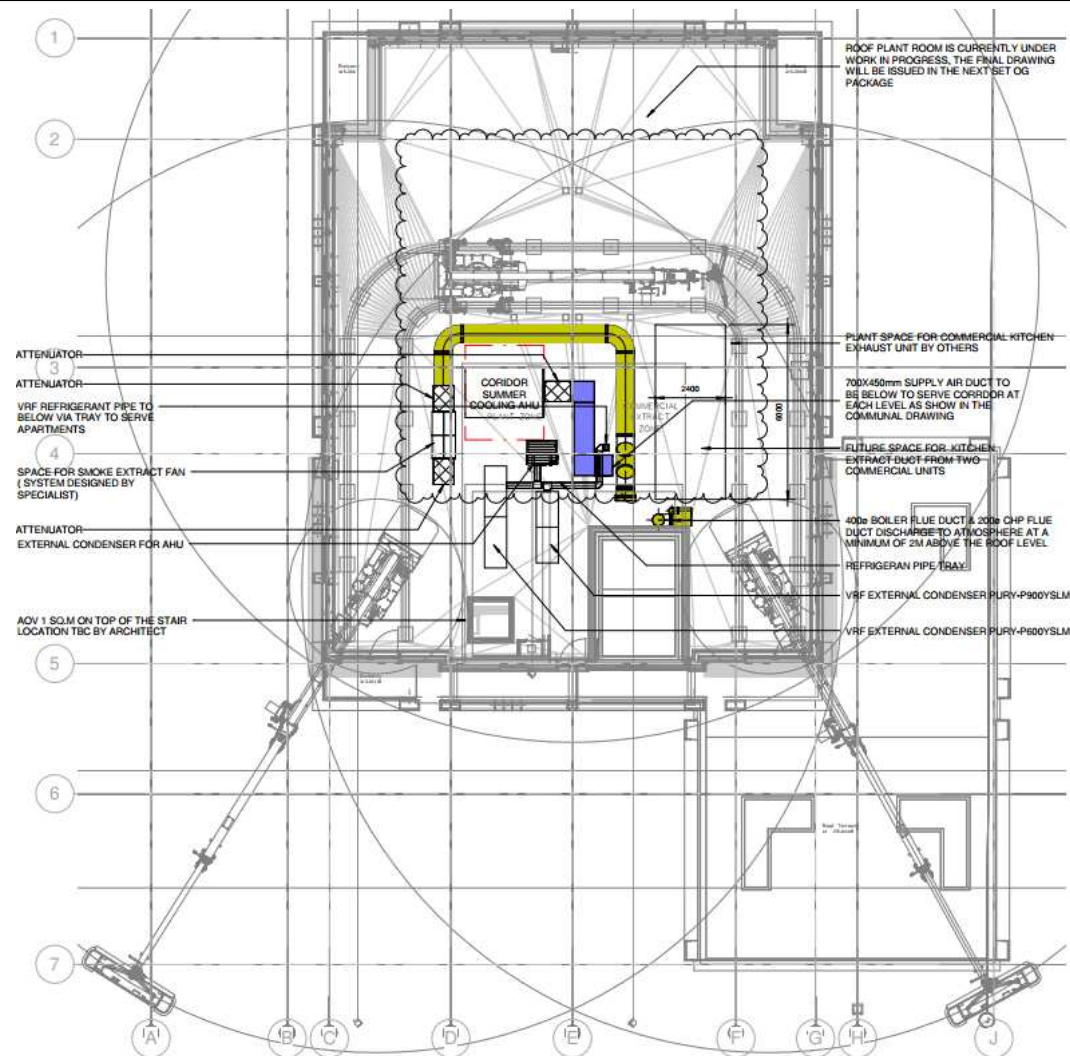
Title: Indicative site picture showing Ground Floor Plant Room layout.

Date: 26 September 2017

Revision: A

FIGURE 14120.PCR.SP2





Title: Indicative site picture showing the proposed plant roof installation.

