SANDY BROWN

Consultants in Acoustics, Noise & Vibration

13478-R01-A

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G06 and G07, The Avenue, Spinningfields

Acoustic planning report

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Summary

Sandy Brown Associates LLP (SBA) has been appointed to carry out an acoustic planning report in relation to change-of-use planning application for retail units G06 and G07, The Avenue, Spinningfields, Manchester.

An unattended noise survey was carried out between 18 July 2013 and 22 July 2013 to establish the existing background noise levels in the vicinity of nearby noise sensitive premises and an additional noise survey was performed on 8 January 2014 in order to determine activity noise levels around the site.

On the basis of the requirements of the Manchester City Council, the relevant plant noise limits at the worst affected existing noise sensitive premises have been set to be 5 dB below the minimum background noise levels (L_{A90}) in each octave band. A preliminary assessment of the additional plant proposed to the plant room indicates that the predicted plant noise levels 1 m from the facade of the noise sensitive premises meet the plant noise limits.

Internal noise limits due to amplified music have been set for each of the G06 and G07 units. Additionally external noise limits due to amplified music at 1 m from the worst affected windows of existing noise sensitive premises have been set to be 10 dB below the minimum background noise levels (L_{A90}) in each octave band. Based on the assumption that standard thermal double glazing is used to the existing units G06 and G07 the external noise limits are capable of being met.

Based on the required internal noise levels in adjacent spaces the minimum sound insulation requirements for separating partitions and separating floors have been given.

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1 Introduction

Sandy Brown Associates LLP (SBA) has been commissioned by Deloitte to carry out an acoustic planning report in relation to a change-of-use planning application for retail units G06 and G07, The Avenue, Spinningfields, Manchester.

An unattended noise survey was carried out to establish the existing background noise levels in the vicinity of nearby noise sensitive premises. The background noise levels measured enable appropriate limits to be set regarding noise emission from proposed building services plant. These limits are to be set in accordance with the requirements of the Manchester City Council (MCC). An additional attended noise survey was performed on 8 January 2014 in order to determine activity noise levels around the site.

This report presents the survey method, results of the environmental noise survey, and a discussion of acceptable limits for noise emission from building services plant and operational noise, and sets minimum sound insulation requirements for the facade, separating partitions and separating floors.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1. It is proposed that the use of A1 retail units G06 and G07 is changed to A3 restaurant units. The units are located on ground floor of Magistrates Court building on The Avenue.

