Sound Licensing Ltd.
Kemp House
152 City Road
London
EC1V 2NX

T: +44 (0) 20 7096 1555
Mob: +44 (0) 7536 088 512
www.soundlicensing.co.uk
enquiries@soundlicensing.co.uk

NOISE IMPACT ASSESSMENT REPORT MECHANICAL PLANT

188-189 DRURY LANE, LONDON WC2B 5QD

FOR

MR. CEMAL POLAT

ISSUE STATUS: FINAL
DATE OF ISSUE: 11/10/2017
AUTHOR: C BANKS, AMIOA MIEMA
CHECKED: M LAUEZZARI, MIOA MIOL
APPROVED: M LAUEZZARI, MIOA MIOL

Contents Page

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, with recommended mitigation measures installed with minimum sound insulation specifications, ***"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 is considered to comply with the London Borough of Camden's policy.

2. INTRODUCTION

No.188-189 Drury Lane, London WC2B 5QD is proposing to install 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.

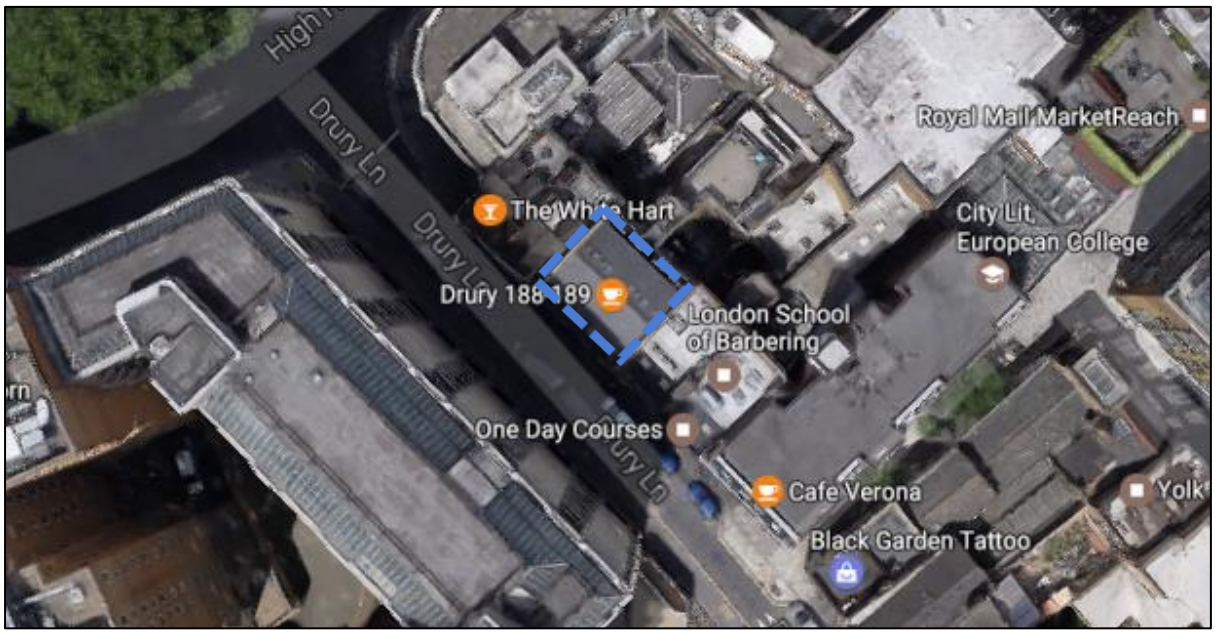
3. SITE DESCRIPTION

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



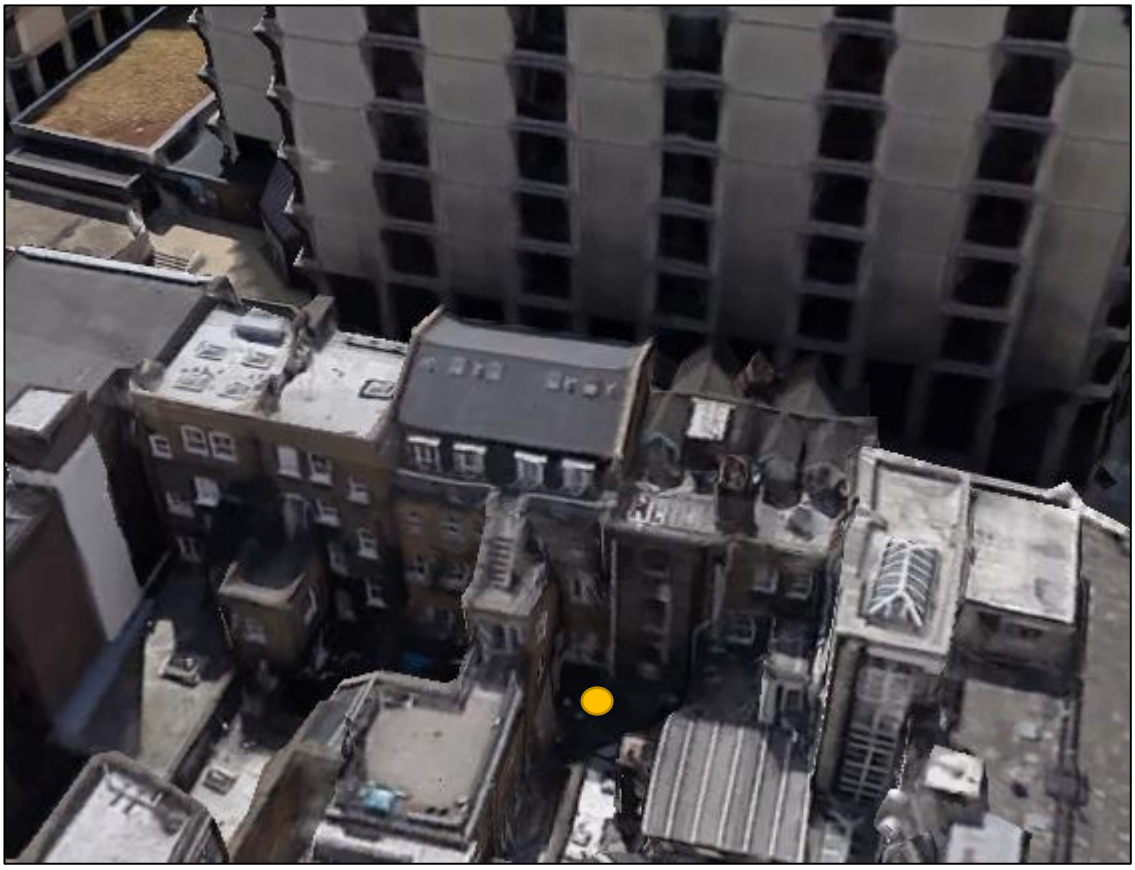
Source: Google maps

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 $L_{A90,1hour}$
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 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. Relevant policy from Camden's Local Plan, Adoption Version 2017, is reproduced below.

Policy A4 Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

a. development likely to generate unacceptable noise and vibration impacts; or
b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

Industrial and Commercial Noise Sources

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden's thresholds for noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- NOEL – No Observed Effect Level
- LOAEL – Lowest Observed Adverse Effect Level
- SOAEL – Significant Observed Adverse Effect Level

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- Green – where noise is considered to be at an acceptable level.
- Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.
- Red – where noise is observed to have a significant adverse effect.

Vibration

Table A: Vibration levels from uses such as railways, roads, leisure and entertainment premises and/or plant or machinery at which planning permission will not normally be granted

Vibration description and location of measurement	Period	Time	Vibration Levels (Vibration Dose Values)
