Bracken View Mill Hill
Barnes London SW13 0HS

Application for Retrospective Planning Consent for Four External AC Units

Acoustic Report on the Assessment of the Noise Impact of These Units

Report Commissioned by:
Mr Nigel Hartley RIBA MRTPI
Chestnut Planning
33 Trinity Church Road
London SW13 8ET

Author:
David Horrocks BA DMS FRSPH MCIEH CEnvH MIOA

7th January 2022

Horrocks Environmental Health Services
88 Puddingstone Drive
St Albans
Herts AL4 0GY
Tel/Fax: 01727 863112

E-mail: enquiries@davehorrocksehs.co.uk

Website: www.davehorrocksehs.co.uk

1.0 EXPERIENCE AND QUALIFICATIONS

I am a chartered environmental health practitioner and hold the Chartered Institute of Environmental Health's Diploma in Environmental Health, a Degree from the Open University in Social Science with Technology and post graduate qualifications in air pollution control, acoustics and noise control, and in management studies. I am currently a Corporate Member of the Chartered Institute of Environmental Health (CIEH), a Fellow of the Royal Society for Public Health (RSPH) and a Corporate Member of the Institute of Acoustics (IOA).
I have worked in consultancy since February 1992 and have been Technical Partner with the consultancy Statutory Nuisance Solutions since 2010 - see our website:
www.statutorynuisancesolutions.co.uk

Prior to 1992 I had enjoyed sixteen years as a practising environmental health officer for various local authorities across the country, the last position I held being a Head of Service post for a district council in Essex. I specialised in environmental protection work, principally the investigation and control of statutory nuisance including community noise, dust, odour and air pollution problems. As a consultant, I advise clients on a whole host of environmental protection matters, including:

- undertaking environmental assessments for town planning purposes;
- advising clients in the engineering, construction, retail, hospitality and leisure industries on the resolution of discrete statutory nuisances;
- attending public inquiries and magistrates and county courts and giving expert evidence;
- undertaking noise at work assessments for clients in the engineering and leisure industries;
- working as a consultant to Network Rail in a large team on the Thameslink railway infrastructure project;
- sitting on the Acoustics Review Group of the HS_2 railway project;
- leading a team in preparing a Noise Management Guide for Local Authorities which was published jointly by Defra and the CIEH in 2006
- working as part of a team in preparing Guidance for Local Authorities on Odour which was published by Defra in 2010.

I undertake lecturing assignments and have taught on postgraduate courses in integrated pollution control and acoustics and noise control. I am an accredited assessor for the CIEH's scheme to assess the professional development of Graduate Environmental Health Officers and since 2005 I have acted as an examiner for the IOA in the Regulation and Assessment of Noise module of their Diploma course. My published works include: a paper examining the environmental noise impact of a proposed heliport facility; a paper reviewing the British Standard 4142: 1990; papers analysing the complementary roles of planning and environmental health in the control of community noise and a paper jointly authored with John Pointing on Licensing and Public Nuisance.

2.0 INTRODUCTION

2.1 Background

2.1.1 Mr Lineker has owned this property since 2014 and took up residence in 2015. There were already two external ac units at the property when he acquired it (labelled as #2 and #5 on the layout plan taken from Chestnut Planning Drawing 02 of Project No 681 presented in Appendix 5) and I understand that these two units are now obsolete and non-operational.

2.1.2 In February 2021 Mr Lineker installed a further 4 external ac units to provide comfort cooling to various rooms within the property (labelled as #1; #3; #4 and #6 and highlighted in yellow in the same drawing presented in Appendix 5).

2.1.3 It is intended to re-locate 4 of these units: #1, #2, #3 and #6 in order to render them less obtrusive. Units #1, #2, and #3 are to be lowered to positions at the base of the house wall and unit #6 is to be re-located onto the 1st floor balcony, as illustrated in the Elevation Drawings extracted from Chestnut Planning Drawing 01 of Project No 681 presented in Appendix 5. The additional benefit of re-locating units #1 and #3 will be the noise attenuation afforded by the boundary wall acting as a partial barrier

2.1.4 A full description of each of the units is presented in the table below:

Unit #	Model	Area of House Served	Sound Power Level dBA	Approximate distance to Nearest Window of Adjoining Property
1	*DAIKIN 3MXM68N*	1ST Floor Bedroom	61	10 m
2	Obsolete	/	/	/
3	*DAIKIN RXM35N9*	1ST Floor Bedroom	61	3 m
4	*DAIKIN RXJ50N*	Kitchen	63	8 m
5	Obsolete	/	/	/
6	*RXJ35M*	2nd Floor Master Bedroom	61	4.5 m

2.1.5 I understand that no complaints of noise have been received by the local planning authority, the LB Richmond, but the council has determined that the installation of these four external ac units amounts to development for which planning consent needs to be

obtained. This acoustic report has been prepared in support of the application submitted for retrospective planning consent.

