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5 PILGRIMS LANE,
HAMPSTEAD, LONDON

NOISE IMPACT ASSESSMENT

Report **16850-NIA-01**

Prepared on 22 June 2021

Issued For:

Portner Law Limited

Executive Summary

This noise impact assessment has been undertaken in order to assess a proposed plant installation for residential use at 5 Pilgrims Lane, Hampstead, London NW3 1SJ.

The proposed plant installation comprises the following plant units:

- 2 No. Daikin RXA35A Condenser Units.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with the requirements of the London Borough of Camden.

Calculations were undertaken for the nearest identified receiver, identified as the adjacent residential property to the south, understood to be 3 Pilgrims Lane. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that the amenity of residential receivers can be suitably protected, dependant on the following material considerations:

- The plant could be in use at any time over a 24 hour period
- The noise emissions data for the proposed units as obtained from available manufacturer information
- Plant and receiver locations are as established in this report and marked on the attached site plan
- Mitigation is applied as recommended in this report, in the form of an acoustic enclosure

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

This report is designed to be suitable to discharge typical plant noise planning conditions, as per our original scope of work. The report should not be relied upon for further reasons, such as the detailed design of mitigation measures.

Contents

List of Attachments

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	22/06/2021	First Issue	Duncan Martin MIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Portner Law Limited to measure existing background noise levels at 5 Pilgrims Lane, Hampstead, London NW3 1SJ. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation in agreement with the planning requirements of the London Borough of Camden.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site is in a largely residential area in Hampstead, with residential dwellings to either side, Pilgrims Lane to the front and Rosslyn Hill Chapel located to the rear. The surrounding area is predominantly residential in nature.

Current proposals are to install two Daikin condenser units for residential use, on the south façade of 5 Pilgrims Lane, at ground floor level.

The residential dwelling located immediately to the south, understood to be 3 Pilgrims Lane has been identified as the nearest affected receiver. This nearest noise sensitive receiver was identified through observations on-site. If there are any receivers closer to that identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receiver should be confirmed by the client before the plant is installed or any noise mitigation measures are implemented.

Locations are shown in attached site plans 16850-SP1 & SP2.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 16850-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The surroundings and position used for the monitoring location are described in Table 3.1.

Position No.	Description
1	The microphone was mounted on a tripod at the south side of 5 Pilgrims Lane, close to the residential boundary. The microphone was positioned 1.5 m above ground. [1]

Table 3.1: Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 14:10 on 10 June 2021 and 11:50 on 14 June 2021.

The measurement procedure generally complied with BS 7445: 1991: '*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*'.

3.2 Weather Conditions

At the time of set-up and collection of the monitoring equipment, the weather conditions were dry with light cloud coverage and low wind speeds. It is understood that the weather conditions during the unattended survey were dry with light winds.

It is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 958 Class 1 Sound Level Meter
- Rion Type NC-74 Class 1 Calibrator

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured at the location shown in site drawing 16850-SP1.

Measured noise levels are shown as a time history in Figure 16850-TH1, with typical background noise levels summarised in Table 4.1.

It should be noted that the guidance of the latest revision of British Standard 4142: 2014 'Methods for rating and assessing industrial and commercial sound' (which is referenced in Appendix 3 of the Camden Local Plan) detailed in Section 8.1 of the standard is as follows:

'The objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.'

Therefore, the typical background noise level will be used for the purpose of this assessment.

Time Period	Typical background noise level $L_{90: 5min}$
Daytime (07:00 - 23:00)	35 dB(A)
Night-time (23:00 - 07:00)	28 dB(A)

Table 4.1: Typical background noise levels

5.0 NOISE CRITERIA

The London Borough of Camden general criteria for noise emissions have been derived from Appendix 3 of the Camden Local Plan as follows:

> *"The 'A' weighted sound pressure level from the plant, when operating at its noisiest, shall not at any time exceed a value of 10 dB below the external background noise, at a point 1 metre outside any window of any residential property, assessed according to the guidance of BS 4142: 2014.*
>
> *Where the source noise contains tones, noise emissions should not at any time exceed a value of 15 dB below the external background noise."*

It is understood that the proposed plant units will be for residential use and could therefore be operational at any time.

Based on the results of the environmental noise survey, the requirements of the London Borough of Camden and the nature of the proposed plant, Table 5.1 presents the proposed plant noise emission criteria to be achieved at 1 m from the nearest noise sensitive receiver.

