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NOISE IMPACT ASSESSMENT REPORT MECHANICAL PLANT

188-189 DRURY LANE, LONDON WC2B 5QD

FOR

MR. CEMAL POLAT

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1. EXECUTIVE SUMMARY

It is proposed to install new commercial mechanical plant (an air conditioning [AC] condenser and a chiller room condenser) to service the premises at No.188-189 Drury Lane, London WC2B 5QD.

Sound Licensing has undertaken an environmental noise survey at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive properties, which have been identified as the flats directly above the premises.

The results of the noise survey were considered reasonable given the location of the measurement position and the existing noise sources in the local vicinity.

Noise calculations of the mechanical plant have been undertaken using all available details and plans provided by the client and obtaining manufacturers' specifications wherever possible. The data and information forms the basis of the assessment.

Noise break-out limits for the mechanical plant have been proposed based on the methodologies of British Standard (BS) 4142:2014 and the London Borough of Camden's Policy. A robust, worst-case assessment of the noise levels associated to the proposed mechanical plant has been undertaken.

In accordance with BS 4142:2014, the predicted noise impact due to the operation of the mechanical plant ***"is an indication of the specific sound source having a low impact"***. The predicted noise level of the mechanical plant at the nearest noise sensitive properties complies with the London Borough of Camden's Policy.

2. INTRODUCTION

No.188-189 Drury Lane, London WC2B 5QD is proposing to install a mechanical plant at the rear of the premises, the noise from which could have the potential to affect existing noise sensitive properties nearby.

The purposes of this report are:

- To determine prevailing environmental noise levels affecting surrounding properties due to nearby noise sources (e.g. road traffic, commercial noise, aircraft etc),
- Based on the above, to present noise emission limits in accordance with the requirements of BS 4142:2014 and the London Borough of Camden's Policy, and
- To undertake an assessment to demonstrate compliance with the Local Authority noise requirements.

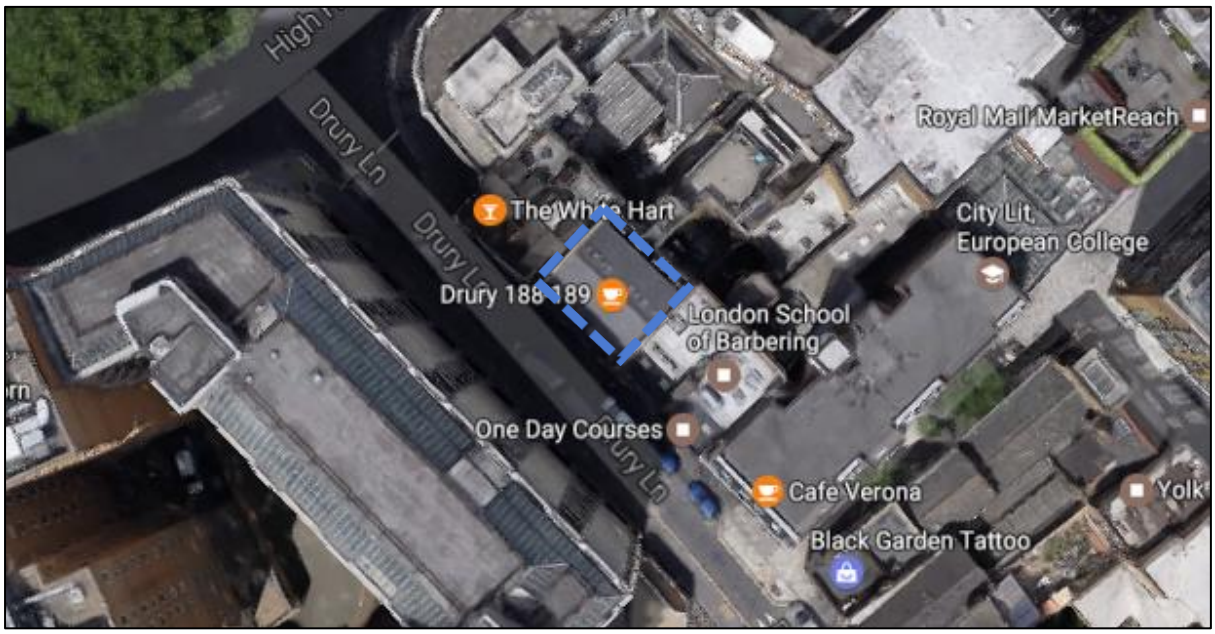
3. SITE DESCRIPTION

No.188-189 Drury Lane (hereafter 'the site') is seeking planning permission for the installation of mechanical plant at the rear of the premises. The site is over ground floor only with residential premises located above. The site is located in a mixed commercial and residential area.

