BAY HORSE TAVERN LIMITED

THE BAY HORSE, MANCHESTER

NOISE ASSESSMENT FOR PLANNING PURPOSES

24 May 2017

AEC REPORT: P3515/R1d/AGB

Prepared by:



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ANC ACOUSTICS & NOISE CONSULTANTS

1.0 INTRODUCTION

1.1 Acoustic and Engineering Consultants Limited (AEC) has been instructed by Paul Astill Associates on behalf of Bay Horse Tavern Limited to undertake a noise assessment in relation to the redevelopment of The Bay Horse pub, Manchester.

1.2 This report provides details of the noise measurements undertaken around the proposed development and an assessment of the various elements of concern to Manchester City Council (MCC) based on guidance presented in their document GD 03 *'Environmental and Public Protection Information for Developers.'*

1.3 The assessment covers the following items:

- Music and patron noise break-out from the pub;
- Plant noise break-out;
- Patron noise from within the courtyard at the rear of the building.

1.4 Acoustic terminology used throughout this report is described in brief in Appendix A.

2.0 DEVELOPMENT / SITE DESCRIPTION

2.1 The Bay Horse is an existing pub located on Thomas Street Manchester, as identified on Figure 1, below.

2.2 The development already has planning permission for use as a public house (approved under planning permission 072054/FU/2004/C1) and has operated for a number of years. Permitted opening hours are: 1100h to 2300h / Mon - Sat and: 1100h to 1030h / Sun and Bank Holidays, although it is understood that the operating hours for at least the last 10 years have actually been:

- Midday – 2330h / Mon – Thurs;
- Midday – 0100h / Fri – Sat;
- Midday – 2230h / Sun.

2.3 The Pub has a basement and a ground floor area. In addition there is a courtyard that was used by clientele. It is understood that each room within the pub and the external courtyard (pictured on Figure 2) were previously in use throughout the trading hours indicated above.

2.4 The current proposals are to extend the trading hours as below:

- Midday – 2330h / Mon – Thurs (courtyard open throughout);
- Midday – 0200h / Fri – Sat (courtyard open until 0000h);
- Midday – 2230h / Sun (courtyard open throughout).

2.5 Further to the above, there is new mechanical service plant associated with the re-development and there will be an internal remodelling which will include a new set of lobbied doors being introduced as identified on Figures 3 (existing layout) and 4 (proposed layout).

2.6 The Bay Horse is buffered to the west by a stairwell leading up to adjacent businesses on the upper levels of the building, which includes a martial arts centre directly above on the first floor. Directly adjacent to the stairwell is a jewellers. Adjoining the building to the east is the Lifeline charity which provides a drug and alcohol support services.

2.7 The courtyard is located at the rear of the building (directly to the north) and this is partly formed by the façade of Bollin House, a six storey residential building which has windows directly overlooking the courtyard and a restaurant on the ground floor level.

2.8 Directly opposite the pub on Thomas Street are commercial buildings with ground floor shops.

3.0 EXTERNAL NOISE CLIMATE

3.1 AEC installed a sound level meter in the rear courtyard and continuously logged noise levels between approximately 1830h on Tuesday 11 April to around 1830h on Wednesday 12 April 2017. Noise levels were measured over 15-minute periods in terms of 'average' (dBL_{Aeq}) and 'background' (dBL_{A90}) noise. The measurement location is identified on Figures 1 and 2, below.

3.2 Although the measurements were unattended, audio recordings were obtained throughout the night-time period, which have confirmed that the background noise affecting the courtyard was due to the mechanical services plant located in the courtyard and associated with the existing ground floor restaurant in Bollin House. This existing plant is in the form of condenser units that are located directly below the existing residential buildings as identified on the photograph included as Figure 2, below.

3.3 Full details of the measurement procedure are included in Appendix B with the measured data presented in Graph B1 and Table B1 of Appendix B.

3.4 In summary, the lowest night-time background noise level measured during the survey was $50dBL_{A90,15\text{-minute}}$ as measured at approximately 0300h. During the daytime, the lowest measured background noise level was approximately $51dBL_{A90,\ 15\ min}$.

3.5 As the background noise is due to the existing condenser units that are directly under the windows of the residential properties and the measurement location was at least 2m from these items, the background noise levels affecting the windows will be significantly higher than those measured by AEC.

3.6 Based on distance attenuation alone, the plant noise levels at a distance of 0.5m (representative of the windows directly above the condenser units) as opposed to a distance of 2.5m (representative of the measurement location) would be approximately 14dB higher.

3.7 However, as there will be a reverberant build up within the courtyard, it is considered that, as a conservative estimation, the noise levels at the windows of the residential would be at least 6dB higher than those measured by AEC, which relates to a night-time background noise level of $56dBL_{A90}$ and a daytime level of $57dBL_{A90}$.

4.0 BASIS OF ASSESSMENT

4.1 As discussed above, it is important to note that the planning application is to refurbish the existing Bay Horse Pub and extend the trading hours. Part of the refurbishment will include the installation of new mechanical service plant, however, it must be noted that this will be a replacement of the plant that has been used by previous operators of the pub, which is identified on Figure 2.

4.2 With regard to Entertainment Venues, MCC's guidance (GD 03) states the following:

'Noise from entertainment venues, for example noise from recorded music, live bands, or karaoke, can be particularly annoying for local residents and businesses if it is not adequately contained within the venue.

When considering the potential impact of a proposal for an entertainment venue consultants should consider the overall noise level (L_{Aeq}) and the 63 Hz and 125 Hz octave band noise levels (L_{eq}). Music noise in the 63 Hz and 125 Hz octave bands, which is often described as "bass noise", is particularly difficult to contain and the impulsive character of this low frequency music noise is particularly disturbing for local residents exposed to it.

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A planning application for an entertainment venue should demonstrate that music noise from the proposal will not be audible inside residential properties nearby assuming that the residential properties in question have their windows open. The target noise criteria here should be 10dB (L_{Aeq}) below the existing L_{A90} in each octave band.

Applicants and consultants should note that although a particular business model may require a "chilled out" or "acoustic" venue Planning Approval for an entertainment venue will remain in place as long as the development exists. Subsequent owners or tenants may wish to provide much louder entertainment in the future. For this reason applicants and consultants should predict the noise impact of a proposed entertainment venue using noise levels that are representative of those found in "typical" venues of the kind being applied for. Consultants should provide their rational for using particular noise levels and reference the source of the noise levels used during their predictions.'

4.3 For external mechanical services noise, GD 03 indicates that plant noise levels affecting the nearest noise sensitive location must be controlled to at least 5dB below the lowest measured background noise levels at the nearest noise sensitive location to the plant, at the quietest time that the plant could be operational.

4.4 In addition to the above, the noise from the plant must not contain any characteristics (e.g. tonal or clicks). If the noise character of the plant cannot be controlled, the noise limit for the plant at the nearest noise sensitive property must be at least 10dB below the lowest measured background level.

5.0 ASSESSMENT

Noise to Adjoining Properties

5.1 As indicated above, there is a martial arts gym located directly above the Bay Horse on the first floor with a jewelers and alcohol support services charity in adjacent ground floor units. As indicated above, the building already has planning permission to operate as a pub during the day when these adjacencies will be open. Further to this, the walls will be timber clad, which should at least marginally improve the sound insulation performance at mid and high frequencies.

5.2 As there are no proposed changes to the building fabric between the Pub and the adjacencies and as any proposed extension of trading hours will not have any impact on the adjacent uses, there is no requirement to consider this element further as this element is already covered by the current planning permission.

Noise Break-out

5.3 In terms of noise break-out, the building already has permission for Pub and there are no material changes to the external building fabric with the exception that an additional lobby is proposed to the rear courtyard of the building, as identified on Figures 3 and 4.

5.4 The rear façade is formed by the 2 lobbies and traditional masonry walls with a single window in (which are buffered via internal constructions). Based on this, a noise break-out calculations have been undertaken and these are included as Appendix C with a summary included in Table 1, below.

5.5 With reference to the

5.6 It is important to note that the sound insulation performance anticipated for the rear lobbied doors assumes that both sets of doors have a sound insulation performance rating of at least 30dB, which is a solid core timber door with acoustic (compressible rubber) seals to the head, jambs and threshold.

5.7 AEC has assumed an internal noise level of 97dBL_{Aeq} within the bar to calculate the noise break-out. This is based on previous discussions with Manchester City Council where it has been asked that bars are assessed based on this level. Whilst this noise level is considered appropriate in this instance, it should be noted that AEC considers that a level of 97dBL_{Aeq} would only be generated in bars that play loud music and would never be generated in bars that only played background music.

