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ACOUSTICS PLUS

Proposed Installation of Mechanical Plant

2 Villas on the Heath, London, NW3 1BA.

Environmental Noise Assessment

Author: Andy Dodd B.Sc. (Hons) MIOA
Senior Consultant

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VAT Registration Number: 788 2610 94

Proposed Installation of Mechanical Plant	
Project Address:	2 Villas on the Heath London NW3 1BA
Project Reference:	104591C

Issue/Revision Record

Issue:	Date:	Remarks:	Author:
1	08/04/2024	First Issue	Andy Dodd

	Signature:	Print:	Title:	Date:
Author:		**Andy Dodd**	**Senior Consultant**	**08/04/2024**
Reviewer:		**Phil Huffer**	**Principal Consultant**	**08/04/2024**

1. INTRODUCTION

1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients. APL is a registered member of The Association of Noise Consultants (ANC) and the author is a corporate member of The Institute of Acoustics (IOA).

1.2 APL has been instructed by Kudos Design & Build (on behalf of the applicant), to consider and advise upon the noise implications of a proposed installation of mechanical plant.

1.3 It is understood that it is the intention to install a new air source heat pump (ASHP) which will consist of a single externally located unit.

1.4 It is understood the London Borough of Camden (LBC) require further information on noise levels from the proposed installation in order to fully assess the noise impact upon the surrounding neighbourhood. This report provides the response to the LBC, on behalf of the Applicant.

1.5 This report has been prepared by Acoustics Plus Limited (APL) with all reasonable skill, care, and diligence in accordance with generally accepted acoustic consultancy principles and taking account the services and terms agreed between APL and our client.

1.6 Any information provided by third-parties and referred to herein may not have been checked or verified by APL unless expressly stated otherwise. Certain statements made in the report are predictions based on reasonable assumptions and good industry practice.

1.7 Such statements involve risk and uncertainty which could cause measured and predicted results to differ materially. APL does therefore not guarantee or warrant any prediction contained in this report.

