

Tel: +44(0)208 222 8778

Fax: +44(0)208 2228575

Email: info@kpacoustics.com

www.kpacoustics.com

THE EASY HOTEL, 132-138 CAVERSHAM ROAD, READING

PLANNING COMPLIANCE REPORT

Report 17219.PCR.01

For:

TW Construct Ltd.

Stowe House

15 Beeche Waye

Gerrards Cross SL9 8BL

Site Address	Report Date	Revision History
The Easy Hotel, 132-138 Caversham Road, Reading, RG1 8AY	03/04/2018	-

CONTENTS

1.0	INTRODUCTION	2
2.0	ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT	2
2.1	Procedure	2
2.2	Equipment	2
3.0	RESULTS	3
4.0	NOISE CRITERIA	3
5.0	DISCUSSION	4
5.1	Objective overview	4
5.2	Noise Control Strategy	5
5.3	BS8233 Assessment	5
6.0	CONCLUSION	6

List of Attachments

17219. SP1	Indicative Site Plan
17219. TH1	Environmental Noise Time History
Appendix A	Glossary of Acoustic Terminology
Appendix B	Acoustic Calculations

1.0 INTRODUCTION

KP Acoustics Ltd, 1 Galena Road, London, W6 0LT has been commissioned by TW Construct Ltd., Stowe House, 15 Beeche Way, Gerrards Cross, SL9 8BL to undertake an environmental noise survey at 132-138 Caversham Road, Reading, RG1 8AY. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for an external plant unit installation in agreement with 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 and outline mitigation measures as appropriate.

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

Automated noise monitoring was undertaken at the site as shown in in Site Plan 17219.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 proposed plant installation.

The duration of the survey was between 18:03 on 23/03/2018 and 18:03 on 25/03/2018.

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of a quiet residential area.

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 complied with 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 957 Class 1 Sound Level Meter
- 1 No. Svantek External Windshield
- 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 17219.TH1.

Minimum background noise levels are shown in Table 3.1.

	Minimum background noise level $L_{A90: 5min}$ dB(A)
Daytime (07:00-23:00)	38
Night-time (23:00-07:00)	28

Table 3.1: Minimum measured background noise levels

4.0 NOISE CRITERIA

The following planning condition has been applied by Reading Borough Council:

10. No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted to and approved in writing by the Local Planning Authority. The assessment shall be carried out in accordance with BS4141:2014 methodology. The predicted specific sound level ($L_{Aeq, TR}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing sound level, $LA_{90,T}$ when all plant / equipment (or any part of it) is in operation. The predicted rating level, $L_{ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the existing background sound level, $LA_{90,T}$ when all plant / equipment (or any part of it) is in operation. The plant shall thereafter only be installed and maintained in accordance with the assessment.

We therefore propose to set the noise criteria as shown in Table 4.1 in order to comply with the above requirements. As the unit could be operational at any time of the day, the night-time minimum background noise level (LA_{90}) has been used to derive the noise emission criterion.

	Daytime 07:00-23:00
Noise criterion at nearest residential receiver (10dB below minimum L_{A90})	18 dB(A)

Table 4.1: Proposed noise emissions criterion

5.0 DISCUSSION

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

- 1 no. Daikin VRV RYYQ10T
- 1 no. Daikin VRV RYYQ12T
- 1 no. Daikin VRV RYYQ14T

The installation location for the condensers, as shown in indicative site plan 17219.SP1 is understood to be within the external screened plant area.

The closest noise sensitive receiver to the aforementioned location has been identified as being a residential window to the rear of 130 Caversham Road, Reading at an approximate distance of 15 meters away.

The sound pressure level as provided by the manufacturer for the proposed 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
Daikin VRV RYYQ10T (Continuous Heating)	62	65	57	58	51	48	41	35
Daikin VRV RYYQ12T (Continuous Heating)	59	66	60	62	58	50	44	37
Daikin VRV RYYQ14T (Continuous Heating)	65	67	64	59	54	50	47	39

Table 5.1 Sound Pressure Levels at 1m as per manufacturer's datasheet.

5.1 Objective overview

Taking all acoustic corrections into consideration, the noise level contribution expected at the closest residential windows from the external condenser units would be as shown in Table 5.2. Detailed calculations are shown in Appendix B.