Table 1: Anticipated Noise Break-out Noise to residential Windows Compared to the Lowest Measured Night-time Background Noise Levels

Details	Overall, dB(A)	Noise Level, dB @ Octave Band Centre Frequency, Hz						
		63	125	250	500	1k	2k	4k
Internal Noise Level Assumed, L_{eq}	97	90	90	90	90	90	90	90
Noise breaking out from bar, L_{eq}	35	45	34	29	29	22	23	28
Night-time Background noise level, L_{90}	56	59	59	56	52	52	46	42
Amount break-out noise below background	-21	-14	-25	-27	-23	-30	-23	-14

5.8 As identified above, noise levels breaking out from the development would be at least 10dB below the lowest measured night-time background noise levels in each octave band centre frequency as per the requirements of MCC.

Courtyard

5.9 In terms of patron noise within the courtyard, the current proposals are to limit courtyard use at the weekend to 0000h as opposed to the previous permitted hours of up to 0100h.

5.10 With reference to Goole Maps, it is clear that the Bay Horse was trading prior Bollin House (the residential block that overlooks the rear courtyard) being constructed. As such, it is assumed that the correct planning process occurred in relation to this residential development and that an assessment of patron noise associated with the Courtyard was undertaken by a competent acoustic consultant. If this is the case the residential building envelope and ventilation means should include appropriate mitigation measures to control noise from the courtyard.

5.11 Taking the above into account the situation in terms of courtyard noise would improve compared to the previously permitted use based on an earlier courtyard closing time at the weekend.

Mechanical Services Plant

5.12 The mechanical plant to be installed will include:

- Kitchen extract fan (located inside building);
- Kitchen fresh air fan (located inside building);
- Cellar cooler outdoor condensing unit 42dB @1m;
- AC system 1 outdoor condenser 43dB @1m;
- AC system 2 outdoor condenser 43dB @1m;
- Toilet extract fan (located inside building) 33dB @1m;

5.13 The location of the plant items are identified on Figures 5 and 6, below. Full details of each item are included in Appendix D.

5.14 With reference to the above and the calculation methods included in *'Noise Control in Building Services'* by Sound Research Laboratories, the plant noise levels have been calculated at the nearest residential windows (some 2.5m from the plant) taking into consideration a +6dB allowance for a semi-reverberant build-up of noise in the courtyard / location of plant.

5.15 The calculations demonstrate that the noise from the kitchen extract and supply alone would result in noise levels of approximately 65dB(A) at the residential windows without mitigation.

5.16 As such provided that the atmospheric sides of the kitchen supply and extract fans are fitted with 900mm long silencers (30% free area) (refer to Appendix D for the agreed silencers that will be used), which would reduce kitchen extract noise by 25dB, the total plant noise at the residential windows has been calculated as 46dB(A), which is 10dB below the lowest measured night-time background noise at the nearest residential window. The basic calculation is presented in Table 2, below.

Table 2 – Anticipated Plant Noise Levels at Nearest Window

Item	dB(A)	Distance, m	Reciever Distance, m	Distance attenuation, dB	resultant, dB(A)
Toilet Extract	33	1	3	8	25
AC condenser	43	1	3	8	35
AC condenser	43	1	3	8	35
Cellar Condenser	42	1	3	8	34
Kitchen F Fan*	38	1	3	8	30
Kitchen Ext Fan*	33	1	3	8	25
				Total	40
				Total + Semi reverberant build-up	**46**