2. BASELINE SITUATION

2.1 The Application Site (the "site") is situated at 2 Villas on the Heath. A location plan is shown in Diagram 1.

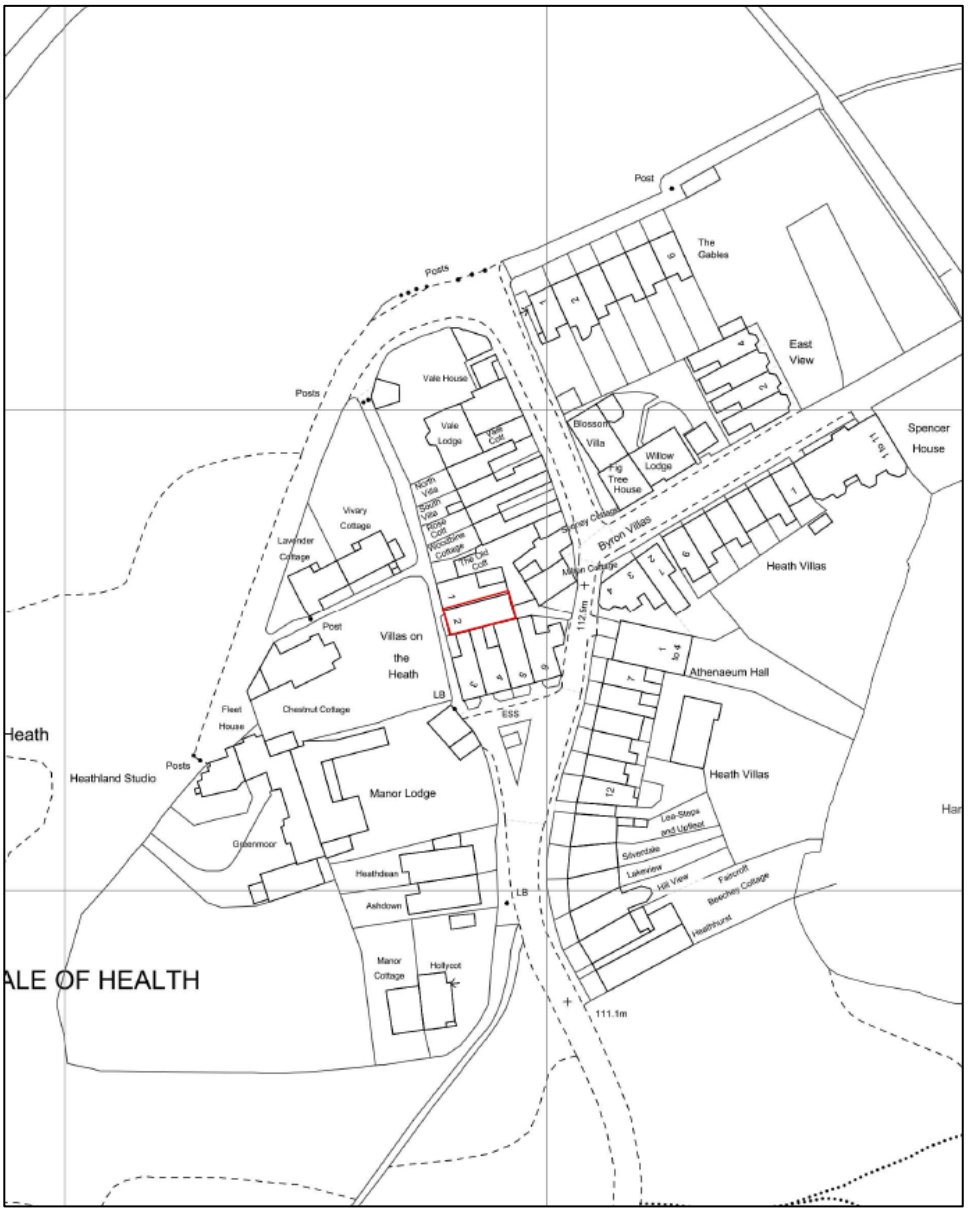


Diagram 1

2.2 The site is an existing residential building arranged over ground and three upper floor levels. The site and surrounding area is shown in Figures 1 to 8 attached.

2.3 It is the proposal to redevelop the site which will include the addition of a new ASHP system to service the property. This will require the installation of 1No. external unit. The unit will be located within a proprietary acoustic enclosure that will be mounted at roof level at the rear of the site. The details of the acoustic enclosure are contained in Appendix A. The proposed arrangement can be seen in Diagram 2 overleaf.