3.0 Noise Assessment

3.1 The noise climate during the daytime in this part of London is dominated by low-flying aircraft on their descent path into Heathrow Airport, where aircraft overflights are typically experienced every 60 seconds. This made it very difficult to record meaningful close-to-source noise measurements of the mechanical plant during the daytime.

3.2 As a consequence I decided to visit the site in the dead of night in order to undertake the necessary noise measurements when there were no aircraft over-flights 'contaminating' the measurements and to assess a genuine 'worst case' condition when ambient/background noise levels were at their lowest. I judged that if I could demonstrate that the noise impact from the operation of these 4 ac units was acceptable in the dead of night when background and residual noise levels are very low, then the equivalent noise impact during the daytime when background and residual noise levels are appreciably higher would equally be acceptable.

3. 3 I initially visited the site on Wednesday 13th October in the presence of Mr Lineker, Nigel Hartley of Chestnut Planning and Tom Osborn of Frostbite UK, the company who installed these latest 4 ac units. Mr Lineker gave us a demonstration of each of the units and described the respective areas of the house that they served.

3.4 Owing to issues relating to Covid isolation, Mr Lineker's non-availability and various days of inclement weather, it was not possible to arrange a night time visit to the property until the early hours of Thursday 23rd December 2021 when I undertook a programme of noise measurements. Throughout the noise measurement programme I used both *NORSONIC Type 118* and *NORSONIC Type 140* Precision Grade Sound Level Meters complying with IEC 651 Type 1 fitted with a windshield, mounted on a tripod and calibrated at 114.0 dB using an external sound source. These measurement results are presented in Tables (1) and (2) of Appendix 1.

3.5 Between 00.12 hrs and 00.35 hrs I recorded the background and residual noise levels in the absence of any noise from the ac units which were all switched off. This was done from a position on the ground floor patio to the rear of the house some 2m from the property's façade – see site plan in Appendix 5. At this time of night the endemic noise climate was

quiet and peaceful where the main sources contributing to the measured noise levels included distant traffic and train noise. I ensured that the noise from the occasional vehicle movement along Mill Road was paused from the measurements in order to replicate the quietest part of the night time period when there would be no traffic on this road. The short term residual noise level ranged from $L_{Aeq5min}$ 38 - 40 dB (rounded up/down) with $L_{A905min}$ levels ranging from 34 – 37 dB (rounded up/down) – see Appendix 2 Glossary of Acoustic Terms. The lowest figure of $L_{A905min}$ 34 dB was considered to be representative of the night time background noise level for the application site and as a proxy for the nearest noise-sensitive neighbouring properties.

3.6 I then attempted to obtain accurate, close-to-source measurements of each of the 4 ac units' individual operation. At a position 1m from Unit #1 *DAIKIN 3MXM68N* serving the 1st floor bedroom I recorded a measurement of $L_{Aeq1min}$ 45.1 dB. Unfortunately I was unable to record a measurement of Unit #3 since we could not get this unit to operate. At a position 1m from Unit #4 *DAIKIN RXJ50N* serving the kitchen I recorded a measurement of $L_{Aeq1min}$ 50.4 dB. Finally at a position 1m from Unit #6 *DAIKIN RXJ35M* serving 2nd floor master bedroom I recorded a measurement of $L_{Aeq1min}$ 50.3 dB. I observed that in each case the noise levels were modest where the noise was steady and continuous with no obvious or discernible tones. This is illustrated by the octave band levels provided by the manufacturer for each of the 4 units presented in Appendix 3. Each of the close-to-source measurements accorded closely with the manufacturer's noise levels as set out in Appendix 3.

3. 7 In order to assess the likely noise impact of each of these units at the nearest noise-sensitive property, the predicted noise level can be calculated from the unit's sound power level and the distance between the sound source and the nearest noise-sensitive receptor, according to the following equation, where the sound source is radiating sound hemi-spherically. In the event, the distances were measured using an infra-red measuring device:

$L_{Aeqreceptor} = L_{WA} – 20\log.r – 8$ dB

Where L_{WA} is the A-weighted sound power level of the sound source; and
where r is the distance in m between the sound source and the nearest window of the nearest noise-sensitive property.