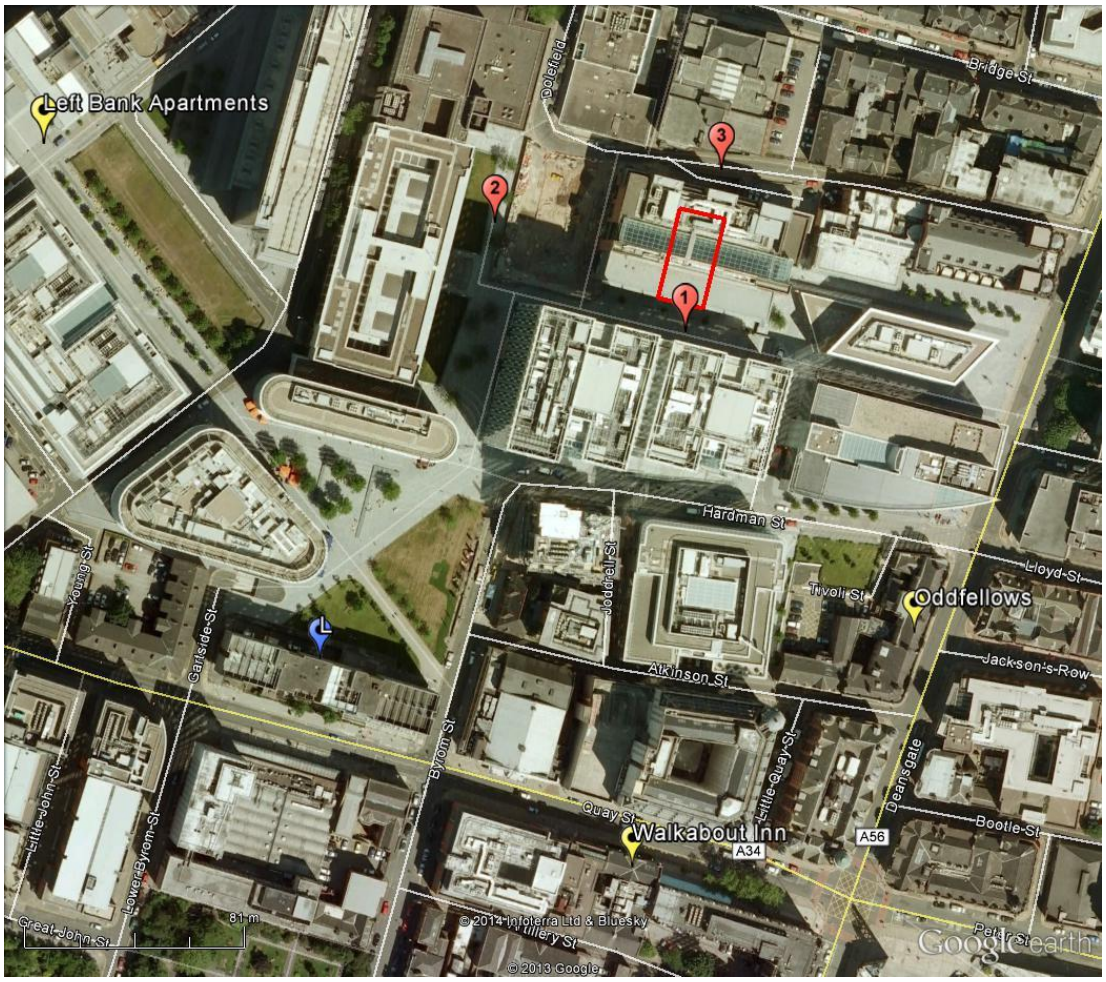


Figure 1 Site layout (Google Earth)

2.2 Adjacent premises

The surrounding area consists of retail, office and court premises, the nearest being the Magistrates Court immediately above the G06 and G07 units and adjacent to the G07 unit. The Magistrates Court above units G06 and G07 have windows facing onto Wood Street, overlooking the plant room louvre. The Magistrates Court is only considered to be noise sensitive during opening hours, these are understood to be Mon-Fri 9am-5pm.

The nearest residential premises are the Left Bank apartments, these are approximately 220 m away and are fully screened from the proposed site.

Rooms for residential purposes are located at Oddfellows on Deansgate, approximately 130 m away and are fully screened from the proposed site. The Walkabout Inn, which provides hostel accommodation is approximately 195 m away on Quay Street and is fully screened from the proposed site.

3 Environmental noise surveys

3.1 Unattended measurements

A 4 day unattended continuous noise logging survey was undertaken at the site to determine the existing background noise levels in the vicinity of nearby noise sensitive premises and is detailed in SBA report *13247-R01-C Environmental noise survey report*.

The unattended measurements were performed over 5 minute periods between 16:30 on 18 July 2013 and 17:00 on 22 July 2013.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. The Microphone was positioned out of a 6th floor window of Quay House, at least 0.5 m away from the external wall and approximately 25m above the ground. This location was chosen to be reasonably representative of the noise levels experienced at Left Bank apartments, rooms for residential purposes are located on Deansgate and the Walkabout Inn.

3.2 Attended measurements

Attended sample measurements were performed at a number of different locations around the site. These are indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out on 8 January 2014 over 5 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

The locations of the measurements are indicated in Figure 1. In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 3 m from any other reflective surface.

3.3 Equipment

The attended measurements were carried out using a Rion NL-52 and Nor 118 sound level meter. The calibration data for the equipment used during the survey is provided in Appendix A to this report.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

3.4 Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{Amax,T}$ The A-weighted maximum sound pressure level that occurred during a given period. Measured using the fast time weighting in accordance with the requirements of BS 8233 : 1999.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background noise level.