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	00:00-24:00	0.1 VDV ms-1.75
Vibration inside dwellings	Day and evening	07:00-23:00	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	23:00-07:00	0.13 VDV ms-1.75
Vibration inside offices	Day, evening and night	00:00-24:00	0.4 VDV ms-1.75
Vibration inside workshops	Day, evening and night	00:00-24:00	0.8 VDV ms-1.75

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

For the purposes of this report, an assessment has been undertaken in line with the above policy guidance and 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}	Rating noise level 1m from nearest noise sensitive receptor if source contains audible tonal elements, dB L_{Aeq}
53	43	38

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 Condenser	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. A penalty has not been applied for tonality as spectral data of the Mitsubishi plant shows no significant characteristics. Spectral data for the Maxcold plant could not be gained however it is from Sound Licensing's experience that modern mechanical plant such as the above are relatively quiet and are unlikely to produce noticeable tonality that would be distinguishable against residual ambient noise. The Maxcold manufacturers' specifications are also notably quiet in operation (31dBA @ 10metres). Penalty additions have not been applied for impulsiveness or any other unusual characteristics as mechanical plant of this type generally do not demonstrate such features.

It is noted from the site survey that there was no apparent residential/noise-sensitive premises with external amenity spaces in which the mechanical plant could impact upon; this report has therefore not included an assessment of frequency analysis or an assessment against Noise Rating curves at external amenity spaces.

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 43dB L_{Aeq} at 1 metre from the façade of the nearest/most affected noise sensitive 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 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, is predicted to be **48dB L_{Aeq} which is 5dB(A) above** the maximum noise emission design target and **5dB(A) below** the typical background noise level (53dB $L_{A90,\ 1\ hour}$). Acoustic mitigation is required to be installed to reduce noise levels to the design target given in Table 6.1, as recommended below.

