KP Acoustics Ltd
1 Galena Road
London
W6 0LT

Tel: +44(0)208 222 8778
Fax: +44(0)208 222 8575
Email: info@kpacoustics.com
www.kpacoustics.com

SAFFRON HOUSE

6-10 KIRBY STREET, LONDON

PLANNING COMPLIANCE REVIEW

Report 17715.PCR.01 Rev B

For:

Morgan Lovell

16 Noel Street

London

W1F 8DA

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Revision History **Report** 17715.PCR.01			
A	**16/07/18** Revision of plant installation location with updated calculations	D	
B	**06/11/18** Revision of council's criterion and proposed noise mitigation measures	E	
C		F	

Written by:	Checked by:	Approved by:
Ben Ford AMIOA Junior Acoustic Consultant	**Daniel Green MIOA** Acoustic Consultant	**Kyriakos Papanagiotou MIOA** Managing Director

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1.0 INTRODUCTION

KP Acoustics has been commissioned by Morgan Lovell, 16 Noel Street, London, W1F 8DA, to undertake an environmental noise survey at Saffron House, 6-10 Kirby Street, London. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for a proposed Air Conditioning Unit 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 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

The site is bounded by residential properties to the North, Kirby Street to the West, residential and commercial properties to the South, and Saffron Hill to the East. Entrance to the site is located on Kirby Street. 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. 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 08:58 on 12/06/2018 and 08:42 on 13/06/2018.

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
Noise Measurement Position 1 (MP.1)	The meter was installed on a balcony on the 4th floor of the western façade, as shown in Figure 2.1. A correction of 3dB has been applied to account for non-free field conditions

Table 2.1 Measurement position and description

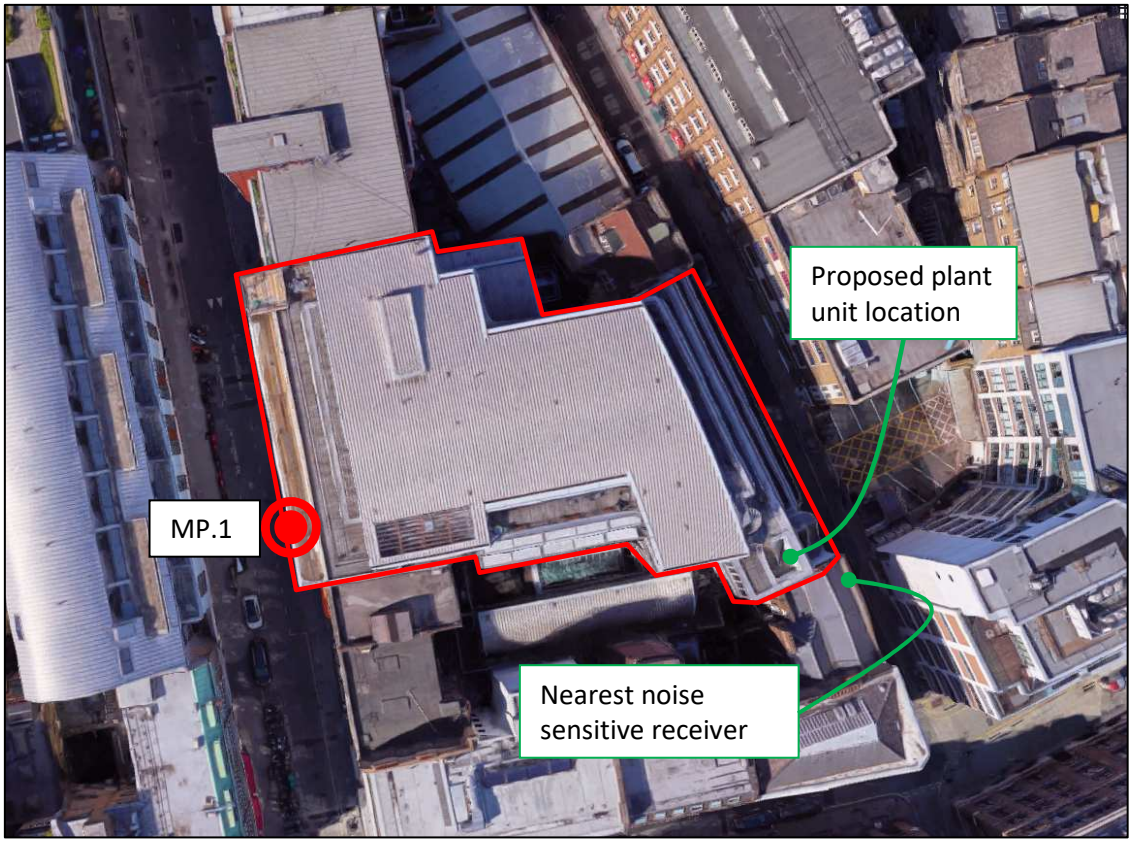

Figure 2.1 – Site Measurement position (Image Source: Google Maps)

