UNIVERSITY COLLEGE LONDON
26 BEDFORD WAY
LONDON
WC1H 0DS

24 HOUR ENVIRONMENTAL NOISE ASSESSMENT

Our Ref: CPT/191217/001/R01

Report prepared on behalf of

H + C Contracts Ltd
Unit 3 Holt Barns
Frith End Road
Frith End
Borden
Hants
GU35 0QN

By:

Eurovib Acoustic Products Ltd
Goodwood House
86 Holmethorpe Avenue
Redhill
Surrey
RH1 2NL

Written By:

Cliff Tucker AMIOA

Date: 2nd May 2018

CONTENTS

1.0 Brief

1.1 To carry out an Environmental Noise Assessment & Report in order to establish the prevailing environmental noise levels enjoyed by the site.

1.2 From these measurements and through liaison with the Local Authority we establish an acoustic design criterion (the Rating Level) at the nearest noise sensitive boundary (the Assessment Position).

1.3 To analyse the published acoustic data for the proposed equipment in relation to the Rating Level including any proposed acoustic control hardware in order to establish compliance or otherwise.

1.4 We have excluded the following from our brief:

- Construction noise
- Any Building Regulations noise considerations
- Traffic noise/traffic count per se, although we have recorded LA10 percentiles.
- Health and safety acoustics.

2.0 Executive Summary

2.1 An Environmental Noise Assessment has been carried out at UCL, 26 Bedford Way, London WC1H 0DS.

2.2 A minimum background noise level of 39 (39.4) dB $LA_{90,\ 15mins}$ has been measured for the hours of operation of the proposed plant.

2.3 A Rating Level is set at 10 dB below the relevant background noise levels, as per Camden Council's normal conditions.

2.4 The Rating Level is therefore be 29 dB $LA_{eq,\ 15\ mins}$.

2.5 The proposed plant is to be installed at basement level at the rear of the building.

2.6 It is proposed to install a discharge attenuator to the air cooled chiller to control discharge noise. The attenuator should be nominally be 45% free area and not less than 1800 mm long.

2.7 It is also proposed to install inlet attenuators to the air cooled chiller. The attenuators should be nominally 30% free area and not less than 900 mm long.

2.8 The calculated resultant noise level at the Assessment Position with all units operating at full duty is 29 dB LAeq.

2.9 This is equal to the Rating Level and the Local Authority's requirements in regard to noise will therefore be met.

3.0 Location

3.1 26 Bedford Way is a large multi-storey building currently occupied by the University College London's division of Psychology and Language.

3.2 The building bounded by Bedford Way to the North East; Gordon Square to the North West; the rear of the properties on Woburn Square to the South West; and further UCL buildings with Russell Square beyond to the South East.

4.0 Instrumentation

4.1 The instrumentation employed was:

- Rion NL-32/NX-22RT Class 1 Environmental Noise Analyser
- Rion NC74 Class1 Acoustic Calibrator
- Rion 12 mm Condenser Microphone & Foam Windshield on 1,5 meter Extension Pole.
- Rion Weatherproof Security Box

4.2 The instruments carry current calibration certificates a copy of which can be found in Appendix C and were additionally hand calibrated both before and after completion of the survey with no deviation found.

5.0 Time, Date & Environmental Conditions

5.1 The survey was conducted from 14.21 on the 18th December 2017 through until 09.51 on the 19th December 2017.

5.2 The weather throughout the survey period was cold with clear skies, light winds, and no rain.

5.3 The site engineer was Cliff Tucker: the results were analysed & reported by Cliff Tucker.

6.0 Methodology.

6.1 The survey and report generally follow the procedures, method and assessments as described in BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

6.2 The standard requires a comparison between the typical measured background noise level and the equivalent continuous A-weighted sound pressure level of the proposed plant at the Assessment Position.

6.3 BS4142: 2014 also requires uncertainty to be considered as part of the assessment.

- We have undertaken a 24 hour background noise survey and the data gathered has been analysed to ensure that any influences from the weather conditions have been accounted for in the assessment.
- The calibration of the sound level meter was checked before and after the survey period and no significant drift found.
- Standard acoustic theory has been applied in the noise propagation calculations.

