clement acoustics
www.clementacoustics.co.uk

London office
1B(c) Yukon Road
London
SW12 9PZ
Tel: 0203 475 2280

Manchester office
105 Manchester Road
Bury
BL9 0TD
Tel: 0161 850 2280

132 CLEVELAND STREET,
LONDON

NOISE IMPACT ASSESSMENT

Report **15055-NIA-01**

Prepared on 06 September 2019

Issued For:

Dawood Partnership

132 Cleveland Street

London

W1T 6AB

Contents

List of Attachments

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Dawood Partnership, 132 Cleveland Street, London W1T 6AB to measure existing background noise levels at 132 Cleveland Street, 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.

2.0 SITE DESCRIPTION

Current proposals are to install 7 No. air conditioning units on the roof. Based on the proposed plant locations, plant units have been divided into two banks for assessment, as follows:

Bank 1

- 1 No. Mitsubishi SRC50ZJX-S
- 1 No. Daikin RXS35J
- 1 No. Mitsubishi SUZ-KA35VA

Bank 2

- 2 No. Mitsubishi FDC155KXEN6
- 1 No. Daikin RZQG71LV1B
- 1 No. Mitsubishi PUHZ-RP35VHA2

It is understood the plant units will be restricted to be in use between 08:00 and 18:00 only.

A third-floor window on the rear façade of an adjacent residential property facing on to Warren Street, and a fourth-floor window on the front façade of the opposite property 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 those identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receptor 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 15055-SP1 and SP2.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

Measurements were undertaken at one position as shown on indicative site drawing 15055-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the site.

The microphone was mounted on a 4th storey balcony at the rear of the building. The microphone was positioned 1 m in front of the wall and as such the monitoring position is not considered free-field according to the guidance of BS 4142: 2014. 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. Noise levels at the monitoring position were dominated by traffic noise during the installation and collection of equipment.

Continuous automated monitoring was undertaken for the duration of the survey between 15:00 on 10 July 2019 and 15:00 on 11 July 2019.

Weather conditions were generally dry with light winds, therefore suitable for the measurement of environmental noise.

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 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- Norsonic Type 1251 Class 1 Calibrator

4.0 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 15055-SP1.

Measured noise levels are shown as a time history in Figure 15055-TH1, with average ambient and minimum background noise levels summarised in Table 4.1.

	Average ambient noise level $L_{eq:\ T}$	Minimum background noise level $L_{90:\ 5min}$
Daytime (07:00 - 23:00)	51 dB(A)	44 dB(A)
Night-time (23:00 - 07:00)	48 dB(A)	40 dB(A)
Proposed Operating Hours (08:00 – 18:00)	52 dB(A)	48 dB(A)

Table 4.1: Average ambient and minimum background noise levels

5.0 NOISE CRITERIA

The London Borough of Camden criteria for noise emissions 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 (15dB if tonal components are present) should be considered as the design criterion)."*

It is understood that the proposed plant units will be for commercial use, operational 08:00 – 18:00. The noise emissions criterion of 42 dB(A), the value 10 dB below the minimum measured background noise level during operating hours, will therefore be used for the purpose of this assessment.

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following:

Bank 1

- 1 No. Mitsubishi SRC50ZJX-S
- 1 No. Daikin RXS35J
- 1 No. Mitsubishi SUZ-KA35VA

Bank 2

- 2 No. Mitsubishi FDC155KXEN6
- 1 No. Daikin RZQG71LV1B
- 1 No. Mitsubishi PUHZ-RP35VHA2

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.

	Sound Pressure Levels (at 1 meter, dB) in each Frequency Band								
Unit	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Mitsubishi SRC50ZJX-S	53	56	68	51	49	41	38	35	60
Daikin RXS35J	40	45	43	42	38	32	27	19	43
Mitsubishi SUZ-KA35VA	51	54	47	44	42	39	32	29	47
Mitsubishi FDC155KXEN6	62	56	53	52	51	51	40	34	56
Mitsubishi FDC155KXEN6	62	56	53	52	51	51	40	34	56
Daikin RZQG71LV1B	48	53	52	48	45	39	36	27	50
Mitsubishi PUHZ-RP35VHA2	51	54	47	41	42	45	28	27	49

Table 6.1: Manufacturer provided noise emissions levels

The proposed plant locations are on the fifth-floor roof which is shown on indicative site plan 15055-SP1.

The closest receivers have been identified as the third-floor window on the rear façade of an adjacent residential property which is a minimum of 12 m from the proposed plant location, and a fourth-floor window on the front façade of the opposite property which is a minimum of 19 m from the closest proposed plant location.

6.2 Noise Impact Assessment

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.