Date: 13 September 2017

FIGURE 14120.PCR.SP3



King's Point, Reading
Environmental Noise Time History
30th to 31st March 2016

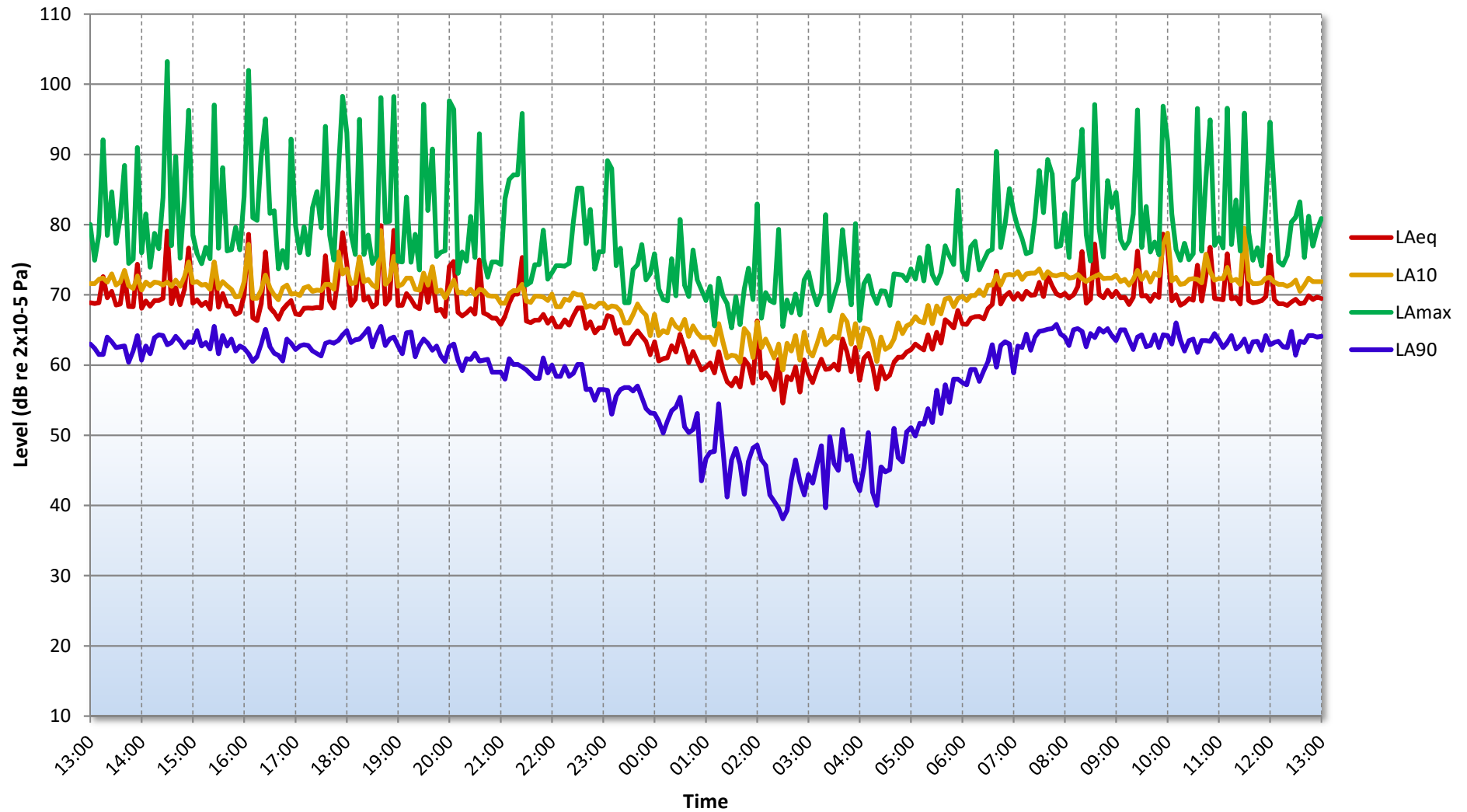


Figure 14120.TH1

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.

PLANT UNIT EMISSIONS CALCULATIONS. NORTH FACADE

Receiver: First Floor Window, 95 King's Road, Reading

Receiver: Inside First Floor Window, 95 King's Road, Reading

Source: Plant rooms discharging on King's Point North Facade Receiver: Inside First Floor Window, 95 King's Road, Reading	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside bedroom window	-	-	-	-	-	-	-	-	27
Minimum attenuation from partially open bedroom window, dB	-10	-10	-10	-10	-10	-10	-10	-10	-10
Maximum Sound pressure level inside receiver due to source	-	-	-	-	-	-	-	-	17
					BS8233 Design Criterion			30	

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.