(1) For Unit #1 *DAIKIN 3MXM68N*

$L_{Aeqreceptor} = 61 – 20\log.10 - 8$

$L_{Aeqreceptor} = 61 – 20 – 8$

$L_{Aeqreceptor}$ = 33 dB.

(2) For Unit #3 *DAIKIN RXM35N9*

$L_{Aeqreceptor}$ = 61 – 20log.3 - 8

$L_{Aeqreceptor}$ = 61 – 10 – 8

$L_{Aeqreceptor}$ = 43 dB.

At this same receptor position, this would yield an aggregate L_{Aeq} value of
(33 + 43 dB) = L_{Aeq} 43 dB.
By lowering each of these ac units to the base of the house wall to which they are attached this should yield a further 5 dBA attenuation achieved by the partial barrier effect provided by the boundary wall – see photographic log in Appendix 4.
$L_{Aeqreceptor}$ is therefore predicted to be L_{Aeq} 38 dB with both unit #1 and unit #3 operating simultaneously. This level accords with the night time residual noise level and whilst it is some 4 dB above the L_{A90} background noise level, it is unlikely that the noise will make any significant contribution to the pre-existing night time/daytime noise climate. Accordingly this predicted level can be seen to represent a 'No Observed Effect Level' (NOEL), in planning terms as set out in the government's Noise Policy Statement for England published by Defra in 2010 and which is further referenced in the government's revised National Planning Policy Statement. This is because the noise is unlikely to be perceived or measurable inside the neighbouring bedroom when the attenuating effects of a partially open window (15 dBA) are taken into consideration.

(3) For Unit #4 *DAIKIN RXJ50N*

$L_{Aeqreceptor}$ = 63 – 20log.8 - 8

$L_{Aeqreceptor}$ = 63 – 18 – 8

$L_{Aeqreceptor}$ = 37 dB.

This predicted level is 1 dBA below the night time residual level and only 3 dBA above the night time L_{A90} background noise level. Again this level represents a 'NOEL' in planning terms since the noise is not likely to be perceived or measurable inside the adjoining property.

(4) For Unit #6 *DAIKIN RXJ35M*

$L_{Aeqreceptor}$ = 61 – 20log.4.5 - 8

$L_{Aeqreceptor}$ = 61 – 13 – 8

$L_{Aeqreceptor}$ = 40 dB.

However the wall of the adjoining property which faces this unit has no window since the bedroom windows are located on the property's front and rear façades. This means that a further 5 dBA attenuation is likely to be achieved due to the partial barrier effect provided by the neighbouring property's structure. The likely predicted level is therefore (40 – 5) = L_{Aeq} 35 dB. This predicted level is some 3 dBA below the night time residual level of L_{Aeq} 38 dB and is in accord with the night time L_{A90} background noise level. Again this level represents a 'NOEL' in planning terms since the noise is not likely to be perceived or measurable inside the adjoining property.

3.8 Since there are no acoustic feature corrections to be added in each case to the specific noise levels $L_{Aeqreceptor}$, these levels equate to the Rating Noise Levels for the purpose of assessing their individual noise impacts.

3.9 Achieving rating noise levels that equate to NOELs for each of these 4 units when operating must suggest that the respective noise impacts will be acceptable in planning terms.

4.0 CONCLUSION

4.1 All four of these *DAIKIN* air cooled condenser units are extremely quiet by design, as confirmed by the close-to-source noise measurements recorded in the early hours of the morning. I understand that no complaints of noise from the operation of these units have been received by the council since they were installed in February 2021.

4.2 In order to hide from sight from the adjoining neighbour and to increase the level of noise attenuation achieved by the partial barrier effect of the boundary wall, it is recommended that units # 1, #2 and #3 are lowered to the base of the wall to which they are attached, as illustrated in Chestnut Planning Drawing 01 of Project No 681 presented in Appendix 5. Alternatively the obsolete unit # 2 could be removed completely. Unit #6 is to be re-located to a position to the rear of the 1st floor balcony, as illustrated in this same drawing from where it will be less obtrusive.

4.3 If these necessary modifications are made then the noise impact from the daytime/night time operation of each of these 4 units will be acceptable since the noise impact can be

characterised, in planning terms, as No Observed Effect Level, notwithstanding the modest excess of the rating noise above the night time backgrounds noise level, which, ostensibly, characterises the noise impacts as 'Medium' by reference to Figure 2 of LB Richmond's Supplementary Planning Document *Development Control for Noise Generating and Noise Sensitive Development.* This is because the predicted rating noise levels are very low.