Noise sources have been assumed to be at the centre of each bank, except for the screening calculation between Bank 1 and Receiver 1, in which the noise source has been assumed to be at the position of the outermost plant unit (Mitsubishi SUZ-KA35VA), where screening is least effective**.**

Receiver	Operational Hours Criterion	Noise Level at Receiver (due to proposed plant)
Receiver 1	42 dB(A)	42 dB(A)
Receiver 2	42 dB(A)	39 dB(A)

Table 6.2: Noise levels and criterion at noise sensitive receivers

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

6.3 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 35 dB(A) as being acceptable internal resting/sleeping conditions during daytime hours, when the plant units could be in use.

With loudest external levels of 42 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 resting/sleeping conditions, in BS 8233: 2014, during daytime*	Noise Level at Receiver (due to plant installation)
Inside Residential Window at Receiver 1	35 dB(A)	27 dB(A)
Inside Residential Window at Receiver 2	35 dB(A)	24 dB(A)

Table 6.3: Noise levels and criteria inside nearest residential space

7.0 CONCLUSION

An environmental noise survey has been undertaken at 132 Cleveland Street, London. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant units 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 plant units should meet the requirements of the London Borough of Camden.

Report by

Peter Shakeshaft AMIOA

Checked by

Duncan Martin MIOA

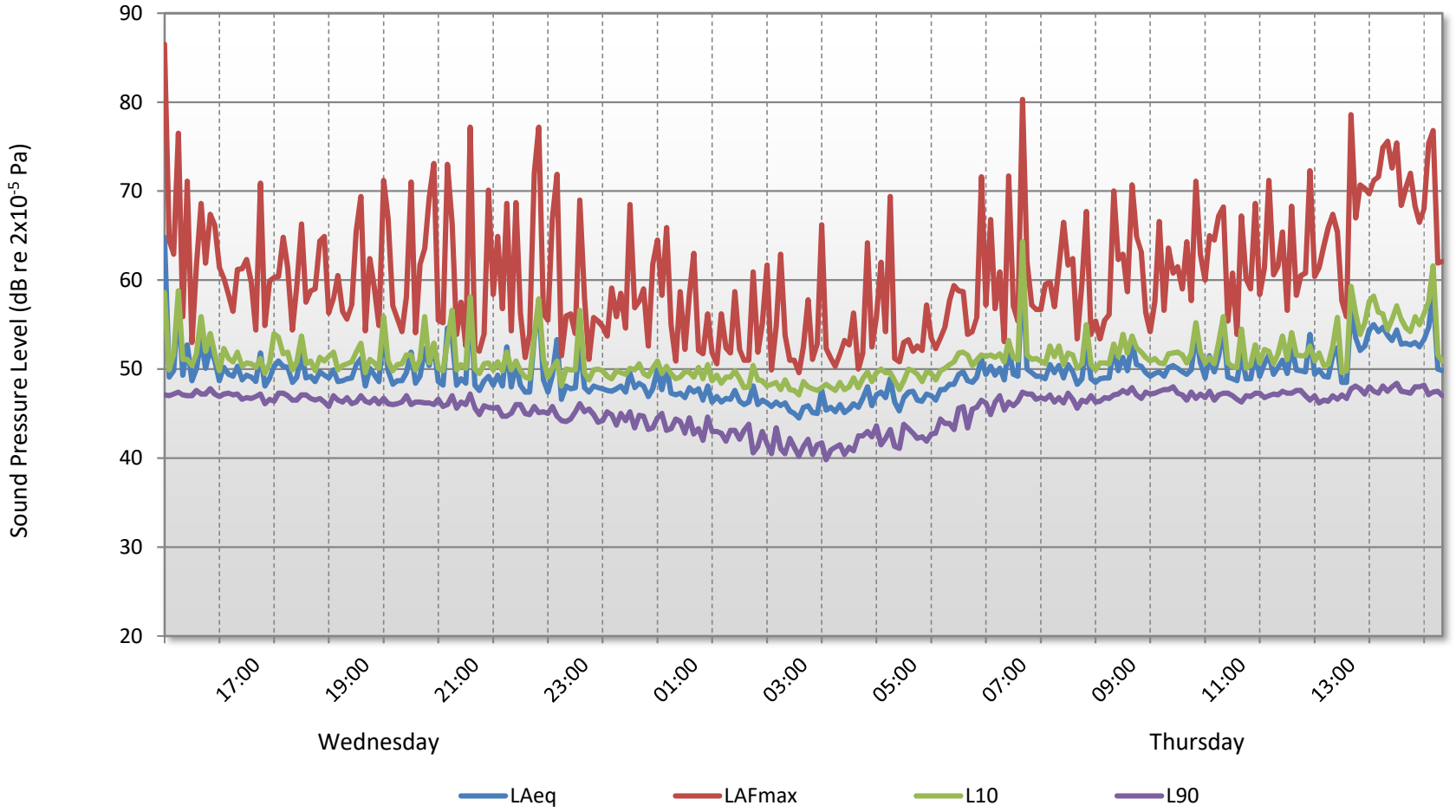
15055-SP1 Indicative site plan indicating noise monitoring position and nearest noise sensitive receiver. **Date:** 6 September 2019