Receiver - Nearest Noise Sensitive Window	Criterion	Noise Level at Receiver (Residential Window)
Operating hours of plant	18 dB(A)	18 dB(A)

Table 5.2: Predicted noise level and criterion at nearest noise sensitive location

5.2 Noise Control Strategy

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the external plant unit installation fully satisfies the requirements of Reading Borough Council provided that the proposed plant screen is installed as per Drawing No. 4132-WD-432-Revision A as provided by Axiom Architects.

A typical screen of this make/model would be anticipated to provide the attenuation figures shown in Table 5.3, combining the screen's properties in terms of its dimensions and inclusion of louvres.

Mitigation Type	Predicted attenuation (dB) in each Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Acoustic Screen	6	6	10	10	12	12	12	12

Table 5.3 Predicted spectral attenuation from proposed plant screen

5.3 BS8233 Assessment

Furthermore, the highest value of 18dB(A) is to be considered outside of the building. 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.

With a calculated external level of 18dB(A), the residential window itself would need to provide no additional attenuation in order for the recommended internal noise conditions to be achieved during daytime hours. 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 – For resting/sleeping conditions in a bedroom, in BS8233:2014	Noise Level at Receiver (due to plant installation)
Inside Nearest Residential Space	30dB(A)	Non-significant

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 Reading Borough Council,

the noise emissions from the plant unit installation 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 132-138 Caversham Road, Reading, RG1 8AY, by KP Acoustics Ltd between 18:03 on 23/03/2018 and 18:03 on 25/03/2018. The results of the survey have enabled criteria to be set for noise emissions.

Using noise data measured on site, noise levels are predicted at the nearby noise sensitive receivers for compliance with current requirements.

Calculations show that noise emissions from the proposed external plant units would meet the requirements of Reading Borough Council without the need of any further noise control strategy.

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.

Report by

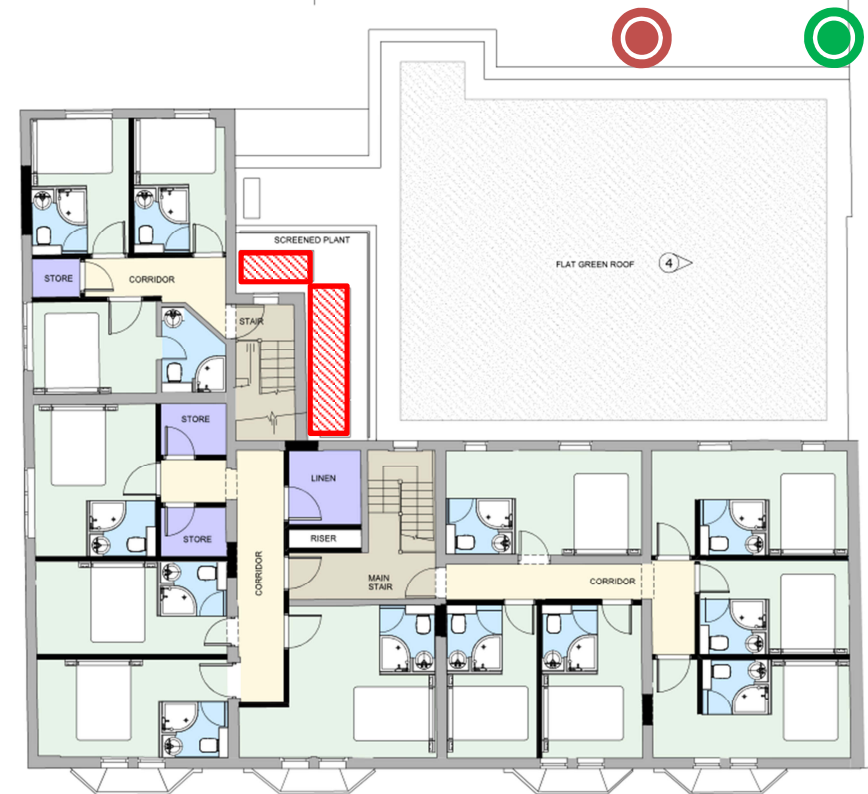
Aidan Tolkien AMIOA

KP Acoustics Ltd

Checked by

Kyriakos Papanagiotou MIOA

KP Acoustics Ltd



The closest noise sensitive receiver to the external VRV units would be a window of a residential property overlooking the rear of the hotel at an approximate distance of 15 metres away.