Period	Plant Noise Emission Limit $L_{eq:T}$
Daytime (07:00 - 23:00)	25 dB(A)
Night-time (23:00 - 07:00)	18 dB(A)

Table 5.1: Plant noise emission limits

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following:

- 2 No. Daikin RXA35A condenser units

Noise emissions for the proposed plant units, as provided by the manufacturer, are shown in Table 6.1. Loudest modes of operation have been used in order to present a robust worst-case assessment.

Plant Unit	Sound Pressure Levels (at 1 meter, dB) in each Frequency Band								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Daikin RXA35A Condenser Unit	51	53	52	47	43	39	35	27	49

Table 6.1: Manufacturer provided noise emissions levels

The proposed plant location is on the south facing side elevation of 5 Pilgrims Lane, at ground floor level, which is shown on indicative site plan 16850-SP2.

6.2 Proposed Mitigation Measures

In order to reduce noise as far as is practicable, it is recommended that an enclosure is installed around the plant. The enclosure should provide sufficient attenuation to achieve a maximum cumulative sound pressure level of 33 dB(A) when measured at 1 m in all directions and accounting for reflections.

Based on the information provided, an enclosure meeting the sound reduction indices as stated in Table 6.2 should be suitable to achieve this.

Mitigation	*Required Attenuation (dB) in each Frequency Band*							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Louvred Enclosure	14	16	23	30	37	39	38	39

Table 6.2: Required attenuation from mitigation

6.3 Noise Impact Assessment

The closest receiver has been identified as the window on the rear facade of a residential property to the south which is a minimum of 3.5 m from the proposed plant location.

Although there is a solid boundary wall, windows higher up the rear façade of the receiver building will overlook the plant location and direct line of sight is therefore assumed.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.3. Detailed calculations are shown in Appendix B.

Receiver	Night-Time Hours Criterion	Noise Level at Receiver (due to proposed plant)
Nearest Residential Property	18 dB(A)	22 dB(A)

Table 6.3: Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.3 and Appendix B, the proposed plant installation with acoustic enclosure would be expected to marginally exceed the Local Authority criterion.

However, it is noted that a predicted receiver noise level of 22 dB(A) is considered particularly low. BS 4142: 1997 states that *'rating levels below about 35 dB are considered to be very low'*. We would therefore not expect a negative impact on the amenity of residential receivers, provided acoustic enclosures are used as specified in this report.

The amenity of the residential receiver will be further investigated through the use of the relevant British Standard as shown in Section 6.4.

6.4 British Standard Requirements

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

British Standard 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 30 dB(A) as being acceptable internal sleeping conditions during night-time.

With loudest external levels of 22 dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, although marginally exceeding the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.4.

Receiver	Recommended Target – *For sleeping conditions in a bedroom, in BS 8233: 2014*	Noise Level at Receiver (due to plant installation)
Inside Residential Window	30 dB(A)	Negligible

Table 6.4: Noise levels and BS 8233: 2014 criteria inside nearest residential space

7.0 CONCLUSION

An environmental noise survey has been undertaken at 5 Pilgrims Lane, Hampstead, London NW3 1SJ. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of the London Borough of Camden.

