Lee Cunningham Partnership

Acoustic Consultancy Report

71800/3/3/2
Acoustic Commissioning Report

Report Prepared For

Imperial Works Ltd
Imperial Works
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i) Executive Summary

Acoustic commissioning testing has been performed at Imperial Works, London.

External testing of a new plantroom on the roof of Imperial works, London was carried out on the 10/12/2015.

The new plantroom holds 4 condensers which operate between the hours of 07:00 – 18:00. The plantroom is made primarily out of brick. There are acoustic louvres on each of the 4 facades for ventilation and access to the plantroom.

An external plant assessment has been carried out previously by LCP Ref: 71800/3/2/5. This report sets the criteria at the nearest residential receiver with direct line of sight.

Day:	39 dB $L_{Aeq,\,T}$ at 46m, Binsmead Apartments.

Measured results for the new external plant area is as follows.

Day:	38 dB $L_{Aeq,\,T}$ at 46m, Binsmead Apartments.

The external noise measurements taken on site conclude that the noise levels at the above noise sensitive receiver meet the noise criteria specified.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	16/12/2015	Initial Issue	RM	MB

1 Introduction

Acoustic commissioning testing has been performed at Imperial Works, London.

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

Commissioned Aspect
External airborne noise 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 10/12/2015 from 11:20 to 12:10.

Testing was carried out by Robert Martin of LCP.

Acoustic tests were performed on the roof.

All plant had been balanced and commissioned prior to acoustic testing.

2.1 Equipment

Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003. Calibration checks were made prior to and after completion of measurements using a calibrator complying with Class 1 specification of BS EN 60942:2003. All acoustic instrumentation carries current certificates of conformance which are available upon request.

Table 1: Equipment

Equipment	Serial Number
Svantek 959 Sound Level Meter	11205
Svantek pre-amplifier SV12L	13245
Microphone capsule 40AE	75181
Svantek SV30A calibrator	43066

2.2 Calibration

The measurement equipment was calibrated prior to and after obtaining measurements. As required, the equipment was also calibrated under the circumstances outlined in paragraph 4.3 of ANC-9701-1.

The recorded calibration gain adjustment levels were as follows:

Table 2: Calibration gain adjustment levels (94 dB at 1 kHz), dB re $2x10^{-5}$ Pa

Before	After
1.45	1.47

3 Design Criteria

The design criteria have been obtained from LCP report ref: 71800/3/2/5, and is summarised below.

Airborne noise from all externally located building services shall be controlled to the following levels at the respective noise sensitive receptors:

Table 3: External design rating levels, dB re $2x10^{-5}$ Pa

Receiver premises	Approximate distance (m)	Design Level $L_{A,T}$
Binsmead Apartments	46	39

4 Results

The table below shows the summary of the noise measurements.

Table 4: Measured results, dB re $2x10^{-5}$ Pa

Measurement	Results
Plant on @ 1m	70 $L_{Aeq,15\ mins}$
Plant off @ 1m	66 $L_{Aeq,15\ mins}$
Specific @ 1m	68 $L_{Aeq,15\ mins}$
Distance corrected to residential @ 46m	38 $L_{Aeq,15\ mins}$

5 Comments and Notes

The noise measurement results indicate that the project acoustic design specification has been met the specified criteria.

It should be noted that in the plant area in question had a temporary roof made from scaffolding covering the area which would cause added reflections to the design. Fortunately, the current design meets the criteria at the residential which suggests that the noise levels from the mechanical plant will slightly decreases when the temporary roof is dismantled.

6 Conclusion

The external noise measurements taken at Imperial Works, London conclude that the noise levels at the above noise sensitive receiver meet the noise criteria specified.

Appendix A: Site Plan

Appendix B: 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.