It is therefore considered that the uncertainty associated with the assessment is minimal and the results, as stated, are therefore valid.

6.4 The Reference Time Interval used for the survey was 15 minutes.

6.5 The microphone position (the measurement position) was the bottom of the vehicle access ramp to the parking area for the building.

6.6 The background level as measured at the microphone position is considered to be representative of the levels enjoyed at the assessment position.

6.7 The Assessment Position is taken to be the rear of the properties aligning Woburn Square, a distance of not less than 28 m from the proposed plant location.

6.8 The measurement position; assessment positions; and the other relevant points of interest are shown on the plan within Appendix 'A'.

6.9 The measured levels were the principle LA percentiles as prescribed in BS 4142.

6.10 The most significant of the measured percentiles for our purposes are as follows:

- LA_{eq}, (the mean sound pressure level corresponding to a fluctuation level across time period 't'). Used for the measurement and assessment of the Ambient Noise Level; The Specific Noise Level; The Residual Level and the Rating Level
- LA_{10} ('A' weighted level exceeded for 10% of the time) is used for traffic noise assessment.
- LA_{90}, ('A' weighted level exceeded for 90% of the time). Represents the Background Level and is often used as the target threshold against which the acoustic design criteria are set.

  We also measured the maximum and minimum levels.

6.11 You will note the basic objective is to establish a Rating Level at the Assessment Point for comparison with the specific noise level from any new plant in order to predict the likelihood of noise complaint.

6.12 Camden Council's requirements are that the specific noise from the proposed plant shall be no greater than 10 dB-A below the minimum measured background noise level measured for the proposed hours of operation of the plant.

6.13 The plant has the propensity to operate 24 hours per day, 7 days per week.

7.0 Results Summary & Assessment of Required Rating Level

7.1 The full set of measured levels are presented in Appendix C of this report

7.2 The plant has the propensity to operate 24 hours per day 7 days per week.

7.3 The minimum L90 level measured was 39.4 dB LA90 at 03.21 on the 19th December 2017.

7.4 The Rating Level is therefore set at 29 dB LAeq, 15 mins.

8.0 Analysis

8.1 Proposed Plant & Location

The proposed items of plant are:

- 1 no. ICE090 Air cooled chiller.
- 2 no. Daikin RZQG71 Air cooled condenser
- 1 no. Daikin RXS50 Air cooled condenser

The plant is to be installed at basement level to the rear of building.

The Assessment Position is taken to be the rear of the properties aligning the Western side of Woburn Square.

The Assessment Position is not less than 28 m from the proposed plant location.

The plant has the propensity to operate 24 hours per day 7 days per week.

The manufacturers published Sound Power Level spectrum for the chiller under full load is as follows:

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
ICE090	81	85	88	90	88	83	76	68

The manufacturers published Sound Pressure Level spectra for the condensers under full load in their loudest mode is as follows:

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
RZQ71	54	53	53	47	44	40	37	31
RXS50	42	47	44	39	38	33	24	15

The plant noise has no tonal properties. Being inverter driven, there is no intermittency.

8.2 Plant Analysis

8.2.1 ICE090 Discharge

It is proposed to install a discharge silencer on top of the chiller in order to control discharge noise, which is dominant. By dominant we mean that the discharge noise level is at least 10 dB-A louder than the inlet noise levels.

The calculation is based on using a 45% free area silencer not less than 1800 mm long, which will have a pressure drop of 20 Pa at full duty.

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
Lw	81	85	88	90	88	83	76	68
Dist Loss Q=4	34	34	34	34	34	34	34	34
D.I.L.	8	15	24	35	45	37	27	18
Lp Ass	39	36	30	21	9	12	15	16
A-Weight	26	16	9	3	0	-1	-1	1
Lp-A Ass	13	20	21	18	9	13	16	15

This is equivalent to 26 dB-A.

8.2.2 ICE090 Inlet

It is proposed to install inlet silencers to the chiller in order to control inlet noise.

The calculation is based on using a 30% free area silencers not less than 900 mm long, which will have a pressure drop of 12 Pa at full duty.