Andrew Burke

FIGURE 1 – Site Location Showing Measurement Position

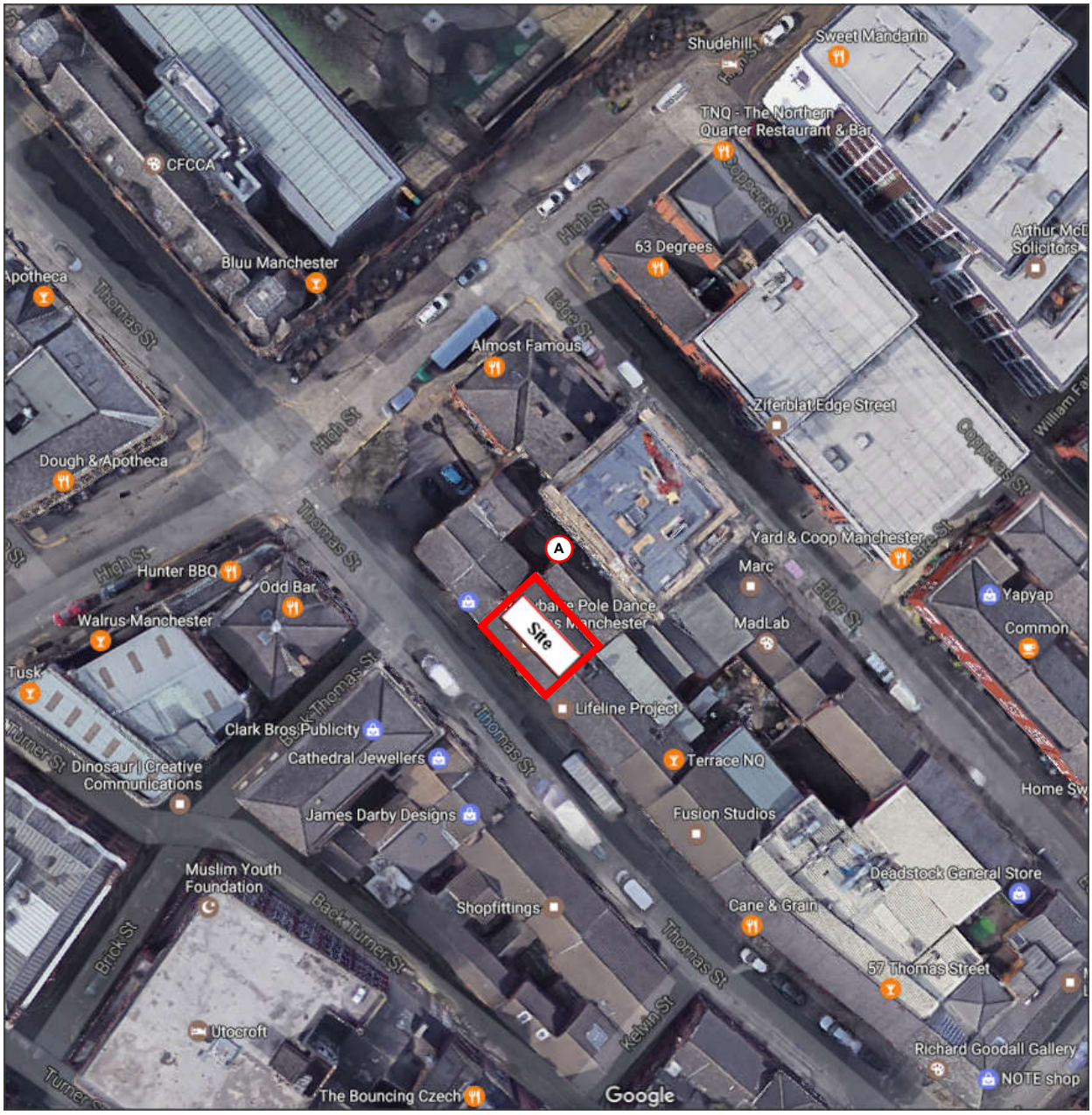


Figure 2 – Photograph of Courtyard Showing Existing Mechanical Services

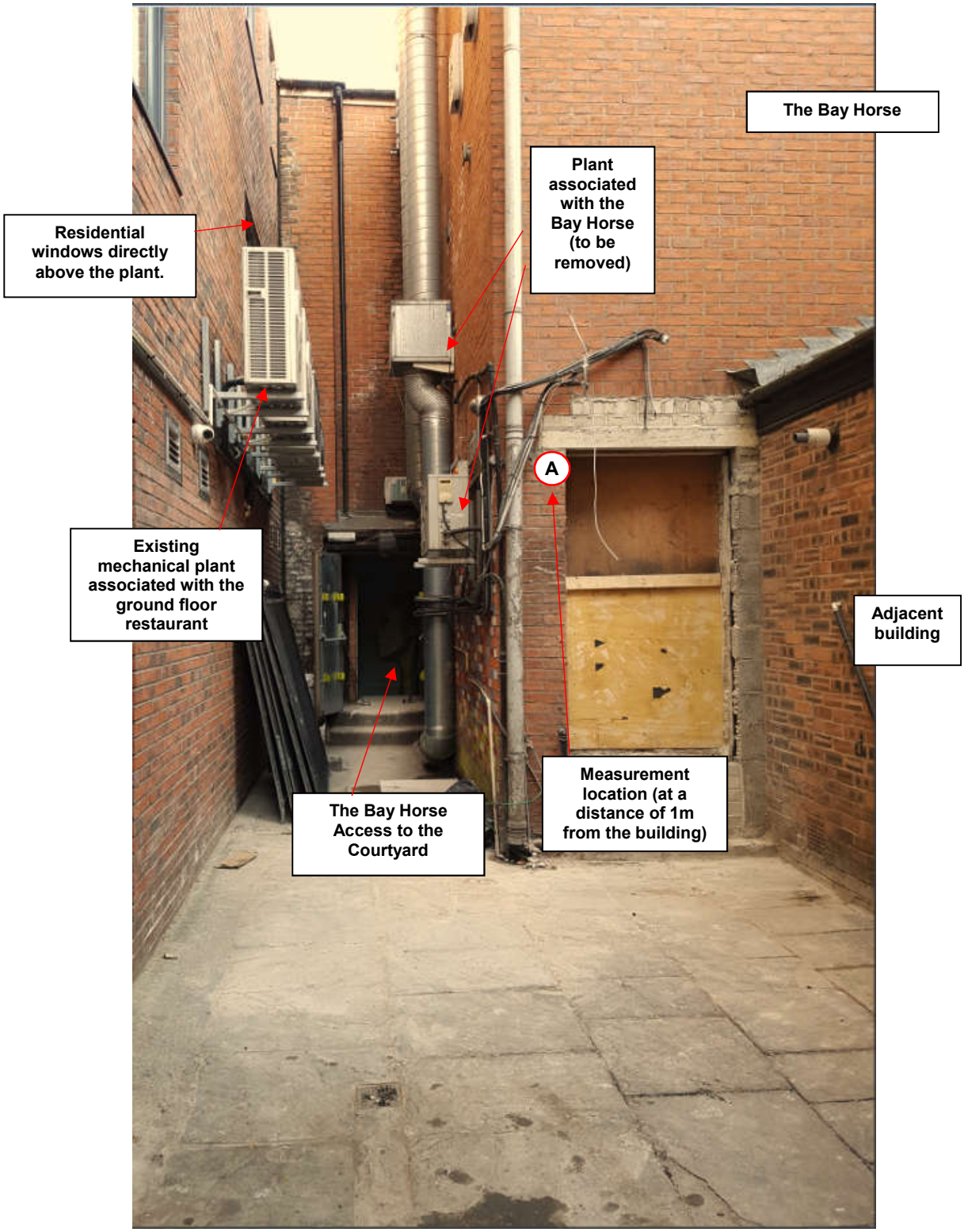


Figure 3 – Existing GF Layout

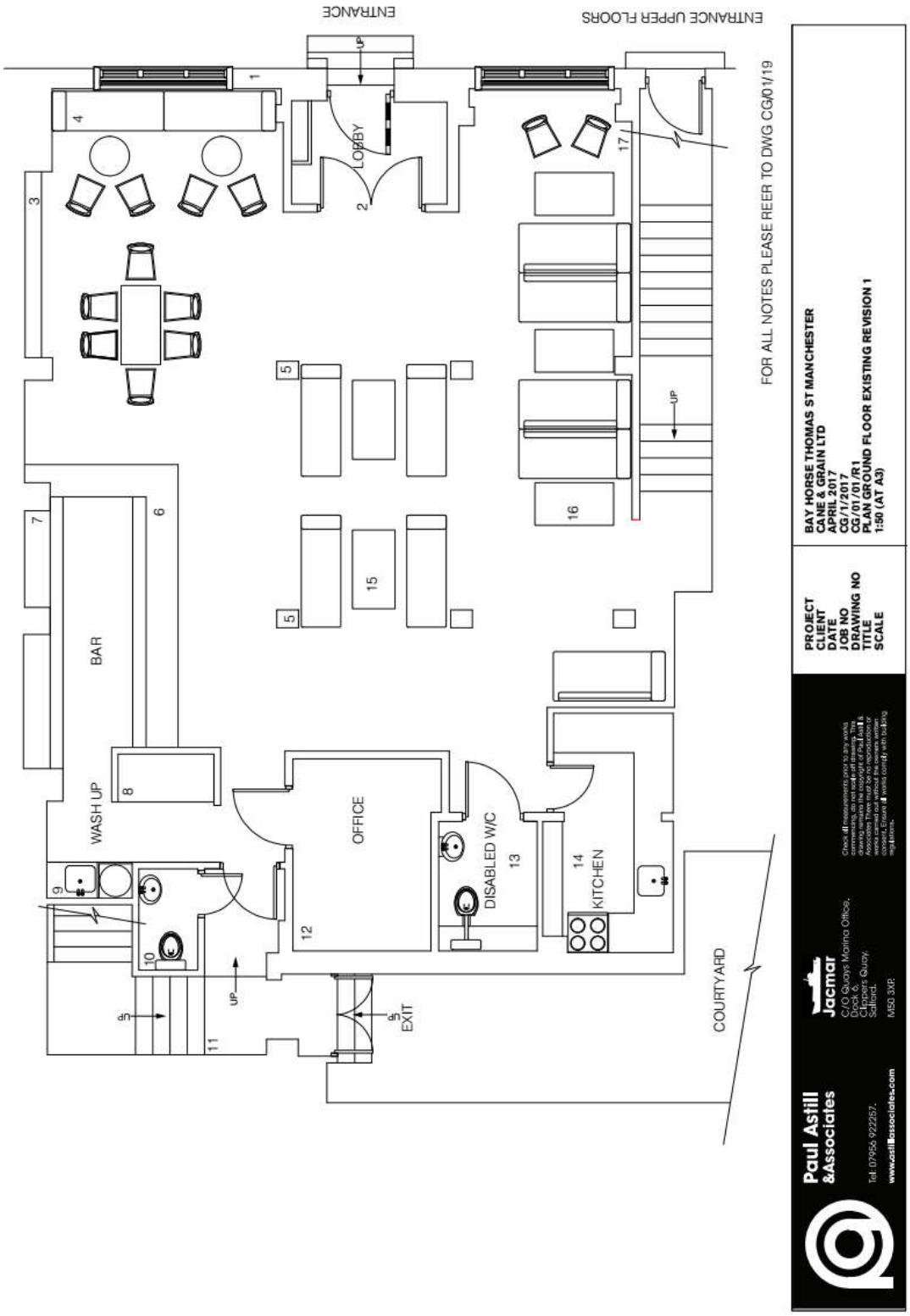


Figure 4 – Proposed GF Layout

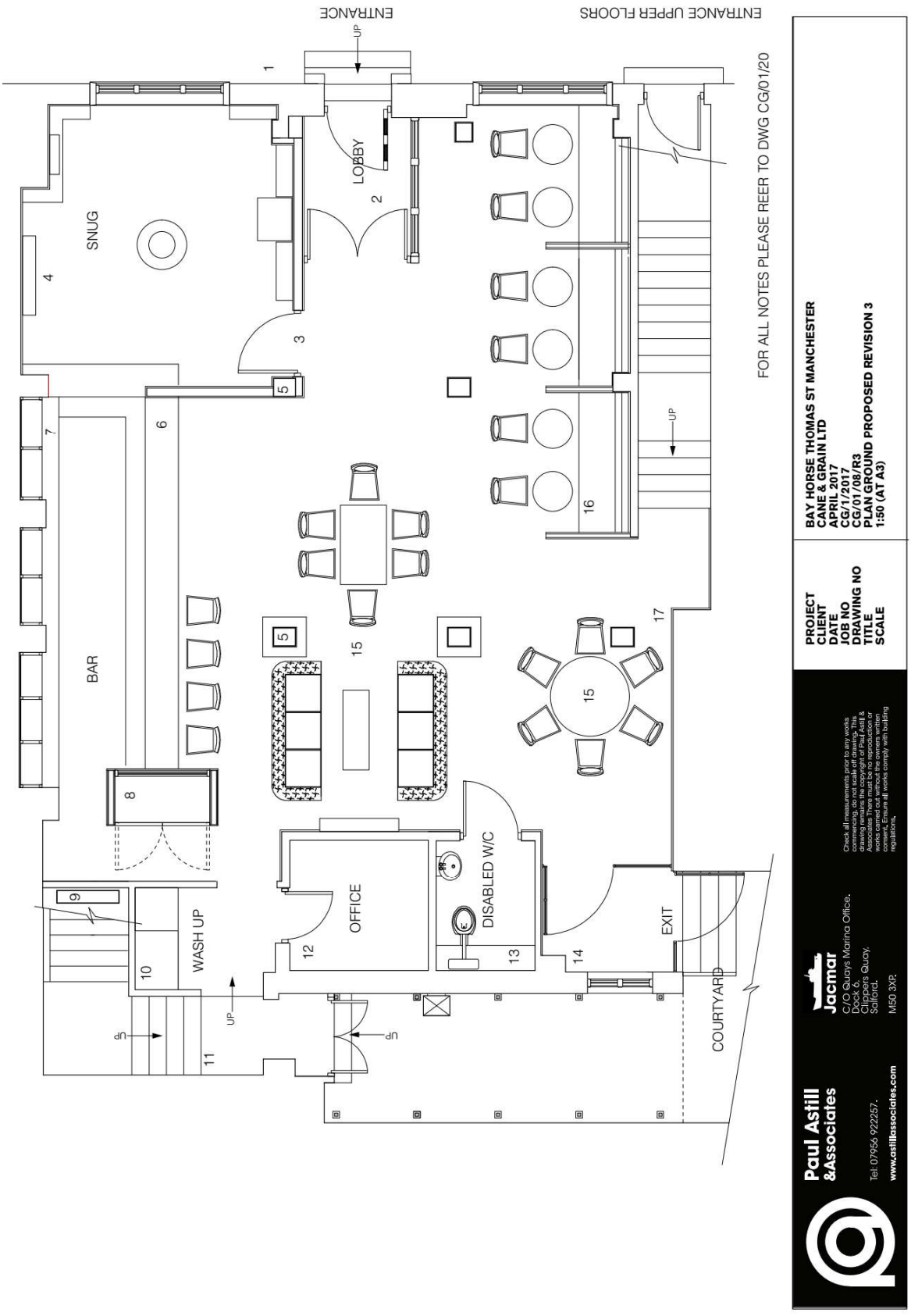


Figure 5 – Plant Details (GF)

