NOISE IMPACT ASSESSMENT

FOUNTAIN HOUSE, WELWYN GARDEN CITY

PR8098 16059-NIA-01 RevC

Date: 16/12/2020

27-31 High Street
Kidlington, OX5 2DH
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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 Fountain House, Welwyn Garden City AL8 6AL.

A noise impact assessment has previously been undertaken by AIRO. An updated assessment has now been undertaken due to changes to the proposed external plant installation.

The proposed plant installation comprises the following plant units, to be installed on the main roof of a residential block:

- 9 No. Panasonic External Condenser Units.

A background noise survey was previously undertaken by AIRO, in order to determine an appropriate noise emission criterion, in accordance with typical local authority requirements.

Calculations were undertaken for the nearest identified receiver, identified as top floor windows of the same residential block. 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 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

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.

Contents

List of Attachments

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	26/11/2020	First Issue	Duncan Martin MIOA
RevA	26/11/2020	Amended conclusion	Duncan Martin MIOA
RevB	10/12/2020	Revised proposed mitigation	Duncan Martin MIOA
RevC	16/12/2020	Accounted for changes to plant layout	Duncan Martin MIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by ERS Consultants Ltd to undertake an assessment of noise emissions from proposed external plant units to be installed at Fountain House, Welwyn Garden City AL8 6AL.

Measured noise levels from a previously undertaken noise survey have been used to determine noise emissions criteria for a proposed plant installation in agreement with typical planning requirements of the Local Authority.

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

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site comprises a mixed use block at Fountain House, Welwyn Garden City AL8 6AL. The block comprises commercial units with residential apartments above.

Current proposals are to install 9 external condenser units on the main roof of the building, to service a number of residential apartments.

Top floor windows to the residential apartments within the block itself have been identified as the nearest affected receivers. These nearest noise sensitive receivers were 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 16059-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

An environmental noise survey has previously been undertaken on site by AIRO. The survey comprised a 4 day survey between Friday 1 July 2016 and Tuesday 25 July 2016, undertaken at two positions on the main roof of Fountains House.

The survey methodology and results are summarised in AIRO report DJB-R6982-D.

3.2 Results

Over the course of the survey, the $L_{Aeq:\ 1hr}$, $L_{Amax:\ 1hr}$, $L_{A10:\ 1hr}$ and $L_{A90:\ 1hr}$ acoustic parameters were measured in the two survey positions.

Over the course of the surveys, the lowest background noise level measured at each position was **$L_{A90:\ 1hr}$ 48 dB**. This level was measured during night-time hours.

4.0 NOISE CRITERIA

Typical Local Authority criteria for noise emissions are 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 minimum external background noise, at a point 1 metre outside any window of any residential property."*

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 and requirements of the Local Authority, Table 5.1 presents the proposed plant noise emission criteria:

Period	Plant Noise Emission Limit $L_{eq:\ T}$
Night-time (23:00 - 07:00)	38 dB(A)

Table 5.1: Plant noise emission limits

5.0 PLANT NOISE IMPACT ASSESSMENT

5.1 Proposed Installation

The proposed plant installation comprises a total of 9 external condenser units. Each unit will serve a different residential apartment, and they have been named accordingly. The condenser units as named are as follows:

- Flat 19 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 20 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 21 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 22 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 23 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 24 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 25 Unit: Panasonic Condenser Unit type CU-2Z50TBE
- Flat 26 Unit: Panasonic Condenser Unit type CU-5Z90TBE
- Flat 27 Unit: Panasonic Condenser Unit type CU-2Z50TBE

Noise emissions for the proposed plant unit types, 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)
Panasonic Condenser Unit type CU-2Z50TBE[1]	49	53	49	52	46	40	33	25	52
Panasonic Condenser Unit type CU-5Z90TBE[1]	50	54	50	53	47	41	34	26	53

Table 6.1: Manufacturer provided noise emissions levels

[1] Only overall sound pressure levels are provided by the manufacturer. Known spectral data for similar units has therefore been used, shifted to match the stated overall levels.

The proposed location of each plant unit is shown on indicative site plan 16059-SP1, which shows the proposed roof layout.