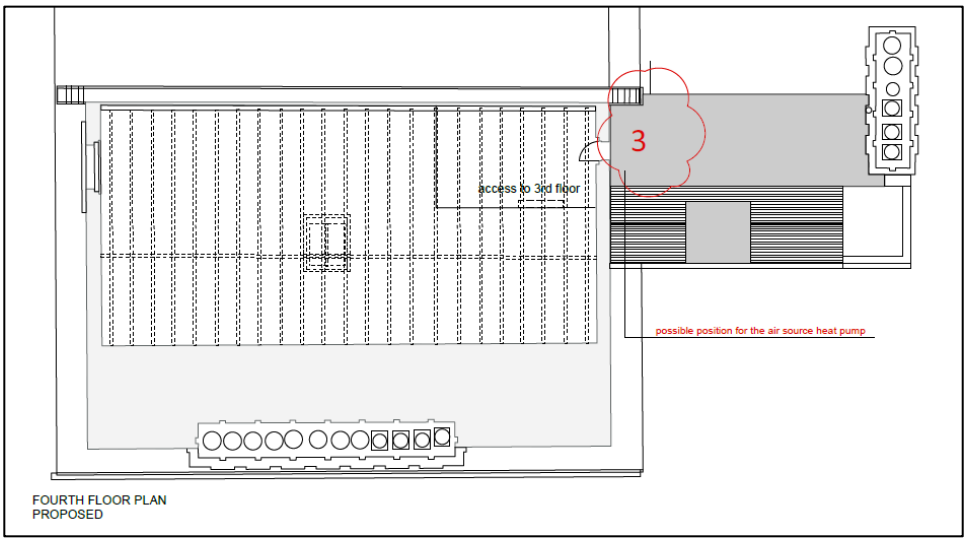
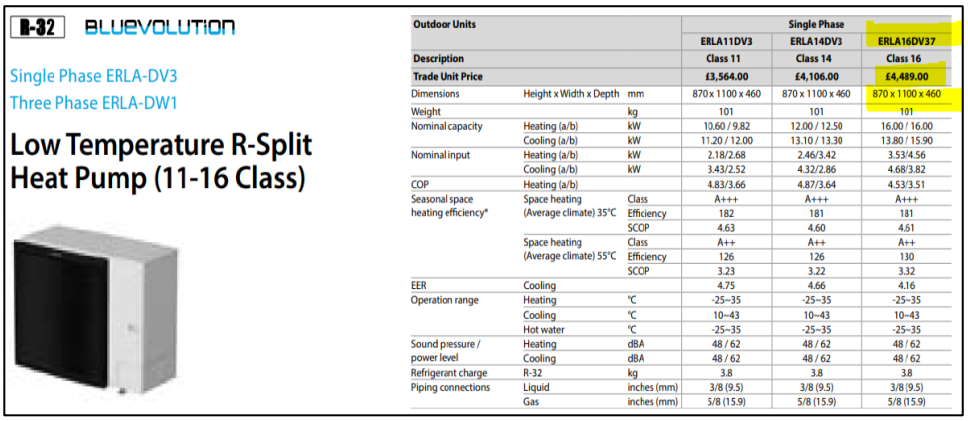


Diagram 2

2.4 The proposed ASHP unit model is a Daikin ERLA16DV37.


R-32 BLUEVOLUTION

Single Phase ERLA-DV3
Three Phase ERLA-DW1

Low Temperature R-Split Heat Pump (11-16 Class)

Outdoor Units			Single Phase		
			ERLA11DV3	ERLA14DV3	ERLA16DV37
Description			Class 11	Class 14	Class 16
Trade Unit Price			£3,564.00	£4,106.00	£4,489.00
Dimensions	Height x Width x Depth	mm	870 x 1100 x 460	870 x 1100 x 460	870 x 1100 x 460
Weight		kg	101	101	101
Nominal capacity	Heating (a/b)	kW	10.60 / 9.82	12.00 / 12.50	16.00 / 16.00
	Cooling (a/b)	kW	11.20 / 12.00	13.10 / 13.30	13.80 / 15.90
Nominal input	Heating (a/b)	kW	2.18/2.68	2.46/3.42	3.53/4.56
	Cooling (a/b)	kW	3.43/2.52	4.32/2.86	4.68/3.82
COP	Heating (a/b)		4.83/3.66	4.87/3.64	4.53/3.51
Seasonal space heating efficiency*	Space heating (Average climate) 35°C	Class	A+++	A+++	A+++
		Efficiency	182	181	181
		SCOP	4.63	4.60	4.61
	Space heating (Average climate) 55°C	Class	A++	A++	A++
		Efficiency	126	126	130
		SCOP	3.23	3.22	3.32
EER	Cooling		4.75	4.66	4.16
Operation range	Heating	°C	-25~35	-25~35	-25~35
	Cooling	°C	10~43	10~43	10~43
	Hot water	°C	-25~35	-25~35	-25~35
Sound pressure / power level	Heating	dBA	48 / 62	48 / 62	48 / 62
	Cooling	dBA	48 / 62	48 / 62	48 / 62
Refrigerant charge	R-32	kg	3.8	3.8	3.8
Piping connections	Liquid	inches (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Gas	inches (mm)	5/8 (15.9)	5/8 (15.9)	5/8 (15.9)