4.4 This assessment has confirmed, through objective noise measurement and prediction that the noise impacts resulting from the operation of each of these 4 ac units will be acceptable at night time since they will make no significant contribution to the pre-existing ambient noise climate and are highly likely to be imperceptible inside the bedrooms of the adjoining neighbouring properties when operating. It therefore follows that the noise impacts of their daytime operation will be equally acceptable.

4.5 Accordingly, I believe that planning consent should now be retrospectively granted for the installation of these 4 external ac units.

4.6 I trust this report satisfactorily addresses the relevant issues and I remain available to offer further advice and assistance on any aspect of this report as may be necessary.

APPENDIX 1

Table (1) Results of Night time/Early Morning Noise Level Monitoring undertaken on Thursday 23rd December 2021

Equipment Used: *NORSONIC Type 118* Precision Grade Sound Level Meter complying with IEC 651 Type 1 fitted with a windshield, mounted on a tripod and calibrated at 114.0 dB using an external sound source.

Weather Conditions: cloudy, overcast sky; air temperature 5^0C with no discernible breeze.
Background Noise Measurements

TIME	Measurement Position	L_{pA} dB	Residual Noise $L_{Aeq\ FAST}$ dB	L_{A90} dB	L_{Amax} dB	COMMENTS
00.12 hrs	On ground floor patio at rear of house 2m from facade	36-45	40.4 [5 min]	36.8 [5 min]	63	**Background/Residual Noise Measurements**
00.17 hrs	----ditto-----	36-43	39.1 [5 min]	35.9 [5 min]	58	All ac units switched off. Noise climate very quiet and peaceful. Main sources contributing to background noise climate include: distant road traffic and distant train noise.
00.25 hrs	----ditto-----	33-41	37.9 [5 min]	**34.1** [5 min]	58	Noise measurements paused when vehicles passed along Mill Hill Road to replicate quietest period of the night. The lowest of these measurements highlighted in yellow taken to be representative of night time background noise levels at each of the nearest noise-sensitive properties.

Table (2) Results of Night time/Early Morning Noise Level Monitoring undertaken on Thursday 23rd December 2021

Equipment Used: *NORSONIC Type 140* Precision Grade Sound Level Meter complying with IEC 651 Type 1 fitted with a windshield, mounted on a tripod and calibrated at 114.0 dB using an external sound source.

Weather Conditions: cloudy, overcast sky; air temperature 5^0C with no discernible breeze.
Close-to-Source Noise Measurements of External AC Units Operating

TIME	Measurement Position	L_{pA} dB	Specific Noise $L_{Aeq\ FAST}$ dB	L_{A90} dB	L_{Amax} dB	COMMENTS
00.40 hrs	Im from Unit #4 *DAIKIN RXJ50N* serving kitchen		50.4 [1 min]	49.7 [1 min]		Unit quiet in operation with noise steady and continuous with no distinctive tones.
01.00 hrs	1m from Unit #1 *DAIKIN 3MXM68N* serving 1st floor bedroom		45.1 [1 min]	44.2 [1 min]		Unit very quiet in operation with no distinctive tones.
	1m from Unit #3 *DAIKIN RXM35N9* serving 1st floor bedroom					Unable to get unit to operate
01.09 hrs	1m from Unit #6 *DAIKIN RXJ35M* serving 2nd floor master bedroom		50.3 [1 min]	49.8 [1 min]		Unit quiet in operation with noise steady and continuous with no distinctive tones. Measured noise levels approximate with manufacturer's quoted noise levels presented in Appendix 3.

APPENDIX 2

Glossary of Acoustical Terms

A-Weighted Sound Pressure Level (L_{pA}) - is the fluctuating root mean square (RMS) measured sound pressure level, expressed in dB(A), having been passed through an electronic filter network having a frequency response similar to that of the human ear.

Maximum Sound Pressure Level (L_{Amax}) - is the maximum recorded sound pressure level within the relevant time interval (t).

Equivalent Continuous Sound Level (L_{Aeq}) - is the steady notional sound level which contains the same acoustic energy over a specified time period as the actual time varying sound, measured in dB(A). It represents in a single figure the **average** noise level of the actual varying noise level over the defined time interval (t).

Ambient Noise Level (L_{Aeq}) – the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval T. In practice this is a measure of the residual sound and the specific sound, when present.