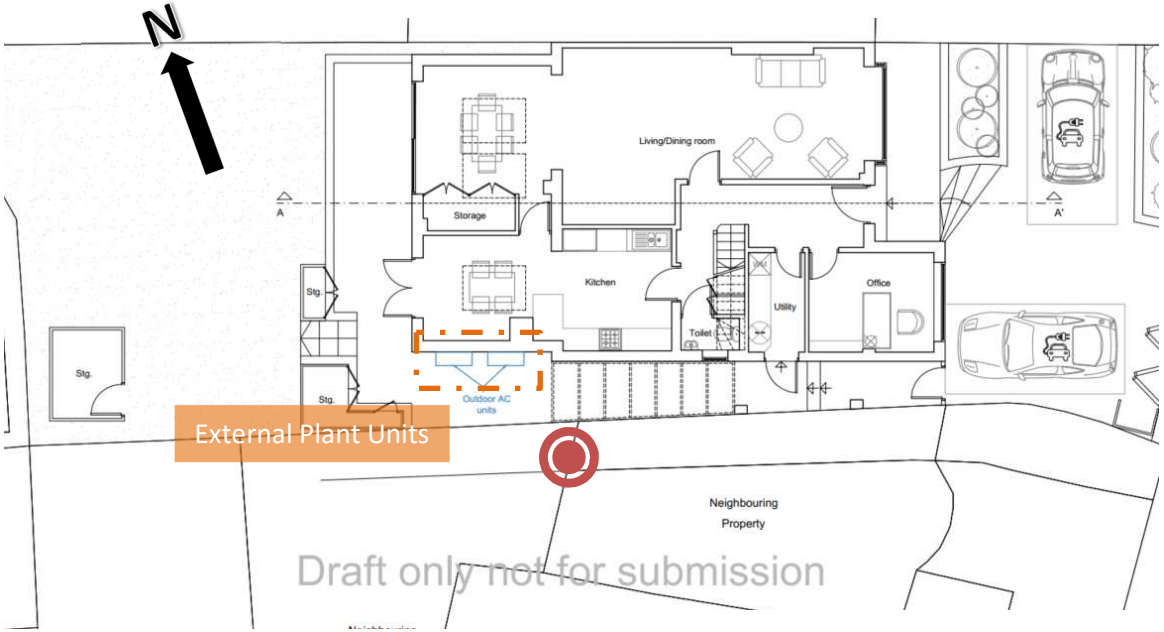
A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed units marginally exceed the requirements of the Local Authority. However, with suitable acoustic enclosures, receiver levels are such that no negative impact on the amenity of residential receivers is anticipated. This has been further investigated by comparison of internal levels with the guidance of the relevant British Standard.

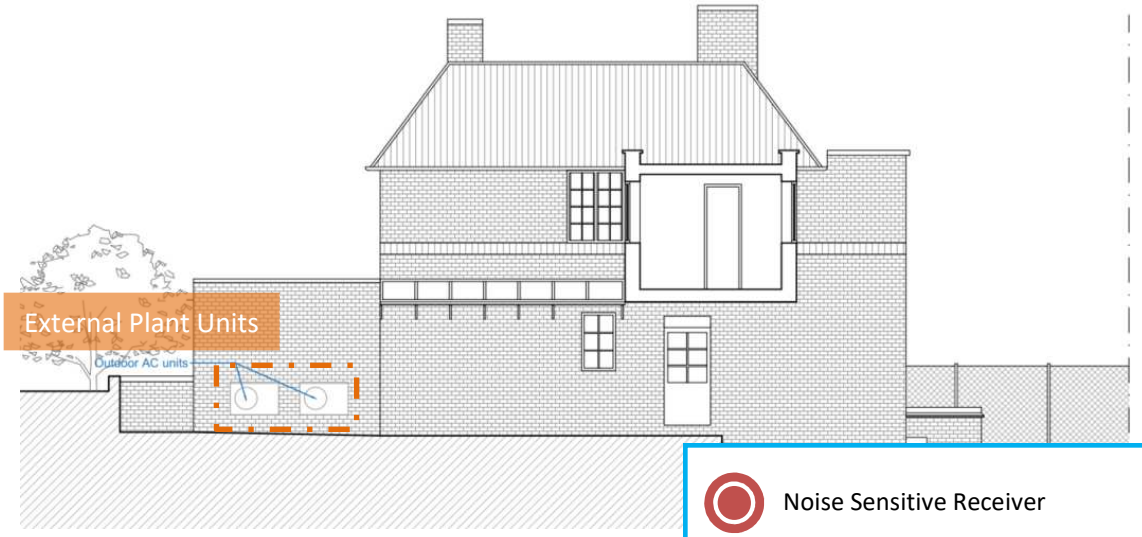
Author	**Duncan Martin** Director BSc (Hons) MIOA		22 June 2021
Approved	**John Smethurst** Director BSc (Hons) MIOA		22 June 2021

16850-SP1 Indicative site plan indicating noise monitoring position and nearest noise sensitive receiver **Date:** 22 June 2021