Diagram 3

2.5 It is anticipated that the nearest noise sensitive façade to the proposed acoustically enclosed ASHP is identified in Diagrams 4 & 5 overleaf, this is:

(a) *the upper floor rear windows of 5 Vale of Heath which are approximately 5-6m from the proposed location of the enclosure. There is line of sight with the enclosed ASHP unit.*

Diagram 4

Diagram 5

3. NOISE OUTLINE

3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.

3.2 Measurements of background noise were obtained over a 24 hour period at a location deemed representative of background noise levels experienced at the nearest noise sensitive façades. The measurements obtained during the exercise were obtained within the rear of 2 Villas on the Heath.

3.3 The particulars of the measurement exercise are recorded below:

Date:	5th & 6th March 2024
Start Time:	11:15 hrs
Location:	Rear facade, 2 Villas on the Heath.
Weather:	Appropriate to monitor environmental noise.

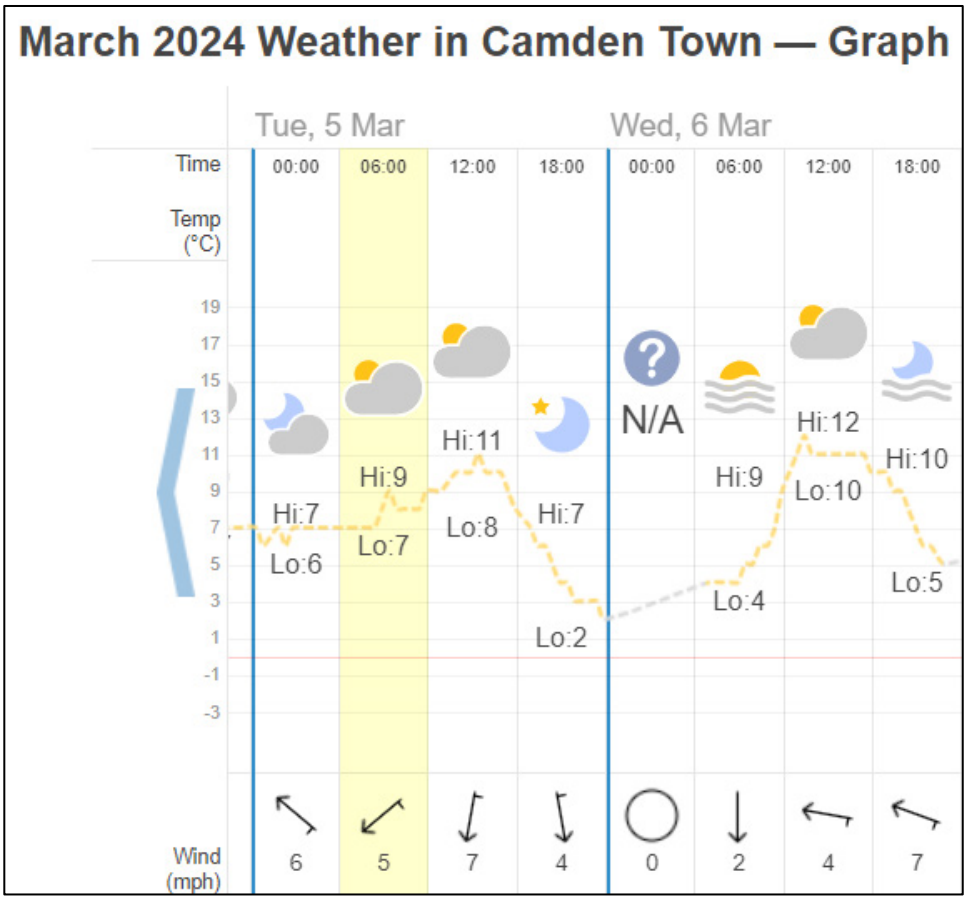


Diagram 6

3.4 Minimum background and average noise levels obtained at the rear are shown in Table 1 below with the full level vs time history shown in Diagram 7 (L_{Aeq} and L_{A90}).