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
Lw	71	75	78	80	78	73	66	58
Dist Loss Q=4	34	34	34	34	34	34	34	34
D.I.L.	7	13	19	26	31	38	33	20

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
Lp Ass	30	28	25	20	13	1	-1	4
A-Weight	26	16	9	3	0	-1	-1	1
Lp-A Ass	4	12	16	17	13	2	0	3

This is equivalent to 21 dB-A.

8.2.3 RZQ71

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
Lp @ 1 m	54	53	53	47	44	40	37	31
Add for 2 no.	3	3	3	3	3	3	3	3
Resultant	57	56	56	50	47	43	40	34
Dist Loss	29	29	29	29	29	29	29	29
Lp Ass	28	27	27	21	18	14	11	5
A-Weight	26	16	9	3	0	-1	-1	1
Lp-A Ass	2	11	18	18	18	15	12	4

This is equivalent to 24 dB-A.

8.2.4 RXS50

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
Lp @ 1 m	42	47	44	39	38	33	24	15
Dist Loss	29	29	29	29	29	29	29	29
Lp Ass	13	18	15	10	9	4	-5	-14
A-Weight	26	16	9	3	0	-1	-1	1

	Octave Band Mid Frequency Hz							
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
Lp-A Ass	-13	2	6	7	9	5	-4	-15

This is equivalent to 14 dB-A.

8.2.5 Cumulative Level

The cumulative level is the logarithmic addition of the above calculated levels and equals 29 dB-A with the chiller remaining the dominant noise source.

This is equal to the Rating Level and the Local Authority's requirements in terms of noise will therefore be met.

8.3 Vibration

As the proposed plant is to be in close proximity to the building the units should be resiliently mounted to prevent the transfer of vibration or structure borne noise.

Piped connections should be via flexible pipe connectors.

9.0 Conclusion

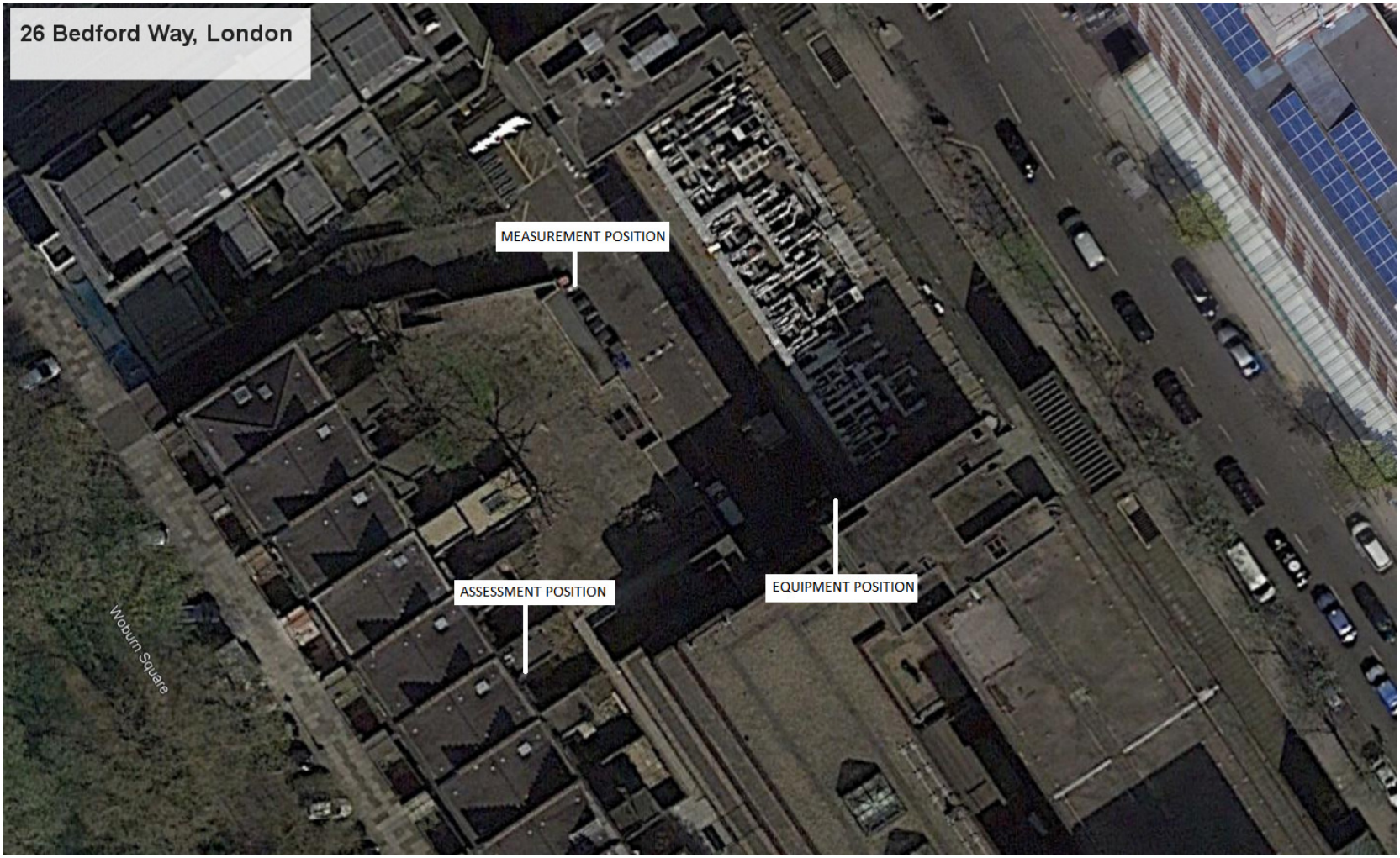
The new plant that is to be installed should be designed, selected, and located to ensure compliance with the above objectives.