-  External VRV units
-  Noise Survey Monitoring Position
-  Closest noise-sensitive receiver

Title:

Indicative site plan showing noise monitoring position
(Image Source: Axiom Architects)

Date: 03 April 2018

FIGURE 17219.SP1



The Easy Hotel, Caversham Road, Reading
Environmental Noise Time History
From 23 March 2018 To 25 March 2018

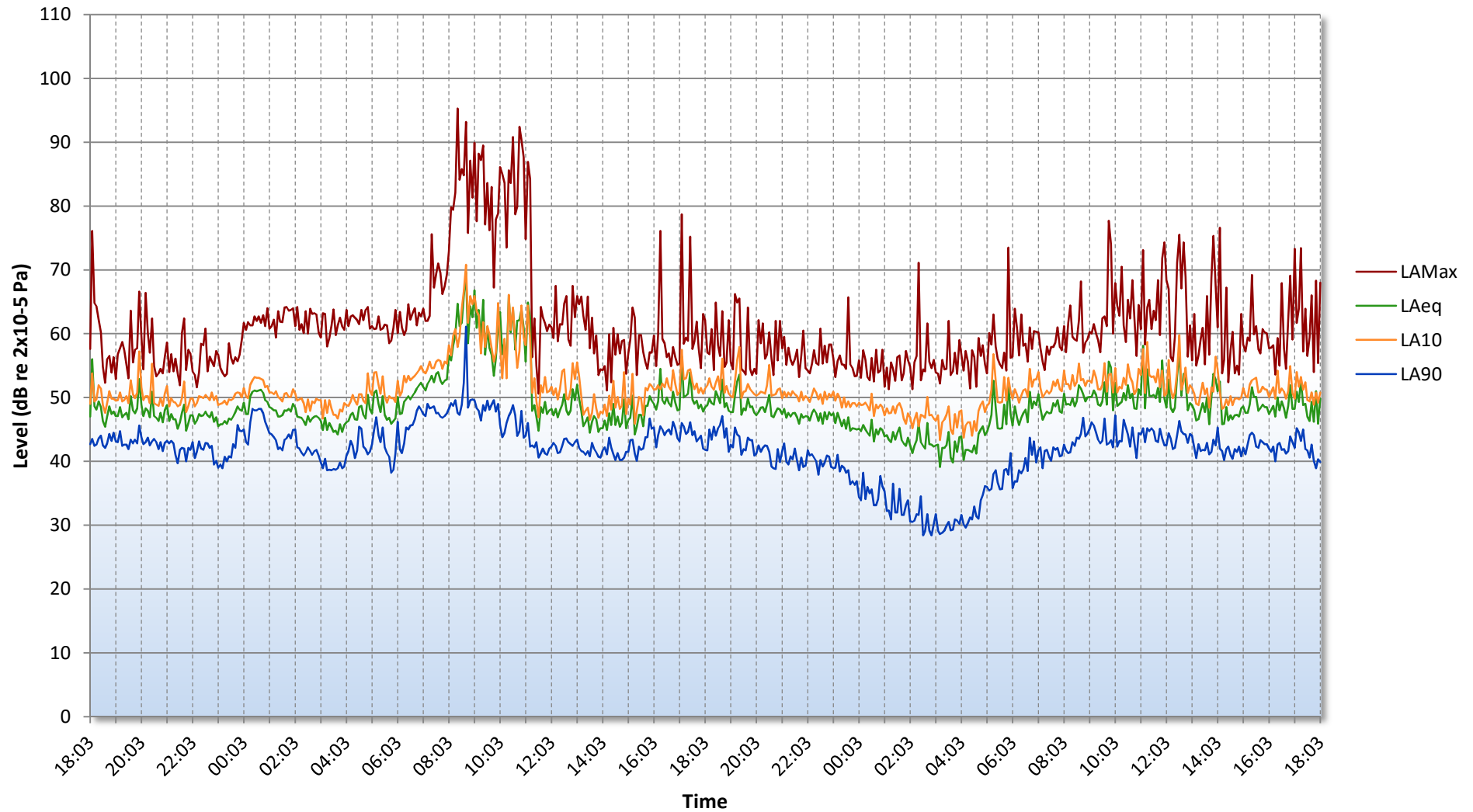


Figure 17219.TH1

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.

CONDENSER UNIT EMISSIONS CALCULATIONS

Design Criterion	18
------------------	----

Receiver: Inside Nearest Residential Window									
	<i>Frequency, Hz</i>								
Source: External Plant Units	63	125	250	500	1k	2k	4k	8k	<i>dB(A)</i>
Sound pressure level outside window									18
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest noise sensitive window									8