ALLAWAY ACOUSTICS
LIMITED

Our Ref: 28955/HA100

Client: Circle Anglia,
Circle Anglia House,
1-3 Highbury Station Road,
Islington,
London, N1 1SE

Project: 93-95 Kings Cross Road,
WC1X 9LP, London

Existing Environmental Noise Levels & Plant Noise Assessment

Date of Survey: 2nd – 3rd February 2010

Prepared By: Chris Swiejkowski BSc/MSc AMIOA
Checked By: Chris Williams BSc (Hons) MIOA

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93-95 Kings Cross Road, WC1X 9LP, London

1. Introduction

1.1 Prior to the installation of new building services plant at this site, we have carried out an environmental noise survey to establish the existing minimum background noise levels.

1.2 This report describes the survey and details the results obtained.

1.3 On the basis of the survey results, a target noise level will be determined for the proposed future plant.

2. Site Description

2.1 The site is located at 93-95 Kings Cross Road, London WC1X 9LP. The building is surrounded by Cubitt Street to the west, Kings Cross Road to the east, Frederick Street to the north and adjacent buildings to the south.

2.2 The site is exposed to high levels of background noise due to the busy roads and existing plant.

2.3 A Daikin VRV REYQ8P heat pump is to be located at Basement level – Appendix B shows the BW Partnership Basement Mechanical Services Layout drawing BWS-498-501 Rev T.

2.4 The Daikin heat pump technical data is shown in Appendix C.

2.5 The nearest affected residential properties are located at ground floor level and are approximately 10m from the plant location. Although the Client or Local Authority should confirm this.

2.6 The plant will operate during normal office hours of 8am – 6pm.

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3. Survey

3.1 The survey was carried out between the hours of 11:30am on Wednesday 3rd February and 2:30pm on Thursday 4th February 2010.

3.2 The weather during the survey period was cool with occasional winds and no rain. This was deemed not to have any significant effect on the measured noise levels.

3.3 To the best of our knowledge there were no roadworks or other unusual influences on traffic flow within the vicinity.

3.4 Noise levels were measured for 15-minute periods at basement level, at the rear of the building. This is the location of the proposed new plant.

3.5 Of the parameters measured, the L_{A90} gives the closest representation of the background level, as it is the level exceeded for 90% of the measurement period. The L_{AEQ} is an energy-averaged value, and the L_{A10} is indicative of traffic noise.

4.6 In addition to the A-weighted levels referred to above, representative octave-band spectra were also recorded so that the frequency distribution of the noise could be assessed.

4. Instrumentation

4.1 All measurements were obtained using a Norsonic NOR131 Sound Level Meter (s/n 1312779). This instrument conforms to IEC60651 and 60804 Type 1 specifications and to IEC61260 and 61672-1:2002 Class 1 specifications.

4.2 Before commencing the readings, the meter was checked for correct calibration with both the internal reference signal and an acoustic calibrator. The calibration was rechecked after the survey with no change noted.

4.3 To minimise environmental effects, the microphone was fitted with a windshield at all times.

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5. Results

5.1 Full details of the results obtained are attached to this report (Appendix A).

5.2 The minimum background (L90) noise level was 48dB(A) during the measurement period.

6. Discussion

6.1 The constant noise from existing plant discharge means that the background noise level is quite steady.

6.2 In order that plant noise does not increase existing noise levels it must by at least 10dB(A) lower than the measured background.

6.3 To this end, we would recommend that a limit of 38dB(A) be set as the plant noise limit. This limit should apply to the nearest noise sensitive location, which is approximately 10m away from the measurement position.

6.4 Suppression of any tonal components from the plant is also important, as this can increase the potential disturbance.

7. Assessment

7.1 Table 7.1 below shows the calculation of the resultant noise level at the nearest receiver:

Table 7.1

Description	dB(A)	Comment
Daikin Lp at 1m	58	Published (Appendix C)
Distance correction	-16	Conformal method
Location Correction	+6	Reflections from building
Resultant Lp	**48**	

7.2 The calculated resultant noise level is 48dB(A), which exceeds the target noise level by 10dB(A).

7.3 To this end, we would recommend that the Daikin unit be positioned with a proprietary acoustic louvred enclosure.

7.4 The enclosure should be constructed using 300mm deep acoustic louvres with the following minimum insertion loss:

Minimum acoustic louvre performance, insertion loss (dB)

63	125	250	500	1k	2k	4k	8k
5	6	8	11	18	25	20	16

7.5 Additionally, an attenuated discharge skirt shall be fitted to the top of the enclosure and shall have a radius bend 'hood' so that there is no direct line of sight to the fan from the listener location at ground floor. The discharge skirt should have the same acoustic performance as the acoustic louvres.

7.6 Providing the Daikin unit is located within the acoustic enclosure as described above, then it will be possible for the target noise level of 38dB(A) to be achieved.

Prepared:

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Chris Swiejkowski BSc/MSc AMIOA
24 February 2010

Checked:

.....

Chris Williams BSc (Hons) MIOA

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APPENDIX A - SCHEDULE OF RESULTS