Mechanical Plant Acoustic Enclosure

An acoustic enclosure is recommended to be fitted around the plant with a minimum Sound Reduction Index (SRI) of 5dB(A). The levels of attenuation can be achieved by installing a purpose made enclosure with the above minimum sound reduction performance.

Custom-made enclosures can be gained from:

- ENVIRON (http://www.environ.co.uk/products/packaged-plant-solutions.html)
- CAICE (http://www.caice.co.uk/home/content/acoustic-enclosures), and
- WAKEFIELD ACOUSTICS (http://www.wakefieldacoustics.co.uk/our-products/acoustic-enclosures/).

An alternative method can be to construct a 19mm chipboard enclosure on a wooden structure with a weatherproof outer skin which would provide the below levels of attenuation:

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	TOTAL R_w
14	17	18	25	30	26	32	38	24dB

*Ref: (Woods. *etal*) insertion loss for chipboard screen on wood framework (19mm thickness, 11Kg/m^2 mass approximately)

The enclosure must be installed on a minimum 4 sides to allow the source to be screened from the residential receiver. The enclosure shall have 25mm absorptive acoustic insulation attached to each inner-facing screen to reduce the amount of reverberant noise within the enclosure. The enclosure shall be constructed such that access for maintenance can be gained. It must be ensured that there are no gaps or airborne pathways that would allow noise to 'leak' through the structure, except to allow ventilation for the plant. Any gaps in between parts of any enclosure must be sealed with good quality acoustic mastic. Flanking paths for the transmission of sound must be avoided or minimised by effectively isolating the plant from the enclosure. Ventilation requirements should be checked with the plant installer/manufacturer.

In accordance with BS 4142:2014 guidance the rating noise level, with recommended mitigation measures installed with minimum sound insulation specifications**, *"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*.

In accordance with the Camden Local Plan (2017), with recommended mitigation measures installed with minimum sound insulation specifications, the mechanical plant operational noise level at 1 metre from the nearest residential premises is determined to be at the Lowest Observed Effect Level (LOAL) and meets the London Borough of Camden's 'Green' Design Target whereby '*where noise is considered to be at an acceptable level*'.

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, with recommended mitigation measures installed with minimum sound insulation specifications, in accordance with BS 4142:2014 guidance, indicates to creating a low impact. In accordance with the Camden Local Plan (2017), with recommended mitigation measures installed with minimum sound insulation specifications, the mechanical plant operational noise level at 1 metre from the nearest residential premises is determined to be at the Lowest Observed Effect Level (LOAL). 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'

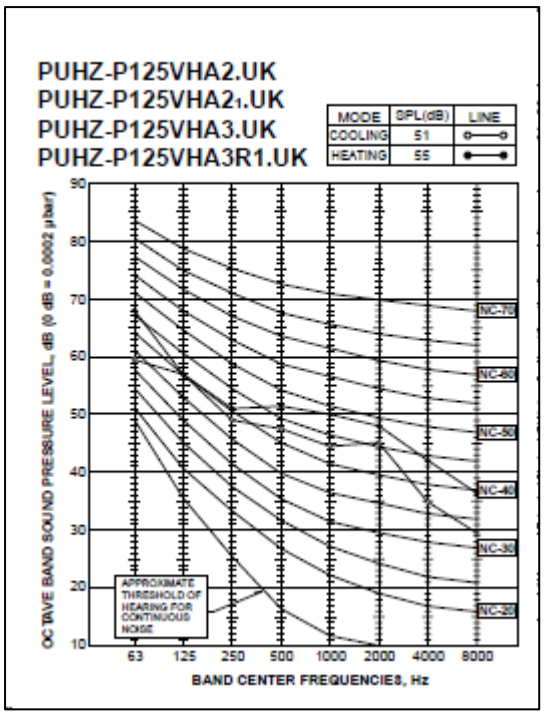
http://camden.gov.uk/ccm/cms-service/stream/asset/?asset_id=3601932&

https://www.camden.gov.uk/ccm/cms-service/download/asset?asset_id=2694293

Red Book of Acoustics

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	620 x 380 x 630	3/8 1/2	42	230v1ph 50hz	6.0
NFR100DL	QXD-16K	1.0	31	2140	1830	1540	1270	1030	620 x 380 x 630	3/8 1/2	42	230v1ph 50hz	8.0
NFR150DL	QXD-23K	1.5	32	2420	2100	1860	1560	1220	620 x 380 x 630	3/8 1/2	48	230v1ph 50hz	6.2
NFR200DL	QXD-30K	2.0	34	3680	3030	2670	2260	1850	620 x 380 x 630	3/8 5/8	61	230v1ph 50hz	7.8
NFR250DL	QXD-36K	2.5	35	4170	3490	3010	2530	2000	620 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.

All products are sold within the Terms & Conditions of Maxiheld Ltd. These are available on request. Maxiheld Ltd reserves the right

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	