The L_{A90} is considered most representative of the background noise level for the purposes of complying with any local authority requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

3.5 Weather Conditions

During the unattended noise measurements between 18 July 2013 and 22 July 2013, weather reports for the area indicated that temperatures varied between 17°C at night and 28°C during the day, and the wind speed was less than 2 m/s.

During the attended measurements carried out on 8 January 2014, the weather was generally clear and dry and no rain occurred. Wind speeds varied between approximately 0.2 m/s and 0.6 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

4 Results of survey measurements

4.1 Observations

The dominant noise sources observed at the site during the survey consisted of plant noise and road traffic noise.

Less significant noise sources included amplified music egress from retail units, pedestrians and delivery vans unloading.

4.2 Unattended measurement results

The results of the unattended noise measurements performed at position 'L' are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B of this report.

The day and night time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Thursday 18 July 2013	67*	58
Friday 19 July 2013	65	63
Saturday 20 July 2013	66	66
Sunday 21 July 2013	62	53
Monday 22 July 2013	61*	-

* Measurement not made over full period due to monitoring start and end time; not included in the average

The minimum background noise levels measured during the unattended survey are given in Table 2.

Table 2 Minimum background noise levels (L_{A90} dB) measured during the survey

Date	Daytime (07:00 – 23:00) $L_{A90,5min}$ (dB)	Night (23:00 – 07:00) $L_{A90,5min}$ (dB)
Thursday 18 July 2013	62 *	46
Friday 19 July 2013	54	47
Saturday 20 July 2013	51	46
Sunday 21 July 2013	48	45
Monday 22 July 2013	54 *	-

* Measurement not made over full period due to monitoring start and end time

The lowest background noise levels measured during the survey were $L_{A90,5min}$ 48 dB during the daytime and $L_{A90,5min}$ 45 dB at night.

The octave band sound pressure levels corresponding to the minimum background L_{A90} (dB) levels measured are provided in Table 3.

Table 3 Minimum octave band background noise levels measured during the survey

Time of day	Minimum background noise level, $L_{90,5min}$ (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	54	55	49	44	43	39	32
Night (23:00-07:00)	53	53	46	41	40	36	28

4.3 Attended measurement results

Attended measurements were performed at a number of different locations around the site on 8 January 2014. The sound pressure levels recorded during these measurements are summarised in Table 4. The dominant noise sources noted during the measurements are also described in the following table. All the attended measurements were performed over 5 minute periods.

Table 4 Sound pressure levels from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{Amax,5min}$	$L_{A90,5min}$	
1	15:12	59	68	57	Plant noise, amplified music egress from retail units, pedestrians, occasional road traffic noise from Deansgate
	15:17	59	65	58	
	15:22	59	71	58	
2	15:29	58	70	56	Plant noise, pedestrians, distant amplified music egress from retail units
	15:34	57	68	56	
	15:39	56	62	56	
3	15:46	72	79	70	Plant noise, occasional road traffic noise from Wood Street, pedestrians
	15:51	71	76	70	
	15:56	71	74	70	

The average sound pressure level at position 1 is L_{Aeq} 59 dB, at position 2 is L_{Aeq} 57 dB, and at position 3 is L_{Aeq} 71 dB.

The octave band sound pressure levels corresponding to the minimum background L_{A90} (dB) levels measured at position 3 are provided in Table 5.

Table 5 Minimum octave band background noise levels measured at position 3

Time of day	Minimum background noise level, $L_{90,5min}$ (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	71	68	67	66	66	63	57

5 Noise egress assessment

5.1 Plant noise

5.1.1 Standard guidance

Standard guidance for noise emission from proposed new items of building services plant is given in BS4142: 1997 '*Method for rating industrial noise affecting mixed residential and industrial areas*'.

BS4142 provides a method for assessing noise from items such as building services plant against the existing background noise levels at the nearest noise sensitive receptors to assess the risk of complaints occurring.

BS4142 suggests that if the rating noise level is 10 dB or more higher than the existing background noise level, complaints are likely. If the rating level is 5 dB above the existing background noise level, it is considered of marginal significance. If the rating level is 10 dB or more below the existing background noise level, this is considered a positive indication that complaints are unlikely.