The nearest noise sensitive receptors to the proposed mechanical plant were noted to be the rear window at 1st floor level above the site (approximately 4 metres distance from the mechanical plant). If the noise impact assessment details that there is an indication of the specific sound source having a low impact at this premises then it can be safely assumed it will be met at other properties of equal distance and/or those further away.

Figure 3.1 shows the site highlighted in blue.

Figure 3.1 Site Location and Surrounding Land Use



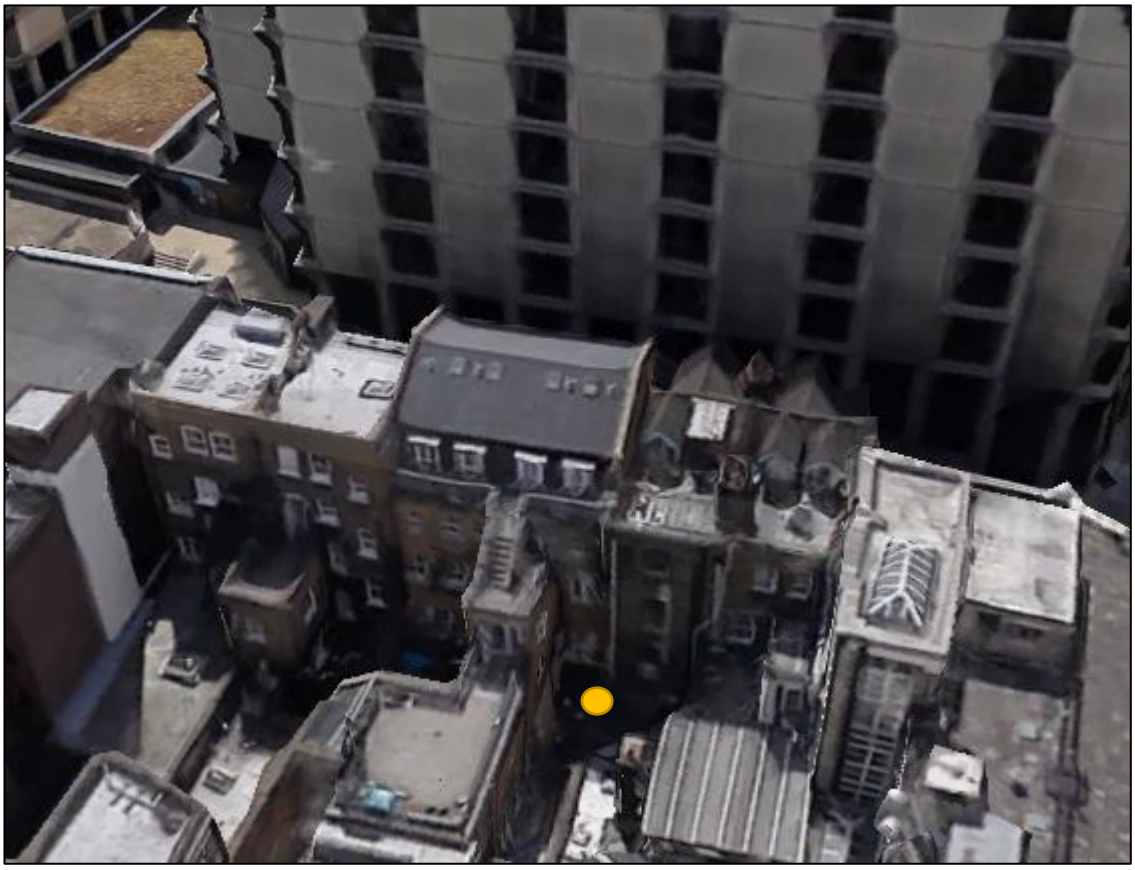
Source: Google maps

4. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

An unmanned environmental noise survey was undertaken at a single measurement location at the rear of the site. The survey was undertaken between 14:45 hours on Friday 19th May and 11:00 hours on Monday 22nd May 2017. A survey at this time covers the most sensitive period of time in which the mechanical plant may be operational (when background noise levels would be expected to be lower as opposed to weekdays).

