Acoustic Consultancy Report

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Acoustic Commissioning Report

Report Prepared For

D Three Studio
Red Bull, 42-52 Earlham St
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Checked By

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i) Executive Summary

Acoustic commissioning testing has been performed at 42 – 52 Earlham Street, in London.

External testing of plant was carried out in accordance with the procedure outlined in BS4142:2014.

The BS4142 assessment undertaken concludes that there is an Indication of low impact.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	13/09/2018	Initial Issue	RM	MB
2	19/09/20158	Minor Amendments	RM	MB

1 Introduction

The development at 42 – 52 Earlham Street has reached Practical Completion.

Acoustic commissioning testing has been carried out to confirm the following noise aspect of the design has been achieved:

Commissioned Aspect
External Airborne noise levels from mechanical plant.

This report details all measurement results and data obtained during the testing period, and sets out all findings following comparison of the obtained data with the project design criteria.

2 Testing Programme

The testing was carried out on 06/09/2018 from 11:00 to 13:00.

Testing was carried out by Robert Martin of LCP.

All plant had been balanced and commissioned prior to testing.

All external noise measurements have been made in accordance with the method outlined in BS4142:2014.

3 Suitably qualified acousticians

Acoustic testing was carried out by a suitably qualified acoustician, Robert Martin (AMIOA) who has completed the Institute of Acoustics Certificate of Competency and the Institute of Acoustics Diploma.

3.1 Calibration

The measurement equipment (as detailed at the end of Appendix B) was calibrated prior to and after obtaining measurements.

The recorded calibration gain adjustment levels were as follows:

Table 1: Calibration gain adjustment levels (114dB at 1 kHz), dB re $2x10^{-5}$ Pa

Sound Level Meter	Before	After
Svantek 959	+1.67	+1.69
Svantek 959	+1.07	+0.81

3.2 Site Description

The site layout, together with the measurement positions, is shown in the drawing contained within Appendix A.

The nearest receiver with direct line of sight to the plant area is 55m to the west of the site. This is shown in the site plan in Appendix A.

3.3 Local Noise Climate

The predominant local noise source was road traffic and pedestrian noise.

3.4 Weather

The weather conditions monitored during the survey are shown in the following table.

Table 2: Weather Conditions at Measurement Location

Weather	Value
Average Wind Speed	3m/s
Wind Direction	E
Cloud Cover	50%
Temperature	18°C
Precipitation	None

4 Design Criteria

4.1 BS4142:2014

BS4142:2014 states that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

Table 3: BS4142 assessment based upon rating level

Difference between background noise and rating levels	Assessment
+ 10 dB	Indication of a significant adverse impact
+ 5 dB	Indication of an adverse impact
0 dB	Indication of low impact

Certain acoustic features can increase the significance of impact. The specific sound level should be corrected if a tone, impulse or other acoustic feature is expected to be present.

Table 4: Corrections for acoustic features, subjective method

Acoustic Feature	Correction, dB		
	Just Perceptible	Clearly Perceptible	Highly Perceptible
Tonality	2	4	6
Impulsivity	3	6	9
Other Characteristics	3		
Intermittency	3		

Typically the acoustic feature correction would not be expected to exceed 10dB.

Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty.

5 Current Design

The new mechanical plant has been installed on the roof within an existing plant area. The new installation consists of 1 x Samsung AC100MNTDEH condenser, 1 x Samsung AM080KXMDGH condenser, 1 x Samsung AM100KXMDGH condenser and 1x Samsung AC052MNADKH condenser.

The new mechanical plant will operate between the hours of 07:00 and 19:00.

6 Results

Noise measurements have been carried out to assess if the new plant installation will have an impact on the nearest noise sensitive receivers.

MP1 – Measurements have been taken 1m away from mechanical plant in the plant area.

MP2 – Background noise measurements were taken away from the plant area to establish a typical noise level.