Date of Survey: 2nd-3rd February 2010

RE: 93-95 Kings Cross Road, London, WC1X 9LP

Table 1 – Leq

Leq	Octave Band Centre Frequency								
Time	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1.0 k**	**2.0 k**	**4.0 k**	**8.0 k**	**dB(A)**
11:31	59.1	55.0	55.4	50.9	49.5	49.2	46.9	45.3	56.1
11:46	59.5	54.6	53.6	50.5	47.8	43.2	36.6	29.3	52.7
12:01	59.8	53.7	52.4	49.9	48.1	43.6	36.5	28.7	52.5
12:16	59.4	53.8	52.4	49.7	47.6	43.6	37.2	30.2	52.2
12:31	58.9	54.5	52.5	49.4	47.0	42.8	37.2	30.5	51.9
12:46	59.2	53.6	52.4	49.2	46.9	42.5	36.7	31.2	51.7
13:01	60.0	55.5	54.3	52.1	51.4	46.8	39.5	30.7	55.3
13:16	58.5	53.0	52.1	49.2	46.8	42.4	36.3	29.7	51.5
13:31	60.8	55.4	53.3	51.7	48.8	46.4	46.3	38.9	54.8
13:46	59.1	54.3	53.2	50.7	48.6	45.1	38.3	31.3	53.3
14:01	59.1	54.5	53.5	51.6	49.7	47.3	44.1	39.8	54.9
14:16	58.4	52.9	52.0	50.2	48.7	44.8	39.7	34.1	53.1
14:31	58.9	54.2	52.9	50.1	48.2	44.4	39.1	32.8	52.9
14:46	57.9	52.7	51.5	48.7	47.0	43.5	36.2	29.1	51.6
15:01	59.4	53.7	51.9	49.4	47.5	44.3	40.3	35.8	52.5
15:16	58.3	53.2	51.4	49.3	48.3	47.5	45.6	41.8	54.2
15:31	58.7	53.7	52.0	49.7	49.0	48.6	46.7	43.3	55.1
15:46	58.1	53.5	52.1	49.2	47.6	44.5	39.7	34.1	52.4
16:01	58.3	53.7	53.2	49.8	47.2	43.6	37.4	30.5	52.2
16:16	58.7	53.5	52.4	49.1	47.6	43.5	35.6	27.1	52.0
16:31	58.5	54.2	52.5	49.4	47.1	44.2	38.4	28.3	52.2
16:46	57.7	54.0	52.2	48.8	46.1	41.9	34.6	25.5	51.1
17:01	58.2	54.6	52.7	49.2	46.5	42.1	35.9	27.8	51.5
17:16	57.8	53.9	51.8	48.9	46.8	42.1	34.1	25.5	51.3
17:31	58.1	54.9	53.0	51.4	48.1	42.5	34.9	25.9	52.9
17:46	59.1	56.9	56.5	55.7	53.3	46.3	36.9	26.2	57.2
18:01	59.4	55.2	52.5	48.7	46.8	42.1	34.7	25.4	51.5
18:16	58.3	55.3	53.3	51.4	48.2	42.3	34.0	24.6	52.9
18:31	58.3	54.5	52.3	48.7	46.4	41.7	33.6	24.8	51.2
18:46	57.9	53.0	52.0	48.6	46.0	41.1	32.9	22.9	50.8

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Table 1 – Leq – Cont...

Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
19:01	58.2	54.9	53.5	49.6	46.6	41.4	33.4	23.3	51.7
19:16	57.8	55.2	52.4	49.4	47.3	42.6	34.8	26.2	51.8
19:31	57.2	53.6	52.2	49.2	48.1	43.9	34.7	26.6	52.3
19:46	57.6	52.8	51.7	48.8	47.3	42.7	34.7	26.0	51.6
20:01	58.0	53.4	52.5	48.8	47.0	43.1	35.5	26.8	51.6
20:16	56.8	53.1	52.1	48.4	46.9	43.1	35.1	26.2	51.4
20:31	57.1	53.2	52.2	48.6	46.9	42.5	34.7	25.7	51.4
20:46	55.9	51.2	51.4	48.3	47.0	42.9	35.1	26.6	51.3
21:01	56.6	51.8	50.9	47.8	46.7	42.4	34.5	26.4	50.9
21:16	57.1	54.8	54.8	50.1	47.7	43.3	35.0	26.2	52.7
21:31	55.9	51.3	50.9	47.9	46.0	41.5	33.9	25.8	50.5
21:46	55.0	50.1	50.5	47.5	46.2	41.8	33.7	25.1	50.4
22:01	55.4	49.9	50.8	47.2	46.1	41.3	33.9	25.6	50.2
22:16	54.8	48.8	50.3	47.1	46.5	42.3	34.0	25.9	50.5
22:31	55.5	49.3	50.3	47.0	45.6	41.4	34.1	25.7	50.0
22:46	54.8	49.3	50.3	47.0	45.7	41.6	34.0	25.1	50.0
23:01	55.5	48.8	50.3	47.1	45.6	41.5	34.3	25.5	50.0
23:16	55.4	49.8	50.8	47.5	46.0	42.2	35.4	27.4	50.5
23:31	54.5	48.8	50.3	47.1	45.4	41.8	35.2	27.9	50.0
23:46	56.3	50.0	51.2	48.9	47.0	42.4	35.5	27.3	51.3
00:01	55.5	48.9	50.3	47.0	45.4	41.2	34.3	26.2	49.8
00:16	55.1	49.0	50.4	47.1	45.6	41.4	34.5	26.1	50.0
00:31	53.3	47.5	49.9	46.7	45.1	40.9	33.6	25.1	49.5
00:46	53.3	47.5	49.9	46.7	45.3	41.2	33.8	25.0	49.6
01:01	52.8	47.7	49.7	46.7	45.0	40.9	33.8	25.6	49.4
01:16	52.5	47.0	49.6	46.4	44.3	40.7	33.4	25.0	49.0
01:31	54.4	46.6	49.4	46.6	44.4	40.6	33.5	25.1	49.0
01:46	55.5	48.0	49.7	46.8	44.4	40.5	33.6	25.4	49.1
02:01	52.3	47.7	49.4	46.3	43.9	40.2	33.1	24.7	48.7
02:16	50.8	46.0	49.3	46.4	44.4	40.7	33.8	26.2	49.0
02:31	51.9	46.5	49.2	46.4	44.0	40.7	33.9	25.4	48.8
02:46	51.6	46.5	49.5	46.8	44.0	40.6	33.4	24.8	48.9
03:01	52.7	47.7	49.3	46.4	43.9	40.3	33.2	24.7	48.8
03:16	51.6	46.4	49.3	46.5	44.4	40.5	33.4	25.0	49.0
03:31	55.4	51.2	52.1	50.5	46.7	41.2	33.4	25.2	51.6
03:46	52.6	48.1	49.3	46.4	44.3	40.6	33.3	24.5	49.0
04:01	52.1	46.4	49.4	46.4	44.4	40.7	33.2	24.6	49.0
04:16	51.9	46.1	49.2	46.4	44.4	40.7	33.0	24.4	48.9
04:31	53.2	47.4	49.5	46.7	44.7	41.3	33.6	24.6	49.4
04:46	51.9	47.8	49.6	46.5	44.6	41.3	33.6	24.7	49.3

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Table 1 – Leq – Cont...

Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
05:01	55.8	47.7	49.7	46.6	44.8	40.8	33.4	25.2	49.3
05:16	56.8	48.8	50.1	46.8	44.8	41.0	33.4	24.5	49.5
05:31	52.5	47.8	49.6	46.7	44.8	40.7	33.4	25.0	49.3
05:46	54.7	49.3	50.4	47.2	44.9	40.8	33.1	24.3	49.6
06:01	55.1	50.7	51.8	48.4	45.6	41.2	33.4	24.4	50.5
06:16	55.1	50.3	51.1	47.7	45.2	41.1	33.1	24.6	50.0
06:31	56.9	52.6	52.0	48.7	46.0	41.6	34.0	25.0	50.8
06:46	56.2	52.2	50.8	47.6	44.6	39.9	31.2	22.4	49.5
07:01	57.5	51.5	50.9	47.6	44.5	40.1	32.6	26.8	49.6
07:16	57.1	52.3	51.4	47.8	44.7	41.5	32.4	25.6	50.0
07:31	57.9	52.1	50.3	47.4	44.5	41.4	32.0	22.1	49.6
07:46	58.3	54.5	53.0	52.0	47.1	41.5	31.8	21.6	52.7
08:01	58.9	56.2	53.9	51.6	48.9	43.4	34.1	23.2	53.4
08:16	58.1	52.6	51.8	48.4	46.3	42.2	34.7	33.4	51.1
08:31	58.8	54.4	52.4	49.6	47.0	44.0	42.8	35.8	52.7
08:46	58.5	54.0	52.6	49.2	45.4	41.8	44.9	44.3	52.6
09:01	58.4	54.0	52.5	48.6	45.8	42.5	35.3	26.8	51.1
09:16	58.8	54.1	52.6	48.7	45.5	41.3	33.5	24.1	50.8
09:31	59.3	56.6	53.1	48.8	45.6	42.2	40.9	37.5	51.8
09:46	58.7	53.8	52.2	48.8	45.6	41.6	34.3	26.9	50.9
10:01	58.9	54.5	52.3	49.3	47.2	41.6	34.2	25.7	51.6
10:16	59.3	53.4	52.3	50.6	46.2	41.5	33.9	26.0	51.6
10:31	58.2	53.2	52.2	48.7	45.6	42.1	39.5	37.8	51.3
10:46	58.5	53.2	52.0	49.3	46.1	41.9	36.2	31.3	51.3
11:01	59.0	53.5	52.9	50.7	47.2	42.5	37.2	31.7	52.4
11:16	59.5	54.5	53.6	50.7	47.0	41.2	38.8	32.5	52.3
11:31	59.3	55.6	54.9	51.3	50.1	47.0	37.5	29.9	54.6
11:46	58.3	53.6	52.7	49.0	47.5	43.5	34.7	27.7	51.9
12:01	57.5	52.1	52.7	49.2	46.0	41.9	36.3	32.9	51.2
12:16	57.8	52.3	51.3	48.6	46.2	44.6	36.2	29.7	51.5
12:31	59.6	55.8	56.3	56.3	52.5	47.4	37.0	27.7	57.2
12:46	57.3	52.7	52.2	48.7	45.3	41.4	35.2	29.4	50.7
13:01	58.0	51.6	50.7	47.9	44.6	39.8	33.0	27.8	49.6
13:16	58.3	53.1	51.5	48.8	45.4	41.1	33.7	25.0	50.6
13:31	59.4	53.3	51.5	48.6	46.6	41.4	36.8	33.2	51.1
13:46	59.0	53.0	51.1	48.6	44.9	40.9	34.0	30.5	50.3
14:01	57.8	51.4	50.5	48.4	47.6	41.1	33.3	25.2	51.1
14:16	57.8	52.7	51.5	48.5	44.8	40.7	32.6	23.8	50.2
14:31	57.2	54.6	52.7	50.7	49.1	49.5	49.0	45.7	56.2

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Table 2 – L10

	Octave Band Centre Frequency								
Time	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1.0 k**	**2.0 k**	**4.0 k**	**8.0 k**	**dB(A)**
11:31	60.5	55.4	53.9	50.8	48.8	44.4	38.2	31.5	53.4
11:46	61.2	56.0	54.6	51.7	48.2	44.0	37.8	30.7	53.5
12:01	61.5	55.3	53.6	51.2	49.1	45.0	38.3	29.9	53.7
12:16	61.2	55.5	53.5	50.6	48.5	44.2	37.9	30.0	53.0
12:31	61.1	56.4	54.1	50.7	48.3	44.2	38.9	32.5	53.0
12:46	61.2	55.1	53.5	50.3	48.2	44.0	38.3	33.0	52.8
13:01	61.9	55.7	53.8	50.5	48.4	44.3	39.0	32.4	53.0
13:16	60.7	54.7	53.3	50.1	47.8	43.4	37.8	31.7	52.6
13:31	63.1	57.0	54.3	52.7	48.8	44.5	38.6	31.1	54.0
13:46	61.4	56.1	54.9	52.1	49.2	45.6	39.0	30.6	54.3
14:01	60.9	56.0	54.6	52.2	49.0	47.5	44.9	40.9	55.0
14:16	60.9	54.8	53.4	51.7	50.7	46.3	41.4	36.2	54.7
14:31	60.7	55.7	54.0	51.2	49.1	45.1	40.5	35.0	53.9
14:46	60.4	54.4	52.7	49.7	48.3	44.9	38.2	31.2	52.7
15:01	61.4	55.8	53.5	50.7	49.0	46.2	42.7	38.7	54.0
15:16	60.6	55.3	52.6	50.5	49.9	49.5	47.8	44.2	55.9
15:31	60.3	55.2	53.0	51.2	51.2	51.8	50.1	46.8	57.7
15:46	60.3	54.9	53.1	50.2	48.5	45.8	41.2	35.9	53.2
16:01	60.6	55.5	54.6	50.7	48.4	45.0	39.3	32.1	53.2
16:16	61.3	55.5	53.6	50.2	49.3	45.4	37.4	29.0	53.7
16:31	60.6	56.0	53.7	50.6	48.2	44.0	37.1	28.8	53.2
16:46	59.8	55.8	53.6	50.2	47.6	43.2	35.9	26.5	52.6
17:01	60.3	56.6	54.0	50.8	47.6	42.8	36.1	27.3	52.8
17:16	60.1	55.7	52.8	50.0	47.7	43.3	35.5	26.4	52.3
17:31	60.4	57.3	54.5	50.8	48.5	43.7	36.2	27.0	52.9
17:46	61.3	59.6	57.9	57.5	54.5	45.5	37.2	27.9	58.7
18:01	61.5	56.6	53.5	49.7	47.8	43.3	35.7	26.5	52.3
18:16	60.6	57.3	54.6	51.2	48.4	43.6	34.9	25.9	53.2
18:31	60.6	56.6	53.4	49.6	47.7	43.0	34.9	25.3	52.2
18:46	60.1	55.1	53.1	49.4	47.4	42.6	34.8	25.2	51.8
19:01	60.5	57.1	55.3	51.4	48.0	42.8	35.4	25.8	53.3
19:16	60.4	57.2	53.6	50.9	48.6	43.9	36.5	27.7	53.1
19:31	59.6	55.7	53.6	50.6	49.5	46.2	35.8	27.1	53.7
19:46	60.4	55.0	52.9	50.3	48.6	44.1	36.1	27.4	52.9