Ambient, background and maximum noise levels (L_{Aeq}, L_{A90} and L_{Amax} respectively) were measured throughout the noise survey in continuous 15-minute periods. The approximate measurement position is indicated in **orange** on Figure 4.1 below.

Figure 4.1 Site Plan Showing Approximate Location of Measurement Position



Source: Google maps

The sound level meter was positioned at ground floor approximately 3.5 metres from nearby walls/fences and approximately 1.5 metres above ground level. The position is considered to be in free-field. The monitoring position is considered representative of background noise levels at the nearest identified noise sensitive property.

The equipment used for the noise survey is summarised in Table 4.1.

Table 4.1 Description of Equipment used for Noise Survey

Equipment	Description	Quantity	Serial Number
Larson Davis Sound Expert LxT	Type 1 automated logging sound level meter	1	0004720
Larson Davis 377B02	½" microphone	1	159605
Larson Davis	Pre-amplifier	1	42612
Larson Davis CAL200	Class 1 Calibrator	1	12245

The noise survey and measurements were conducted, wherever possible, in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures'*. Measurements were made generally in accordance with ISO 1996-2:2007 '*Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*'.

Weather conditions throughout the entire noise survey period were noted to be warm (approx. 10-17° Celsius), dry, clear skies (10-30% cloud cover approximately) with a light wind (<5m/s). These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were maintained throughout the majority of the survey period and are considered reasonable for undertaking environmental noise measurements.

The noise monitoring equipment was calibrated before and after the noise survey period. No significant drift was recorded. Equipment calibration certificates can be provided upon request.

5. NOISE SURVEY RESULTS AND OBSERVATIONS

5.1 Results

A summary of the measured ambient and typical background noise levels during the proposed (most sensitive) operational hours are shown in Table 5.1 below.

Table 5.1 Measured ambient and typical background sound pressure levels

Date	Ambient Noise Level, dB L_{Aeq}	Typical Background Noise Level, dB L_{A90}
19.05.17 – 22.05.17	51-64	**53**

The typical background noise level at the measurement position during the survey, at the time in which the plant could be operational, is 53dB $L_{A90\ (1\ hour)}$.

5.2 Observations

Given that the background noise survey was unmanned, noise sources could not be identified. However, at the beginning and end of the survey background noise at was dominated by vehicles on the local road network, existing commercial activity with minor influence from overhead planes. After analysis of the data no significant abnormal noise source(s) were identifiable. It is considered that the measured noise levels are reasonable given the location of the measurement position.

6. EXTERNAL NOISE EMISSION LIMITS

6.1 Local Authority Requirements

The site lies within the jurisdiction of the Local Authority, the London Borough of Camden. Camden's Development Policy (DP28 – Noise & vibration) states:

'*The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for: a) development likely to generate noise pollution; or b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided. Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted. The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds…*'

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$_{LAeq}$

For the purposes of this report, an assessment has been undertaken in line with BS 4142:2014.

Table 6.1 Maximum noise emission design target

Typical Measured Background Noise Level, dB $L_{A90,1\ hour}$	Rating noise level 1m from nearest noise sensitive receptor, dB L_{Aeq}
53	48

These representative noise levels are considered appropriate for the assessment.

6.2 BS 4142:2014

BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" presents a method for assessing the significance and possible adverse impact due to an industrial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or other unusual characteristic. This can result in a maximum total correction of +21dB being added if the new noise source demonstrates all of the above characteristics. The rating level is then compared to the background noise level and the significance of the new noise source likelihood of any adverse impact is determined in accordance with the following advice:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occur. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context. The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

7. PROPOSED MECHANICAL PLANT AND ASSOCIATED NOISE LEVELS

It is proposed to install the following items of plant at the rear of the premise.