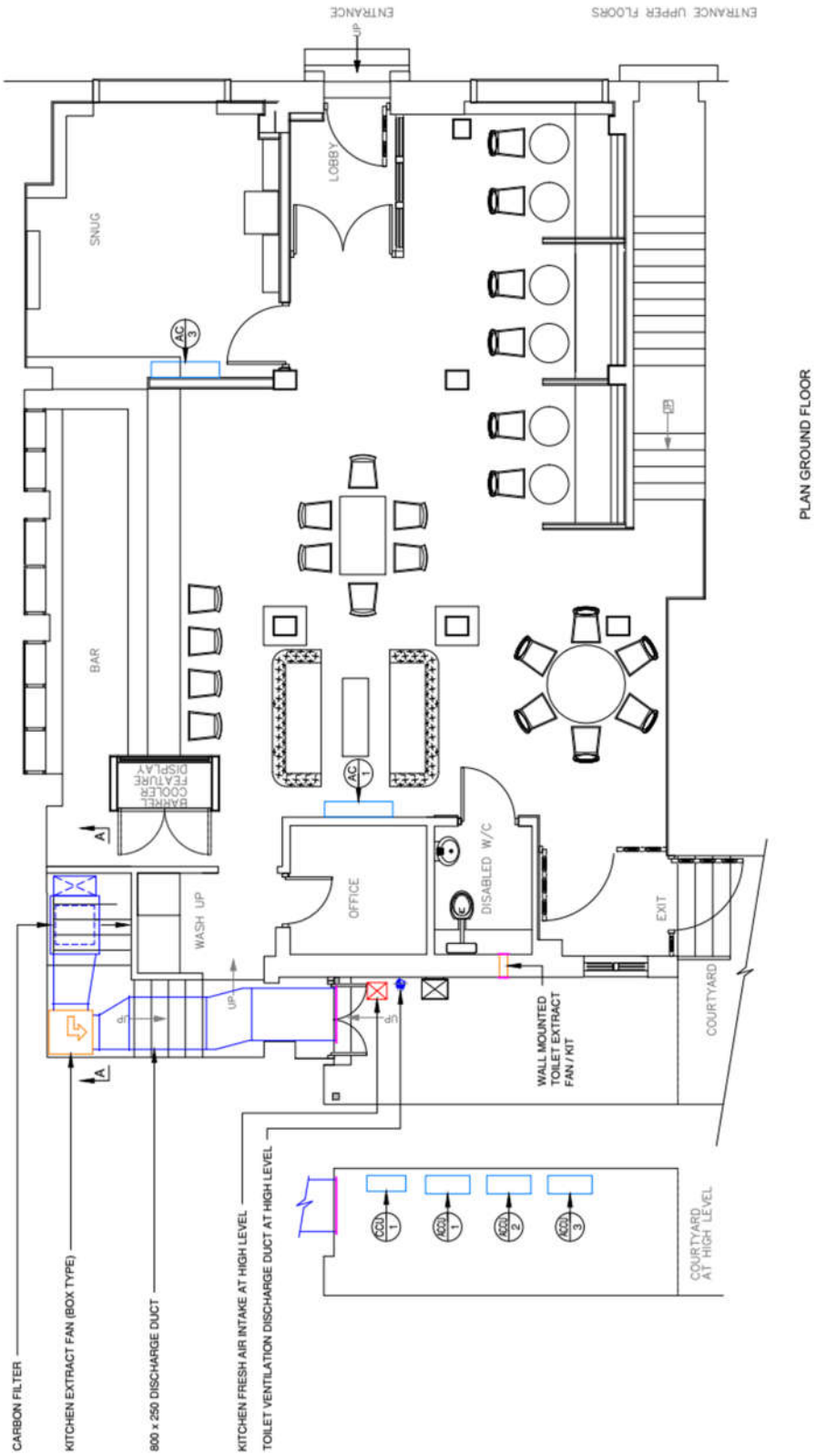
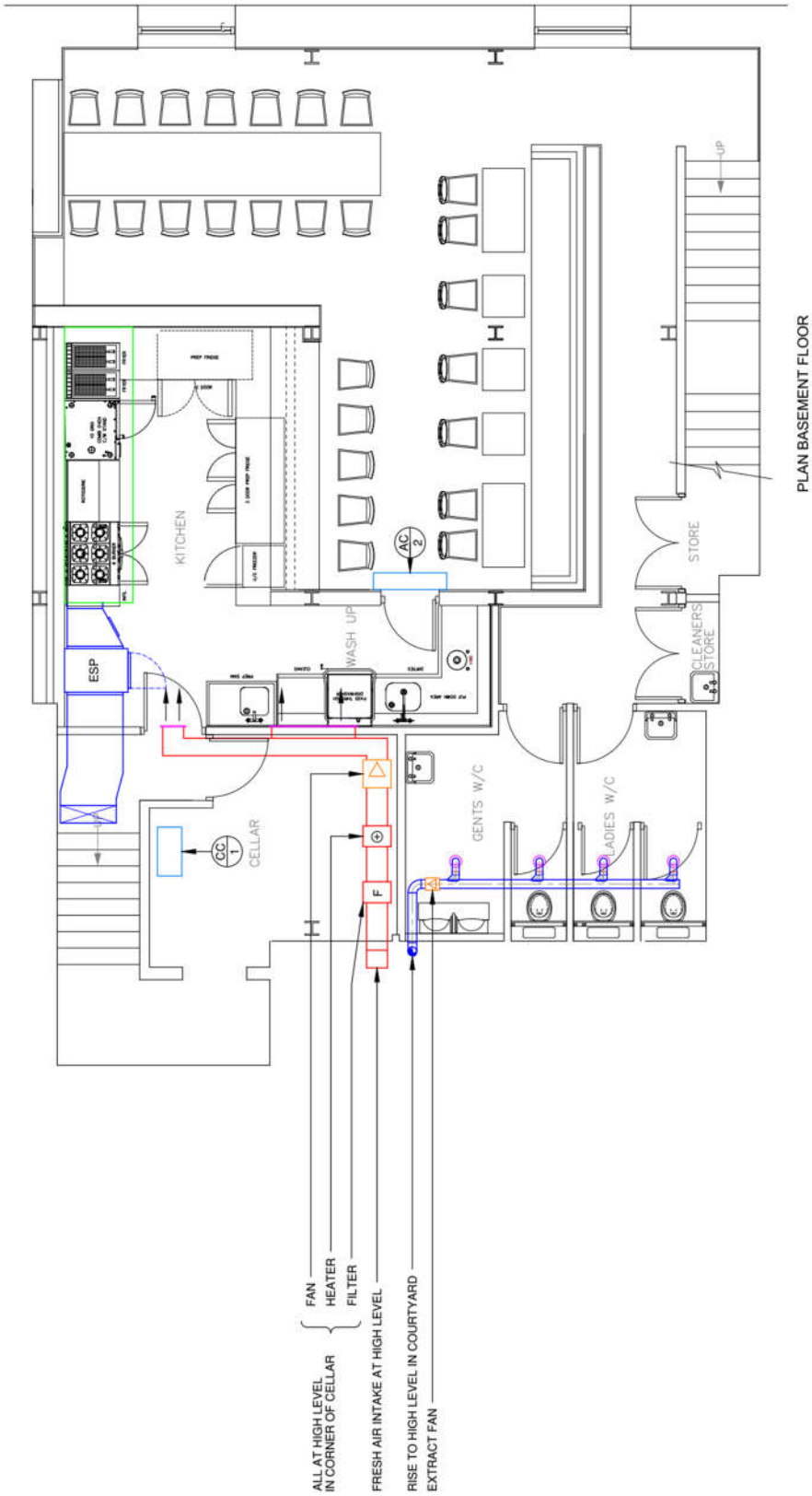


Figure 6 Plant Details (Basement)