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Table 2 – L10 – Cont...

Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
20:01	59.7	55.4	53.9	50.2	48.2	44.1	36.6	27.6	52.8
20:16	59.1	55.1	53.5	49.6	48.1	44.5	36.1	27.1	52.4
20:31	59.6	54.7	53.5	50.0	48.2	43.6	35.6	26.5	52.5
20:46	58.5	53.0	52.5	49.5	48.3	44.1	35.8	27.1	52.3
21:01	58.8	53.7	52.1	48.9	48.1	43.7	35.7	27.3	52.0
21:16	58.8	57.3	55.0	52.0	49.5	43.8	35.1	26.0	54.8
21:31	58.6	53.8	52.1	48.9	47.2	42.5	34.9	26.1	51.3
21:46	57.6	52.3	51.5	48.4	47.4	43.0	34.5	25.5	51.4
22:01	58.2	52.1	51.9	48.1	47.1	42.3	34.2	25.4	51.1
22:16	57.9	51.2	51.4	48.1	47.5	42.9	35.4	27.3	51.4
22:31	58.2	51.5	51.4	48.0	46.9	42.5	34.9	26.1	50.9
22:46	57.9	51.5	51.6	48.0	47.2	42.8	35.1	26.0	51.1
23:01	57.9	51.0	51.4	48.2	47.1	42.9	35.5	26.5	51.1
23:16	58.4	51.3	51.7	48.4	47.3	43.4	36.7	28.8	51.5
23:31	57.6	51.0	51.4	48.0	46.7	43.1	36.4	29.5	51.0
23:46	58.8	51.6	51.7	48.9	47.4	43.3	36.4	28.5	51.5
00:01	58.4	51.3	51.4	48.0	46.8	42.7	35.9	27.6	50.9
00:16	58.1	52.0	51.7	48.3	47.2	43.0	36.1	27.4	51.4
00:31	56.4	50.0	50.9	47.7	46.6	42.4	34.8	26.1	50.7
00:46	56.5	50.0	50.9	47.8	46.8	42.7	35.0	26.1	50.8
01:01	55.8	49.8	50.6	47.5	46.5	42.3	35.0	26.8	50.5
01:16	55.4	49.9	50.6	47.3	45.8	42.0	34.6	25.8	50.1
01:31	56.6	49.2	50.4	47.7	46.0	42.1	34.5	25.9	50.2
01:46	57.1	50.3	50.7	47.9	46.0	41.7	34.7	26.3	50.4
02:01	54.8	48.1	50.2	47.2	45.4	41.4	34.1	25.5	49.7
02:16	53.7	48.3	50.2	47.3	45.7	42.0	35.2	28.2	50.0
02:31	54.9	48.8	50.2	47.3	45.5	41.9	34.6	25.8	50.0
02:46	54.0	48.9	50.7	47.9	45.4	42.0	34.5	25.6	50.1
03:01	55.9	49.7	50.3	47.4	45.4	41.7	34.3	25.5	49.9
03:16	54.3	48.5	50.3	47.5	46.0	42.0	34.4	25.8	50.2
03:31	58.1	53.2	51.5	47.9	46.4	42.5	34.6	25.6	50.9
03:46	55.6	49.3	50.1	47.3	46.2	42.3	34.3	25.2	50.3
04:01	55.4	49.0	50.4	47.4	46.3	42.3	34.1	25.2	50.4
04:16	55.1	48.6	50.2	47.4	46.1	42.2	34.0	24.9	50.2
04:31	56.2	50.1	50.6	47.8	46.7	43.2	35.1	25.4	50.9
04:46	54.5	50.4	50.7	47.5	46.2	43.1	35.0	25.3	50.5

ALLAWAY ACOUSTIC
LIMITED

Table 2 – L10 – Cont...

Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
05:01	56.5	50.2	50.6	47.6	46.4	42.4	34.3	25.0	50.5
05:16	57.7	51.3	51.2	48.0	46.7	42.6	34.3	24.9	50.9
05:31	55.4	49.8	50.6	47.8	46.6	42.3	34.2	25.1	50.6
05:46	58.1	51.7	52.0	48.3	46.6	42.2	34.0	25.0	50.9
06:01	58.1	53.1	53.2	49.1	47.2	42.7	34.1	24.9	51.7
06:16	57.7	52.7	52.5	48.8	46.9	42.6	34.0	25.3	51.3
06:31	59.5	55.1	52.8	49.5	47.4	43.0	34.9	25.3	51.8
06:46	59.0	54.2	52.3	48.7	46.5	41.6	32.9	22.7	51.0
07:01	60.1	53.7	52.4	49.0	46.3	41.7	34.1	24.8	51.1
07:16	60.1	54.6	52.9	49.2	46.0	41.6	33.4	23.1	51.4
07:31	60.5	54.3	51.7	48.6	46.2	42.5	34.1	23.4	51.1
07:46	61.2	57.6	54.6	52.5	47.9	42.6	34.0	23.6	53.3
08:01	60.6	56.1	53.2	49.5	47.1	42.2	33.8	23.7	51.7
08:16	60.7	55.0	52.7	49.0	47.0	42.3	35.6	29.3	51.6
08:31	61.3	56.9	54.0	50.7	47.9	43.5	35.8	25.4	53.1
08:46	60.8	56.5	54.1	50.5	46.9	43.2	46.2	44.4	54.3
09:01	61.0	56.3	54.0	49.9	47.3	43.3	35.8	26.2	52.4
09:16	61.4	56.7	54.3	50.1	46.9	42.6	34.9	25.1	52.1
09:31	62.2	60.0	54.7	50.2	47.0	43.1	43.7	38.7	53.8
09:46	61.5	56.4	53.7	50.3	46.9	42.9	35.1	26.8	52.2
10:01	61.2	56.6	54.1	51.1	47.4	42.4	37.1	28.8	53.0
10:16	61.6	55.4	54.0	52.6	47.7	42.1	34.1	24.8	53.3
10:31	60.6	55.8	54.2	50.2	46.9	42.8	41.7	38.1	53.0
10:46	61.1	55.8	53.6	50.6	47.2	42.7	36.7	28.7	52.6
11:01	61.7	56.0	54.0	51.1	47.8	43.8	39.7	31.9	53.1
11:16	61.5	57.4	55.1	50.9	48.1	43.3	39.1	32.5	53.8
11:31	62.0	58.1	57.2	53.5	52.9	49.8	38.5	31.7	56.9
11:46	60.5	56.1	54.1	50.5	48.7	44.9	36.9	28.3	53.5
12:01	59.6	53.8	52.7	49.7	47.2	42.9	37.9	30.1	51.9
12:16	59.9	54.1	52.4	49.4	47.3	43.2	36.9	29.7	51.8
12:31	61.0	55.7	54.7	50.8	47.4	43.1	36.3	29.0	52.7
12:46	59.7	54.6	53.7	50.2	46.7	42.0	34.6	25.1	52.1
13:01	60.4	53.8	52.0	49.1	46.5	41.3	33.4	23.6	51.0
13:16	59.9	54.7	52.3	49.6	46.3	41.6	34.2	24.6	51.1
13:31	60.5	54.2	52.1	49.0	46.9	42.0	36.9	33.3	51.7
13:46	61.3	54.5	52.4	50.0	46.3	41.5	34.6	26.4	51.6
14:01	60.2	53.3	51.8	49.7	47.3	41.9	34.1	24.6	51.6
14:16	60.5	54.8	52.7	49.5	46.3	41.5	33.6	23.4	51.2
14:31	59.9	57.2	54.4	52.2	47.7	44.1	38.5	36.0	54.0

ALLAWAY ACOUSTIC
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Table 3 – L90

	Octave Band Centre Frequency								
Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
11:31	54.7	50.8	50.1	47.4	44.4	39.9	32.1	23.2	49.6
11:46	55.0	51.1	50.9	48.0	45.2	40.3	32.4	23.2	50.4
12:01	55.3	51.3	50.8	48.0	45.4	40.8	33.0	23.8	50.4
12:16	55.2	51.1	50.6	47.9	45.5	41.0	33.1	24.0	50.4
12:31	55.1	51.3	50.6	47.9	45.0	40.7	34.0	25.8	50.3
12:46	55.0	50.8	50.5	47.6	45.0	40.5	33.3	27.0	50.2
13:01	55.3	51.2	50.9	47.8	45.2	40.6	33.3	25.3	50.3
13:16	54.7	50.8	50.5	47.7	44.7	40.2	32.7	24.1	50.0
13:31	55.3	51.5	50.8	48.1	45.1	40.2	32.5	23.0	50.3
13:46	54.7	51.0	50.8	47.9	45.0	40.3	32.0	22.7	50.1
14:01	54.7	51.1	50.9	48.2	46.0	42.1	36.3	29.4	51.3
14:16	54.2	50.4	50.4	47.7	45.0	41.3	35.8	29.7	50.3
14:31	54.5	50.9	50.6	47.9	45.3	41.1	34.5	27.0	50.5
14:46	54.1	50.5	50.0	47.5	45.1	40.8	33.2	24.6	50.1
15:01	54.6	50.8	50.1	47.6	45.4	41.7	35.4	27.6	50.7
15:16	54.5	50.5	50.0	47.7	46.2	43.2	39.3	34.6	51.5
15:31	53.9	50.0	49.9	47.5	45.5	43.3	39.3	34.0	51.3
15:46	54.4	51.0	50.5	47.6	45.5	42.0	35.4	28.4	50.7
16:01	54.7	51.2	51.4	48.0	45.6	41.8	34.4	25.7	50.9
16:16	54.7	50.9	50.7	47.6	45.5	40.9	32.7	22.9	50.4
16:31	54.5	50.7	50.7	47.5	44.4	40.0	32.0	22.4	49.8
16:46	54.1	50.7	50.5	47.1	44.0	39.4	30.6	20.2	49.4
17:01	54.1	50.5	50.4	47.2	44.2	39.6	31.2	20.7	49.5
17:16	54.1	50.8	50.2	47.1	44.2	39.5	30.5	20.3	49.4
17:31	54.1	51.1	50.8	47.7	45.3	39.7	30.5	20.2	50.1
17:46	54.6	51.8	51.9	48.0	45.4	41.2	32.4	22.2	50.7
18:01	54.2	51.2	51.2	47.6	45.2	40.3	31.6	21.2	50.2
18:16	54.4	51.4	51.1	47.6	45.4	40.2	30.3	19.7	50.3
18:31	54.2	51.1	50.8	47.5	44.6	39.5	30.2	19.2	49.8
18:46	53.9	50.3	50.5	47.2	44.2	39.3	30.2	19.2	49.5
19:01	54.1	51.1	51.1	47.5	44.6	39.5	29.9	19.2	49.9
19:16	53.8	50.6	50.5	47.4	45.1	39.9	30.5	20.6	50.0
19:31	53.1	50.2	50.6	47.4	46.0	41.2	33.0	24.5	50.6
19:46	53.0	49.7	50.1	47.1	45.3	41.0	33.0	24.4	49.9

ALLAWAY ACOUSTIC
LIMITED

Table 3 – L90 – Cont....