Measurements obtained in rear garden		
Time period	**Lowest $L_{A90,15min}$**	**Average $L_{Aeq,T}$**
07:00-23:00hrs	36dB	48dB
23:00-07:00hrs	27dB	39dB

Table 1

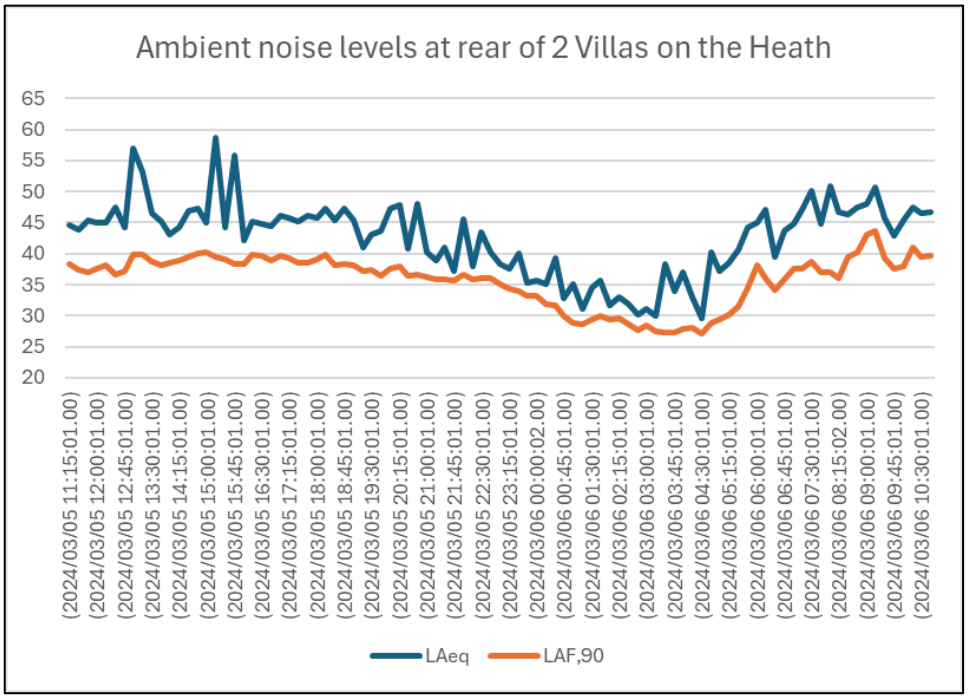


Diagram 7

4. DESIGN CRITERIA

4.1 Information regarding the noise levels not to be exceeded by the proposed installation was extracted from the London Borough of Camden's Local Plan Policy A4 adopted 3 July 2017 (Appendix 3 Noise thresholds). Please see extract below:

"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).

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."

4.2 The procedure contained in BS4142 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one-hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.3 The specific sound level is converted to a rating level by adding penalties to account for either tonality or impulsivity. The standard sets out objective methods for determining the presence of tones or impulsive elements but notes that it is acceptable to subjectively determine these effects.

4.4 The penalty for tonal elements is between 0dB and 6dB, and the standard notes:

"Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

4.5 The penalty for impulsive elements is between 0dB and 9dB, and the standard notes:

"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

4.6 The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that:

"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

4.7 The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

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.
Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

4.8 The standard goes on to note that:

"*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

4.9 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."

4.10 The background noise levels were assessed using statistical analysis of the measured data, as directed in BS4142. The histogram of L_{A90} noise levels obtained during the more noise sensitive night-time period of the proposed plant operation can be seen in Diagram 8.

