AIRO

Report No. DJB/6982/G

for
GPL 2014 Ltd
9 Bridewell Place
London
EC4V 6AW

Dated: 27 July 2017

ROOF MOUNTED CONDENSERS

PLANT NOISE ASSESSMENT

FOR

FOUNTAIN HOUSE, WELWYN GARDEN CITY

Report Author: D J Boaden BSc MInstP MIOA

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FOR

FOUNTAIN HOUSE, WELWYN GARDEN CITY

1. INTRODUCTION

AIRO is retained by GPL 2014 Ltd to provide independent measurement services and specialist advice in respect of proposed third floor residential development at Fountain House, 1-7 Howardsgate, Welwyn Garden City.

This report provides an assessment of the likely noise impact at the nearest noise sensitive locations due to proposed roof mounted condenser units.

The report makes reference to external background noise level measurements made by AIRO on the roof of Fountain House. The measurement survey details and results have been reported separately in AIRO Report No. DJB/R6982/D dated 12 May 2017. A description of the site and the general proposals as well as a site location plan is also included in that report.

2. NOISE MEASUREMENT UNITS

2.1 A-Weighted Equivalent Continuous Sound Level - $L_{Aeq,T}$

As its name suggests, the $L_{Aeq,T}$ is a measure of the acoustic energy of a fluctuating noise climate over a given period T expressed as the single continuous noise level having the same energy as the time varying signal.

The 'A' within the descriptor means A-weighted, an internationally agreed frequency response generally similar to that of the human ear so that A-weighted sound levels in dB correspond reasonably well with what is heard.

For assessment purposes, the day is typically divided into a 16-hour daytime period (07:00 to 23:00) and an 8-hour night-time period (23:00 to 07:00). The period values may be derived from the logarithmic average of the relevant hourly values.

2.2 Maximum Noise Level - L_{AFmax}, L_{ASmax}

In some circumstances it is useful to quantify the maximum level of fluctuating noise and a commonly used descriptor is L_{Amax}. The L_{Amax} represents the maximum reading given by a sound level meter for a given event or period of time and is usually qualified by F for 'Fast' or S for 'Slow' according to the response time setting of the meter.

2.3 A-Weighted Percentile Noise Levels - L_{An}

Percentile noise levels are a statistical representation of the time varying level. The value is the noise level L exceeded for n% of the period T.

To measure background environmental noise levels the statistical index L_{A90} is commonly preferred. The L_{A90} is the Sound Pressure Level that is exceeded for 90% of the measurement period. The L_{A90} therefore discriminates against short duration peaks of noise and is consequently considered to provide a better representation of typical minimum noise levels compared with, for example, the L_{Aeq}.

3. PLANNING REQUIREMENTS

3.1 Local Authority Requirements

It is understood that the local authority will require that the rating level of the noise emitted from the proposed condenser units shall be at least 10 dB lower than the existing background noise level as determined at the nearest residential premises in accordance with British Standard 4142, Methods for rating and assessing industrial and commercial sound.

3.2 BS 4142

British Standard BS 4142 (ref 1) (latest edition being October 2014) is the most commonly used method for assessing the likelihood of complaints where industrial or commercial noise sources affect dwellings. It is commonly referred to in Local Authority Planning Conditions. The BS 4142 method compares the background noise level with the rating level for the new noise source.

BS 4142 defines three main noise parameters:

- Background Noise Level - the L_{A90} measured without the noise source in operation.
- Specific Noise Level - the L_{Aeq} due to only the noise source operating (in this case plant associated with the proposed development), when measured (or calculated) at the assessment location over a 1 hour period during the daytime and over a 15 minute period at night.
- Rating Level - the Specific Noise Level with a correction applied if the noise contains a distinguishable discrete or continuous tone, distinct impulses (e.g. bangs, clicks etc) or is irregular enough to attract attention.

BS 4142 provides indicators of the likely impact based on the resultant value of the Rating Level minus the lowest background noise levels.

BS 4142 says

> ***"a) Typically, the greater this difference, the greater the magnitude of the impact.***
>
> ***b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.***
>
> ***c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.***
>
> ***d) 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.***

The assessment location is defined as 3.5 metres in front of the nearest residential façade (or 1 metre in front of the façade for receiver positions above ground floor level).