APPENDIX A - Acoustic Terminology in Brief

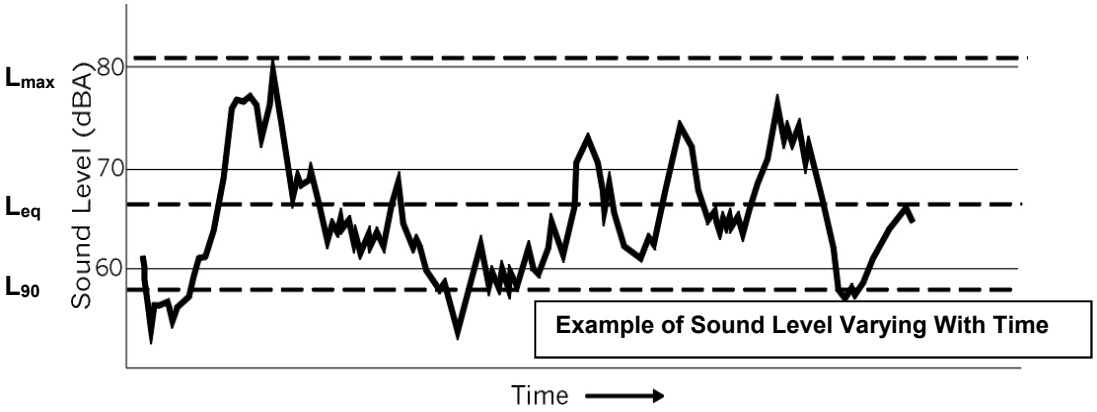
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.



$L_{Aeq,T}$ The equivalent continuous (A-weighted) sound level. May be thought of as the "average" sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the "ambient" noise level.

L_{Amax} The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.

L_{A90} The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to represent a background level.

Free-field This refers to the sound level measured outside, far away from reflecting surfaces

R_w Single number rating used to describe the laboratory airborne sound insulation of a material or building element over a range of frequencies, typically 100-3150Hz.

D_w Single number rating used to describe the on-site airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.

NR Noise Rating – a graphical method for assigning a single number rating to a noise spectrum and is often use to specify noise level limits for mechanical services.

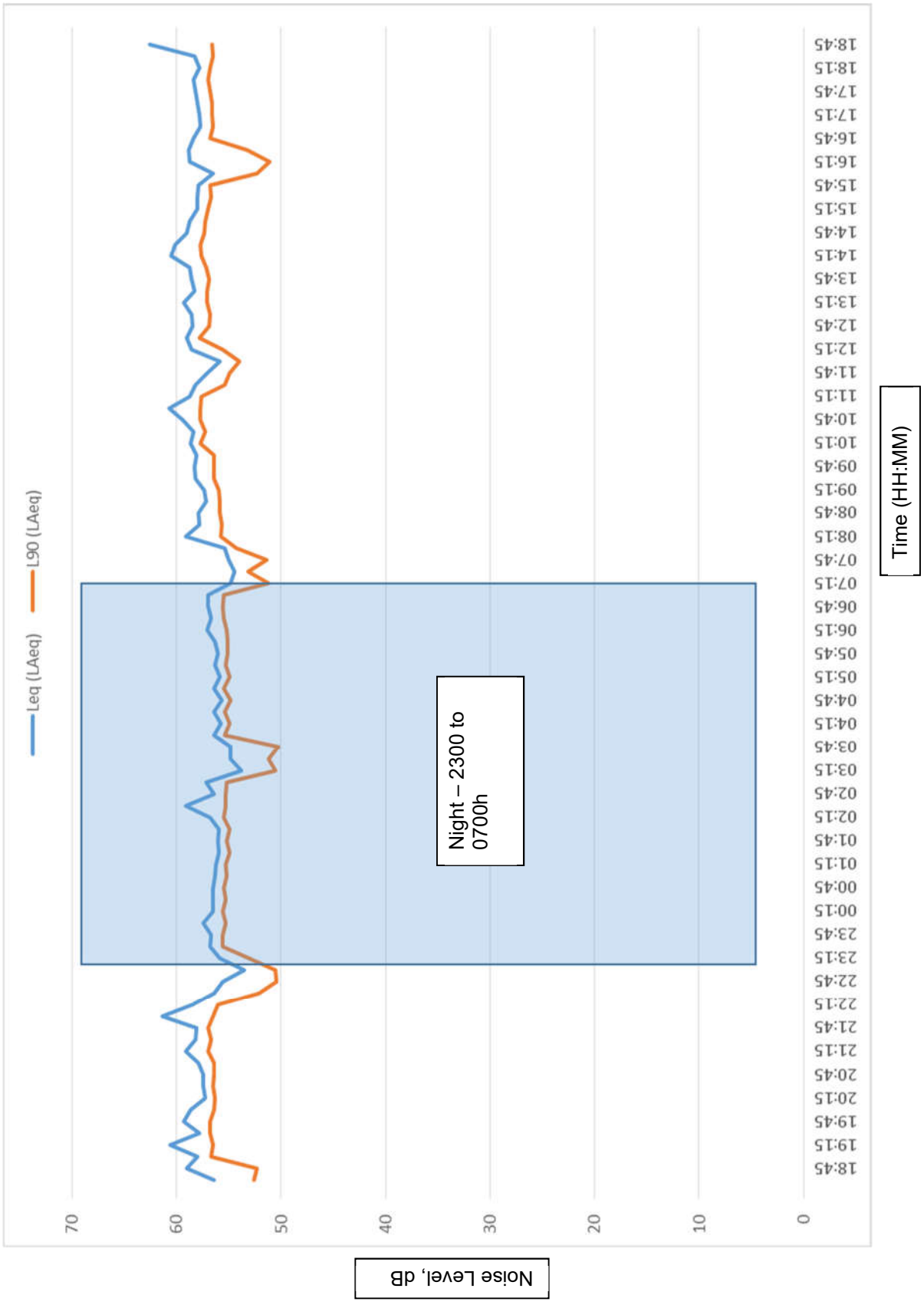
APPENDIX B – Measurement Procedure

Dates & Times of Survey:	1830h on Tuesday 11 April to 1830h on Wednesday 12 April.
Personnel Present:	All measurements were unattended with the exception of the start and end which were attended by Andy Burke of AEC.
Equipment Used:	Cirrus Optimus Real Time Analyser (AEC Kit 3).
Weather Conditions:	Full details are known, however, it is understood that conditions were overcast, little or no wind with temperatures of around 12 deg centigrade.
Measurement Procedure:	Ambient and background noise levels were measured at a single location, at a height of around 1.5m and 1m from the corner of the rear façade of The Bay Horse pub as identified on Figures 1 and 2. The measurement locations were selected to measure ambient noise levels and background noise levels, which were measured in terms of L_{Aeq} and L_{A90} typically over 5 minute periods. The sound level analyser, which conforms to BS EN 61672-1:2003 *'Electro acoustics – sound level meters - Part1:Specifications'* for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration.
Measured Data:	The measured results are presented in Table B1 and Graph B1, below.

TABLE B1 – Measured Noise Levels

Start Time	Leq LAeq)	L90 (LAeq)		Start Time	Leq (LAeq)	L90 (LAeq)
18:30	56.4	52.6		06:45	57.0	55.6
18:45	59.0	52.3		07:00	57.0	55.5
19:00	58.0	56.7		07:15	54.8	51.2
19:15	60.6	56.5		07:30	54.5	53.2
19:30	57.8	56.8		07:45	55.0	51.4
19:45	59.3	56.8		08:00	55.4	54.3
20:00	58.7	56.4		08:15	59.1	55.8
20:15	57.3	56.3		08:30	57.8	55.7
20:30	57.5	56.5		08:45	57.9	55.9
20:45	57.5	56.4		09:00	57.2	55.9
21:00	57.9	56.4		09:15	57.4	56.0
21:15	59.1	57.0		09:30	58.2	56.4
21:30	58.2	56.7		09:45	58.3	56.4
21:45	58.1	57.0		10:00	58.1	56.4
22:00	61.4	56.5		10:15	58.7	57.7
22:15	58.5	56.1		10:30	58.4	57.3
22:30	56.4	52.1		10:45	59.4	57.7
22:45	55.6	50.5		11:00	60.7	57.7
23:00	53.5	50.6		11:15	58.8	57.6
23:15	55.9	53.1		11:30	58.2	55.4
23:30	56.8	55.6		11:45	57.1	54.9
23:45	56.7	55.6		12:00	55.9	54.0
00:00	57.5	55.3		12:15	58.6	55.6
00:15	56.5	55.6		12:30	59.0	57.8
00:30	56.5	55.3		12:45	58.5	56.9
00:45	56.5	55.5		13:00	58.6	56.8
01:00	56.3	55.2		13:15	59.3	57.1
01:15	56.2	55.3		13:30	58.3	57.1
01:30	56.0	54.9		13:45	58.6	56.9
01:45	56.1	55.2		14:00	58.8	57.2
02:00	56.0	54.9		14:15	60.5	57.6
02:15	56.8	55.5		14:30	60.2	57.7
02:30	59.1	55.3		14:45	59.0	57.4
02:45	56.4	55.3		15:00	58.8	57.3
03:00	57.2	55.2		15:15	58.0	57.0
03:15	53.8	50.6		15:30	58.0	56.7
03:30	54.8	51.2		15:45	57.9	56.8
03:45	54.8	50.3		16:00	56.5	52.3
04:00	56.4	55.4		16:15	58.8	51.1
04:15	55.8	54.9		16:30	58.9	53.3
04:30	56.4	55.4		16:45	58.4	56.8
04:45	55.7	54.8		17:00	57.7	56.5
05:00	56.4	55.5		17:15	57.8	56.6
05:15	55.9	54.9		17:30	58.0	56.6
05:30	56.3	55.3		17:45	58.2	56.8
05:45	56.1	55.1		18:00	58.4	57.0
06:00	56.3	55.1		18:15	57.8	56.8
06:15	57.1	55.2		18:30	58.3	56.5
06:30	56.7	55.5		18:45	62.6	56.6