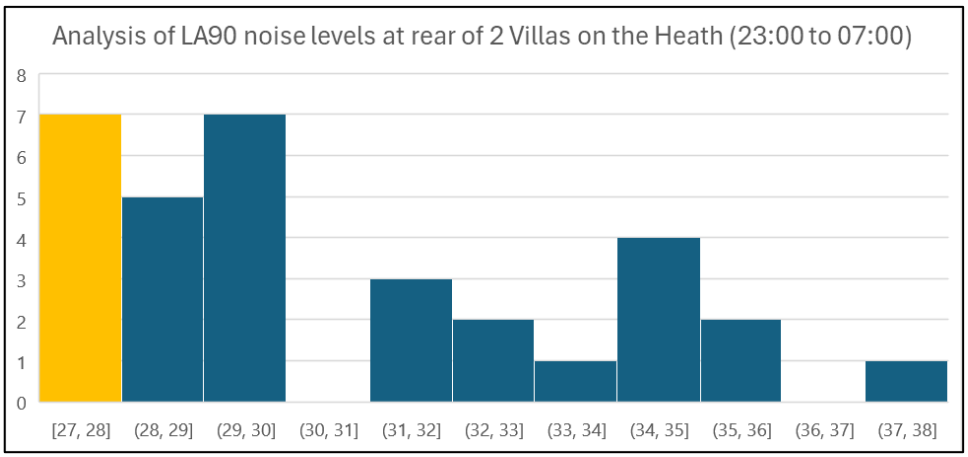


Diagram 8

4.11 In this instance the most commonly occurring night-time background noise level was 27 and 29dB $L_{A90,15min}$. In the context in which the sound occurs, the lowest value of 27dB $L_{A90,15min}$ is considered as representative for night-time noise levels at the nearest noise sensitive façade.

4.12 The plant noise emission criteria that should not be exceeded is therefore based on the statistical analysis and is shown in Table 2 below. This level should not be exceeded at the nearest noise sensitive façade and is representative of the LOAEL green value.

Noise emission limit for mechanical plant
L_{Aeq} ≤17dB

Table 2

4.13 The octave band sound levels of the unit (see Appendix A) do not indicate any tonal component. As the unit is inverter driven, the unit should not exhibit a marked onset of noise when the unit turn on. Therefore, no corrections are deemed necessary for tonality or impulsivity.

5. EQUIPMENT

5.1 All measurements were obtained using the following equipment:

- Norsonic Nor-140 Sound Level Meter Class 1 Serial No. 1403466
- Rion Calibrator Type NC-74 Class 1 Serial No. 00410215

5.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

6. NOISE IMPACT OF PLANT

6.1 Where necessary, mitigation measures have been incorporated into the calculation exercise to ensure that compliance with the LBC criteria is obtained. These mitigation measures are identified separately in the body of the report and are an essential requirement in meeting the LBC criteria.

6.2 In order to predict the noise impact of the proposed installation of plant, consideration has been given to noise egress from the acoustic enclosures to the nearest noise sensitive façade.

6.3 The following noise impact was calculated.

- **IMPACT** - The noise impact from the roof mounted enclosure to the upper floor rear windows of 5 Vale of Heath (See Diagram 4).

6.4 The calculation exercise utilised information provided by Daikin and Environ Group (https://www.environgroup.uk/environ-acoustic). A copy of the data sheets are provided in Appendix A.