15055-SP2 Indicative site plan indicating noise monitoring position and nearest noise sensitive receiver. **Date:** 6 September 2019

132 Cleveland Street, London

Environmental Noise Time History

10 July 2019 to 11 July 2019



15055-TH1

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 10dB 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 B1

15055
132 Cleveland Street, London
Receiver 1

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Source: Proposed plant installation	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Manufacturer provided sound pressure level at 1 metre (Bank 1)									
Mitsubishi SRC50ZJX-S	53	56	68	51	49	41	38	35	60
Daikin RXS35J	40	45	43	42	38	32	27	19	43
Mitsubishi SUZ-KA35VA	51	54	47	44	42	39	32	29	47
Combined noise level of plant (Bank 1)	**55**	**58**	**68**	**52**	**50**	**43**	**39**	**36**	**61**
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Distance correction to receiver, dB (12 m)	-22	-22	-22	-22	-22	-22	-22	-22	
Screening correction to receiver, dB*	-2	-3	-3	-4	-6	-8	-10	-14	
Sound pressure level at Receiver 1 from Bank 1	**38**	**40**	**49**	**33**	**29**	**20**	**14**	**7**	**42**
Manufacturer provided sound pressure level at 1 metre (Bank 2)									
Mitsubishi FDC155KXEN6	62	56	53	52	51	51	40	34	56
Mitsubishi FDC155KXEN6	62	56	53	52	51	51	40	34	56
Daikin RZQG71LV1B	48	53	52	48	45	39	36	27	50
Mitsubishi PUHZ-RP35VHA2	51	54	47	41	42	45	28	27	49
Combined noise level of plant (Bank 2)	**65**	**61**	**58**	**56**	**55**	**55**	**44**	**38**	**60**
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (13 m)	-22	-22	-22	-22	-22	-22	-22	-22	
Screening correction to receiver, dB	-5	-7	-9	-12	-15	-18	-21	-22	
Sound pressure level at Receiver 1 from Bank 2	**41**	**35**	**30**	**25**	**21**	**18**	**4**	**-3**	**28**
Combined sound pressure level at Receiver 1	**43**	**41**	**50**	**33**	**30**	**22**	**14**	**7**	**42**

Design Criterion	**42**

*Screening for Bank 1 has been calculated assuming the source is at the position of the proposed outermost plant unit (Mitsubishi SUZ-KA35VA)

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window (Receiver 1)

Source: Proposed plant installation	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Sound pressure level outside window	43	41	50	33	30	22	14	7	42
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**28**	**26**	**35**	**18**	**15**	**7**	**-1**	**-8**	**27**

Design Criterion	**35**

APPENDIX B2

15055
132 Cleveland Street, London
Receiver 2

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre (Bank 1)									
Mitsubishi SRC50ZJX-S	53	56	68	51	49	41	38	35	60
Daikin RXS35J	40	45	43	42	38	32	27	19	43
Mitsubishi SUZ-KA35VA	51	54	47	44	42	39	32	29	47
Combined noise level of plant (Bank 1)	**55**	**58**	**68**	**52**	**50**	**43**	**39**	**36**	**61**
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Distance correction to receiver, dB (22 m)	-27	-27	-27	-27	-27	-27	-27	-27	
Screening correction to receiver, dB	-2	-3	-3	-4	-5	-7	-9	-13	
Sound pressure level at Receiver 2 from Bank 1	**32**	**35**	**45**	**28**	**25**	**16**	**9**	**3**	**37**
Manufacturer provided sound pressure level at 1 metre (Bank 2)									
Mitsubishi FDC155KXEN6	62	56	53	52	51	51	40	34	56
Mitsubishi FDC155KXEN6	62	56	53	52	51	51	40	34	56
Daikin RZQG71LV1B	48	53	52	48	45	39	36	27	50
Mitsubishi PUHZ-RP35VHA2	51	54	47	41	42	45	28	27	49
Combined noise level of plant (Bank 2)	**65**	**61**	**58**	**56**	**55**	**55**	**44**	**38**	**60**
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction to receiver, dB (19 m)	-26	-26	-26	-26	-26	-26	-26	-26	
Screening correction to receiver, dB	-2	-2	-2	-3	-3	-4	-5	-8	
Sound pressure level at Receiver 2 from Bank 2	**41**	**36**	**33**	**31**	**30**	**29**	**16**	**8**	**35**
Combined sound pressure level at Receiver 2	**41**	**39**	**45**	**33**	**31**	**29**	**17**	**9**	**39**

Design Criterion	**42**

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window (Receiver 2)
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Sound pressure level outside window	41	39	45	33	31	29	17	9	39
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**26**	**24**	**30**	**18**	**16**	**14**	**2**	**-6**	**24**

Design Criterion	**35**