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**5 ELM ROW,
LONDON**

NOISE IMPACT ASSESSMENT

Report **17263-NIA-01**

Prepared on 22 December 2021

Issued For:
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Executive Summary

This noise impact assessment has been undertaken in order to assess a proposed plant installation for residential use at 5 Elm Row, London.

The proposed plant installation comprises the following plant units (there are two alternative options):

- Option A: 2 No. Panasonic WH-UD09JE5-1 Air Source Heat Pumps.
- Option B: 2 No. Viessmann Vitocal 222 Air Source Heat Pumps.

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 window on the rear façade of a residential property opposite (1 Hampstead Square). 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 compliance with the established criterion is feasible, 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 a louvred enclosure for the plant units should Option A be chosen, or an acoustic screen if Option B is chosen

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.

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List of Attachments

17263-SP1	Indicative Site Plan
17263-TH1	Environmental Noise Time History
Appendix A	Glossary of Acoustic Terminology
Appendix B	Acoustic Calculations

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	22/12/2021	First Issue	Kenny Macleod MIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Isabelle Wyndham to measure existing background noise levels at 5 Elm Row, London. 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 bound by Elm Row to the south, and existing residential dwellings to all other elevations. The surrounding area is predominantly residential in nature.

Current proposals are to install two air source heat pumps on the third floor roof of the building. The plant will provide heating for the residential building.

The window on the rear façade of a residential property opposite (1 Hampstead Square) 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 plan 17263-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 17263-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 on the 3 rd flat roof at the rear of the building. The microphone was positioned 1 m in front of the building façade. ^[1]

Table 3.1: Description of unattended monitoring locations

Note [1]: The position was not considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore been applied. Based on the presence of the reflective surface and the nature of surrounding noise sources, a correction for reflections of 3 dB has been applied, in line with the recommendations of the standard.

Continuous automated monitoring was undertaken for the duration of the survey between 10:15 on 16 December 2021 and 09:10 on 17 December 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 generally dry with light winds. It is understood that the weather conditions during the unattended survey remained the same.

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. 01dB-Stell Black Solo 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 17263-SP1.

Measured noise levels are shown as a time history in Figure 17263-TH1, with average ambient and 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 +A1 2019 'Methods for rating and assessing industrial and commercial sound', as 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	Average ambient noise level	Typical background noise level
	$L_{eq}: T$	$L_{90}: 5min$
Daytime (07:00 - 23:00)	49 dB(A)	34 dB(A)
Night-time (23:00 - 07:00)	35 dB(A)	23 dB(A)

Table 4.1: Average ambient and typical background noise levels

5.0 NOISE CRITERIA

5.1 Relevant Local Policy

The assessment and recommendations in this report have been undertaken in accordance with Policy D14 of the London Plan 2021, which contains the following relevant sections:

“D14. In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

5) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses”.

5.2 Local Authority Criteria

The London Borough of Camden general criteria for noise emissions are outlined in the Camden Local Plan (2017) and are as follows:

“Where appropriate and within the scope of the document it is expected that British Standard 4142: 2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142 will be used. For such cases a ‘Rating Level’ of 10 dB below background (15 dB if tonal components are present) should be considered as the design criterion.”

It is understood that the proposed plant units will be for residential use, and could be operational at any time over a 24 hour period.

Based on the results of the environmental noise survey and requirements of London Borough of Camden, 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)	24 dB(A)
Night-time (23:00 - 07:00)	13 dB(A)

Table 5.1: Plant noise emission limits

It should be noted that BS 4142: 1997 states that:

‘For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.’

In line with the above guidance, it is therefore considered suitable to set the proposed plant noise emissions criterion at 35 dB(A).

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following (there are two alternative options):

- Option A: 2 No. Panasonic WH-UD09JE5-1 air source heat pumps
- Option B: 2 No. Viessmann Vitocal 222 air source heat pumps

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	Noise Emissions Levels (dB) in each Frequency Band ^[1]								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Panasonic WH-UD09JE5-1 Sound Pressure Level at 1 m	54	51	51	49	46	41	37	29	51
Viessmann Vitocal 222 Sound Power Level	61	58	58	56	53	48	44	36	58

Table 6.1: Manufacturer provided noise emissions levels

Note [1] Noise levels as provided by the manufacturer do not include spectral data, as only the overall level is available. The octave band data for a comparable unit has therefore been used, shifted accordingly.

Note [2] Understood to be Type AWOT-M-E/AWOT-M-E-AC 221.A08 based on given unit height of 800 mm.

British Standard 4142: 2014 +A1 2019 ‘Methods for rating and assessing industrial and commercial sound’ provides guideline penalties that can be applied to noise emissions to account for tonality, impulsivity and intermittency. Where a sound source is neither tonal nor impulsive, but is still distinctive against the residual acoustic environment, a penalty may still be applied.

The available penalties for different characteristics are summarised in Table 6.2.