Graph B1 – Measured Noise Levels, Tuesday 11th April to Wednesday 12th April 2017



Appendix C – Example Break-out Calculation

AEC Ltd						**Date:**	25-May-17		
Contract No:	P3515								
Client:	Bay Horse						Consultant:	AGB	
Project:	P3515								
		NOISE BREAK OUT TO OUTSIDE							
Source	Internal bar noise with amplified music								
Noise Level	97	dBA							
	Corrections to obtain Lp at element ?								
	(eg distance/directivity)								
Building & Element	2 sets of lobbied doors								
Area (S)	8	m^2	Width(a)=	4	m	Height(b)=	2	m	
Position Directivity (Q)	4	(=4 for a wall, 2 for a roof)							
Additional Directivity									
Receiver	Residential windows in the courtyard								
Distance (R) from element	3	m							
Propagation Corrections									
Barrier	0								
Façade	0								
Calculation									
Frequency, Hz		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**dBA**
Internal Level,	dB	90	90	90	90	90	90	90	97
Internal Corrections ,	dB								
Corrected Internal Level,Lin,	dB	90	90	90	90	90	90	90	97
SRI of Element,	dB	33	44	49	49	56	55	50	4mm
Additional Directivity,	dB	0	0	0	0	0	0	0	
Silencer									
Barrier,	dB								
Façade,	dB								
Level (2) at Receiver	dB	45	34	29	29	22	23	28	35
Criterion	dB	59	59	56	52	52	46	42	
Shortfall (2)	dB	-14	-25	-27	-23	-30	-23	-14	
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi^2*R^2)) + 10Log(Q/2)							

AEC Ltd						**Date:**	25-May-17		
Contract No:	P3515								
Client:	Bay Horse						Consultant:	AGB	
Project:	P3515								
		NOISE BREAK OUT TO OUTSIDE							
Source	Internal bar noise with amplified music								
Noise Level	97	dBA							
	Corrections to obtain Lp at element ?								
	(eg distance/directivity)								
Building & Element	Buffered masonry walls and window								
Area (S)	15	m^2	Width(a)=	5	m	Height(b)=	3	m	
Position Directivity (Q)	4	(=4 for a wall, 2 for a roof)							
Additional Directivity									
Receiver	Residential windows in the courtyard								
Distance (R) from element	3	m							
Propagation Corrections									
Barrier	0								
Façade	0								
Calculation									
Frequency, Hz		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**dBA**
Internal Level,	dB	90	90	90	90	90	90	90	97
Internal Corrections ,	dB								
Corrected Internal Level,Lin,	dB	90	90	90	90	90	90	90	97
SRI of Element,	dB	48	56	65	82	98	98	95	4mm
Additional Directivity,	dB	0	0	0	0	0	0	0	
Silencer									
Barrier,	dB								
Façade,	dB								
Level (2) at Receiver	dB	33	25	16	-1	-17	-17	-14	13
Criterion	dB	59	59	56	52	52	46	42	
Shortfall (2)	dB	-26	-34	-40	-53	-69	-63	-56	
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi²*R²)) + 10Log(Q/2)							

Appendix D – Plant Details



Northern Fan Supplies Ltd
Technical Data Sheet
MaXfan Compac

KITCHEN EXTRACT

FläktWoods

Quotation Number	:	Project Code	:
Project Name	:	Customer	:
Item Reference:	:	Date:	: Thursday, April 6, 2017

Fan Code	45 MaXfan Compac
Fan Diameter / Size	450 Size / mm
Fan Speed	2910 rpm
Velocity	10.6 m/s
Blade Angle	16°
Installation Type / Form of Running	D / AB
Fan Casing	Long
Requested Duty	1.6m³/s @ 400 Pa (static)
Actual Duty	1.68m³/s @ 441 Pa (static)
Outlet Dynamic Pressure	67 Pa
Duty Shaft Power	1.25 kW
Max Shaft Power	1.43 kW
Total Efficiency	68.4 %
Motor Frame	80
Motor Rating	1.32 kW [IE2]
Full Load Current	4.71 A
Starting Current	25.5 A
Motor Mounting	Pad
Electrical Supply	220-240 Volts 50 Hz 1 Phase
Start Type	DOL
Motor Winding	Standard
Enclosure	Standard All
ErP [FMEG] Rating	N 60 (ErP Compliant 2015)
ErP [FMEG] Target	N 58
FMEG Blade Angle [Range]	0° [0° - 0°]
Measurement Category	D (Total)
VSD	N
Fan + Motor Efficiency	55.4% (1.67 m³/s @ 515 Pa)
Motor Input Power (ErP)	1.55 kW
SFP value	0.91 W/(l/s) @ Actual Duty
Power from mains	1.54 kW
Energy Consumption	4611 kWh (3000 h/year)
Running Cost / Year	£553
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting
Product Number	EJ463266

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using an auto transformer speed controller for noise sensitive applications. Bifurcateds are Erp exempt when used continuously at >100C. They are not for use in the EEA at lower temperatures.

The MaXfan Compac includes a preprogrammed inverter drive to operate via 1 phase supply, offering full speed control and optimised performance.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt 2, 1985 / BS EN ISO 5136 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions.

Acoustic figures for adjusted running speeds have been interpolated and are for reference only.

Terms and Conditions:This offer is made subject to the terms and conditions detailed on the accompanying letter.

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	81	78	85	87	84	83	78	74	92	69
Outlet*	82	78	87	88	84	83	79	74	93	69
Breakout*	72	60	65	65	59	55	57	50	74	45

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa
Sound data at actual duty.

Description	Qty
Fan	
EJ463266 - 45 MaXfan Compac	1
Accessories	
Inverter	1
Thermistors	1

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KITCHEN SUPPLY



Northern Fan Supplies Ltd
Technical Data Sheet
MaXfan Compac

FläktWoods

Quotation Number	:	Project Code	:
Project Name	:	Customer	:
Item Reference:	:	Date:	: Thursday, April 6, 2017

Fan Code	40 MaXfan Compac
Fan Diameter / Size	400 Size / mm
Fan Speed	2840 rpm
Velocity	10.5 m/s
Blade Angle	16°
Installation Type / Form of Running	D / AB
Fan Casing	Long
Requested Duty	1.2m³/s @ 175 Pa (static)
Actual Duty	1.31m³/s @ 210 Pa (static)
Outlet Dynamic Pressure	66 Pa
Duty Shaft Power	0.548 kW
Max Shaft Power	0.737 kW
Total Efficiency	66.0 %
Motor Frame	80
Motor Rating	1.32 kW [IE2]
Full Load Current	4.71 A
Starting Current	25.5 A
Motor Mounting	Pad
Electrical Supply	220-240 Volts 50 Hz 1 Phase
Start Type	DOL
Motor Winding	Standard
Enclosure	Standard All
ErP [FMEG] Rating	N 62 (ErP Compliant 2015)
ErP [FMEG] Target	N 58
FMEG Blade Angle [Range]	0° [0° - 0°]
Measurement Category	D (Total)
VSD	N
Fan + Motor Efficiency	55.8% (1.29 m³/s @ 375 Pa)
Motor Input Power (ErP)	0.870 kW
SFP value	0.55 W/(l/s) @ Actual Duty
Power from mains	0.72 kW
Energy Consumption	2160 kWh (3000 h/year)
Running Cost / Year	£259
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting
Product Number	EJ413456

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using an auto transformer speed controller for noise sensitive applications. Bifurcateds are Erp exempt when used continuously at >100C. They are not for use in the EEA at lower temperatures.

The MaXfan Compac includes a preprogrammed inverter drive to operate via 1 phase supply, offering full speed control and optimised performance.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt 2, 1985 / BS EN ISO 5136 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions.

Acoustic figures for adjusted running speeds have been interpolated and are for reference only.

Terms and Conditions:This offer is made subject to the terms and conditions detailed on the accompanying letter.