The measured background noise level was L_{A90} 51dB, therefore the criteria set for background noise has been set as 10dB lower. This is to ensure that once the plant is in operation it will not have a negative impact on noise sensitive receivers.

The measurements taken in the plant area have been distance corrected to the nearest residential property which is 55m away on Mercer street.

A 3dB feature correction has been applied for intermittency.

Table 5: BS4142 assessment, dB re $2x10^{-5}$ Pa

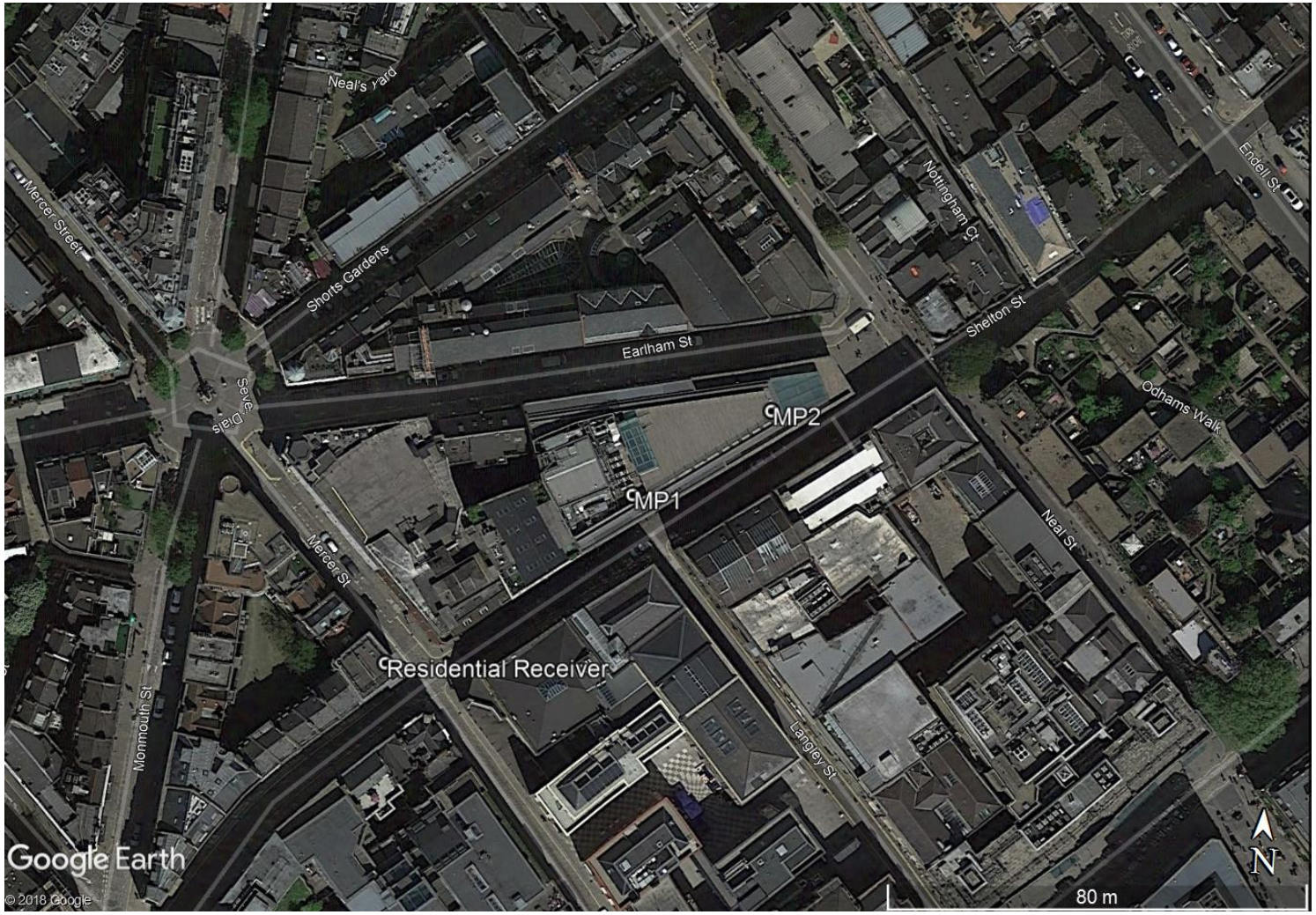
Results	Result dB(A)
Measured Ambient sound level L_{Aeq} (Plant on)	57
Residual sound level L_{Aeq} (Plant off)	55
Background sound level L_{A90}	41
Specific sound level calculated by correcting the ambient sound level to remove the contribution of the residual sound level L_{Aeq}	54
Distance Correction at 55m	54 – 35 = 19
Acoustic feature correction	3
Rating level	22
Excess of rating over background sound level	-19
Assessment	Indication of low impact

