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14 BEDFORD SQUARE, LONDON

NOISE IMPACT ASSESSMENT

Report **10344-NIA-01**

Prepared on 21 August 2015

Issued For:

Irina Listovskaya

The Collective

14 Bedford Square

London

WC1B 3JA

committed to CSCS Platinum award

ISO 17025

ISO 9001

Institute of Acoustics sponsoring organisation

Contents

List of Attachments

1.0 INTRODUCTION

Clement Acoustics Ltd has been commissioned by Irina Listovskaya, The Collective, 14 Bedfod Square, London WC1B 3JA to measure existing background noise levels at 14 Bedford Square, London WC1B 3JA. Measured noise levels have been used to determine noise emission criteria for proposed air conditioning units 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

14 Bedford Square, London WC1B 3JA is a building consisting of commercial business. It is understood that current proposals are to install a single external air conditioning unit at basement level within the light well, as shown on indicative site plan 10344-SP1.

The nearest noise sensitive receiver to the plant installation is expected to be 13 Bedford Square.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

Measurements were undertaken at one position as shown on indicative site drawing 10344-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the site.

Continuous automated monitoring was undertaken for the duration of the survey between 11:40 hours on 4 August and 15:30 hours on 6 August 2014.

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

Background noise levels at the monitoring positions consisted of existing plant from the surrounding area and low level traffic noise.

The measurement procedure generally complied with BS7445:1991. *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 10344-SP1.

The measured noise levels are shown as a time history in Figure 10344-TH1, with ambient and background noise levels summarised in Table 4.1.

	Average ambient noise level $L_{Aeq:\ 5min}$ dB(A)	Minimum background noise level $L_{A90:\ 5min}$ dB(A)
Daytime (07:00 - 23:00)	52 dB(A)	42 dB(A)
Night-time (23:00 - 07:00)	51 dB(A)	33 dB(A)

Table 4.1: Minimum background noise levels

5.0 NOISE CRITERIA

It is understood that Camden Council's noise emissions criteria is 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."*

As the proposed plant units will be operating 24 hours a day, the night-time criterion of 23dB(A) will be used for this assessment, the value 10 dB below the minimum calculated background noise during the night-time hours.

6.0 DISCUSSION

6.1 Proposed Installation

The proposed plant installation system comprises the following:

- 1 No. ElectrIQ eIQ-12WMINV condenser

ElectrIQ only provide overall sound pressure levels for their Hitachi powered condenser. However comparable spectral data from the same manufacturer has been used and shifted to meet the overall sound pressure levels for the proposed plant units. The comparable unit is the Hitachi RAC-50NPA.

The estimated spectral data is shown in Table 6.1 below. Noisiest modes of operation have been used in order to present a robust worst case assessment.

	Sound Pressure Levels (at 1 meters, dB) in each Frequency Band							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
ElectrIQ eIQ-12WMINV Condenser Unit	52	59	58	52	50	44	41	42

Table 6.1: Estimated Noise Emissions Levels

The proposed plant location is at basement level within the buildings light well, which is shown on indicative site plan 10344-SP1.

The closest noise sensitive windows most likely to be affected by noise emissions from the plant units have been identified as the first floor neighbouring window, as shown on 10344-SP1 labelled receiver 1. This is the closest window that had no screening from the building envelope, which is approximately 11 metres away from the plant unit. However, the ground floor window on the same facade, labelled receiver 2 on 10344-SP1, is approximately 6 metres away with screening from the building envelope. To ensure a robust assessment both windows have been assessed.

6.2 Proposed Mitigation Measures

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 45dB when measured at 1 m in all directions. Based on the information provided, an enclosure meeting the sound reduction indices as stated in Table 6.2 should be suitable to achieve this.

	Required Attenuation (dB) in each Frequency Band							
Mitigation	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Louvred Enclosure	7	9	12	24	31	33	29	30

Table 6.2: Required Attenuation from Mitigation

6.3 Noise Impact Assessment

Taking into account all necessary acoustic corrections, the highest 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	23 dB(A)	24 dB(A)

Table 6.3: Noise levels and criteria at noise sensitive receivers

As presented in Table 6.3 and Appendix B, the proposed plant installation with acoustic enclosure would be expected to exceed the requirements of the proposed criteria by 1dB. However a 1dB exceedance is considered to have a non-significant impact on the closest residential receiver.

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 '*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) as being acceptable internal resting/sleeping conditions during night-time.

With loudest external levels of 24dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS8233:2014, 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 6.4.

Receiver	'Good' Conditions Design Range – *For resting/sleeping conditions in a bedroom, in BS8233:2014*	Noise Level at Receiver (due to plant installation)
Inside Residential Window	30 dB(A)	10 dB(A)

Table 6.4: Noise levels and criteria inside nearest residential space

7.0 CONCLUSION

An environmental noise survey has been undertaken at 14 Bedford Square, London WC1B 3JA. 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 Camden Council.

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 with the recommended mitigation measures installed as stated herein.