Table 7.1 Proposed Mechanical Plant

Make	Model	Reference Noise Levels*
Mitsubishi	1no. PUHZ-ZRP125VKA	Cooling 51dB(A) / Heating 55dB(A) @ 1m
Maxcold Condenser	1no. NFP075DGM	31dB(A) @ 10m

*Reference 'A' weighted sound pressure level. Manufacturer's specification is provided in Appendix B.

In reference to section 6 of this report, a penalty addition of 3dB for intermittency has not been applied in the calculations as it is considered that this will be insufficient to attract attention at the residential receptor over the existing residual noise level and modern mechanical plant such as above are relatively quiet. A penalty has not been applied for tonality as spectral data of the plant shows no significant characteristics. Penalty additions have also not been applied for impulsiveness or any other unusual characteristics as mechanical plant of this type generally do not demonstrate such features.

8. NOISE IMPACT ASSESSMENT

This section presents calculations to predict the noise impact of the proposed mechanical plant located at the rear of the site, at the nearest noise sensitive properties.

8.1 Proposed Operational Hours and Background Noise Levels

The plant is proposed to operate between the following times:

Monday – Friday, 07:00 -19:00
Saturday, 08:00 -19:00
Sunday, 08:00 – 18:00

As detailed in Section 6.1 of this report, the typical background noise level used in this assessment is 53dB $L_{A90\ (1\ hour)}$. The design range is 48dB L_{Aeq} at 1 metre from the façade of the residential premises.

8.2 Nearest Noise Sensitive Properties

The nearest residential premises to the proposed plant was noted to be the rear façade of the first-floor flats directly above the site at approximately 4 metres distance. Measurements have been completed to ensure noise levels are 1 metre from the façade of the premises in line with Local Authority requirements.

8.3 Description of Calculation Process

In accordance with the methodologies of BS 4142:2014 and the London Borough of Camden's Policy, calculations have been undertaken to predict noise levels in which the plant could be operational. It has been assumed that the plant will be operational continuously for a full hour and that it will be operating at their typical level. Given the distances between the plant to the sensitive receptors, point source calculations have been used.

8.4 Noise Level Predictions

Calculations to predict the noise of the plant operating 1metre from the window of the residential property is given below.

Mitsubishi PUHZ-ZRP125VKA

Level distance given a LPA @ a distance (Assumes point source and Hemispherical)							(Pressure Calculations)
LPA =	55	dB	at distance of =	1	metre		
	dB level at	3	metres =	45.5			
	Formula =	$L_{PA1} = L_{PA2} - 20 \text{ Log } (d_1/d_2)$					

Maxcold Condenser

Level distance given a LPA @ a distance (Assumes point source and Hemispherical)							(Pressure Calculations)
LPA =	31	dB	at distance of =	10	metre		
	dB level at	3	metres =	41.5			
	Formula =	$L_{PA1} = L_{PA2} - 20 \text{ Log } (d_1/d_2)$					

Combined Sound Pressure Level = 48dB(A)

The rating noise level at 1m from the 1st floor residential rear façade window, with the mechanical plant operating cumulatively and in their highest operating noise level, is predicted to be **48dB L_{Aeq} which is 0dB(A) below** the maximum noise emission design target and **5dB(A) below** the typical background noise level (53dB $L_{A90,\ 1\ hour}$).

In accordance with BS 4142:2014 guidance, the rating noise ***"is an indication of the specific sound source having a low impact"***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact*.

8.5 Vibration

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. Vibration from the system is not expected, however, as a precaution plant should wherever possible be installed on steel spring type isolators. The isolators shall incorporate rubber or neoprene high-frequency isolation pads. The fan should be installed with flexible connections to adjacent structures. Anti-vibration mounts are widely available from suppliers/installers often in pedestal rubber mountings. Examples of these are MPO and MP1, and ISL Maxi pedestal vibration mounts. These types of anti-vibration and shock isolators are industry standard and commonplace for mechanical plant installations. They are designed to provide medium to high frequency isolation from vibration and noise via high resilience rubber. In our experience, these isolation products should offer high levels of design mitigation to reduce vibration.