6.5 Environ Group state that their EG-U94-DK33 enclosure will reduce the noise output from the ASHP to SPL 22dBA @ 1m (taken from datasheet).

unity acoustic enclosures

environ group

+ 44 (0) 20 3540 7179

DATA SHEET

www.environgroup.uk

EG-U94-DK33

Acoustic enclosure for AC Split Systems

04 April 2024

CUSTOMER:	SITE / LOCATION / REFERENCE
Acoustics Plus	TBC

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

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

MAKE	MODEL	AIR IN	AIR OUT
Daikin	ERLA16DV3	H - 2 Side	H - Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPW dB(A)
1100	460+71	870	1.42	1	48

INNER CUBE DIMENSION			ENCLOSURE DETAIL		
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1200	600	1370	1900	1200	1435
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
1.42	1.0	48	1.42	1.0	22

INLET AIRWAYS			DESIGN CRITERIA		
WIDTH (MM)	HEIGHT (MM)	NO.	UNIT SIZE	INTLET	OUTLET
275	1370	1	OK	OK	OK

OUTLET AIRWAYS			AIRFLOW INFORMATION		
WIDTH (MM)	HEIGHT (MM)	NO.	PD (NM^{-2})	INLET (MS^{-1})	OUTLET (MS^{-1})
275	1370	1	17	3.8	3.8

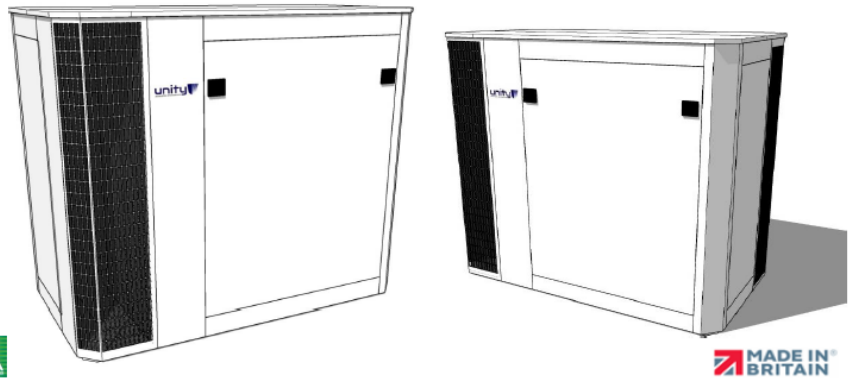
ENCLOSURE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY	275		1370
OUTLET AIRWAY	275		1370
EXTERNAL SIZE	1900	1200	1435
INDICATIVE NOISE LEVEL	22	**SPW dB(A) SOUND PRESSURE	

NOTES CONCERNING ENCLOSURE DESIGN

Minimum Space Required in front of airways - 300mm

Unity Access Panels Lift Off or Hinged for Maintenance/Service

** Noise level above based on Free Field condition - actual noise levels will be dependant on site conditions



HVPA

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Diagram 9

6.6 In order to predict the noise impact of the enclosed ASHP, consideration has been given to noise egress from the unit to the nearest noise sensitive façade. It has been assumed that the ASHP unit could be operational at any time during the daytime or night-time period.

6.7 The enclosed unit will be located at roof level at the rear of the site.

6.8 The following acoustic feature corrections were used to determine a rating level:

Results	**Penalty**	**Relevant clause**	**Commentary**
Acoustic feature corrections BS4142	+3dB	9.2	Other acoustic characteristics

Table 3

6.9 The noise impact assessment of the proposed installation is shown in the calculations below.

IMPACT TO UPPER FLOOR REAR WINDOWS NO.5 VALE OF HEATH

Roof mounted acoustically enclosed unit	Noise impact calculation
Daikin ERLA16DV37(in enclosure)	22dBA @ 1m
Distance attenuation over 5m	-14dB
Reflecting planes (x2 – roof and rear façade /chimney wall)	+6dB
BS4142 Acoustic corrections	+3dB
Total Rated Level	**17dBA**
LPA requirement (based on night-time L_{A90})	≤17dBA

Table 4

6.10 Any noise from the installation of the enclosed ASHP unit related to the site should not exceed a level of 17dBA at the nearest noise sensitive façade.