Report by

Andrew Thomas

Assistant consultant

Checked by

John Smethurst

Principle Consultant

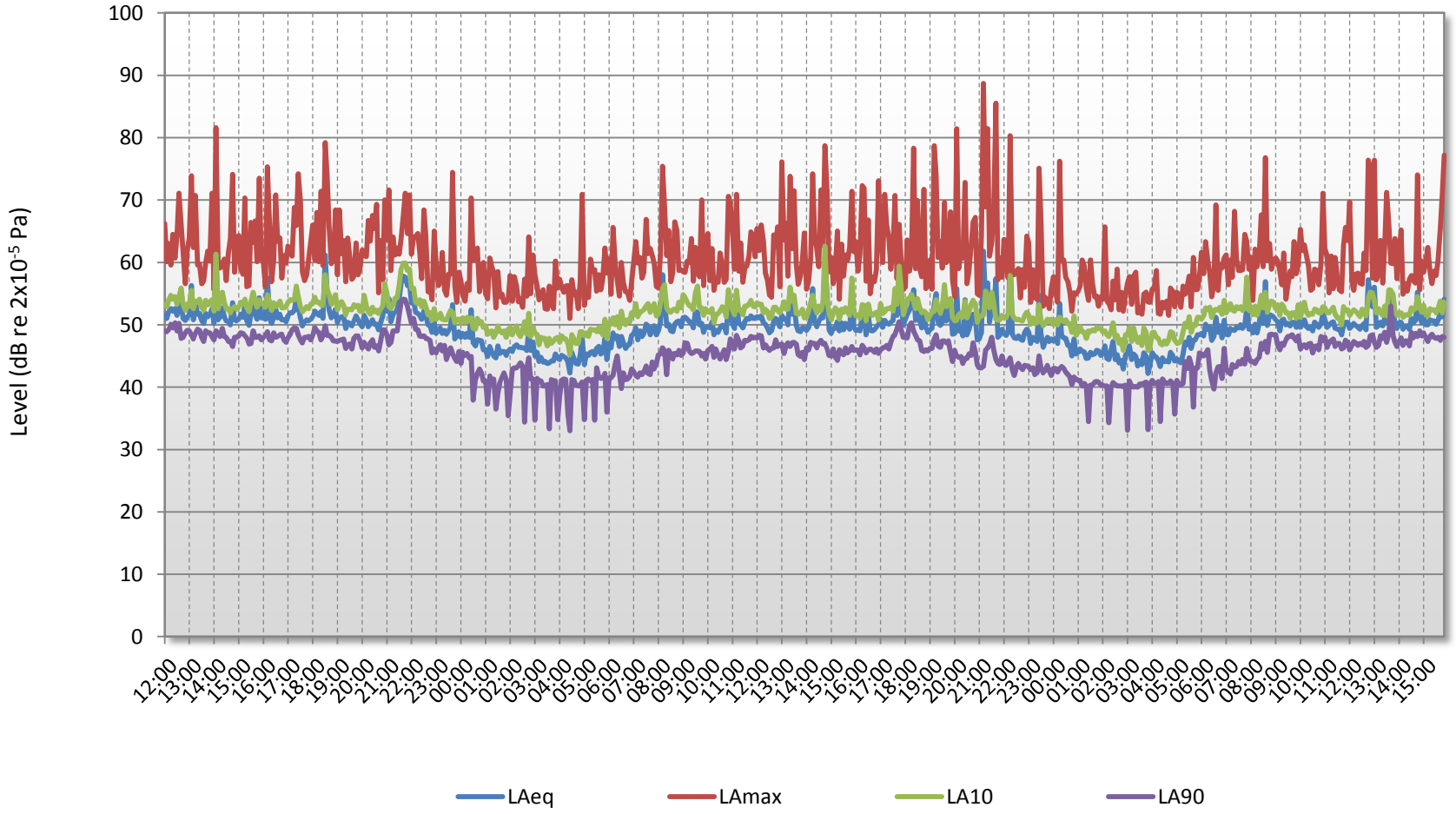
10344-SP1 Indicative site plan ~~showing~~ indicating noise monitoring position and nearest noise sensitiv receiver

Date: 21 August 2015

14 Bedford Square, London

Environmental Noise Time History

4 August to 6 August 2015



10344-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 B

10344

14 Bedford Square, London

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: 1
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
ElectrIQ eIQ-12WMINV	52	59	58	52	50	44	41	42	55
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Proposed mitigation, dB	-7	-9	-12	-24	-31	-33	-29	-30	
Distance correction to receiver, dB (11m)	-21	-21	-21	-21	-21	-21	-21	-21	
Sound pressure level at receiver	**30**	**35**	**31**	**13**	**4**	**0**	**0**	**0**	**24**

Design Criterion	**23**

Receiver: 2
Source: Proposed plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
ElectrIQ eIQ-12WMINV	52	59	58	52	50	44	41	42	55
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Proposed mitigation, dB	-7	-9	-12	-24	-31	-33	-29	-30	
Attenuation from building envelope, dB	-6	-8	-11	-13	-14	-14	-14	-14	
Distance correction to receiver, dB (6m)	-16	-16	-16	-16	-16	-16	-16	-16	
Sound pressure level at receiver	**29**	**32**	**25**	**5**	**0**	**0**	**0**	**0**	**20**

Design Criterion	**23**

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	30	35	31	13	4	0	0	0	24
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**15**	**20**	**16**	**0**	**0**	**0**	**0**	**0**	**10**

Design Criterion	**30**