Uncertainty

The levels of uncertainty in the data and calculations are considered to be low given the robust

exercise undertaken in noise monitoring and the confidence in the data statistical analysis. Manufacturers' data for the plant is highly likely to be robust. Detailed calculations and resultant noise levels at the residential location are considered to be confidently predicted.

9.0 Conclusion

Sound Licensing has undertaken an environmental noise survey at the site in order to determine prevailing background noise levels that are representative of the nearest noise sensitive properties. The operation of the mechanical plant, in accordance with BS 4142:2014 guidance, indicates to creating a low impact. All worst-case scenarios have been applied to the assessment. The predicted maximum operating noise level of the mechanical plant is demonstrated to comply with the London Borough of Camden's Policy requirements.

APPENDIX A – Acoustic Terminology

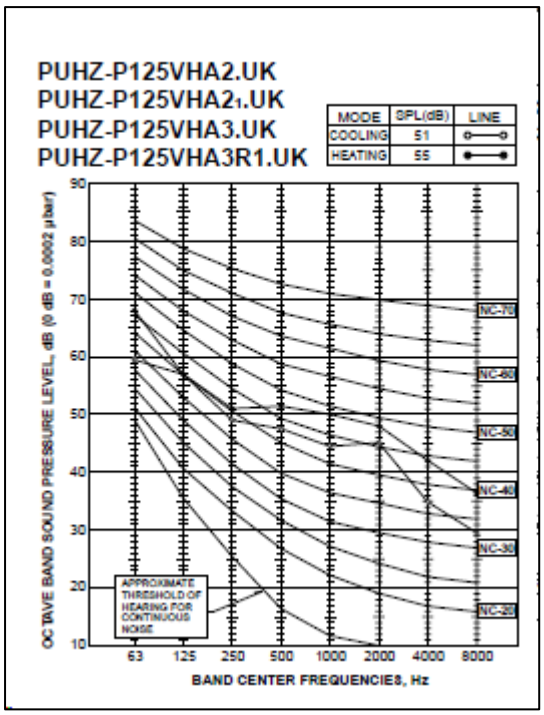
Parameter	Description
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing ($20x10^{-6}$ Pascals).
Sound Pressure Level (L_p)	The sound pressure level is the sound pressure fluctuation caused by vibrating objects relative to the threshold of hearing.
A-weighting (L_A or dBA)	The sound level in dB with a filter applied to increase certain frequencies and decrease others to correspond with the average human response to sound.
LAeq,T	The A-weighted equivalent continuous noise level over the time period T (typically T= 16 hours for daytime periods, T = 8 hours for night time periods). This is the sound level that is equivalent to the average energy of noise recorded over a given period.
Ln,T	The noise level exceeded for n% of the time over a given period T. e.g., L90, the noise level exceeded for 90% of the time (background noise) level.
Lmax	The maximum noise level measured.

References:

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'

APPENDIX B – Data Sheets and Figures

Service Ref.				PUHZ-P125VHA2.UK PUHZ-P125VHA2₁.UK PUHZ-P125VHA3.UK PUHZ-P125VHA3R1.UK		PUHZ-P140VHA2.UK PUHZ-P140VHA2₁.UK PUHZ-P140VHA3.UK PUHZ-P140VHA3R1.UK	
Mode				Cooling	Heating	Cooling	Heating
OUTDOOR UNIT	Power supply (phase, cycle, voltage)			Single 50Hz, 230V			
		Running current	A	17.37	16.74	22.48	21.31
		Max. current	A	28		29.5	
	External finish			Munsell 5Y 7/1 / Munsell 3Y 7.8/1.1 (VHA3R1)			
	Refrigerant control			Linear Expansion Valve			
	Compressor			Hermetic			
		Model		TNB306FPGM			
		Motor output	kW	3.4		3.9	
		Starter type		Inverter			
		Protection devices		HP switch Discharge thermo			
	Crankcase heater		W	30			
	Heat exchanger			Plate fin coil			
	Fan	Fan(drive) × No.		Propeller fan × 2			
		Fan motor output	kW	0.060+0.060			
		Airflow	m³/min(CFM)	100(3,530)			
	Defrost method			Reverse cycle			
	Noise level	Cooling	dB	51		52	
		Heating	dB	55		56	
	Dimensions	W	mm(in.)	950(37-3/8)			
		D	mm(in.)	330+30(13+1-3/16)			
		H	mm(in.)	1,350(53-1/8)			
	Weight		kg(lbs)	99(218)			
	Refrigerant			R410A			
		Charge	kg(lbs)	4.5(9.9)			
		Oil (Model)	L	0.87(FV50S)			
REFRIGERANT PIPING	Pipe size O.D.	Liquid	mm(in.)	9.52(3/8)			
		Gas	mm(in.)	15.88(5/8)			
	Connection method	Indoor side		Flared			
		Outdoor side		Flared			
	Between the indoor & outdoor unit	Height difference		Max. 30m			
		Piping length		Max. 50m			