4. NOISE ASSESSMENT AND DISCUSSION

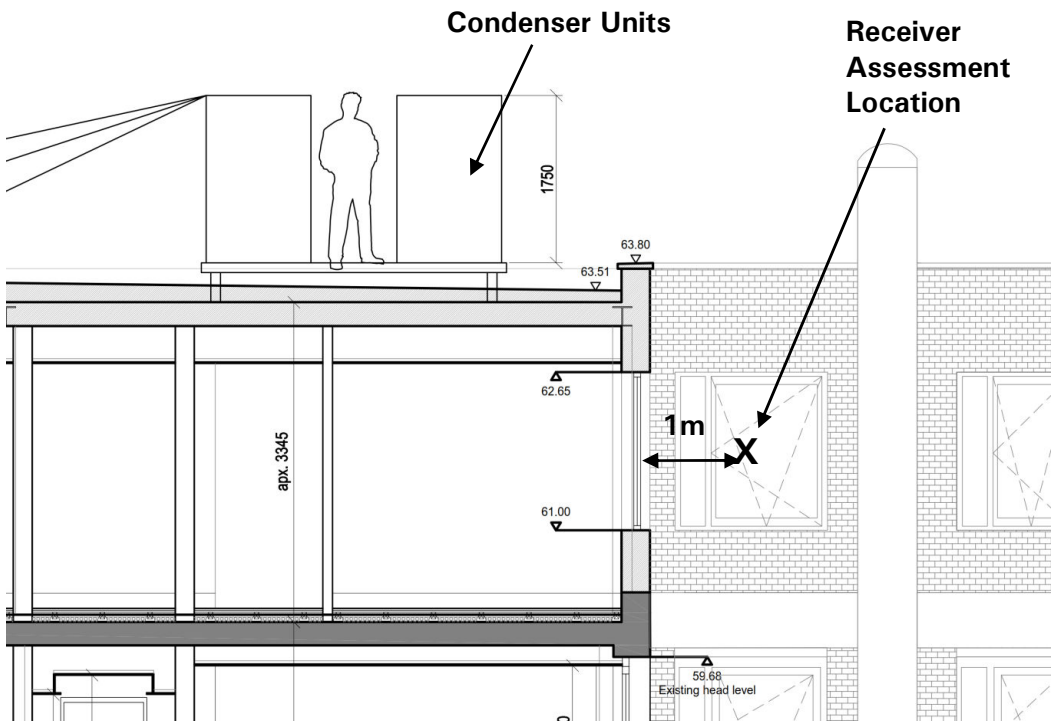
The following information and assessment is based on information and drawings supplied to AIRO (ref 2).

A total of 22 roof mounted condenser units are proposed as part of the development. The closest noise sensitive location, and therefore the location that will yield the worst case noise impact assessment, is in front of the windows on the car park facing elevation to the flats proposed directly below.

It may be noted that consideration has also been given to more exposed locations (less building screening) but which are further away. The assessment provided here is for the worst case location.

Figure 1 provides an extract of a section drawing annotated to illustrate the assessment location in relation to the condenser unit location.

Figure 1 – Proposed site plan extract indicating the assessment position



The following assessment has been carried out using the methodology principles set out in BS 4142. The calculations have been made using data for octave bands. A copy of the calculations is provided in Appendix A whilst the assessment below provides a summary quoting estimated equivalent single figure values.

The assessment provided is for the night-time (23:00 to 07:00 hours) period as this was when the lowest background noise level measurements prevailed during the measurement survey (see AIRO Report No. DJB/R6982/D for more information) and therefore provides the worst case assessment (given that the condenser unit noise output should be consistent regardless of whether operated during the daytime or night-time).

The lowest hourly background noise level measured during the survey was 48 dB L_{A90} and therefore this level has been used in the assessment.

It is understood that consideration is currently being given to three Mitsubishi condenser unit models (PUMY-P112 VKM, PUMY-P152 VKM and PUMY-P140 VKM). For assessment purposes the PUMY-P140 VKM model has been assumed to be operating in heating mode as this model and mode is quoted as producing the highest noise levels.

An enclosure produced by Environ Techologies Ltd is currently proposed and therefore the transmission loss data provided (reproduced in Appendix A for reference) has been incorporated into the assessment calculations. It is assumed that any reflections associated with the enclosure have been accounted for in the values supplied.

Distance and screening corrections have also been incorporated in order to calculate the noise level at the receiver location.

It may be noted that no acoustic features correction has been applied. The calculated noise level at the receiver location is significantly below the lowest background noise level and therefore it is unlikely to be perceptively audible at this location. This being the case no acoustic features should be discernible.

Table 1 provides the assessment for the night-time (worst case) period.