Plan View



South Elevation



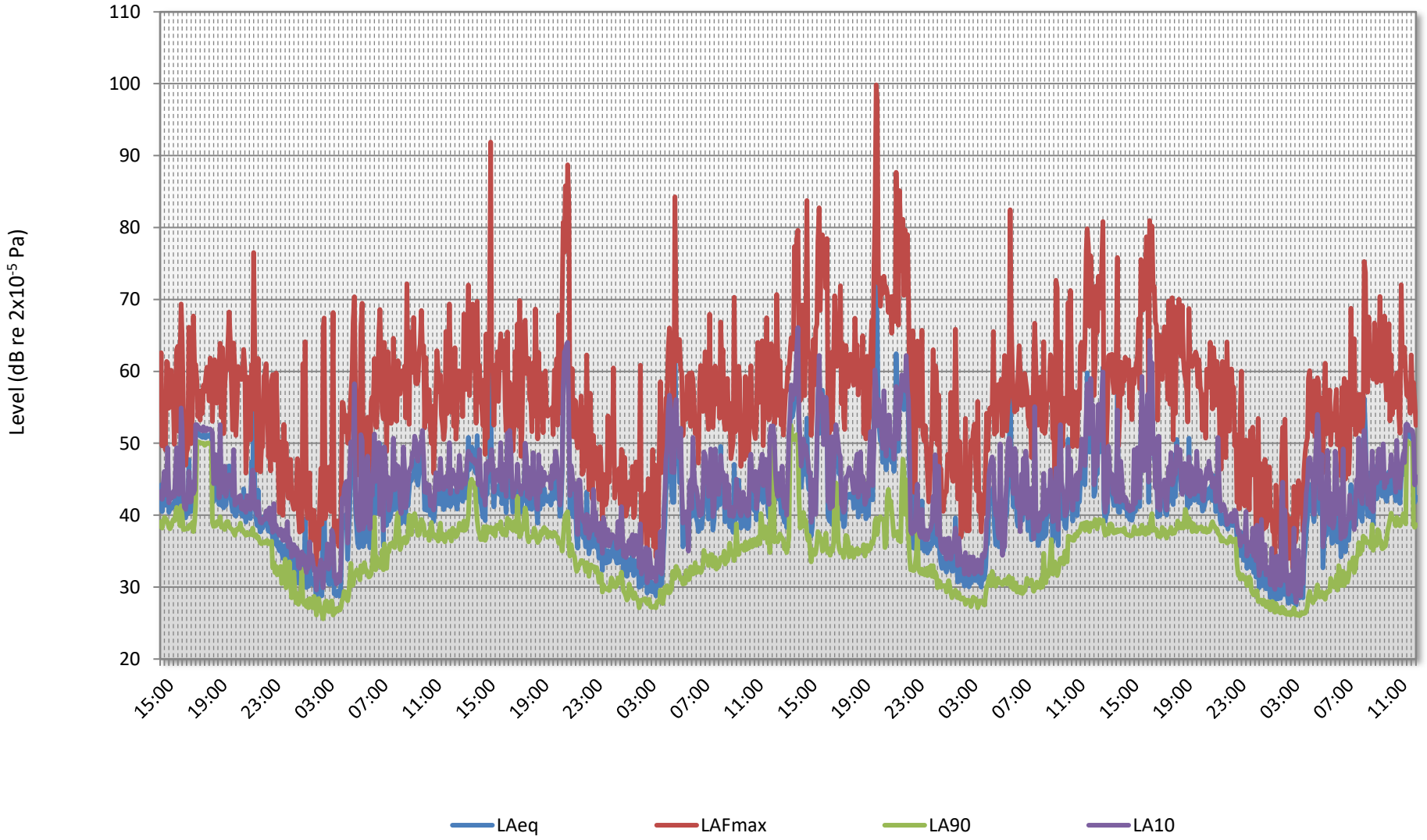
Noise Sensitive Receiver

16850-SP2 Indicative site plan indicating proposed plant location

Date: 22 June 2021

5 Pilgrims Lane, Hampstead, London

Environmental Noise Time History
10 June 2021 to 14 June 2021



APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and 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 not 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 not 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 10 such octave bands whose centre frequencies are defined in accordance with international standards.

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 one alone and 10 sources produce a 10 dB 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

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception 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 reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

APPENDIX B

16850

5 Pilgrims Lane, Hampstead, London

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
Daikin RXA35A Condenser Unit	51	53	52	47	43	39	35	27	49
Correction for number of units (2)	3	3	3	3	3	3	3	3	
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Attenuation from proposed enclosures, dB	-14	-16	-23	-30	-37	-39	-38	-39	
Distance correction to receiver, dB (3.5 m) [1]	-11	-11	-11	-11	-11	-11	-11	-11	
Sound pressure level at receiver	**35**	**35**	**27**	**15**	**4**	**0**	**0**	**0**	**22**

[1] Distance loss caluculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Criterion	**18**

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Sound pressure level outside window	35	35	27	15	4	0	0	0	22
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**20**	**20**	**12**	**0**	**0**	**0**	**0**	**0**	**10**

Design Criterion	**30**