Assuming this is achieved as outlined above then the Local Authority's requirements in terms of noise will be met.

Report ends

Cliff Tucker AMIOA
Eurovib (Acoustic Products) Ltd

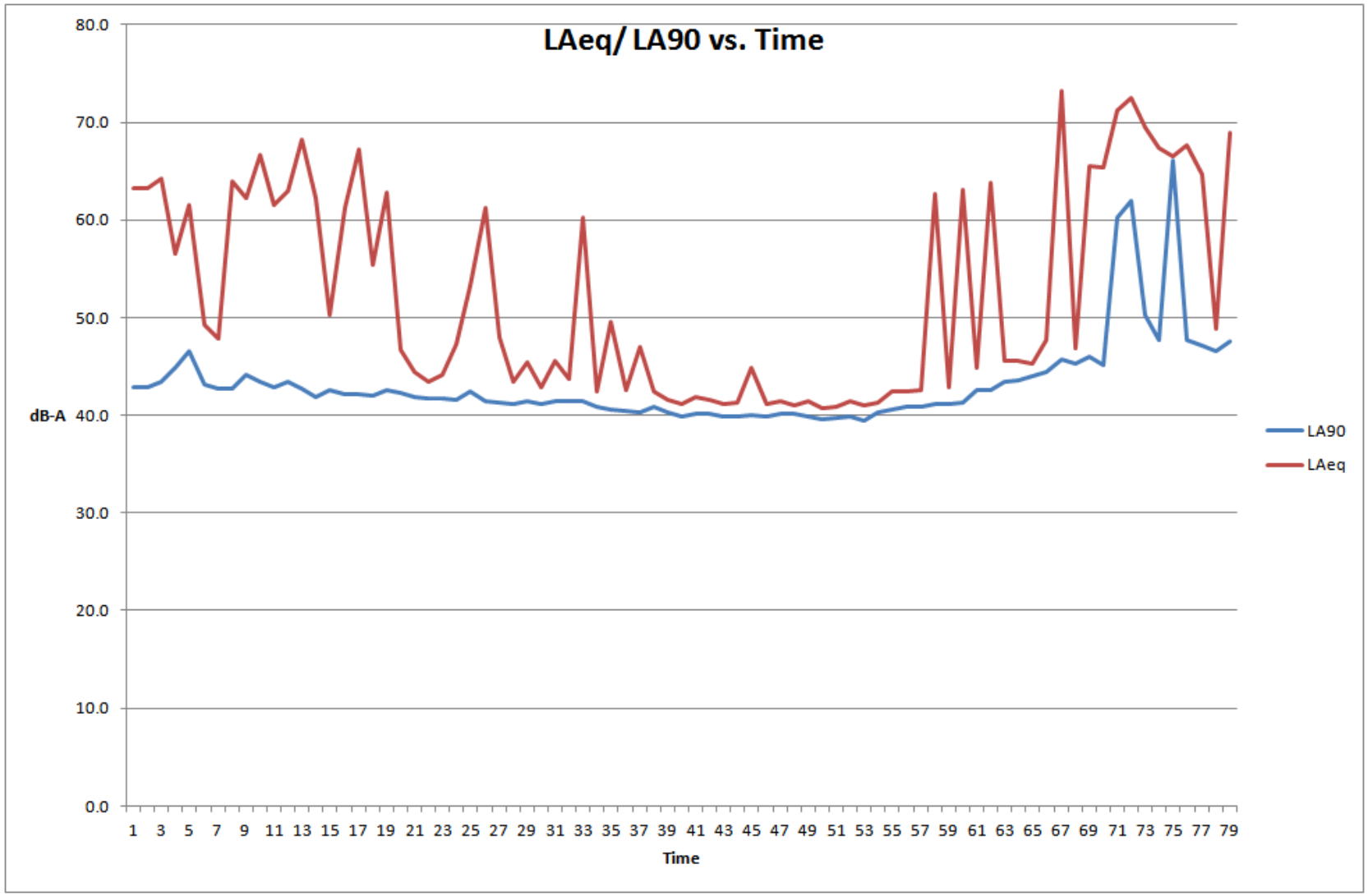
APPENDIX A – Positions, Distances, & Locations


