Acoustic Consultancy Report

89509/3/2/4

Acoustic Commissioning Report

Report Prepared For

Norman Disney And Young Ltd
Virtus London 7
18 May 2022

Report Author

Robert Martin MIOA (D) (E)

Checked By

M Balsom MSc MIOA (D) (E)

Telephone
0118 918 6460
Facsimile
0118 918 6480

enquiries@lcpacoustics.co.uk
www.lcpacoustics.co.uk

LCP
Riverside House
3 Winnersh Fields
Gazelle Close
Winnersh
Wokingham
RG41 5QS

A division of Caice
Acoustic Air Movement Ltd.

Company Registration Number
2790667
VAT Registration Number
GB614683632

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i) Executive Summary

Acoustic commissioning testing has been performed at Virtus 7, Prologis Park West, in Uxbridge.

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

The noise criteria in this report has been taken from a previous plant assessment carried out by LCP report ref: 89509/3/1/2 dated 24th May 2018. The design criterion taken from this report is as follows:

Day:	45 dB $L_{Aeq,\,T}$ at 250m, Nearest Residential Premises;
Night:	40 dB $L_{Aeq,\,T}$ at 250m, Nearest Residential Premises.

This report concludes that the design criteria has been achieved.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	29th March 2022	Initial Issue	RM	MB
2	18th May 2022	Revised Issue	RM	-

1 Introduction

The development at Virtus 7 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 23rd March 2022 from 11:00 to 12:00.

Testing was carried out by Robert Martin of LCP.

Chris Burnett from Norman Disney Young was in attendance to witness/operate the plant.

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.

2.1 Calibration

The measurement equipment (as detailed at the end of Appendix C) 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 (S/N:11207)	+1.72	+1.61

2.2 Site Description

The site plan is shown in Appendix A and layout drawings along with measurement positions are shown in Appendix B.

The nearest noise sensitive receiver to the plant area is 250mm to the south of the site. This is shown in the site plan in Appendix A.

2.3 Local Noise Climate

The predominant local noise source was mechanical plant noise for site.

2.4 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	1.5m/s
Wind Direction	E
Cloud Cover	10%
Temperature	18°C
Precipitation	None

3 Design Criteria

3.1 Local Authority Requirements

Local Authority Conditions state that:

'The level of noise emitted from the data centred shall not exceed 5dB below the background level, as measured at the boundary of the noise sensitive premises, other than during emergency operations of the generators or testing periods when the existing background levels will not be exceeded by more than 5dB'.

3.2 Recommended Residential Design Rating Level

On the basis of the above the recommended residential design rating level should therefore be:

Residential Design Rating Level
Representative $L_{A90,\ 15\ mins}$ - 5 dB

3.3 Design Rating Levels

The design rating levels have been obtained from LCP report ref: 89509/3/1/2 dated 24th May 2018 which follows the Local Authority Conditions stated in section 3.1. The external design rating levels are shown in the table below.

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

Receiver premises	Approximate distance (m)	Design Level (Day) $L_{Aeq,\ 16\ hr}$	Design Level (Night) $L_{Aeq,\ 8\ hr}$
Nearest Residential Premises	250	45	40

4 Results

Measurements were taken at various location on the top deck of the plant gantry, 1m away from the chillers while the chillers were in normal operation. The measured results taken 1m away from the chillers to the south of the gantry (MP13, MP13 and MP15) have been averaged and used to determine the sound level at the nearest noise sensitive receiver from the gantry. The measurement positions are shown in Appendix B.

The measured sound pressure levels are shown within Appendix C. The measured sound levels obtained being as follows:

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

Measurement Position	Measured Level dB(A)	Distance correction	Noise level at receiver dB(A)
Chiller gantry 1m away towards the south	66	-48	18

5 Conclusion

Acoustic commissioning testing has been performed at Virtus 7, Prologis Park West, in Uxbridge.

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

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The design criterion is as follows:

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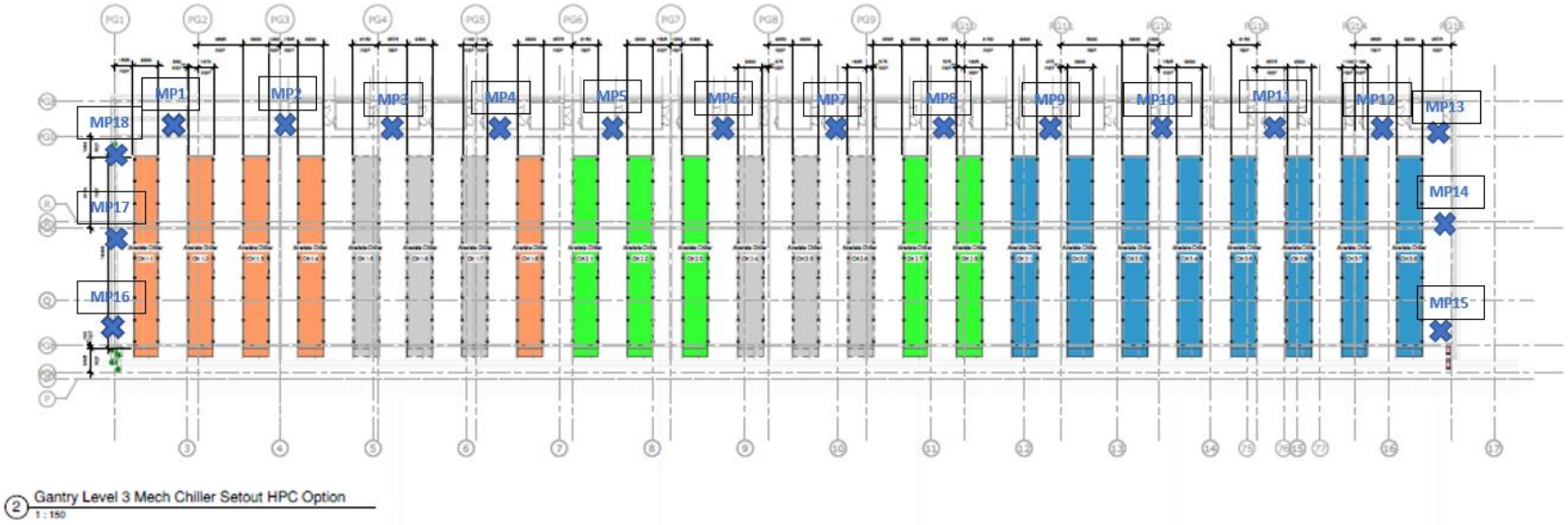
Appendix A: Site Plan

Appendix B: Measurement Positions



Appendix C: Measurement Data

Measurement Position	Date & time	Elapsed time	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	L_{Aeq}	
MP1	23/03/2022 11:36:56	00:00:30	69	69	66	64	59	54	51	44	**65**	3162278
MP2	23/03/2022 11:37:46	00:00:30	73	71	70	67	61	54	51	44	**67**	5011872
MP3	23/03/2022 11:39:12	00:00:30	74	72	70	65	59	53	51	43	**67**	5011872
MP4	23/03/2022 11:40:18	00:00:30	75	73	73	68	62	56	52	44	**69**	7943282
MP5	23/03/2022 11:41:02	00:00:30	75	75	76	71	64	58	53	45	**72**	15848932
MP6	23/03/2022 11:41:40	00:00:30	77	75	76	72	65	59	54	47	**73**	19952623
MP7	23/03/2022 11:42:28	00:00:30	73	70	69	65	59	53	48	41	**66**	3981072
MP8	23/03/2022 11:43:10	00:00:30	71	68	67	62	56	49	48	41	**63**	1995262
MP9	23/03/2022 11:44:12	00:00:30	68	68	67	62	56	49	45	43	**63**	1995262
MP10	23/03/2022 11:44:50	00:00:30	65	68	67	62	56	50	46	47	**63**	1995262
MP11	23/03/2022 11:45:32	00:00:30	64	68	67	62	56	50	46	47	**63**	1995262
MP12	23/03/2022 11:46:28	00:00:30	63	68	67	62	56	49	42	43	**63**	1995262
MP13	23/03/2022 11:47:04	00:00:30	64	70	69	64	57	51	42	42	**64**	2511886
MP14	23/03/2022 11:48:38	00:00:30	66	70	68	65	59	53	47	43	**66**	3981072
MP15	23/03/2022 11:49:12	00:00:30	67	71	70	64	59	53	48	41	**66**	3981072
MP16	23/03/2022 11:51:12	00:00:30	71	67	64	59	57	57	56	47	**64**	2511886
MP17	23/03/2022 11:51:48	00:00:30	72	69	66	62	60	59	59	51	**66**	3981072
MP18	23/03/2022 11:52:26	00:00:30	69	67	66	62	59	53	49	39	**64**	2511886
	Average (MP13, MP14 and MP15)		**66**	**70**	**69**	**64**	**58**	**52**	**46**	**42**	**66**	

Distance correction

Octave	125	250	500	1k	2k	4k	8k	dB(A)
L1	70	69	64	58	52	46	42	66
r1	1	1	1	1	1	1	1	
r2	250	250	250	250	250	250	250	
L2	22	21	16	10	4	-2	-6	18
Loss	48	48	48	48	48	48	48	48

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 Svantek SV30A 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.

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.