Characteristic	Comments	Maximum Penalty
Tonality	Can be converted to 2 dB for a tone which is just perceptible, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible	+6 dB
Impulsivity	Can be converted to 3 dB for impulsivity which is just perceptible, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible	+9 dB
Intermittency	When the sound has identifiable on/off conditions	+3 dB
Distinctiveness	Intended for sources that are neither tonal nor impulsive, but distinctive against background noise sources	+3 dB

Table 6.2: Available penalties according to BS 4142: 2014

The proposed plant units will be generally broadband and continuous in nature and therefore no penalty has been applied.

The proposed plant location is on the third floor roof at the rear of the building which is shown on indicative site plan 17263-SP1.

6.2 Proposed Mitigation Measures – Option A

Should the Option A plant be chosen (the Panasonic WH-UD09JE5-1 air source heat pumps), in order to meet the proposed criteria stated in Section 5.0, it is recommended that an enclosure is installed around the plant. The enclosure should provide sufficient attenuation to achieve a maximum sound pressure level of 51 dB(A) when measured at 1 m in all directions.

Based on the information provided, an enclosure meeting the sound reduction indices as stated in Table 6.3 should be suitable to achieve this.

Mitigation	Required Attenuation (dB) in each Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Louvred Enclosure	1	2	6	8	14	14	9	9

Table 6.3: Required attenuation from mitigation

6.3 Proposed Mitigation Measures – Option B

Should the Option 2 plant be chosen (the Viessmann Vitocal 222 air source heat pumps), in order to meet the proposed criteria stated in Section 5.0, it is recommended that a screen is installed around the Viessmann Vitocal 222 air source heat pumps. The screen should be of sufficient height to completely block line of sight between the plant units and any windows of the identified neighbouring building.

The screen should also be of sufficient mass per unit area to provide an adequate acoustic barrier; it is recommended that 15 kg/m² is targeted. This could be achieved with two layers of 18 mm plywood (with joints staggered). It is also recommended that if practical, the inside surfaces of the screen are treated with mineral wool or similar, in order to minimise reflected sound.

6.4 Noise Impact Assessment

The closest receiver has been identified as the window on the rear façade of a residential property opposite (1 Hampstead Square) which is a minimum of 6 m from the proposed plant location.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.4. Detailed calculations are shown in Appendix B.

Receiver	Night Time Hours Criterion	Noise Level at Receiver (due to proposed plant)
Nearest Residential Property – Option A	35 dB(A)	35 dB(A)
Nearest Residential Property – Option B		35 dB(A)

Table 6.4: Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.4 and Appendix B, the proposed plant installations with mitigation measures would be expected to meet the requirements of the proposed criteria.

6.5 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 35 dB(A), acceptable internal conditions would be met by 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, in addition to meeting 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 6.5.

Receiver	Recommended Target – <i>For sleeping conditions in a bedroom, in BS 8233: 2014</i>	Noise Level at Receiver (due to plant installation)
Inside Residential Window – Option A	30 dB(A)	20 dB(A)
Inside Residential Window – Option B		20 dB(A)

Table 6.5: Noise levels and BS 8233: 2014 criteria inside nearest residential space

6.6 Assessment to Residents of 5 Elm Row

At the request of the client, a further assessment will be undertaken to assess the impact of the noise from the proposed plant units on residents of the site itself (5 Elm Row).

It is understood that the top floor rooms of the building are planned to be used as a home office. However, in order to provide a robust assessment, it will be assumed that that the room with the window closest to the proposed plant units could also be used as a bedroom as a worst-case.

These identified windows have been noted to be approximately 5 m from the proposed plant location, with screening provided by the roof edge of the building.

Taking into account the proposed mitigation measures as required to protect the amenity of the neighbouring residents, the calculated noise levels at 5 Elm Row are as shown in Table 6.6 below.

Plant Installation	External Noise Level	Internal Noise Level
Plant Option A	29 dB(A)	14 dB(A)
Plant Option B	27 dB(A)	12 dB(A)

Table 6.6: Calculated noise levels for receivers within the site itself

As can be seen in Table 6.6, the calculated noise levels demonstrate acceptable internal and external noise levels for both Plant Option A and Plant Option B, when compared with the set requirements.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 5 Elm Row, London. 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 should meet the requirements of the London Borough of Camden with the recommended mitigation installed as stated herein.