26 Bedford Way, London
MEASUREMENT POSITION
ASSESSMENT POSITION
EQUIPMENT POSITION
Woburn Square

Appendix B – Full Measured Levels

Ref	Time	Measurment Time	LAmax	LAmin	LA10	LA90	LAeq
1	18/12/2017 14:21	0:15:00	91.6	40.5	52.3	42.8	63.3
2	18/12/2017 14:36	0:15:00	90.3	40.4	52.7	42.9	63.3
3	18/12/2017 14:51	0:15:00	91.3	40.9	51.4	43.4	64.2
4	18/12/2017 15:06	0:15:00	72.8	41.7	58.0	44.8	56.6
5	18/12/2017 15:21	0:15:00	91.6	42.7	56.1	46.6	61.5
6	18/12/2017 15:36	0:15:00	61.6	41.2	53.2	43.2	49.3
7	18/12/2017 15:51	0:15:00	67.0	40.6	49.4	42.7	47.8
8	18/12/2017 16:06	0:15:00	91.7	41.4	47.4	42.7	64.0
9	18/12/2017 16:21	0:15:00	91.8	42.3	51.2	44.1	62.3
10	18/12/2017 16:36	0:15:00	91.9	41.7	65.1	43.5	66.7
11	18/12/2017 16:51	0:15:00	90.8	40.0	49.0	42.8	61.5
12	18/12/2017 17:06	0:15:00	91.2	41.2	53.2	43.5	62.9
13	18/12/2017 17:21	0:15:00	89.2	40.5	56.0	42.7	68.2
14	18/12/2017 17:36	0:15:00	91.7	40.3	50.9	41.8	62.3
15	18/12/2017 17:51	0:15:00	74.8	40.3	52.0	42.6	50.3
16	18/12/2017 18:06	0:15:00	82.8	40.6	62.0	42.2	61.3
17	18/12/2017 18:21	0:15:00	86.1	40.3	69.9	42.1	67.2
18	18/12/2017 18:36	0:15:00	88.0	40.2	47.1	42.0	55.4
19	18/12/2017 18:51	0:15:00	91.7	40.6	49.0	42.6	62.8
20	18/12/2017 19:06	0:15:00	62.3	39.7	46.9	42.3	46.7
21	18/12/2017 19:21	0:15:00	59.7	39.8	46.1	41.8	44.4
22	18/12/2017 19:36	0:15:00	52.9	40.0	45.1	41.7	43.5
23	18/12/2017 19:51	0:15:00	59.2	40.4	46.0	41.7	44.2
24	18/12/2017 20:06	0:15:00	64.4	40.0	48.4	41.6	47.3
25	18/12/2017 20:21	0:15:00	73.9	39.8	51.7	42.4	53.2
26	18/12/2017 20:36	0:15:00	91.7	39.8	45.4	41.4	61.3
27	18/12/2017 20:51	0:15:00	68.1	39.5	46.7	41.3	48.0
28	18/12/2017 21:06	0:15:00	53.5	39.7	45.3	41.2	43.5
29	18/12/2017 21:21	0:15:00	60.7	40.3	46.0	41.5	45.4
30	18/12/2017 21:36	0:15:00	53.7	40.1	44.4	41.2	42.8
31	18/12/2017 21:51	0:15:00	71.3	40.2	46.5	41.4	45.6
32	18/12/2017 22:06	0:15:00	53.8	40.0	45.9	41.4	43.7
33	18/12/2017 22:21	0:15:00	90.8	39.9	44.9	41.4	60.2
34	18/12/2017 22:36	0:15:00	49.6	39.9	44.1	40.8	42.4
35	18/12/2017 22:51	0:15:00	70.2	39.5	45.0	40.6	49.5
36	18/12/2017 23:06	0:15:00	55.5	39.4	44.5	40.5	42.6
37	18/12/2017 23:21	0:15:00	67.8	38.9	45.3	40.3	47.0
38	18/12/2017 23:36	0:15:00	48.6	39.8	44.2	40.9	42.4
39	18/12/2017 23:51	0:15:00	48.3	39.1	43.2	40.3	41.6
40	19/12/2017 00:06	0:15:00	48.0	38.6	42.5	39.8	41.2