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
Kit 12: Svantek Type 977 Class 1 Sound Level Meter
Svantek 2v12L free-field microphone
B&K Type 4231 Class 1 Calibrator
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 17715.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 $L_{Aeq,16hour}$	45	57
Night-time $L_{Aeq,8hour}$	44	55

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:

"The proposed plant and machinery shall be operated so as to ensure that any noise generated is "not audible" outside the nearest noise sensitive premises. To demonstrate inaudibility, you will need to provide calculations that show that the plant noise level is 10dBA below the lowest background level (LA90 (15minutes)) 1m from the nearest noise sensitive window, over the proposed operating hours."

4.3 Noise Emissions Criterion

As the proposed air conditioning unit 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 effecting 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})	34 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:

- 1 No. Daikin REYQ8T
- 2 No. Daikin REYQ16T
- 1 No. Daikin REYQ20T

The proposed installation location for the Air Conditioning Units will be on the south east corner of the 4th floor balcony.

The closest noise sensitive receiver to the proposed installation location has been identified as being a top floor window of The One Tun pub, located approximately 11 metres from the

proposed plant installation location. Please note that the proposed plant unit would be out of line of site of the receiving window due to screening from the building envelope.

The sound power levels as provided by the manufacturer for the units are shown in Table 5.1.

	Sound Power Level (dB) in each Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Daikin REYQ8T	77	77	78	76	73	66	64	59
Daikin REYQ16T	87	87	86	85	84	74	70	65
Daikin REYQ20T	87	87	87	87	83	77	73	69

Table 5.1 Manufacturers Sound Power levels

5.2 Objective Overview

Taking all acoustic corrections into consideration, the noise level contribution expected at the closest residential window from the air conditioning unit 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 floor window of The One Tun pub	34dB(A)	33dB(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 air conditioning unit installation satisfies the emissions criterion of BS4142:2014 and the Local Authority, providing that the mitigation measures outlined in Section 5.3 are implemented.

5.3 Noise Mitigation Proposals

In order to control noise emissions from the air conditioning units to meet the noise emissions criterion, louvered screens should be installed between the units and the road Saffron Hill. These screens should provide minimum insertion loss values as shown in Table 5.3.

	Insertion Loss (dB) in each Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Louvered Barrier	5	7	10	12	14	16	13	12

Table 5.3 Required insertion loss of acoustic louvres

The attenuation figures shown above can be achieved with a louvered screen with a depth of 300mm.

5.4 BS8233 Assessment

The highest value of 33dB(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 sleeping conditions during night-time hours.

With a calculated external level of 33dB(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.

Receiver	**Design Range** – ***For resting/sleeping conditions in a bedroom during night-time, in BS8233:2014***	**Noise Level at Receiver (due to plant installation)**
Top floor window of The One Tun pub	30dB(A)	18-23dB(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 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.

6.0 CONCLUSION

An environmental noise survey has been undertaken at Saffron House, 6-10 Kirby Street, London by KP Acoustics Ltd between 08:58 on 12/06/2018 and 08:42 on 13/06/2018. 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 air conditioning unit installation would meet the requirements of the London Borough of Camden, providing that the mitigation measures outlined in Section 5.3 are implemented. 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.

Saffron House, 6-10 Kirby Street, London
Environmental Noise Time History
From 12 June 2018 To 13 June 2018