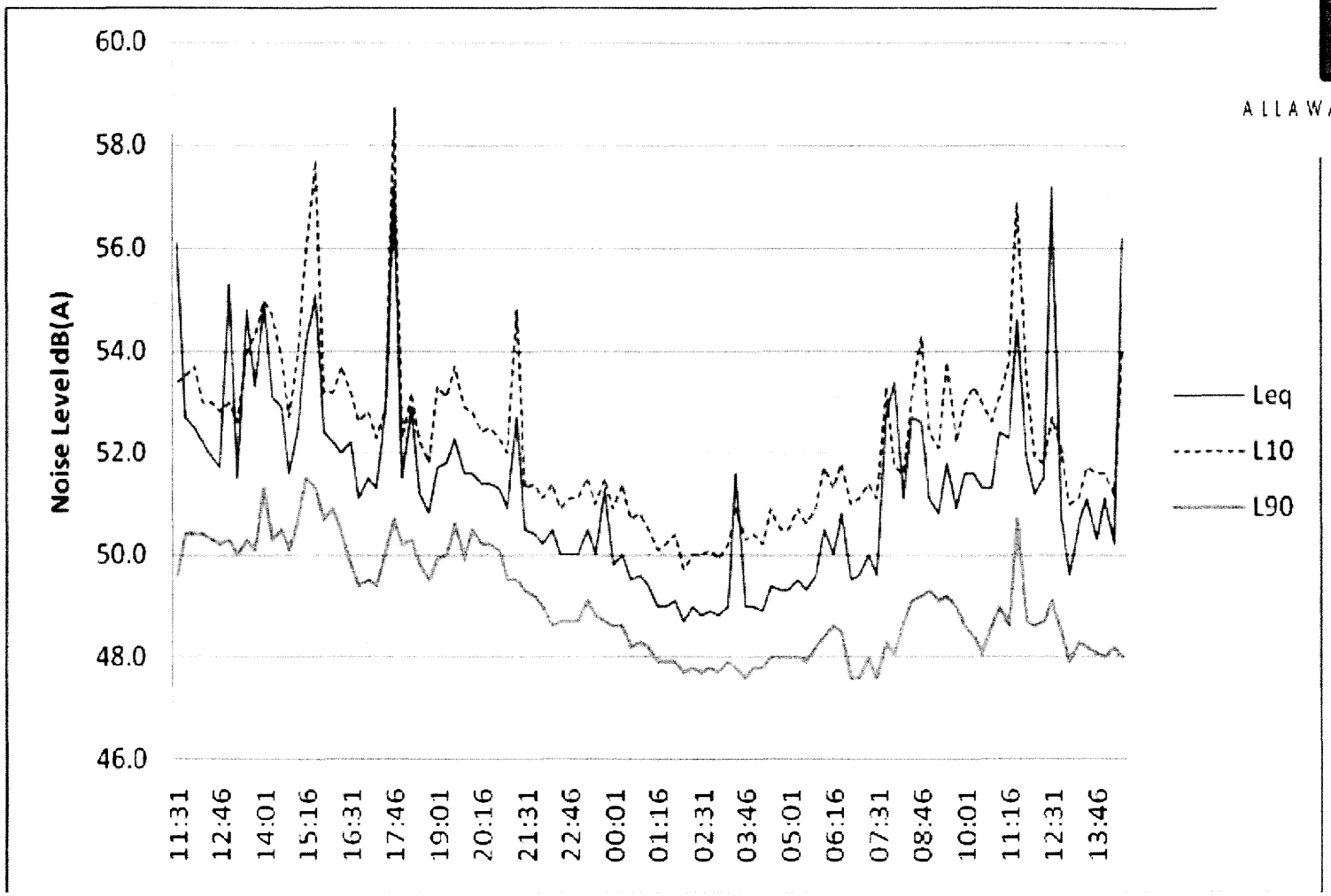
Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
20:01	52.9	50.1	50.8	47.3	45.6	41.9	34.2	25.3	50.5
20:16	52.4	49.4	50.6	47.0	45.3	41.7	33.9	25.1	50.2
20:31	52.2	49.1	50.4	47.1	45.4	41.3	33.6	24.9	50.2
20:46	51.1	48.6	50.1	47.0	45.1	41.5	33.7	25.1	50.1
21:01	51.4	48.4	49.6	46.5	44.7	40.6	32.7	24.3	49.5
21:16	51.5	48.4	49.6	46.6	44.8	40.4	32.5	24.1	49.5
21:31	51.1	47.9	49.5	46.5	44.5	40.2	32.5	24.1	49.3
21:46	50.5	46.9	49.3	46.2	44.4	40.3	32.6	24.0	49.2
22:01	49.2	45.3	49.2	45.8	44.4	39.9	32.5	24.0	49.0
22:16	48.4	45.2	49.0	45.8	43.6	39.6	32.4	23.9	48.6
22:31	49.5	45.5	49.0	45.9	43.5	39.9	32.6	24.1	48.7
22:46	49.1	45.7	49.0	45.9	43.6	40.0	32.7	24.2	48.7
23:01	48.6	45.4	49.0	45.9	43.8	40.0	32.8	24.3	48.7
23:16	49.4	45.6	49.2	46.0	44.2	40.3	33.0	24.5	49.1
23:31	48.9	45.3	49.0	45.9	43.7	40.1	33.2	25.1	48.8
23:46	48.8	45.1	49.0	46.0	43.5	39.9	32.9	24.7	48.7
00:01	48.0	44.6	48.9	45.7	43.4	39.7	32.5	24.3	48.6
00:16	48.0	44.2	48.9	45.7	43.7	39.8	32.6	24.1	48.6
00:31	46.5	43.8	48.7	45.6	43.0	39.5	32.4	24.0	48.2
00:46	46.6	43.7	48.7	45.6	43.1	39.5	32.4	24.0	48.3
01:01	46.4	43.5	48.5	45.5	43.0	39.5	32.4	24.1	48.2
01:16	45.1	43.0	48.4	45.4	42.6	39.3	32.4	24.1	47.9
01:31	45.3	42.9	48.2	45.4	42.7	39.3	32.3	24.0	47.9
01:46	45.2	43.0	48.3	45.4	42.6	39.2	32.3	24.0	47.9
02:01	44.3	42.5	48.1	45.2	42.5	39.1	32.2	23.9	47.7
02:16	44.5	42.6	48.1	45.3	42.6	39.3	32.4	24.1	47.8
02:31	44.5	42.9	48.1	45.3	42.4	39.2	32.3	24.0	47.7
02:46	45.0	43.0	48.2	45.3	42.5	39.3	32.3	23.9	47.8
03:01	45.0	43.1	48.1	45.3	42.4	39.1	32.2	23.9	47.7
03:16	45.7	43.2	48.2	45.3	42.6	39.2	32.3	23.9	47.9
03:31	45.3	43.2	48.1	45.3	42.6	39.3	32.3	23.8	47.8
03:46	45.1	42.9	47.9	45.2	42.3	39.1	32.2	23.8	47.6
04:01	45.2	42.9	48.2	45.3	42.6	39.2	32.2	23.8	47.8
04:16	45.1	43.0	48.1	45.4	42.6	39.2	32.1	23.7	47.8
04:31	46.7	43.6	48.2	45.5	42.8	39.5	32.3	23.8	48.0
04:46	46.2	43.9	48.4	45.4	42.8	39.4	32.3	23.8	48.0
05:01	46.1	43.5	48.4	45.4	42.8	39.3	32.1	23.6	48.0
05:16	47.2	44.5	48.6	45.6	42.8	39.3	32.1	23.6	48.0
05:31	46.7	44.1	48.4	45.5	42.6	39.2	32.1	23.6	47.9
05:46	48.0	44.7	48.6	45.8	43.1	39.4	32.2	23.7	48.2