If the noise contains 'attention catching features' such as tones, bangs etc, these limits should be reduced by a further 5 dB.

5.1.2 Local Authority criteria

Manchester City Council (MCC) typically stipulates the following criteria in regards to plant noise emissions:

'Externally mounted ancillary plant, equipment and servicing shall be acoustically insulated in accordance with a scheme designed so as to achieve a noise level of 5 dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location.'

5.1.3 Plant noise limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the most affected windows of the nearest noise sensitive residential premises, at Oddfellows on Deansgate, should not exceed 5 dB below the minimum external noise level in octave bands. These limits are set out in Table 6.

Table 6 Plant noise limits 1m from the rooms for residential purposes at Oddfellows on Deansgate

Time of day	Maximum sound pressure level at 1m from noise sensitive premises, L_{eq} (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	49	50	44	39	38	34	27
Night (23:00-07:00)	48	48	41	36	35	31	23

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the most affected windows of the Magistrates court (with windows facing onto Wood Street) should not exceed 5 dB below the minimum external noise level in octave bands. These limits are set out in Table 7.

Table 7 Plant noise limits 1m from the Magistrates Court on Wood Street

Time of day	Maximum sound pressure level at 1m from noise sensitive premises, L_{eq} (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	66	63	62	61	61	58	52

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit 5 dB below those set out above.

5.1.4 Assessment

It is currently proposed that 2 additional extract fan units are installed to the plant room to the rear for the G06 and G07 units, facing onto Wood Street. The plant room facade is constructed of masonry, with louvres over a large part of the facade area, though specific details of the louvres are not available.

Octave band noise data received from the manufacturers (via Deloitte) for the proposed extract fan units are given in Appendix C and summarised in Table 8.

Table 8 Octave band sound power levels for proposed plant

	Sound power level, L_w (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Extract fan unit – Model BIFCN063M2-A7/22 – Outlet	99	94	99	99	98	98	96

Calculations have been carried out to determine the noise egress level from the proposed plant at the nearby noise sensitive premises. The calculations take into account attenuation due to distance and screening. For the purposes of the calculations it has been assumed that the fan unit is operating as detailed in the manufacturer's datasheet and that the existing louvres are non-acoustic.

The octave band noise egress levels provided in Table 9 are predicted for the proposed plant, 1 m from the facade of the nearest noise sensitive premises.

Table 9 Predicted plant noise egress levels outside the nearest noise sensitive premises

Noise sensitive premises	Predicted cumulative level 1 m from nearest noise sensitive premises, L_{eq} (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Oddfellows, Deansgate	<5	<5	<5	<5	<5	<5	<5
Magistrates Court (with windows facing onto Wood Street)	54	49	55	54	57	56	51

The predicted plant noise levels 1 m from the facade of the noise sensitive premises, Oddfellows on Deansgate, meets the daytime and night-time plant noise limits set out in Table 6, and the predicted plant noise levels 1 m from the facade of the Magistrates court (with windows facing onto Wood Street), meet the daytime plant noise limits set out in Table 7. If any other plant equipment is added to the scheme it will need to be assessed to ensure that the plant noise limits are met.

5.2 Amplified music

5.2.1 Internal noise limits in A3 units

Recommended internal noise limits due to amplified music within each A3 unit during court opening times are provided in Table 10. These limits would typically be suitable for A3 uses such as restaurants with low level background music. However, the limits would not be suitable for high levels of amplified music (eg DJs or live music). It is understood that the proposed restaurants are not to have DJs or live music.

Table 10 Amplified music limits

Time of day	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Internal noise level, L_{Aeq} (dB)	70	68	68	68	75	79	73

5.2.2 External limits

It is recommended that the cumulative noise egress from amplified music be limited to be 10 dB below the existing background noise level (L_{90}) in each octave band at the nearest noise sensitive premises.

Based on the noise survey results, it is advised that the cumulative noise level as a result of noise egress due to amplified music at the rooms for residential purposes at Oddfellows does not exceed the limits in Table 11.