Technical Specification

Rotary Condensing Units

Model	Comp. Model	Nom. Hp	Noise Rating**	Duty Watts R404a Evaporating @* -8 °C	-10 °C	-15 °C	-20 °C	-25 °C	Dimensions WxDxH mm	Pipe Size (inch) Liquid, Suction	Nett kg	Electrical Data Supply	FLA /ph
NFR075DL	QXD-13K	0.75	31	2000	1680	1380	1140	940	920 x 380 x 630	3/8 1/2	42	230v1ph 50hz	6.0
NFR100DL	QXD-16K	1.0	31	2160	1830	1560	1270	1030	920 x 380 x 630	3/8 1/2	42	230v1ph 50hz	8.0
NFR150DL	QXD-23K	1.5	32	2620	2180	1860	1560	1220	920 x 380 x 630	3/8 1/2	48	230v1ph 50hz	6.2
NFR200DL	QXD-30K	2.0	34	3680	3030	2670	2260	1850	920 x 380 x 630	3/8 5/8	61	230v1ph 50hz	7.8
NFR250DL	QXD-36K	2.5	35	4170	3450	3010	2530	2000	920 x 380 x 630	3/8 5/8	62	230v1ph 50hz	8.0
NFR300DL	QXD-41K	3.0	39	4700	3900	3430	2880	2280	1060 x 430 x 845	3/8 3/4	71	230v1ph 50hz	10.7

Piston Condensing Units

Model	Comp. Model	Nom. Hp	Noise Rating**	Duty Watts R404a Evaporating @* -8 °C	-9 °C	-10 °C	-15 °C	Dimensions WxDxH mm	Pipe Size (inch) Liquid, Suction	Nett kg	Electrical Data Supply	FLA /ph
NFP075DGM	CAJ4468Z	0.75	31	1700	1480	1280	1010	920 x 380 x 630	3/8 1/2	49	230v1ph 50hz	7.7
NFP100DGM	CAJ4516Z	1.0	31	2070	1800	1540	1290	920 x 380 x 630	3/8 1/2	51	230v1ph 50hz	8.3
NFP150DGM	CAJ4519Z	1.5	32	3020	2610	2280	2330	920 x 380 x 630	3/8 1/2	55	230v1ph 50hz	14.6

Model	Comp. Model	Nom. Hp	Noise Rating**	Duty Watts R404a Evaporating @* -15 °C	-20 °C	-25 °C	-30 °C	Dimensions WxDxH mm	Pipe Size (inch) Liquid, Suction	Nett kg	Electrical Data Supply	FLA /ph
NFP075DGL	CAJ4532Z	0.75	31	1120	880	740	640	920 x 380 x 630	3/8 1/2	49	230v1ph 50hz	7.0
NFP100DGL	CAJ4466Z	1.0	31	1610	1260	1110	830	920 x 380 x 630	3/8 1/2	51	230v1ph 50hz	10.0
NFP150DGL	CAJ4464Z	1.5	32	2020	1660	1420	1070	920 x 380 x 630	3/8 1/2	55	230v1ph 50hz	11.3

* Duty at +32°C ambient.
** DBA @ 10m in free field conditions - manufacturer's data.