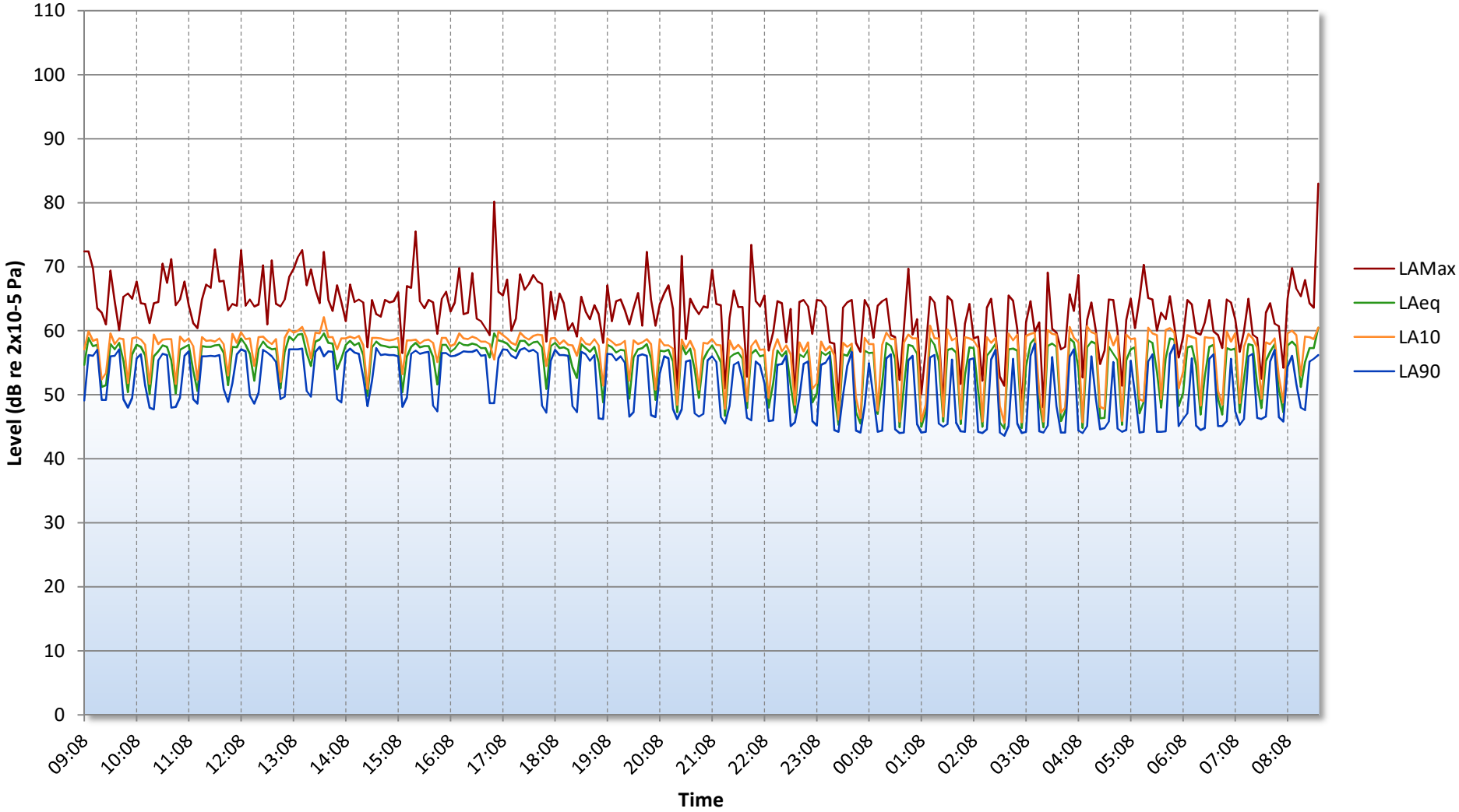

Figure 17715.TH1

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.Rev A

Saffron House, 6-10 Kirby Street, London

PLANT NOISE EMISSIONS CALCULATIONS

Source: Air Conditioning Unit Installation	*Frequency, Hz*								
Receiver: Top floor window of Arlidge House	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Daikin REYQ8T (Sound Power Level)	77	77	78	76	73	66	64	59	
Conversion to SPL at 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 due to building envelope, dB	-10	-13	-16	-19	-22	-25	-28	-31	
Minimum attenuation provided by distance (11m), dB	-21	-21	-21	-21	-21	-21	-21	-21	
Noise at receiver due to Daikin REYQ8T	*38*	*35*	*33*	*28*	*22*	*12*	*7*	*-1*	*30*
Daikin REYQ16T (Sound Power Level)	87	87	86	85	84	74	70	65	
Conversion to SPL at 1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to number of units (2)	3	3	3	3	3	3	3	3	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation due to building envelope, dB	-10	-13	-16	-19	-22	-25	-28	-31	
Minimum attenuation provided by distance (11m), dB	-21	-21	-21	-21	-21	-21	-21	-21	
Noise at receiver due to Daikin REYQ16T	*51*	*48*	*44*	*40*	*36*	*23*	*16*	*8*	*42*
Daikin REYQ20T (Sound Power Level)	87	87	87	87	83	77	73	69	
Conversion to SPL at 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 due to building envelope, dB	-10	-13	-16	-19	-22	-25	-28	-31	
Minimum attenuation provided by distance (11m), dB	-21	-21	-21	-21	-21	-21	-21	-21	
Noise at receiver due to Daikin REYQ20T	*48*	*45*	*42*	*39*	*32*	*23*	*16*	*0*	*40*
Attenuation from proposed barrier	*-5*	*-7*	*-10*	*-12*	*-14*	*-16*	*-13*	*-12*	
Sound Pressure Level at Receiver due to All Units, dB	**48**	**43**	**37**	**31**	**24**	**11**	**7**	**-3**	**33**

Criterion	**34**

Receiver: Inside Nearest Residential Window

Source: Extraction Unit	*Frequency, Hz*								
	63	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window									33
Minimum attenuation from partially open window, dB									-10
Sound pressure level inside nearest noise sensitive window									**23**