Ref	Time	Measurment Time	LAmax	LAmin	LA10	LA90	LAeq
41	19/12/2017 00:21	0:15:00	52.8	39.0	43.3	40.2	41.9
42	19/12/2017 00:36	0:15:00	50.8	38.9	43.3	40.1	41.6
43	19/12/2017 00:51	0:15:00	51.0	38.7	42.6	39.8	41.2
44	19/12/2017 01:06	0:15:00	48.7	38.6	42.7	39.9	41.3
45	19/12/2017 01:21	0:15:00	58.0	38.8	46.5	40.0	44.8
46	19/12/2017 01:36	0:15:00	49.0	38.8	42.5	39.9	41.2
47	19/12/2017 01:51	0:15:00	51.3	38.8	42.8	40.1	41.5
48	19/12/2017 02:06	0:15:00	45.0	39.2	42.2	40.2	41.0
49	19/12/2017 02:21	0:15:00	59.6	38.7	42.3	39.8	41.4
50	19/12/2017 02:36	0:15:00	50.2	38.7	42.0	39.6	40.7
51	19/12/2017 02:51	0:15:00	46.0	38.6	42.2	39.7	40.9
52	19/12/2017 03:06	0:15:00	59.4	38.6	42.6	39.8	41.5
53	19/12/2017 03:21	0:15:00	50.8	38.2	42.6	39.4	41.0
54	19/12/2017 03:36	0:15:00	45.5	39.1	42.3	40.3	41.3
55	19/12/2017 03:51	0:15:00	60.4	39.5	43.1	40.6	42.5
56	19/12/2017 04:06	0:15:00	61.0	39.6	43.4	40.9	42.4
57	19/12/2017 04:21	0:15:00	53.4	39.3	44.2	40.9	42.6
58	19/12/2017 04:36	0:15:00	91.4	39.8	51.8	41.2	62.6
59	19/12/2017 04:51	0:15:00	57.8	40.0	44.2	41.1	42.8
60	19/12/2017 05:06	0:15:00	92.0	39.6	51.7	41.3	63.1
61	19/12/2017 05:21	0:15:00	68.8	41.1	45.3	42.6	44.8
62	19/12/2017 05:36	0:15:00	91.3	41.1	53.0	42.6	63.8
63	19/12/2017 05:51	0:15:00	70.4	41.9	46.0	43.4	45.5
64	19/12/2017 06:06	0:15:00	65.4	42.2	47.0	43.6	45.6
65	19/12/2017 06:21	0:15:00	52.7	42.1	46.5	44.0	45.3
66	19/12/2017 06:36	0:15:00	62.3	43.0	51.1	44.4	47.7
67	19/12/2017 06:51	0:15:00	92.3	44.0	75.5	45.7	73.2
68	19/12/2017 07:06	0:15:00	54.4	44.0	48.5	45.3	46.9
69	19/12/2017 07:21	0:15:00	92.2	44.1	52.4	46.0	65.5
70	19/12/2017 07:36	0:15:00	91.1	43.8	57.5	45.2	65.3
71	19/12/2017 07:51	0:15:00	91.1	58.8	74.2	60.2	71.2
72	19/12/2017 08:06	0:15:00	91.2	56.4	75.0	61.9	72.5
73	19/12/2017 08:21	0:15:00	92.1	46.0	66.4	50.3	69.5
74	19/12/2017 08:36	0:15:00	91.9	46.3	66.7	47.7	67.4
75	19/12/2017 08:51	0:15:00	85.1	45.0	67.1	66.1	66.5
76	19/12/2017 09:06	0:15:00	91.7	45.2	67.0	47.7	67.6
77	19/12/2017 09:21	0:15:00	91.7	45.7	54.8	47.1	64.7
78	19/12/2017 09:36	0:15:00	67.6	45.0	49.8	46.5	48.8
79	19/12/2017 09:51	0:14:33	92.0	45.5	72.6	47.6	69.0