Table 11 Maximum cumulative sound pressure levels for amplified music 1m from the rooms for residential purposes at Oddfellows on Deansgate

Time of day	Maximum sound pressure level at 1m from noise sensitive premises, L_{eq} (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	44	45	39	34	33	29	22
Night (23:00-07:00)	43	43	36	31	30	26	18

Based on the internal noise limits set for each unit in Table 10, the assumption that standard thermal double glazing is used to the existing units (which typically has a sound insulation performance of around R_w+C_{tr} 28 dB), the distance to the nearest noise sensitive premises and existing screening, the cumulative levels given in Table 11 are capable of being met.

Based on the noise survey results, it is advised that the cumulative noise level as a result of noise egress due to amplified music outside the Magistrates Court on Wood Street does not exceed the limits in Table 12.

Table 12 Maximum cumulative sound pressure levels for amplified music 1m from the Magistrates Court on Wood Street

Time of day	Maximum sound pressure level at 1m from noise sensitive premises, L_{eq} (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	61	58	57	56	56	52	47

Based on the internal noise limits set for each unit in Table 10, the assumption that standard thermal double glazing is used to the existing units (which typically has a sound insulation performance of around R_w+C_{tr} 28 dB), the distance to the nearest noise sensitive premises and existing screening, the cumulative levels given in Table 12 are capable of being met.

5.3 External seating areas

No amplified sound systems are to be installed outside the G06 and G07 units.

6 Sound insulation assessment

6.1 Internal noise limits

Guidance on acceptable internal noise levels for various types of use relevant to the development are given in BS 8233:1999 *Sound insulation and noise reduction for buildings – Code of practice* and the *Court Standards and Design Guide 2010* (CSDG 2010). These will be used to determine the required sound insulation to separating building elements. The guidance given by BS 8233 and CSDG 2010 is shown in Table 13.

Table 13 Internal noise criteria for various types of use

Internal space	Design range, L_{Aeq} (dB)		
	BS8233 "Reasonable"	BS8233 "Good"	CSDG 2010
Courtroom	-	-	30
Corridor	55	45	-
Cellular offices	50	40	40
Open-plan offices	50	45	-
Restaurant	55	40	-

Layouts of the Magistrates Court showing types of use for internal spaces are not currently available; therefore the sound insulation requirements for the partitions and floors have been set assuming that areas of the Magistrates Court adjacent to the G06 and G07 units are courtrooms with internal noise criteria of L_{Aeq} 30 dB.

6.2 Facade sound insulation

Construction details of the facade to the G06 and G07 units are not currently available and it has not been possible to carry out measurements of the facade sound insulation; therefore a baseline construction has been assumed for the purposes of assessing the facade sound insulation.

Assuming that standard thermal double glazing is used to the existing units (which typically has a sound insulation performance of around R_w+C_{tr} 28 dB), operational noise from the A3 units (amplified music limits given in Table 10) is expected to controlled to be at least 10 dB below the measured activity noise level of L_{Aeq} 57 dB outside the units.

6.3 Internal sound insulation

Construction details of the partitions and floors separating the G06 and G07 units and other areas of the building are not currently available and it has not been possible to carry out measurements of the existing partitions; therefore a minimum sound insulation performance to the partitions is given.

The minimum sound insulation performance required to separating partitions and floors of the G06 and G07 units are given in Table 14. These are based on the adjacent space within the building and upon achieving at least 10 dB below the internal noise criteria for the adjacent space, given in Table 13. Note in order to achieve the required sound insulation performance additional changes to the separating partitions and floors may be required.

Table 14 Octave band minimum sound insulation performance to partitions and floors

Adjacent space within the building	Minimum sound insulation performance, *R* (dB), Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Courtroom	28	42	55	64	69	70	65
Restaurant	18	32	45	54	59	60	55

7 Conclusion

On the basis of the requirements of the Manchester City Council, the relevant plant noise limits at the worst affected existing noise sensitive premises have been set to be 5 dB below the minimum background noise levels (L_{A90}) in each octave band. A preliminary assessment of the additional plant proposed to the plant room indicates that the predicted plant noise levels 1 m from the facade of the noise sensitive premises meet the plant noise limits.