5.2 Noise Impact Assessment

As shown in attached site plan 16059-SP1, the proposed external units are distributed across the entire roof of the building. Two receivers have therefore been selected for assessment, summarised as follows:

- Receiver 1
  - Top floor window of Fountain House on the west façade of the building to the front, close to Flat 19 Unit and Flat 25 Unit.
- Receiver 2
  - Top floor window of Fountain House on the north façade of the building to the rear, close to Flat 22 Unit and Flat 23 Unit.

Screening from the roof edge will reduce noise emissions from the units. The reduction will be reasonable for units close to the receivers, and significant for units far from the receivers.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.2. Detailed calculations are shown in Appendix B.

Receiver	Night Time Hours Criterion	Noise Level at Receiver (due to proposed plant)
Receiver 1	38 dB(A)	37 dB(A)
Receiver 2		35 dB(A)

Table 6.2: Noise levels and criterion at noise sensitive receivers

As presented in Table 6.2 and Appendix B, the plant installation as proposed would be expected to meet the requirements of the proposed criteria.

5.3 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 37 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 6.3.

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)	22 dB(A)

Table 6.3: Noise levels and criteria inside nearest residential space

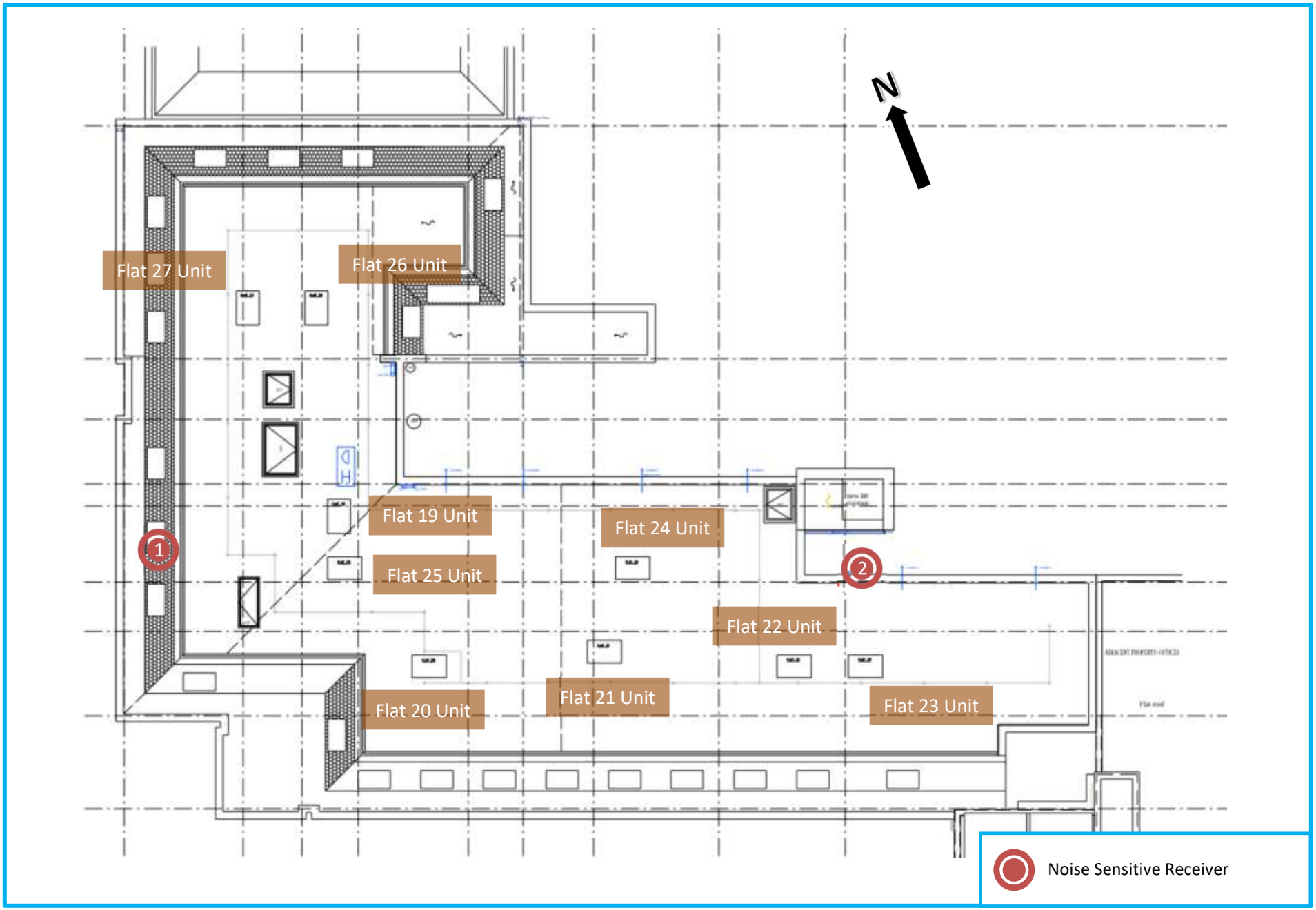
6.0 CONCLUSION

An assessment of plant noise emissions has been undertaken for a proposed installation at Fountain House, Welwyn Garden City AL8 6AL. The results of a previously undertaken survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of the Local Authority.

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 Local Authority.

Author	**Duncan Martin** Director BSc (Hons) MIOA	[redacted]	16 December 2020
Approved	**John Smethurst** Director BSc (Hons) MIOA		16 December 2020



16059-SP1 RevC Indicative site plan indicating plant locations and assessed sensitive receivers **Date:** 16 December 2020

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

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Fountain House, Welwyn Garden City

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

APPENDIX B1: Receiver 1 Assessment

Receiver: Receiver 1 (West Façade)
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
Flat 19 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-4	-6	-8	-10	-13	-16	-19	
Distance correction to receiver, dB (7 m) [1]	-17	-17	-17	-17	-17	-17	-17	-17	