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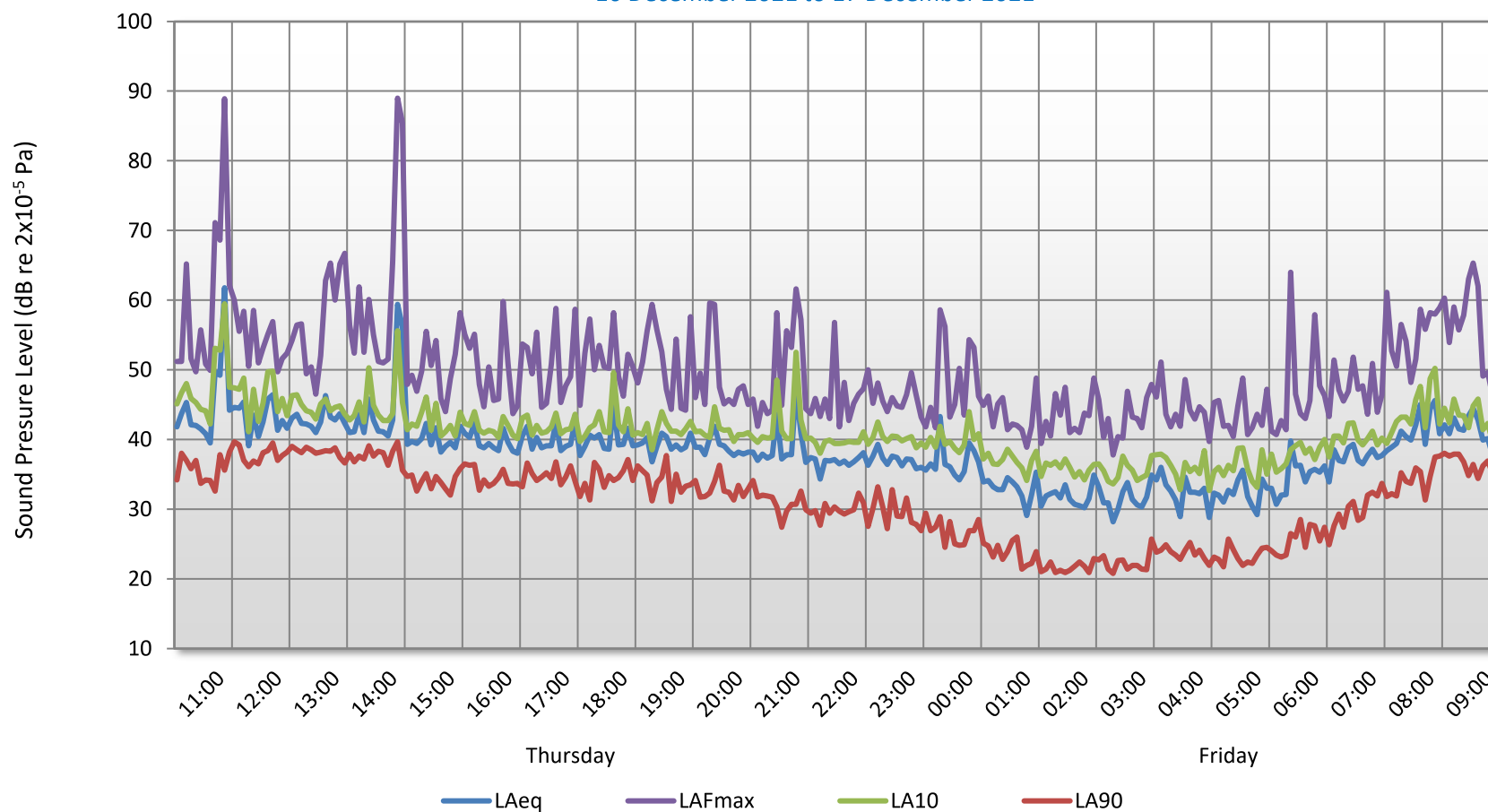
22 December 2021



5 Elm Row, London

Position 1

Environmental Noise Time History
16 December 2021 to 17 December 2021



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 3 dB 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 B1

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5 ELM ROW LONDON

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver

Source: Proposed plant installation - Option A

	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound pressure level at 1 metre									
Panasonic WH-UD09JE5-1	54	51	51	49	46	41	37	29	51
Correction due to number of units, dB (2 No.)	3	3	3	3	3	3	3	3	
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Required attenuation from mitigation, dB (Louvred Enclosure)	-1	-2	-6	-8	-14	-14	-9	-9	
Distance correction to receiver, dB (6 m) ^[1]	-16	-16	-16	-16	-16	-16	-16	-16	
Sound pressure level at receiver	46	42	38	34	25	20	21	13	35

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

Design Criterion	35
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BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation - Option A

	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	46	42	38	34	25	20	21	13	35
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	31	27	23	19	10	5	6	-2	20

Design Criterion	30
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APPENDIX B2

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5 ELM ROW LONDON

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver

Source: Proposed plant installation - Option B

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Manufacturer provided sound power level									
Viessmann Vitocal 222	61	58	58	56	53	48	44	36	58
Conversion to sound pressure level at 1 metre, dB	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to number of units, dB (2 No.)	3	3	3	3	3	3	3	3	
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Minimum attenuation expected by proposed screen, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Distance correction to receiver, dB (6 m) ^[1]	-16	-16	-16	-16	-16	-16	-16	-16	
Sound pressure level at receiver	38	35	35	33	30	25	21	13	35

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

Design Criterion	35
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BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation - Option B

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Sound pressure level outside window	38	35	35	33	30	25	21	13	35
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	23	20	20	18	15	10	6	-2	20

Design Criterion	30
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