Background Noise Level *L_{A90} Level* – is the level of noise exceeded for 90% of the measurement time interval (t) and is the noise recorded in the absence of the offending noise.

Residual Noise Level (L_{Aeq}) – is the ambient noise level where the specific noise level under investigation makes no contribution to the ambient noise.

Specific Noise Level (L_{Aeq}) – is the noise produced by the specific sound source at the assessment location over a given reference time interval T_r.

Rating Noise Level (L_{AeqTr}) – is the specific noise level plus any adjustments for the characteristic features of the sound under investigation.

Sound Power Level (L_{WA}) – is the rate at which sound energy is emitted, reflected, transmitted or received, per unit time. The SI unit of sound power is the watt (W).[1] It relates to the power of the sound force on a surface enclosing a sound source, in air. For a sound source, unlike sound pressure, sound power is neither room-dependent nor distance-dependent. Sound pressure is a property of the field at a point in space, while sound power is a property of a sound source, equal to the total power emitted by that source in all directions.

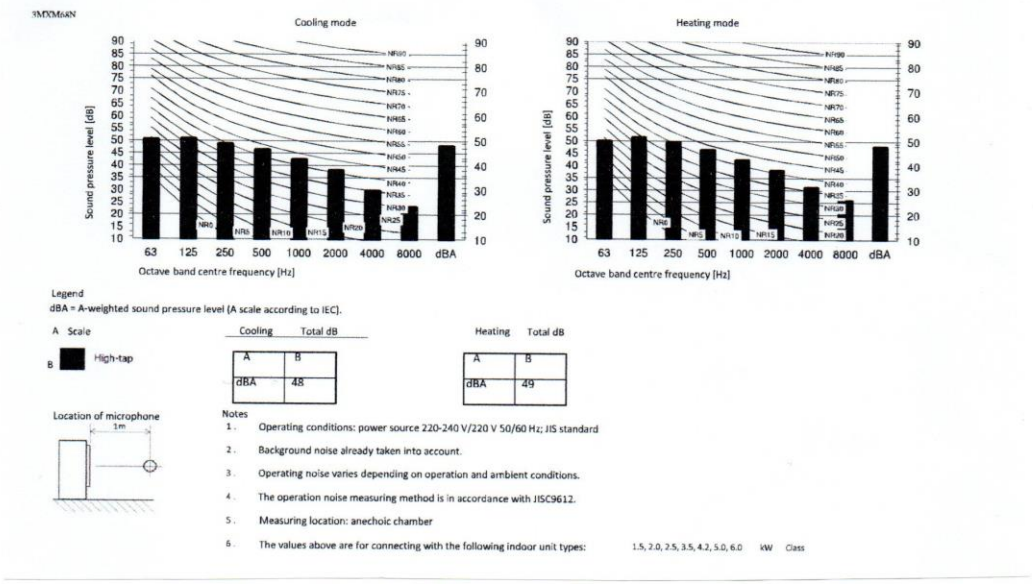
Manufacturer's Noise Level Data for Each of the 3 External AC Units

DAIKIN • Outdoor Unit • 3MXM-N → 1ST FLOOR BEDROOM UNIT #1

2 Specifications

2-1 Technical Specifications					3MXM40N	3MXM52N	3MXM68N
Sound power level	Cooling			dBA	59		61
	Heating			dBA	59		61
Sound pressure level	Cooling	Nom.		dBA	46		48
	Heating	Nom.		dBA	47		48
Operation range	Cooling	Ambient	Min.	°CDB	-10		
			Max.	°CDB	46		
	Heating	Ambient	Min.	°CWB	-15		
			Max.	°CWB	18		

3MXM68N



Legend
dBA = A-weighted sound pressure level (A scale according to IEC).