7 Conclusion

Acoustic commissioning testing has been performed at 42 – 52 Earlham Street, in London.

The BS4142 assessment undertaken concludes that there is an Indication of low impact.

Appendix A: Site Plan



Appendix B: Measurement Data

Ambient noise:

No	Date & time	Elapsed time	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	L_{Aeq}
1	06/09/2018 11:27:10	00:15:00	73	64	59	55	51	47	44	41	57
2	06/09/2018 11:42:10	00:15:00	73	63	58	54	51	47	44	43	57
3	06/09/2018 11:57:10	00:15:00	73	64	57	54	50	47	44	43	57
4	06/09/2018 12:12:10	00:15:00	73	64	59	54	51	47	45	43	57
		Average =	**73**	**64**	**58**	**54**	**51**	**47**	**44**	**43**	**57**

MP1
Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11207
- Svantek pre-amplifier SV12L S/N: 49860 with GRAS microphone capsule 40AE S/N: 215511

Calibration checks were made prior to and after completion of measurements using a Bruel & Kjaer 4231 calibrator, S/N: 10893 complying with Class 1 specification of BS EN 60942:2003, calibration level 114.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Background Noise and residual noise:

No	Date & time	Elapsed time	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	L_{A90}
1	06/09/2018 11:33:30	00:15:00	58	54	51	48	46	42	34	21	51
2	06/09/2018 11:48:30	00:15:00	57	53	50	48	46	42	33	20	51

MP2
Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11205
- Svantek pre-amplifier SV12L S/N: 13245 with GRAS microphone capsule 40AE S/N: 75181

Calibration checks were made prior to and after completion of measurements using a Bruel & Kjaer 4231 calibrator, S/N: 10893 complying with Class 1 specification of BS EN 60942:2003, calibration level 94.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Appendix C: Calculation

Octave	63	125	250	500	1k	2k	4k	8k	dB(A)
L1	73	62	56	48	42	42	43	42	54
r1	1	1	1	1	1	1	1	1	
r2	55	55	55	55	55	55	55	55	
L2	38	28	21	13	7	8	9	8	19
Loss	35	35	35	35	35	35	35	35	35

Appendix D: Glossary

The list below details the major acoustical terms and descriptors, with brief definitions:

'A' Weighting
Weighting applied to the level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The letter 'A' will follow a descriptor, indicating the value has been 'A' weighted. An 'A' weighted noise level may also be written as dB(A).
Absorption Class
In order to categorise the absorptive effects of different elements (such as ceiling tiles), classes from A to E were derived, as per BS EN ISO 11654:1997. A class 'A' absorber would be very acoustically absorptive, a Class 'E' absorber would be less absorptive and more reflective. A product that is highly reflective may not be classified.
Absorption Coefficient (α)
A value usually between 0 and 1 assigned to a material to indicate how acoustically absorptive it is. 0 indicates a material is entirely reflective (and therefore not absorptive), and 1 indicates a material is entirely absorptive (and therefore not reflective). Absorption coefficients are usually given for each octave band between 125Hz and 4kHz, or as an overall 'practical' coefficient.
Airborne Noise
Noise transmitted through air.
dB or Decibel
Literally meaning 'a tenth of a bel', the bel being a unit devised by the Bell Laboratory and named after Alexander Graham Bell. A logarithmically based descriptor to compare a level to a reference level. Decibel arithmetic is not linear, due to the logarithmic base. For example:

30 dB + 30 dB ≠ 60 dB	30 dB + 30 dB = 33 dB

$D_{nTw}+C_{tr}$	
The weighted, normalised difference in airborne noise levels measured in a source room (L1) and a receive room (L2) due to a separating partition.	
D	Is simply L1 – L2.

D_{nT}	Is the normalisation of the measured level difference to the expected (in comparison to the measured) reverberation time in the receiving room.
D_{nTw}	Is the weighted and normalised level difference. This value is the result of applying a known octave band weighting curve to the measured result.
C_{tr}	Is a correction factor applied to the D_{nTw} to account for the known effects of particular types of noise, such as loud stereo music or traffic noise.

Frequency (Hz)

Measured in Hertz (after Heinrich Hertz), and represents the number of cycles per second of a sound or tone.

Impact Noise

Re-radiated noise as a result of impact(s) on a solid medium, such as footfalls on floors.

Insertion Loss, dB

The amount of sound reduction offered by an attenuator or louvre once placed in the path of a noise level.

$L_{A90, T}$

The ‘A’ weighted noise level exceeded for 90% of the time period T, described or measured. The ‘90’ can be substituted for any value between 1 and 99 to indicate the noise level exceeded for the corresponding percentage of time described or measured.

$L_{Aeq, T}$

The ‘A’ weighted ‘equivalent’ noise level, or the average noise level over the time period T, described or measured.

L_{Amax}

The ‘A’ weighted maximum measured noise level. Can be measured with a ‘slow’ (1 sec) or ‘fast’ (0.125 sec) time weighting.

L_{Amin}

The ‘A’ weighted minimum measured noise level.

L'_{nTw}

The weighted, normalised impact sound pressure level measured in a receive room below a source room.

L	Is the spatially averaged impact sound pressure level measured in a receive room.
L'_{nT}	Is the normalisation of the measured impact sound pressure level to the expected (in comparison to the measured) reverberation time in the receiving room.
L'_{nTw}	Is the weighted and normalised impact sound pressure level. This value is the result of applying a known octave band weighting curve to the measured result.

NR

Noise Rating (NR) level. A frequency dependent system of noise level curves developed by the International Organisation for Standardisation (ISO). NR is used to categorise and determine the acceptable indoor environment in terms of hearing preservation, speech communication and annoyance in any given application as a single figure level. The US predominantly uses the Noise Criterion (NC) system.

Octave

The interval between a frequency in Hz (f) and either half or double that frequency (0.5f or 2f).

Pa

Pascals, the SI unit to describe pressure, after physicist Blaise Pascal.

Reverberation Time, T_{mf}, RT60, RT30 or RT20

The time taken in seconds for a sound to diminish within a room by 1,000 times its original level, corresponding to a drop in sound pressure of 60 dB. When taking field measurements and where background noise levels are high, the units RT20 or RT30 are used (measuring drops of 20 or 30 dB respectively). Sometimes given as a mid-frequency reverberation time, T_{mf} which is the average of reverberation time values at 500Hz, 1kHz and 2kHz.

R_w

The sound reduction value(s) of a constructional element such as a door, as measured in a laboratory, with a known octave band weighting curve applied to the result.

Sound Power Level

A noise level obtained by calculation from measurement data, given at the face of an item of plant or machinery. Referenced to 10^{-12} W or 1pW.

Sound Pressure Level

A noise level measured or given at a distance from a source or a number of sources. Referenced to $2x10^{-5}$ Pa.

W

Watts, the SI unit to describe power, after engineer James Watt.