Table 1 – BS 4142 Assessment for roof mounted condenser units: Night-time (23:00 to 07:00 hours)			
Results			**Commentary**
Specific Noise Level: 1 m from PUMY-P140 VKM Condenser Unit	$L_{Aeq,60mins}$ =	53 dB	Specific sound source on and the level unaffected by any other sound sources.
Correction to be applied due to residual noise influence is		0 dB	
Assessment made during the night-time. The reference time interval is 15 mins.			
Enclosure transmission loss		-24 dB	Environ Technologies Ltd enclosure. Data sheet in Appendix A. All reflections assumed to be incorporated.
Scaling factor from 1 to 22 condensers		+13 dB	For a worst case assessment all condensers run simultaneously.
Distance correction to receiver location.	20 lg (1/3.8) =	-12 dB	Assessment location is 3.8 m away, 1m in front of window.
Screening correction(s)		-5 dB	The building itself will screen the assessment location.
Resultant Specific Noise Level at receiver location	$L_{Aeq,60mins}$ =	25 dB	
Acoustic Feature Correction		+0 dB	The condenser noise level is significantly below background and therefore should not be perceptively audible.
Rating Level		25 dB	
Night-time Period Background Noise Level	$L_{A90,60mins}$ =	48 dB	
Excess of Rating Level over background level	25 - 48 =	-23 dB	
Assessment indicates a likelihood of low impact.			
Uncertainty of the assessment			The excess of the rating level over the background sound level is -23 dB and in this instance the uncertainty of the measurement does not have any significance to the outcome of the assessment.

The Rating Level is significantly below the background noise level indicating a low impact. Furthermore, the Rating Level is more than 10 dB below the lowest background noise level and therefore the assessment threshold understood to be required by the local authority should be satisfied.

7. CONCLUSIONS

This report has presented an assessment of the potential noise impact of proposed roof mounted condenser units at Fountain House, 1-7 Howardsgate, Welwyn Garden City.

It has been found that the noise associated with the operation of the proposed condenser units is of low noise impact in relation to nearby residential accommodation.

Report Approved by:

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Principal Consultant

Report Author:

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Managing Consultant

REFERENCES

1. British Standard BS 4142:2014
Method for rating and assessing industrial and commercial sound
British Standards Institution, 2014

2. Household Henderson Drawings:

Date	Drawing No.	Title
13.02.2017	4898 A_250 rev. P3	Proposed Elevations: South & East Elevations
30.06.2017	4898 SK004 rev. P2	Roof: Services Coordination
Undated	Untitled	Roof Condensing Units Section BB

APPENDIX A

PLANT NOISE LEVELS AND CALCULATIONS

AIRO

PLANT NOISE INFORMATION SHEET

Job no:	6982		
Client:	GPL 2014 Ltd		
Site:	Fountain House, Welwyn Garden City		
Date:	July 2017		
Engineer:	DJB		

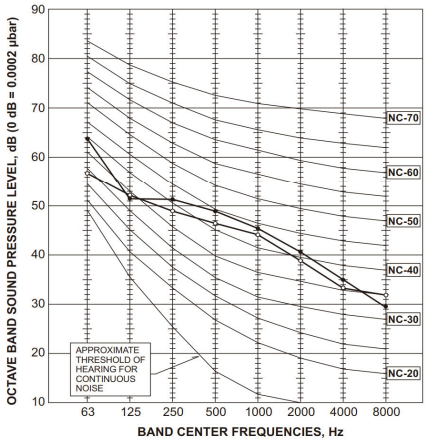
CONDENSER NOISE DATA

Condenser	Mode	Sound Pressure Level (dB) at Centre Band Frequency (Hz)								A-Weighted
		63	125	250	500	1000	2000	4000	8000	
PUMY-P112 VKM	Heating	64	52	52	49	46	41	35	30	51
	Cooling	57	52	49	47	44	39	34	32	49
PUMY-P125 VKM	Heating	56	53	52	51	46	42	36	30	52
	Cooling	60	53	51	48	45	40	33	30	50
PUMY-P140 VKM	Heating	59	60	50	52	47	42	37	31	53
	Cooling	64	52	51	50	46	40	34	28	51

Notes: Sound Pressure Levels measured at 1 metre distance - see manufacturer data. Octave band values estimated from graphs.

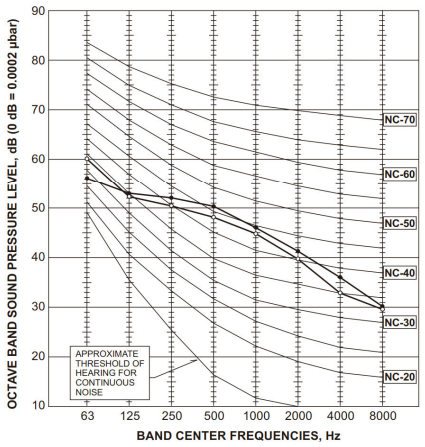
PUMY-P112VKM(-BS)
PUMY-P112YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	49	
HEATING	51	