A Scale
B High-tap

Cooling	Total dB
A	B
dBA	48

Heating	Total dB
A	B
dBA	49

Location of microphone

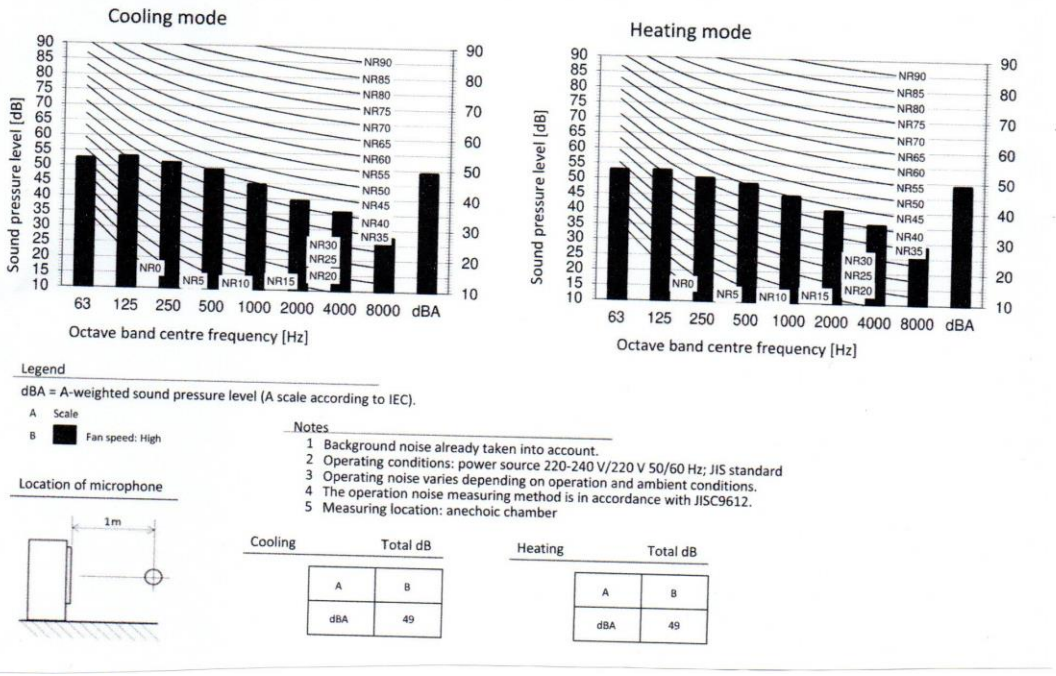
Notes
1. Operating conditions: power source 220-240 V/220 V 50/60 Hz; JIS standard
2. Background noise already taken into account.
3. Operating noise varies depending on operation and ambient conditions.
4. The operation noise measuring method is in accordance with JISC9612.
5. Measuring location: anechoic chamber
6. The values above are for connecting with the following indoor unit types: 1.5, 2.0, 2.5, 3.5, 4.2, 5.0, 6.0 kW Class

Manufacturer's Noise Level Data for Each of the 3 External AC Units

DAIKIN • Outdoor Unit • RXM-N9 — 1ST FLOOR BEDROOM UNIT #3

2 Specifications

2-9 Technical Specifications				RXM20N9	RXM25N9	RXM35N9	RXM42N9	RXM50N9	RXM60N9
Sound power level	Cooling		dBA	59	58	61	62		63
	Heating		dBA	59		61	62		63
Sound pressure level	Cooling	Nom.	dBA	46		49	48		
	Heating	Nom.	dBA	47		49	48	49	
Refrigerant	Type			R-32					
	Charge		kg	0.76			1.10	1.15	
			TCO_2eq	0.52			0.75	0.78	
	Control			Expansion valve			-		
	GWP			675					



Legend

dBA = A-weighted sound pressure level (A scale according to IEC).

A Scale

B Fan speed: High

Notes

1 Background noise already taken into account.
2 Operating conditions: power source 220-240 V/220 V 50/60 Hz; JIS standard
3 Operating noise varies depending on operation and ambient conditions.
4 The operation noise measuring method is in accordance with JISC9612.
5 Measuring location: anechoic chamber