Internal noise limits due to amplified music have been set for each of the G06 and G07 units. Additionally external noise limits due to amplified music at 1 m from the worst affected windows of existing noise sensitive premises have been set to be 10 dB below the minimum background noise levels (L_{A90}) in each octave band. Based on the assumption that standard thermal double glazing is used to the existing units G06 and G07 the external noise limits are capable of being met.

Based on the required internal noise levels in adjacent spaces the minimum sound insulation requirements for separating partitions and separating floors have been given.

Appendix A

Equipment calibration information

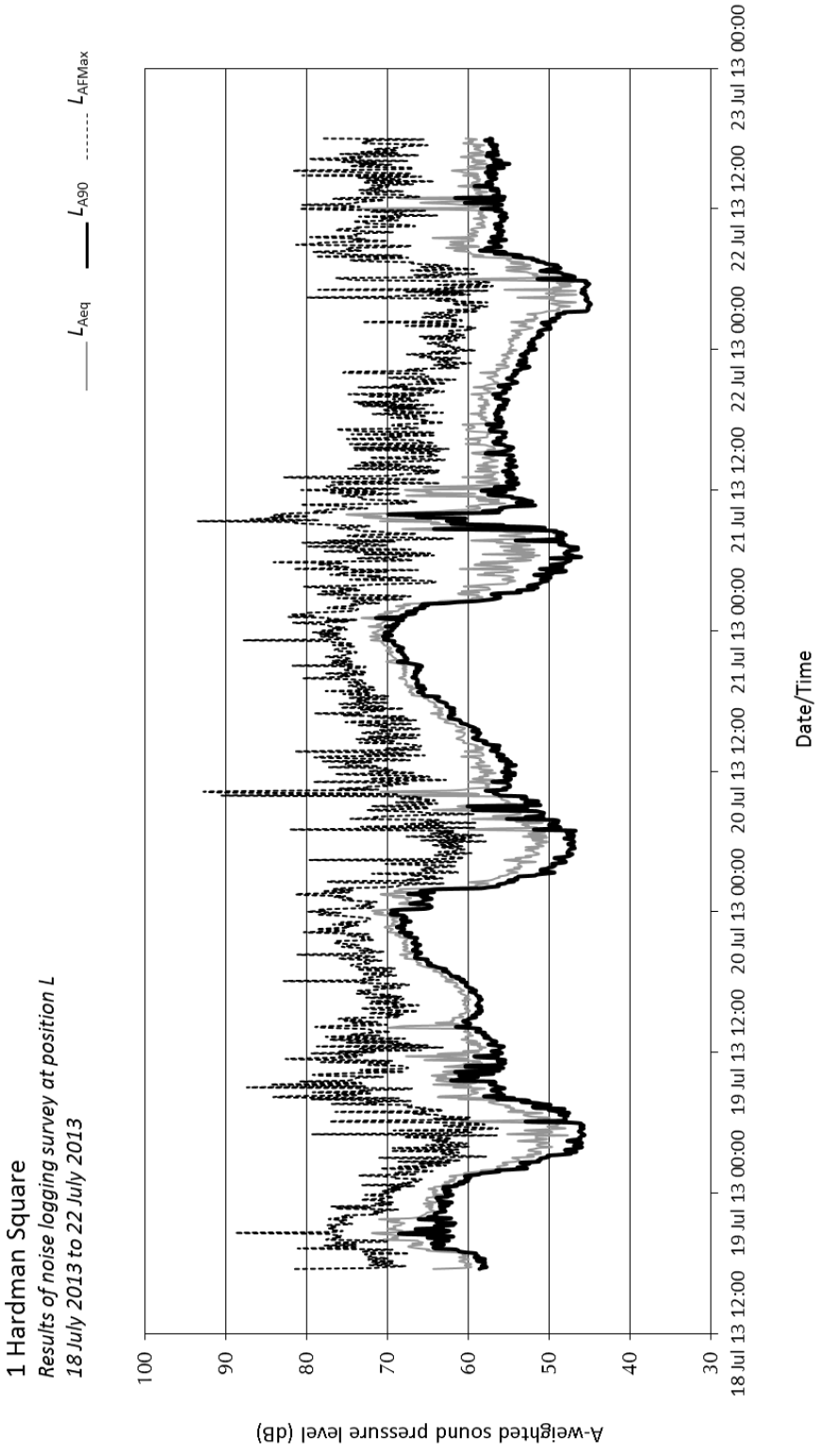
Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	Nor118/31754	Norsonic	3 July 14	1207294
Microphone	40AF/62396	Gras	3 July 14	1207294
Calibrator	1251/31322	Norsonic	3 July 14	1207293

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meter used in this survey are available upon request.