ALLAWAY ACOUSTIC
LIMITED

Table 3 – L90 – Cont...

Time	63 Hz	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k	dB(A)
06:01	49.5	45.9	48.9	46.0	43.3	39.5	32.2	23.6	48.4
06:16	49.9	46.8	49.1	46.2	43.3	39.5	32.1	23.5	48.6
06:31	51.1	47.2	48.9	46.3	43.1	39.4	30.6	19.6	48.5
06:46	51.5	47.3	48.8	45.9	41.8	37.3	28.0	17.1	47.6
07:01	52.3	47.8	49.1	46.0	41.6	37.4	28.1	17.1	47.6
07:16	52.1	47.7	49.1	46.1	42.2	37.5	28.1	17.1	48.0
07:31	52.5	47.8	48.6	46.0	41.7	37.7	28.2	17.1	47.6
07:46	52.9	48.5	49.2	46.4	42.5	38.2	28.6	17.5	48.3
08:01	53.6	49.0	49.2	46.3	41.9	37.7	28.4	17.5	48.1
08:16	53.7	48.8	49.4	46.3	43.2	38.2	28.9	18.1	48.7
08:31	54.2	49.5	50.2	46.7	43.4	39.7	31.0	20.5	49.1
08:46	54.0	50.0	50.4	46.8	42.9	39.9	31.6	21.0	49.2
09:01	53.5	50.3	50.6	46.9	43.4	39.8	31.2	20.7	49.3
09:16	53.9	49.9	50.5	46.9	43.0	39.5	31.0	20.3	49.1
09:31	54.0	50.2	50.5	46.9	42.9	39.5	31.1	20.3	49.2
09:46	53.8	49.1	49.7	46.6	43.5	38.9	29.6	19.1	49.0
10:01	54.1	49.2	49.6	46.5	42.7	38.3	29.3	18.3	48.6
10:16	54.1	49.6	49.7	46.8	42.1	37.6	28.5	17.2	48.4
10:31	53.4	48.7	49.5	46.3	42.0	37.9	28.9	18.1	48.1
10:46	53.7	49.5	49.9	46.7	42.4	37.8	28.8	17.5	48.6
11:01	54.1	49.1	49.7	46.8	43.3	38.7	29.7	18.9	49.0
11:16	53.6	49.6	50.0	46.8	42.0	38.1	28.8	17.6	48.6
11:31	53.9	51.1	51.0	47.9	45.1	41.6	31.8	21.4	50.7
11:46	53.4	49.3	49.6	46.5	42.9	39.6	30.9	20.2	48.7
12:01	52.7	48.4	49.3	46.4	42.7	39.1	30.7	20.0	48.6
12:16	52.8	48.6	49.3	46.6	43.0	39.6	31.1	20.6	48.7
12:31	53.4	49.1	49.6	46.8	43.6	39.5	30.9	20.1	49.1
12:46	52.4	48.2	49.6	46.5	42.7	39.3	30.5	19.8	48.5
13:01	52.9	48.4	49.1	46.4	41.8	37.6	28.4	17.5	47.9
13:16	52.7	48.8	49.1	46.6	42.6	38.0	29.1	18.6	48.3
13:31	53.4	48.3	49.0	46.3	42.7	37.7	28.5	17.6	48.2
13:46	53.7	48.6	49.0	46.5	42.4	37.7	28.3	17.3	48.1
14:01	52.6	48.0	48.6	46.2	42.4	37.6	28.6	17.9	48.0
14:16	53.3	48.7	49.1	46.6	42.3	37.8	28.7	18.1	48.2
14:31	51.9	48.0	48.8	46.5	42.4	37.3	28.5	18.6	48.0

Notes; All readings sound pressure level dB re: $2x10^{-5}$ Nm^{-2}.



Char. 1. Ambient noise levels.