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APPENDIX C – Noise monitoring Data

19th may

Time	Laeq	Lamax	LA90	**LA90,1hour**
14:45:00	57.7	76.7	55.2	
15:00:00	57.1	78.3	54.0	54
15:15:00	62.7	84.4	56.0	
15:30:00	60.3	79.2	56.9	
15:45:00	58.6	74.0	56.7	
16:00:00	58.8	75.5	56.2	56
16:15:00	59.9	74.5	56.6	
16:30:00	71.7	88.8	56.6	
16:45:00	66.9	86.6	55.3	
17:00:00	57.0	71.2	55.1	55
17:15:00	58.3	72.7	55.2	
17:30:00	59.0	76.5	56.1	
17:45:00	56.8	71.3	54.8	
18:00:00	56.3	67.6	54.5	55
18:15:00	57.0	72.4	54.6	
18:30:00	57.2	74.8	55.0	
18:45:00	58.4	86.9	54.6	

20th May

Time	LAFeq	LAFmax	LA90	LA90,1hour
08:00	55	71	53	53
08:15	57	71	53	
08:30	59	75	55	
08:45	58	73	54	
09:00	56	73	53	53
09:15	56	71	53	
09:30	56	72	53	
09:45	57	72	54	
10:00	55	76	53	53
10:15	56	74	53	
10:30	58	72	55	
10:45	58	74	56	
11:00	58	74	56	56
11:15	58	74	55	

11:30	58	74	55	
11:45	59	74	56	
12:00	58	75	56	
12:15	57	73	55	56
12:30	59	75	56	
12:45	57	74	55	
13:00	58	73	54	
13:15	57	75	54	54
13:30	60	76	55	
13:45	57	75	54	
14:00	56	73	54	
14:15	57	77	54	54
14:30	59	74	55	
14:45	57	71	55	
15:00	56	71	55	
15:15	58	77	56	55
15:30	57	74	55	
15:45	56	70	54	
16:00	56	73	54	
16:15	56	71	54	54
16:30	56	73	53	
16:45	54	66	53	
17:00	55	70	53	
17:15	54	67	53	53
17:30	62	89	53	
17:45	54	66	53	
18:00	55	81	54	
18:15	55	70	53	54
18:30	56	70	54	
18:45	56	75	54	

21st May

Time	LAFeq	LAFmax	LA90	LA90,1hour
08:00	50	55	48	
08:15	50	69	48	
08:30	51	62	49	
08:45	54	76	49	48
09:00	51	71	49	
09:15	53	78	49	
09:30	54	84	50	
09:45	56	76	51	49
10:00	56	75	52	
10:15	55	71	53	
10:30	56	75	53	
10:45	56	74	53	52

11:00	56	76	53	
11:15	56	72	53	
11:30	58	70	55	
11:45	56	73	54	53
12:00	58	76	54	
12:15	63	95	55	
12:30	57	71	55	
12:45	57	74	54	54
13:00	56	70	54	
13:15	58	76	54	
13:30	57	76	54	
13:45	58	75	54	54
14:00	57	75	54	
14:15	56	71	53	
14:30	57	72	54	
14:45	57	81	54	54
15:00	56	74	53	
15:15	57	75	53	
15:30	56	75	53	
15:45	56	76	54	53
16:00	58	70	54	
16:15	56	67	54	
16:30	57	75	54	
16:45	55	69	53	54
17:00	56	75	53	
17:15	56	80	53	
17:30	55	67	53	
17:45	55	75	53	53

22nd May

Time	LAFeq	LAFmax	LA90	LA90,1hour
07:00:00	50.6	63.3	45.4	45.4
07:15:00	51.7	66.7	49.4	
07:30:00	54.4	71.8	50.8	
07:45:00	63.9	88.0	53.7	
08:00:00	57.6	78.6	52.2	52.2
08:15:00	57.0	67.5	54.2	
08:30:00	56.6	70.1	54.2	
08:45:00	58.5	69.9	54.8	
09:00:00	59.1	75.9	56.0	56.0
09:15:00	60.5	69.8	58.5	
09:30:00	60.9	77.4	59.1	
09:45:00	60.7	70.1	58.4	
10:00:00	60.4	76.8	57.7	57.7
10:15:00	61.5	70.5	56.8	
10:30:00	58.5	69.8	56.1	
10:45:00	60.2	81.0	56.9	