Sound pressure level at receiver	**32**	**35**	**30**	**31**	**22**	**13**	**4**	**-8**	**30**
Manufacturer provided sound pressure level at 1 metre									
Flat 20 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-8	-11	-14	-17	-20	
Distance correction to receiver, dB (13 m) [1]	-22	-22	-22	-22	-22	-22	-22	-22	
Sound pressure level at receiver	**27**	**30**	**24**	**25**	**17**	**8**	**-3**	**-14**	**24**
Manufacturer provided sound pressure level at 1 metre									
Flat 21 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (20 m) [1]	-26	-26	-26	-26	-26	-26	-26	-26	
Sound pressure level at receiver	**23**	**26**	**20**	**21**	**12**	**4**	**-7**	**-18**	**20**
Manufacturer provided sound pressure level at 1 metre									
Flat 22 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (28 m) [1]	-29	-29	-29	-29	-29	-29	-29	-29	
Sound pressure level at receiver	**20**	**23**	**17**	**18**	**9**	**1**	**-10**	**-21**	**17**
Manufacturer provided sound pressure level at 1 metre									
Flat 23 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (31 m) [1]	-30	-30	-30	-30	-30	-30	-30	-30	
Sound pressure level at receiver	**19**	**22**	**16**	**17**	**8**	**-1**	**-11**	**-22**	**16**
Manufacturer provided sound pressure level at 1 metre									
Flat 24 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (21 m) [1]	-26	-26	-26	-26	-26	-26	-26	-26	
Sound pressure level at receiver	**23**	**26**	**20**	**21**	**12**	**4**	**-7**	**-18**	**20**
Manufacturer provided sound pressure level at 1 metre									
Flat 25 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-4	-6	-8	-10	-13	-16	-19	
Distance correction to receiver, dB (8 m) [1]	-18	-18	-18	-18	-18	-18	-18	-18	
Sound pressure level at receiver	**31**	**34**	**29**	**30**	**21**	**12**	**3**	**-9**	**29**

continued over

Manufacturer provided sound pressure level at 1 metre									
Flat 26 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-5	-6	-8	-11	-13	-16	-20	
Distance correction to receiver, dB (12 m) [1]	-22	-22	-22	-22	-22	-22	-22	-22	
Sound pressure level at receiver	**27**	**30**	**24**	**25**	**17**	**8**	**-2**	**-14**	**24**
Manufacturer provided sound pressure level at 1 metre									
Flat 26 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-5	-6	-8	-11	-13	-16	-20	
Distance correction to receiver, dB (11 m) [1]	-21	-21	-21	-21	-21	-21	-21	-21	
Sound pressure level at receiver	**28**	**31**	**25**	**26**	**18**	**9**	**-1**	**-13**	**25**
Cumulative sound pressure level at receiver due to all units	**37**	**40**	**34**	**35**	**27**	**18**	**8**	**-3**	**35**