ALLAWAY ACOUSTICS
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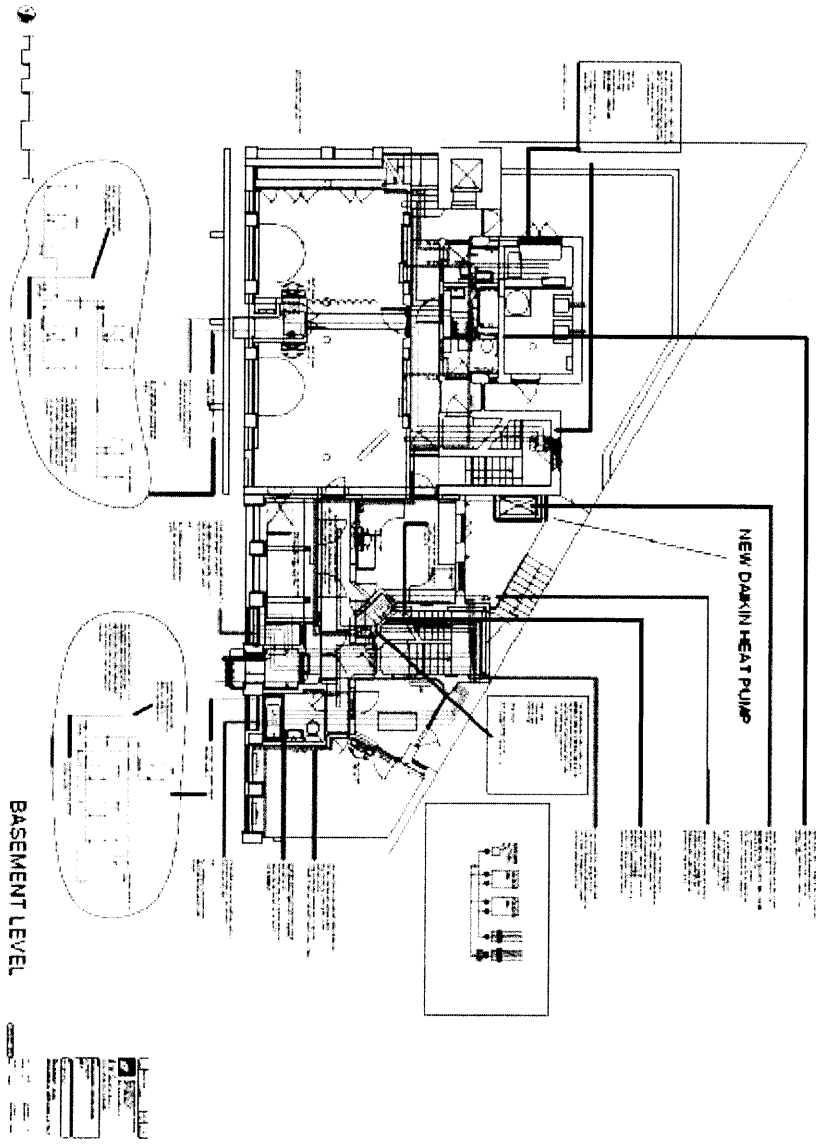
APPENDIX B – BASEMENT MECHANICAL SERVICES DRAWING



ALLAWAY ACOUSTICS
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APPENDIX B – PLANT NOISE DATA

REYQ-P			8	10	12	14	16
Models	REYQ8P		1				
	REYQ10P			1			
	REYQ12P				1		
	REYQ14P					1	
	REYQ16P						1
Number of outdoor units			1	1	1	1	1
Equivalent horsepower		HP	8	10	12	14	16
Capacity	cooling	kW	22.4	28	33.5	40	45
	heating	kW	25	31.5	37.5	45	50
Nominal input	cooling	kW	5.46	7.09	9.08	11.4	14.1
	heating	kW	5.81	7.38	8.93	11.0	12.8
EER	cooling		4.10	3.95	3.69	3.51	3.19
COP	heating		4.30	4.27	4.20	4.10	3.90
Max. number of connectable indoor units			13	16	19	22	26
Minimum capacity index			100	125	150	175	200
Maximum capacity index - 130 %			260	325	390	455	520
Capacity steps			30	37	37	26	26
Dimensions	height	mm	1,680	1,680	1,680	1,680	1,680
	width	mm	1,300	1,300	1,300	1,300	1,300
	depth	mm	765	765	765	765	765
Weight		kg	331	331	331	339	339
Casing			painted galvanised steel				
Colour			ivory white				
Sound pressure level		dB(A)	58	58	60	62	63
Sound power level		dB(A)	*	*	*	*	*
Fan	type		propeller fan				
	air flow rate		190	190	210	235	240
Refrigerant	name		R-410A				
	charge	kg	10.3	10.6	10.8	11.1	11.1
	control		electronic expansion valve				
Refrigerant oil	type		synthetic ether oil				
	charge	l	*	*	*	*	*
Compressor	type		hermetically sealed scroll compressor				
	starting method		soft start				
Piping connections	liquid	mm	9.52	9.52	12.7	12.7	12.7
	gas	mm	19.1	22.2	28.6	28.6	28.6
	discharge gas	mm	15.9	19.1	19.1	22.2	22.2
	pressure equalizer tube	mm	none	none	none	none	none
Operation range	cooling	°CDB	-5 ~ 43	-5 ~ 43	-5 ~ 43	-5 ~ 43	-5 ~ 43
	heating	°CWB	-20 ~ 15.5	-20 ~ 15.5	-20 ~ 15.5	-20 ~ 15.5	-20 ~ 15.5
Power supply		W1	3~, 50Hz, 380-415V				
Safety devices			HPS, fan motor overcurrent protector, inverter overload protector, overcurrent relay, PC board fuse				

*Information was not available at time of publication

ALLAWAY ACOUSTICS
LIMITED

ACOUSTIC TERMINOLOGY

DECIBEL (dB) - The Decibel is a logarithmic unit used to express ratios of quantities such as sound pressure level or sound power. The logarithmic nature of the unit means that decibel values cannot be added or subtracted in the usual way.

dBA or LA - The A weighted scale is used to take account of the fact that the human ear is more sensitive to sounds at high frequencies than sounds at low frequencies. "A" weighted sound pressure level (sound level) measurements correspond roughly to the subjective impression of loudness of the average listener.

LAEQ - The LAEQ index is used as a method of averaging temporally or spatially varying sound levels. At a given position, it may be defined as the notional sound level which contains the same amount of acoustical energy as the actual (time varying) sound level over the same measurement period. The LAEQ is gaining acceptance for many types of noise assessment, and is now referred to within BS4142 (used to assess the likelihood of justifiable environmental noise complaints), and also within the Noise at Work Regulations 1989.

LAMAX - The LAMAX is the maximum sound pressure level (sound level) recorded during any given measurement period.

LA10 - The LA10 is the sound level that is exceeded for 10% of the measurement period and is commonly used to describe road traffic noise, since it has been found to correlate reasonably well with complaint thresholds.

LA90 - The LA90 is the sound level that is exceeded for 90% of the measurements period, and is generally considered to describe the background noise, since it inherently excludes the sounds of transient events.