Location of microphone

Cooling Total dB

A	B
dBA	49

Heating Total dB

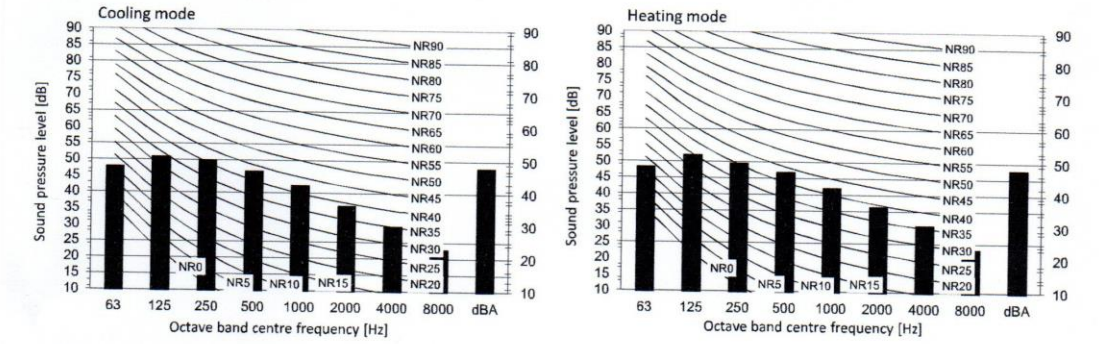
A	B
dBA	49

Manufacturer's Noise Level Data for Each of the 3 External AC Units

DAIKIN • Outdoor Unit • RXJ-N — KITCHEN UNIT #4

2 Specifications

2-3 Technical Specifications					RXJ50N
Sound power level	Cooling			dBA	63.0
	Heating			dBA	63.0
Sound pressure level	Cooling	Nom.		dBA	48.0
	Heating	Nom.		dBA	48.0
Operation range	Cooling	Ambient	Min.	°CDB	-10
			Max.	°CDB	46
	Heating	Ambient	Min.	°CWB	-15
			Max.	°CWB	18



Legend

dBA = A-weighted sound pressure level (A scale according to IEC).

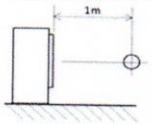
A Scale

B ■ Fan speed: High

Cooling	Total dB
A	B
dBA	48,0

Heating	Total dB
A	B
dBA	48,0

Location of microphone



Notes

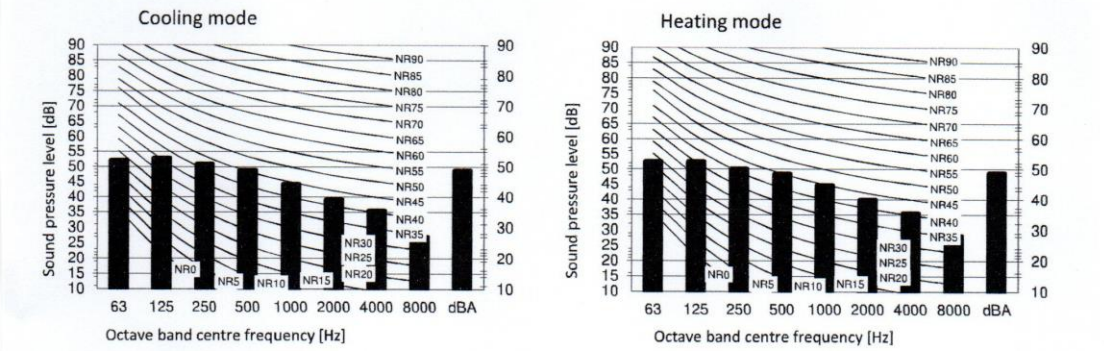
1. Operating conditions: power source 220-240 V/220 V 50/60 Hz; JIS standard
2. Background noise already taken into account.
3. Operating noise varies depending on operation and ambient conditions.
4. The operation noise measuring method is in accordance with JISC9612.
5. Measuring location: anechoic chamber

Manufacturer's Noise Level Data for Each of the 3 External AC Units

DAIKIN • Outdoor Unit • RXJ-M — MASTER BEDROOM UNIT #6

2 Specifications

2-3 Technical Specifications					RXJ20M	RXJ25M	RXJ35M
Sound power level	Cooling			dBA	59		61
	Heating			dBA	59		61
Sound pressure level	Cooling	Nom.		dBA	46		49
	Heating	Nom.		dBA	47		49
Operation range	Cooling	Ambient	Min.	°CDB	-10		
			Max.	°CDB	46		
	Heating	Ambient	Min.	°CWB	-15		
			Max.	°CWB	18		
				°CDB	24		



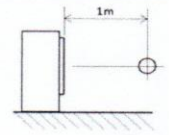
Legend

dBA = A-weighted sound pressure level (A scale according to IEC).

A Scale

B Fan speed: High

Location of microphone



Cooling	Total dB
A	B
dBA	49

Heating	Total dB
A	B
dBA	49

Notes

1 Background noise already taken into account.
2 Operating conditions: power source 220-240 V/220 V 50/60 Hz; JIS standard
3 Operating noise varies depending on operation and ambient conditions.
4 The operation noise measuring method is in accordance with JISC9612.
5 Measuring location: anechoic chamber