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

Design Criterion	**38**

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	37	40	34	35	27	18	8	-3	35
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**22**	**25**	**19**	**20**	**12**	**3**	**-7**	**-18**	**20**

Design Criterion	**30**

APPENDIX B

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Fountain House, Welwyn Garden City

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

APPENDIX B2: Receiver 2 Assessment

Receiver: Receiver 2 (North Façade)
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
Flat 19 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (23 m) [1]	-27	-27	-27	-27	-27	-27	-27	-27	
Sound pressure level at receiver	**22**	**25**	**19**	**20**	**11**	**3**	**-8**	**-19**	**19**
Manufacturer provided sound pressure level at 1 metre									
Flat 20 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (20 m) [1]	-26	-26	-26	-26	-26	-26	-26	-26	
Sound pressure level at receiver	**23**	**26**	**20**	**21**	**12**	**4**	**-7**	**-18**	**20**
Manufacturer provided sound pressure level at 1 metre									
Flat 21 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-5	-6	-8	-11	-13	-16	-20	
Distance correction to receiver, dB (12 m) [1]	-22	-22	-22	-22	-22	-22	-22	-22	
Sound pressure level at receiver	**27**	**30**	**24**	**25**	**17**	**8**	**-2**	**-14**	**24**
Manufacturer provided sound pressure level at 1 metre									
Flat 22 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-4	-6	-8	-10	-13	-16	-19	
Distance correction to receiver, dB (5 m) [1]	-14	-14	-14	-14	-14	-14	-14	-14	
Sound pressure level at receiver	**35**	**38**	**33**	**34**	**25**	**16**	**7**	**-5**	**33**
Manufacturer provided sound pressure level at 1 metre									
Flat 23 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-4	-6	-8	-10	-13	-16	-19	
Distance correction to receiver, dB (5 m) [1]	-14	-14	-14	-14	-14	-14	-14	-14	
Sound pressure level at receiver	**35**	**38**	**33**	**34**	**25**	**16**	**7**	**-5**	**33**
Manufacturer provided sound pressure level at 1 metre									
Flat 24 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-3	-5	-6	-8	-11	-13	-16	-20	
Distance correction to receiver, dB (11 m) [1]	-21	-21	-21	-21	-21	-21	-21	-21	
Sound pressure level at receiver	**28**	**31**	**25**	**26**	**18**	**9**	**-1**	**-13**	**25**
Manufacturer provided sound pressure level at 1 metre									
Flat 25 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (23 m) [1]	-27	-27	-27	-27	-27	-27	-27	-27	
Sound pressure level at receiver	**22**	**25**	**19**	**20**	**11**	**3**	**-8**	**-19**	**19**

continued over

Manufacturer provided sound pressure level at 1 metre									
Flat 26 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (26 m) [1]	-28	-28	-28	-28	-28	-28	-28	-28	
Sound pressure level at receiver	**21**	**24**	**18**	**19**	**10**	**2**	**-9**	**-20**	**18**
Manufacturer provided sound pressure level at 1 metre									
Flat 26 Unit: Panasonic Condenser Unit type CU-2Z50TBE	49	53	49	52	46	40	33	25	52
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Correction for screening of roof edge (dB)	-4	-5	-6	-9	-11	-14	-17	-20	
Distance correction to receiver, dB (30 m) [1]	-30	-30	-30	-30	-30	-30	-30	-30	
Sound pressure level at receiver	**19**	**22**	**16**	**17**	**8**	**-1**	**-11**	**-22**	**16**
Cumulative sound pressure level at receiver due to all units	**39**	**42**	**37**	**38**	**29**	**20**	**11**	**-1**	**37**

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

Design Criterion	**38**

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	39	42	37	38	29	20	11	-1	37
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**24**	**27**	**22**	**23**	**14**	**5**	**-5**	**-16**	**22**

Design Criterion	**30**