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	75	76	82	79	78	77	74	70	86	63
Outlet*	77	77	85	80	79	77	75	71	88	64
Breakout*	67	62	65	59	53	48	50	48	70	40

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa
Sound data at actual duty.

Description	Qty
Fan	
EJ413456 - 40 MaXfan Compac	1
Accessories	
Inverter	1
Thermistors	1

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marstair

R410a cellar cooling



COMPETITIVE RANGE OF R410A CELLAR COOLERS

BASED ON THE SAME HIGH SPECIFICATION INDOOR UNITS AS OUR SUCCESSFUL CX(E)/CKC RANGE

AVAILABLE IN 3 CAPACITIES 2.3 TO 4.5KW



FEATURES

- LP Switch
- 3 minute timer
- Random start contactor
- De-ice stat as standard
- Electronic Control ('E' units only)

SPECIFICATION

- Designed with a high impact resistant moulded polymer cabinet impregnated with an anti-bacterial additive to help prevent mold growth
- A 6 fins-per-inch brewery specification heat exchanger
- Rounded corners, mounting brackets suitable for both wall and ceiling mounting and a waterproof power switch
- Direct access to the electrics at the front of the unit
- ABS drain tray incorporating standard 22mm OD fitting drain stub
- Up to 15m pipe runs
- Easy to install field fit electric heater kit with factory fit option
- Air throws to suit all applications
- Outdoor unit pre charged with R410a refrigerant

Process/Material Cooling • Close Control • Refrigeration

Technical Information

Guide to Cooling Duty

SYSTEM	DUTY @ 12.7°C 27°C AMBIENT			DUTY @ 12.7°C 35°C AMBIENT			DUTY @ 8°C 27°C AMBIENT			SYSTEM CONNECTIONS	
	TD (kW)	SD (kW)	INPUT (kW)	TD (kW)	SD (kW)	INPUT (kW)	TD (kW)	SD (kW)	INPUT (kW)	SUCTION	LIQUID
CX(E)A 30 / CKA 35	2.28	1.98	1.17	2.20	1.77	1.30	1.79	1.69	1.15	1/2"	3/8"
CX(E)A 50 / CKA 35	3.25	2.48	1.19	2.83	2.15	1.25	3.06	2.36	1.15	1/2"	3/8"
CX(E)A 50 / CKA 50	4.25	2.90	1.62	3.50	2.45	1.60	3.44	2.40	1.51	1/2"	3/8"

Approximate Guide to Cellar Sizing in m³ at 27°C Ambient

SYSTEM	ABOVE GROUND CELLAR IN m³		BELOW GROUND CELLAR IN m³	
	8°C	12.7°C	8°C	12.7°C
CX(E)A 30 / CKA 35	20	26	25	31
CX(E)A 50 / CKA 35	25	30	31	39
CX(E)A 50 / CKA 50	30	42	46	57

Dimensions and Weights



CX(E)A



CXA



CX(E)A Indoor Unit

UNPACKED DIMENSIONS				
SYSTEM	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
CX(E)A 30	467	845	320	18
CX(E)A 50	467	845	320	20

CKA Outdoor Unit

UNPACKED DIMENSIONS				
SYSTEM	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
CKA 35	552	760	256	34
CKA 50	552	760	256	42

TEV Ltd

CE

Approved to BS EN ISO 14001:2004 — Certificate No. EMS 91502

Approved to BS EN ISO 9001:2008 — Certificate No. FM 671

marstair

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A division of TEV Limited

Part No: 06617670-02

For full design information, reference should be made to the technical manual.
We reserve the right to alter designs and specifications at any time without notification.

Process/Material Cooling • Close Control • Refrigeration


RAK-18~50PEB


RAC WEB

Room Air Conditioners

Summit - Wall mounted

INDOOR UNITS

	Units	RAK-18PEB	RAK-25PEB	RAK-35PEB	RAK-50PEB
Nominal Cooling Capacity (min - max)	kW	2.00 (0.90 - 2.50)	2.50 (0.90 - 3.10)	3.50 (0.90 - 4.00)	5.00 (1.90 - 5.20)
Sensible Cooling Capacity	kW	1.9	2.2	2.8	3.4
UK Cooling Capacity (sensible)	kW	1.9 (1.7)	2.4 (2.0)	3.3 (2.5)	4.2 (3.1)
Nominal Heating Capacity (min - max)	kW	2.50 (0.90 - 3.20)	3.40 (0.90 - 4.40)	4.20 (0.90 - 5.00)	6.00 (2.2- 7.30)
Nominal cooling power input (min - max)	kW	0.58 (0.25-1.01)	0.70 (0.25 - 1.29)	1.09 (0.25 - 1.46)	1.56 (0.50 - 2.10)
Nominal heating power input (min - max)	kW	0.62(0.25-0.97)	0.88 (0.25 - 1.25)	1.10 (0.25 - 1.70)	1.66(0.50 - 2.75)
Seasonal Efficiency SEER(3) Energy Efficiency Class Annual Energy Consumption	kWh/yr	5.8 A+ 121	5.8 A+ 151	5.9 A+ 209	5.9 A+ 298
Seasonal Efficiency SCOP(3) (Average Climate) Energy Efficiency Class Annual Energy Consumption	kWh/yr	3.8 A 316	3.8 A 909	3.8 A+ 1,124	3.8 A 1,601
Nominal Load Efficiency EER / COP(4) Energy Class (Cool/Heat)		3.45/4.03 A / A	3.57 / 3.86 A / A	3.21 / 3.82 A / A	3.21 / 3.61 A / A
Noise level cooling (sound pressure) (SL / L / M / H)	dB(A)	21/24/33/37	22/24/33/40	25/26/36/43	28/30/40/46
Noise level heating (sound pressure) (SL / L / M / H)	dB(A)	19/22/33/38	20/23/34/41	26/27/36/44	25/30/39/47
Noise level (sound power)(2)	dB(A)	51	54	57	60
Air flow cooling mode (SL / L / M / H)	m^3/h	312 / 350 / 400 / 440	333/370/430/510	333/400/485/600	333/450/600/700
Air flow heating mode (SL / L / M / H)	m^3/h	312 / 350 / 420 / 480	333/400/500/570	333/520/550/660	433/510/650/770
Dehumidification	l/h	1.2	1.4	1.6	2.0
Dimensions (H x W x D)	mm	280 x 780 x 218	280 x 780 x 218	280 x 780 x 218	280 x 780 x 218
Weight	kg	7.5	7.5	7.5	8.0
Power supply		230V / 1Ph / 50Hz			
Drain diameter (ext)		φ16mm	φ16mm	φ16mm	φ16mm
Remote Control	Std	Infra Red (RAR-5F1)	Infra Red (RAR-5F1)	Infra Red (RAR-5F1)	Infra Red (RAR-5F1)
	Opt	Wired (SPX-RCDB)	Wired (SPX-RCDB)	Wired (SPX-RCDB)	Wired (SPX-RCDB)

OUTDOOR UNITS

	Units	RAC-18WEB	RAC-25WEB	RAC-35WEB	RAC-50WEB
Noise level cooling (sound pressure) (night mode)	dB(A)	46	48	49	51
Noise level heating (sound pressure) (night mode)	dB(A)	47	49	50	51
Noise level (sound power)(2)	dB(A)	60	62	63	65
Air flow (Cooling / Heating)	m^3/h	1860/1620	1860/1620	1860/1620	2160/2160
Dimensions (H x W x D)	mm	530x660 x278	530x660 x278	530x660 x278	600x792x299
Weight	kg	27.5	27.5	27.5	40.0
Piping diameter (Liquid / Gas)	Inch mm	1/4 - 3/8 6.35 - 9.52	1/4 - 3/8 6.35 - 9.52	1/4 - 3/8 6.35 - 9.52	1/4" / 1/2" 6.35 - 12.70
Minimum Piping Length	m	3.0	3.0	3.0	3.0
Maximum Piping Length / Height Difference	m	20 / 10	20 / 10	20 / 10	20 / 10
Current Quantity of Refrigerant	kg	0.95	0.95	0.95	1.25
Chargeless / Additional Refrigerant Charge	m / g/m	20 / -	20 / -	20 / -	20 / -
Power supply		230V / 1Ph / 50Hz	230V / 1Ph / 50Hz	230V / 1Ph / 50Hz	230V / 1Ph / 50Hz
Recommended fuse size	A	16	16	16	25
Starting current	A	3.5	4.7	5.6	7.6
Running current (cooling / heating)	A	1.09-4.39/1.09-4.22	1.09-5.61/1.09-5.43	1.09-6.35/1.09-7.39	2.17-9.13/2.17-11.96
Interconnecting Cables	No.	3 + E	3 + E	3 + E	3 + E
Working Range (cooling / heating)	°C	-10°C~43°C / -15°C~21°C	-10°C~43°C / -15°C~21°C	-10°C~43°C / -15°C~21°C	-10°C~43°C / -15°C~21°C
Refrigerant / GWP		R410A / 1975	R410A / 1975	R410A / 1975	R410A / 1975
Compressor type		Rotary	Rotary	Rotary	Rotary