Appendix B

Results of unattended measurements at Location 'L'


1 Hardman Square
Results of noise logging survey at position L
18 July 2013 to 22 July 2013
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
100
90
80
70
60
50
40
30
18 Jul 13 12:00
19 Jul 13 00:00
19 Jul 13 12:00
20 Jul 13 00:00
20 Jul 13 12:00
21 Jul 13 00:00
21 Jul 13 12:00
22 Jul 13 00:00
22 Jul 13 12:00
23 Jul 13 00:00
Date/Time

Appendix C

Plant noise data

Technical Data for Fan Model BIFCN063M2-A7/22

Location: 1
Designation:

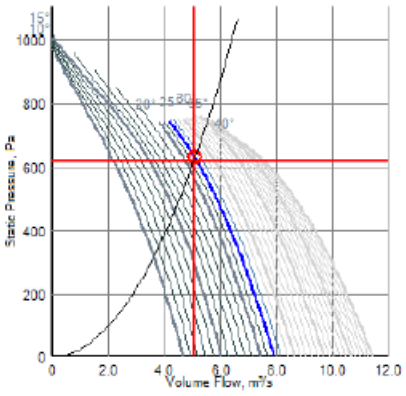
Warning: Static Pressure above 80% of Maximum Pressure; Care should be taken if you choose this selection.

Performance - Required

Air Flow:	5.05 m³/s
Static Pressure:	620 Pa
Selection Pressure:	620 Pa
Installation Type:	TYPE D
Air Density:	1.204 kg/m³
Atmos. Temp.:	20 °C
Altitude: m	0 m
Humidity:	0.0 %

Actual

Air Flow:	5.09 m³/s
Static Pressure:	630 Pa
Total Pressure:	791 Pa

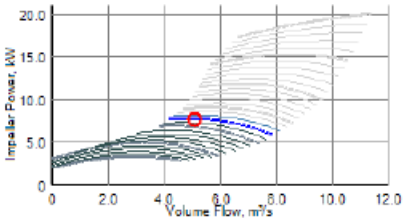


Fan Data

Catalogue Code:	BIFCN063M2-A7/22		
Description:	Bifurcated Axial		
Diameter:	630 mm	Hub:	250 mm
Impeller Type:	Axial	Pitch:	22°
Blade Material:	Aluminium	Blades:	7
Speed:	2880 RPM	Running:	50 Hz
Power, Abs:	7.79	Peak:	7.80
Efficiency Total:	68.5%	Static:	41.2%
SFP:	1.70		
Fan Weight:	0.0 kg		

Motor Data (at STP)

Motor Type:	Standard (IE2)
Electrical Supply:	3ph 400V 50Hz
Motor Frame:	132S
Motor Power:	8.25 kW (AOM)
Motor FLC/Start:	14.10 / 95.88
Motor Speed:	2 pole
Motor Efficiency:	91.0%



Sound Data

Spectrum (Hz):	63	125	250	500	1K	2K	4K	8K	dBW	dB(A) @ 3m
Inlet (dB):	100	92	102	102	100	96	94	88	108	84
Outlet (dB):	99	94	99	99	98	98	96	93	107	84

Sound levels are quoted as in-duct values. dB(A) values are average spherical free-field for comparative use only.

Energy Related Product Data

		At Maximum Efficiency Point	
Overall Efficiency:	51.8%	Input Power :	7.69 kW
Installation Category :	D	Air Flow:	6.86 m³/s
Efficiency Category :	Total	Pressure:	581 Pa
FMEG :	0	Speed :	2880 r/min
Specific Ratio :	1		

Figure B1 Extract fan noise data