LAeq/ LA90 vs. Time
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
dB-A
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79
Time
LA90
LAeq

Appendix C – Calibration Certificate

CERTIFICATE OF CALIBRATION

Issued By BSRIA Instrument Solutions

Date of Issue 01 December 2015

Certificate Number
STD77563

BSRIA
Instrument Solutions
Old Bracknell Lane West, Bracknell,
Berkshire, RG12 7AH, United Kingdom
T: +44 (0) 1344 459314 F: +44 (0) 1344 465556
E: info@bis.fm W: www.bis.fm

BSRIA Quality Assured
M J Trotter

Approved Signatory

Customer : Impulse Acoustics Ltd

Date Received : 25 November 2015

Instrument -

System ID :	98425
Description :	Sound Level Meter, Type 1
Manufacturer :	Rion
Model Number :	NL32
Serial Number :	00403194
Procedure Version :	NO381V1

Environmental Conditions

Temperature :	20°C +/- 4°C	Mains Voltage :	240V +/- 10V
Relative Humidity :	50% +/- 20%	Mains Frequency :	50Hz +/- 1Hz

Comments

Calibration tolerances quoted are those as stated in BS EN 61672-1:2003
Unless otherwise stated all readings are made at 1kHz.
Calibration performed acoustically.
Preamp Serial Number 32499.
Barometric Pressure= 1015.0 mbar. Ambient Temperature = 21.5 °C

Traceability Information

Instrument description	*Serial number*	*Certificate number*	*Cal. Date*	*Cal. Period*
B&K 4226 Calibrator (Danak 307)	1551580	CDK1500895	03/02/2015	104

Calibrated By : D. M. Tovey D.M. Tovey **Date of Calibration :** 01 December 2015

CERTIFICATE OF CALIBRATION

Certificate Number
STD77563

Test Title	Tolerance	Applied Value	Reading	% Of Spec.
Acoustic Pre Calibration Check at 1kHz. 20 to 110dB Range. Lp Mode.				
As Found	1.1dB	94.0dB	94.2dB	18%
As left	1.1dB	94.0dB	94.0dB	0%
CALIBRATION RESULTS				
Lp Mode, 1kHz, Fast Response.				
Range, 20 to 100dB	1.1dB	94.0dB	94.1dB	9%
Range, 20 to 110dB	1.1dB	94.0dB	94.0dB	0%
	1.1dB	104.0dB	104.0dB	0%
Range, 30 to 120dB	1.1dB	94.0dB	93.9dB	9%
	1.1dB	104.0dB	103.9dB	9%
	1.1dB	114.0dB	113.9dB	9%
Range, 40 to 130dB	1.1dB	114.0dB	113.9dB	9%
A level of 94dB, at the frequency shown, was applied to the instrument and its dB(A) weighted response recorded. Range La 20 to 110dB				
94dB @ 125Hz	1.5dB	77.9dB	77.8dB	7%
94dB @ 1kHz	1.1dB	94.0dB	94.0dB	0%
94dB @ 4kHz	1.6dB	95.0dB	95.4dB	25%
A level of 94dB, at the frequency shown, was applied to the instrument and its dB(C) weighted response recorded. Range Lc 20 to 110dB				
94dB @ 125Hz	1.5dB	93.8dB	93.8dB	0%
94dB @ 1kHz	1.1dB	94.0dB	93.9dB	9%
94dB @ 4kHz	1.6dB	93.2dB	93.5dB	19%
Lp Filter Mode, Fast Response, 20 to 110dB Range.				
94dB @ 63Hz	1.5dB	94.0dB	94.0dB	0%
94dB @ 125Hz	1.5dB	94.0dB	93.9dB	7%
94dB @ 250Hz	1.4dB	94.0dB	93.9dB	7%
94dB @ 500Hz	1.4dB	94.0dB	93.9dB	7%
94dB @ 1kHz	1.1dB	94.0dB	94.0dB	0%
94dB @ 2kHz	1.6dB	94.0dB	94.2dB	12%
94dB @ 4kHz	1.6dB	94.0dB	94.4dB	25%