(1) Value includes the defrost ratio.
(2) Sound power level is the A-weighted sound power level [dB(A)] measured at standard rated conditions for the «cooling» mode operation in accordance to EN12102
(1) Value includes the defrost ratio.
(4) Nominal load efficiency (Cooling 35°c/27°c, Heating 7°c/20°c)

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RAF-RPA

Room Air Conditioners

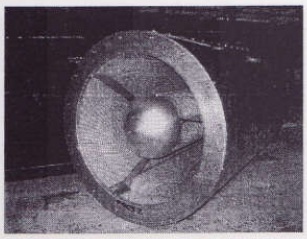
Standard floor mounted

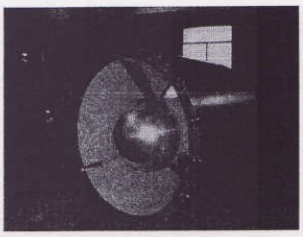
Indoor Unit		RAF-25RPA	RAF-35RPA	RAF-50RPA
Nominal Cooling Capacity (min - max)	kW	2.5 (0.9 - 3.1)	3.5 (1.1 - 4.2)	5.0 (1.9 - 5.2)
Cooling Sensible Capacity	kW	2.3	2.9	3.8
UK Cooling Capacity (sensible)	kW	2.1 (1.9)	2.9 (2.5)	4.2 (3.2)
Nominal Heating Capacity (min - max)	kW	3.4 (0.9 - 4.4)	4.2 (1.1 - 5.2)	6.0 (2.2 - 7.3)
Heating Capacity at -7°C[1]	kW	2.2	2.7	3.9
Nominal Cooling Power Input (min - max)	kW	0.67 (0.25 - 1.29)	0.94 (0.25 - 1.40)	1.51 (0.50 - 2.10)
Nominal Heating Power Input (min - max)	kW	0.85 (0.25 - 1.25)	1.05 (0.25 - 1.80)	1.66 (0.50 - 2.70)
Seasonal Efficiency SEER[3]		5.80	6.00	5.86
Energy Efficiency Class		A+	A+	A+
Annual Energy Consumption	kWh/yr	151	202	299
Seasonal Efficiency SCOP[3] (Average Climate)		4.30	4.30	4.00
Energy Efficiency Class		A+	A+	A+
Annual Energy Consumption	kWh/yr	774	989	1,518
Nominal Load Efficiency EER / COP[4]		3.73 / 4.00	3.72 / 4.00	3.31 / 3.61
Energy Class (Cool/Heat)		A / A	A / A	A / A
Noise Level Cooling (sound pressure) (SL / L / M / H)	dB(A)	23 / 26 / 32 / 40	25 / 29 / 35 / 42	25 / 30 / 37 / 46
Noise Level Heating (sound pressure) (SL / L / M / H)	dB(A)	23 / 27 / 33 / 40	26 / 30 / 35 / 42	25 / 30 / 37 / 47
Noise level (sound power)[2]	dB(A)	54	56	60
Air flow cooling mode (SL / L / M / H)	m^3/h	378 / 462 / 540	400 / 485 / 600	430 / 530 / 650
Air flow heating mode (SL / L / M / H)	m^3/h	408 / 498 / 600	440 / 525 / 600	470 / 570 / 720
Dehumidification	l/h	1.4	1.6	2.0
Dimensions (H x W x D)	mm	600 x 760 x 235	600 x 760 x 235	600 x 760 x 235
Weight	Kg	14.0	14.0	14.0
Included drain pump		no	no	no
Power Supply		35V DC from outdoor unit	35V DC from outdoor unit	35V DC from outdoor unit
Drain Diameter (ext)		φ16mm	φ16mm	φ16mm
Remote Controller (standard)		infra red RAR-5E2	infra red RAR-5E2	infra red RAR-5E2

Outdoor Unit		RAC-25FPA	RAC-35FPA	RAC-50FPA
Noise Level Cooling (sound pressure) (night mode)	dB(A)	47	48	51
Noise Level Heating (sound pressure) (night mode)	dB(A)	49	49	52
Noise level (sound power)[2]	dB(A)	61	62	65
Air flow (Cooling / Heating)	m^3/h	1860/1620	1920/1620	2160/2160
Dimensions (H x W x D)	mm	548 x 750 x 288	548 x 750 x 288	600 x 792 x 299
Weight	Kg	31.0	35.0	40.0
Piping Diameter (Liquid / Gas)	Inch mm	1/4 - 3/8 6.35 - 9.52	1/4 - 3/8 6.35 - 9.52	1/4 / 1/2 6.35 - 12.70
Minimum Piping Length	m	5	5	5
Maximum Piping Length / Height Difference	m	20 / 10	20 / 10	20 / 10
Current Quantity of Refrigerant	Kg	0.87	1.05	1.25
Chargeless / Additional Refrigerant Charge	m/g/m	20 / -	20 / -	20 / -
Power supply		230V / 1Ph / 50Hz	230V / 1Ph / 50Hz	230V / 1Ph / 50Hz
Recommended fuse size	A	16	16	16
Starting Current	A	5.0	5.0	9.0
Running Current (Cooling / Heating)	A	3.43 / 4.11	4.30 / 4.81	6.63 / 7.29
Interconnecting Cables	No.	2 + E	2 + E	2 + E
Working Range (Cooling / Heating)	°C	-10°C~43°C / -15°C~21°C	-10°C~43°C / -15°C~21°C	-10°C~43°C / -15°C~21°C
Refrigerant / GWP		R410A / 1975	R410A / 1975	R410A / 1975
Compressor type		Rotary	Rotary	Rotary

(1) Value includes the defrost ratio.
(2) Sound power level is the A-weighted sound power level [dB(A)] measured at standard rated conditions for the "cooling" mode operation in accordance to EN12102
(3) Data calculated in accordance to prEN14825 and the Commission Communication 2012/C 172/01
(4) Nominal load efficiency (Cooling 35°C/27°C, Heating 7°C/20°C)

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STANDARD CIRCULAR SILENCER INSERTION LOSS DATA

@ +20oC and 5m/sec FACE VELOCITY

			OCTAVE BAND CENTRE FREQUENCIES (Hz)							
SILENCER SIZE	CODE	P.A	63	125	250	500	1K	2K	4K	8K
200-550 dia	CDA.1D	ALL	2	4	6	10	14	10	7	8
	CDA.2D	A	4	8	13	17	23	17	12	11
		B	4	8	12	17	23	17	12	10
		C	4	7	10	15	19	16	12	9
	CDAP.1D	A	4	6	8	12	21	21	18	15
		B	4	6	8	11	18	19	17	14
		C	4	6	8	11	14	16	11	10
	CDAP.2D	A	7	10	12	24	29	29	27	23
		B	7	10	12	21	26	26	24	22
		C	7	10	11	18	21	20	17	15
600-800 dia	CDA.1D	ALL	3	4	9	15	15	8	7	6
	CDA.2D	A	6	8	13	22	23	14	13	9
		B	6	8	13	22	22	13	12	9
		C	6	8	12	20	18	13	11	9
	CDAP.1D	A	4	6	8	17	25	21	18	11
		B	4	6	8	17	23	20	18	10
		C	4	6	8	16	18	16	13	10
	CDAP.2D	A	8	11	16	30	35	31	29	22
		B	8	11	16	27	32	31	29	19
		C	8	11	16	24	23	22	21	17
1000-1500 dia	CDA.1D	ALL	3	4	9	14	13	7	7	6
	CDA.2D	A	6	8	14	22	20	13	12	9
		B	6	8	13	21	18	12	11	9
		C	6	8	12	19	16	11	10	7
	CDAP.1D	A	4	6	11	21	20	16	13	11
		B	4	6	11	20	18	15	13	11
		C	4	6	11	17	16	14	12	10
	CDAP.2D	A	8	11	18	30	32	30	24	16
		B	8	11	18	26	27	26	22	16
		C	8	11	18	21	20	22	20	16
1600-2000 dia	CDA.1D	ALL	4	5	10	14	11	6	6	5
	CDA.2D	A	8	9	14	19	18	12	11	9
		B	8	9	14	19	17	11	10	9
		C	8	9	13	18	14	10	9	8
	CDAP.1D	A	5	7	12	21	20	13	12	9
		B	5	7	12	19	18	13	11	9
		C	5	7	12	15	16	12	10	8
	CDAP.2D	A	10	14	21	26	29	28	18	15
		B	10	14	21	25	27	25	16	14
		C	10	14	21	21	20	20	15	14

P.A = Fan Impeller Pitch Angle.
A = upto 12 degrees
B = upto 20 degrees
C = upto 45 degrees

The Above Data Is Offered As Being Indicative Only
For Guaranteed Data (when applicable) Please Consult With (DBA) Technical Services Ltd.