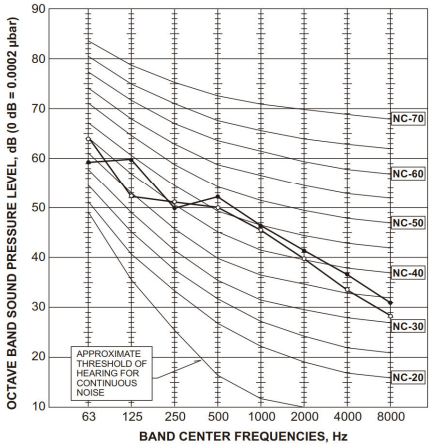
PUMY-P125VKM(-BS)
PUMY-P125YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	50	
HEATING	52	



PUMY-P140VKM(-BS)
PUMY-P140YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	51	
HEATING	53	



AIRO

PLANT NOISE CALCULATION SHEET

Job no:	6982
Client:	GPL 2014 Ltd
Site:	Fountain House, Welwyn Garden City
Date:	JULY 2017
Engineer:	DJB

Noise Source	NOISE FROM CONDENSERS ON ROOF

	Condenser			Octave Centre Band Frequency (Hz) 63	125	250	500	1000	2000	4000	8000	dB (A)
A	PUMY-P140 VKM	Heating	SPL	59.0	60.0	50.0	52.0	47.0	42.0	37.0	31.0	53
B	Environ Technologies Ltd Enclosure transmission loss			-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0	
C	Scaling Factor from 1 to 23 units		23	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	
D	Distance to Receiver (m)		3.8	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	
E	Screening Correction due to building		0.16	-5.6	-6.2	-7.3	-8.9	-11.0	-13.5	-16.2	-19.0	
F	SPL at receiver	Heating		41.4	39.8	21.7	15.1	1.0	-8.5	-15.2	-25.0	25

Notes: The heating operation of the condenser illustrated is the noisiest heating / cooling operation of all condensers considered.
Enclosure transmission loss values are from Environ Technologies Ltd data sheet. It is assumed that the figures presented include all reflection effects associated with the enclosure.

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Fax: +44 (0)1223 598001
www.environ.co.uk

environlite ELV1.1.25ASHP Acoustic Performance Data (March 2010)

Noise Measurement Information:

Test: Environ Lite Acoustic Enclosure — W 1700mm x D 1000mm x H 1550mm

Test Standard:

BS EN ISO 140-3 Acoustics - Measurement of Sound Insulation in Buildings and of Building Elements - Part 1: Airborne Sound Insulation

Sound Level Measuring Equipment:

Norsonic 830 RTA Precision Sound Analyser Type 1
CEL 284/2 Acoustic Calibrator Type 1
JBL Loudspeaker driven by CEL Loudspeaker driven by 830 White Noise Source

Transmission Loss Data:

Transmission Loss — Environ ELV1.1.25AC Acoustic Enclosure							
Octave Frequency in Hertz (dB ref 2 x 10^{-5} Pascal's)							
63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
14	16	23	30	37	39	38	39
Summary							
Transmission Loss Equates to an Overall Reduction of 26 dB(A)							

Support Information:

Monitoring was carried out using the BS3740 technique, insofar as measurements were taken in each quadrant and the results averaged. Internal Test Room: W 6m x D 16m x H 5m. Background noise in the semi-reverberant test room was such as not to interfere with the practical measurements

Tel: 0870 383 3344
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SELECTION MATRIX

environlite 1.1.25AC T3-1750 M2

16 August 2016

Acoustic enclosures for Split AC Unit Applications

CUSTOMER:	SITE / LOCATION / REFERENCE

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

MAKE, MODEL, DIMENSIONS, AIR FLOW & SOUND PRESSURE LEVEL @1.0M FREE FIELD

MAKE:	MODEL:	AIR IN	AIR OUT
Mitsubishi Electric	PUMY-P112/125/140VKM	Rear & 1 Side	Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	SPL dB(A)	DISTANCE (M)
1050	330	1338	1,84	53	1

INNER CUBE DIMENSIONS		
1150	450	1685
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
0.00	1.0	53
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

ENCLOSURE DETAIL		
1850	1100	1750
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.84	1.0	28-33
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

INLET AIRWAYS		
1685	300	1
WIDTH (MM)	HEIGHT (MM)	NO.

DESIGN CRITERIA		
OK	OK	OK
UNIT SIZE	OUTLET	INLET

OUTLET AIRWAYS		
300	1685	1
WIDTH (MM)	HEIGHT (MM)	NO.

AIRFLOW INFORMATION		
16	3.6	3.6
PD (NM^{-2})	OUTLET (MS^{-1})	INLET (MS^{-1})

Select Inlet & Outlet Airway Sizes to Ensure Airflows are kept Below 6.0m/s

ENCLOSURE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY	300		1685
OUTLET AIRWAY	300		1685
EXTERNAL SIZE	1850	1100	1750
SOUND LEVEL RANGE @ 1 M (Free Field)	28-33	SPL dB(A) SOUND PRESSURE	

NOTES CONCERNING ENCLOSURE DESIGN