End.

Uncertainties

Sound Level	±0.5 dB
Instrument Stability	An additional uncertainty of 1 lsd should be added to all values.

CERTIFICATE OF CALIBRATION

Issued By BSRIA Instrument Solutions
Date of Issue 01 December 2015

Certificate Number
STD77565

BSRIA
Instrument Solutions
Old Bracknell Lane West, Bracknell,
Berkshire, RG12 7AH, United Kingdom
T: +44 (0) 1344 459314 F: +44 (0) 1344 465556
E: info@bis.fm W: www.bis.fm

Approved Signatory

Customer : Impulse Acoustics Ltd

Date Received : 25 November 2015

Instrument -

System ID :	98426
Description :	Acoustic Calibrator, Type 1
Manufacturer :	Rion
Model Number :	NC74
Serial Number :	00830764
Procedure Version :	NO192V1

Environmental Conditions

Temperature :	20°C +/- 4°C	Mains Voltage :	240V +/- 10V
Relative Humidity :	50% +/- 20%	Mains Frequency :	50Hz +/- 1Hz

Comments

Calibration performed acoustically.

Barometric Pressure= 1015.2 mbar. Ambient Temperature = 21.5 °C

Traceability Information

Instrument description	*Serial number*	*Certificate number*	*Cal. Date*	*Cal. Period*
B&K 4226 Calibrator (Dansk 307)	1551580	CDK1500895	03/02/2015	104

Calibrated By : D. M. Tovey **Date of Calibration :** 01 December 2015

CERTIFICATE OF CALIBRATION

Certificate Number
STD77565

Test Title	Tolerance	Nominal Level	Measured Level	% Of Spec.
PRE CALIBRATION CHECK				
Battery Level Check	---	---	Pass	
CALIBRATION RESULTS				
The acoustic calibrators output level was compared against a reference acoustic calibrator using a transfer sound level meter. The values recorded are shown on this certificate.				
Acoustic calibration at 1kHz				
Acoustic Level	0.30dB	94.0dB	93.8dB	67%

---------- **END OF DATA** ----------

Uncertainties

Sound Level	±0.5 dB

Appendix D – Definitions

DECIBEL - The ratio of sound pressures that we can hear is a ratio of 10^6. A logarithmic measurement scale is therefore used for convenience. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

The threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain.

A change of 1 dB is only perceptible under controlled conditions.

dB(A) - The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An 'A'-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds to a subjective halving or doubling of the loudness of a sound.

EQUIVALENT CONTINUOUS SOUND LEVEL (LEQ) - An index often used for the assessment of overall noise exposure is the equivalent continuous sound level, (LEQ). This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

The 'A' weighted statistical sound level over a time period, T, is denoted $LA_{EQ,T}$.

AMBIENT NOISE - The total encompassing sound in a given situation at a given time. Most often described in terms of the index $LA_{EQ,.T}$.

SPECIFIC NOISE ($LA_{EQ,T}$) - The equivalent continuous A-Weighted sound pressure level at the assessment position produced by the specific noise source over a time interval T.

STATISTICAL NOISE LEVELS - For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation.

- The L10, the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise.
- The L90, the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level.

'A' weighted statistical noise levels are generally used and are denoted LA10, LA90 etc. The reference time period (T) is normally included, e.g. $LA_{10,}$