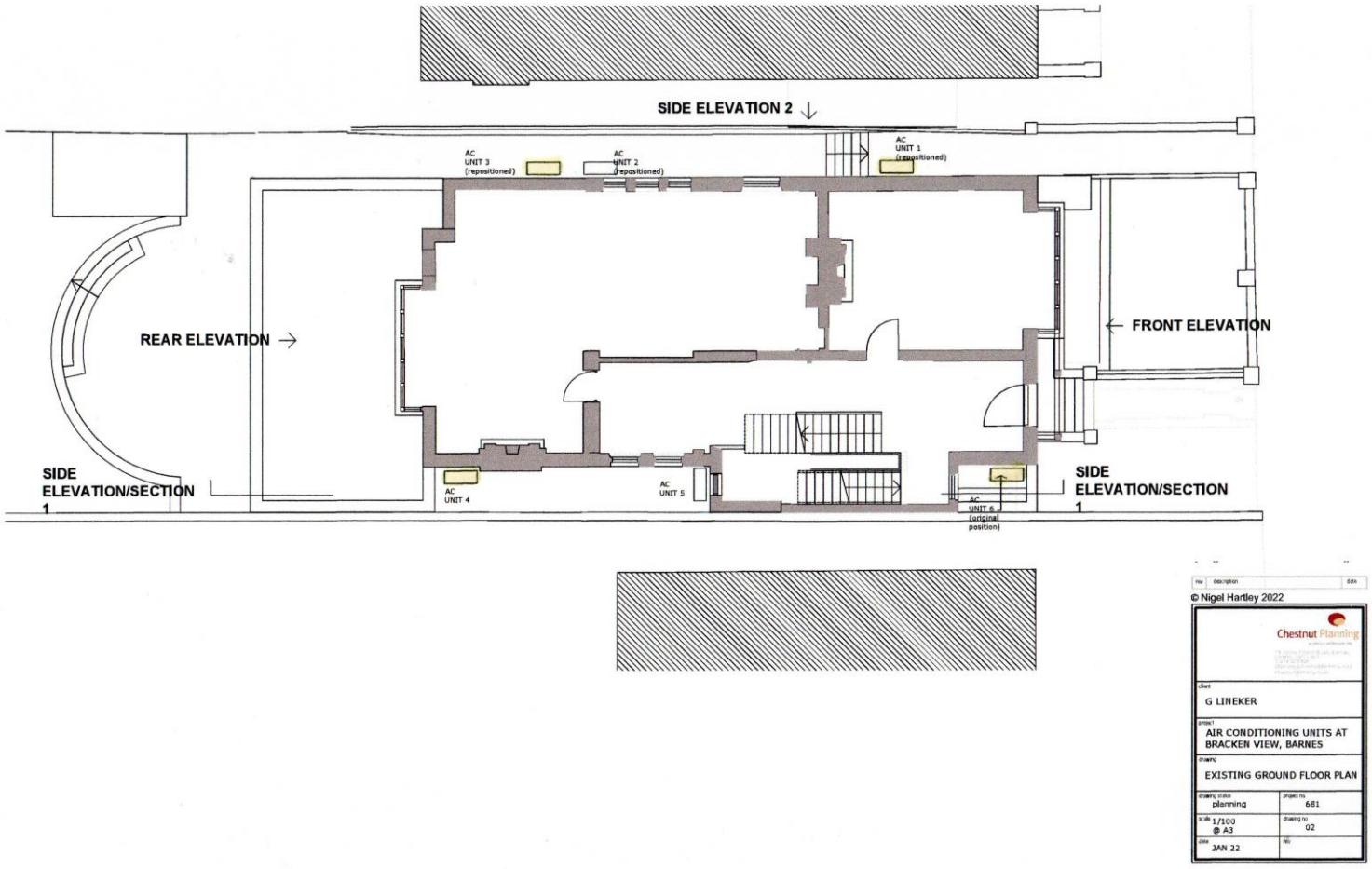
APPENDIX 4
Photographic Log

View of Units #1 to #3 attached to side of house at basement level. Note Unit #2 in the centre is obsolete. It is recommended that the two operational units #1 and #3 are lowered to the base of the house wall which should achieve a further 5 dBA attenuation due to the partial barrier effect provided by the boundary wall to the left.

View of Unit #4 in foreground at basement level with obsolete unit #5 in background

Current position of Unit #6 at ground level. This unit is to be re-located onto the balcony at 1st floor level.

APPENDIX 5
Layout Plan of House and Garden
[Extract of Chestnut Planning Drawing 02 of Project No 681]



APPENDIX 5
Elevation Drawings
[Extract of Chestnut Planning Drawing 01 of Project No 681]

FRONT ELEVATION

SIDE ELEVATION/SECTION 1

SIDE ELEVATION 2

REAR ELEVATION