6.11 The calculation exercise (Table 4) demonstrates that the plant noise impact meets Local Plan Policy A4 adopted 3 July 2017 (Appendix 3 Noise thresholds) as reproduced in para 4.1 above. The noise impact meets the LOAEL green LPA criteria.

7. CONCLUSION

7.1 The foregoing assessment indicates that the proposed installation will meet the specific noise threshold requirements from Appendix 3 of Camden Council's Local Plan referenced in Policy A4. Further mitigation measures, other than those identified, will not be required. The mitigation measures that must be implemented are as follows:

- The ASHP unit should be located within a proprietary acoustic enclosure as specified (or equivalent performance).

7.2 The acoustic enclosures are often supplied flat packed and require assembling on site. Careful attention should be paid to the manufacturers assembly instructions to ensure that unwanted panel resonance is not introduced.

7.3 If an alternative supplier/manufacturer of ASHP unit is chosen, the acoustic performance should be checked prior to installation to ensure that the installation will still meet the requirements imposed by the LPA.

Figures

2 Villas on the Heath, London, NW3 1BA


Figure 1


Figure 2


Figure 3


Figure 4


Figure 5


Figure 6


Figure 7


Figure 8

Appendix A

R-32 BLUEVOLUTION

Single Phase ERLA-DV3

Three Phase ERLA-DW1

Low Temperature R-Split Heat Pump (11-16 Class)

Outdoor Units			Single Phase		
			ERLA11DV3	ERLA14DV3	ERLA16DV37
Description			**Class 11**	**Class 14**	**Class 16**
Trade Unit Price			**£3,564.00**	**£4,106.00**	**£4,489.00**
Dimensions	Height x Width x Depth	mm	870 x 1100 x 460	870 x 1100 x 460	870 x 1100 x 460
Weight		kg	101	101	101
Nominal capacity	Heating (a/b)	kW	10.60 / 9.82	12.00 / 12.50	16.00 / 16.00
	Cooling (a/b)	kW	11.20 / 12.00	13.10 / 13.30	13.80 / 15.90
Nominal input	Heating (a/b)	kW	2.18/2.68	2.46/3.42	3.53/4.56
	Cooling (a/b)	kW	3.43/2.52	4.32/2.86	4.68/3.82
COP	Heating (a/b)		4.83/3.66	4.87/3.64	4.53/3.51
Seasonal space heating efficiency*	Space heating (Average climate) 35°C	Class	A+++	A+++	A+++
		Efficiency	182	181	181
		SCOP	4.63	4.60	4.61
	Space heating (Average climate) 55°C	Class	A++	A++	A++
		Efficiency	126	126	130
		SCOP	3.23	3.22	3.32
EER	Cooling		4.75	4.66	4.16
Operation range	Heating	°C	-25~35	-25~35	-25~35
	Cooling	°C	10~43	10~43	10~43
	Hot water	°C	-25~35	-25~35	-25~35
Sound pressure / power level	Heating	dBA	48 / 62	48 / 62	48 / 62
	Cooling	dBA	48 / 62	48 / 62	48 / 62
Refrigerant charge	R-32	kg	3.8	3.8	3.8
Piping connections	Liquid	inches (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Gas	inches (mm)	5/8 (15.9)	5/8 (15.9)	5/8 (15.9)
Max piping length OU to IU		m	50	50	50
Min pipe length OU to IU		m	3	3	3
Power supply			1-phase / 230V / 50Hz	1-phase / 230V / 50Hz	1-phase / 230V / 50Hz
Recommended fuses		A	32	32	32
SAP ID (Heating only combination)		58°C / 55°C / 45°C / 35°C	106010 / 106007 / 106008 / 106009	106154 / 106151 / 106152 / 106153	TBC
SAP ID (Integrated combination)		58°C / 55°C / 45°C / 35°C	106170 / 106167 / 106168 / 106169	106178 / 106175 / 106176 / 106177	TBC
SAP ID (Reversible combination)		58°C / 55°C / 45°C / 35°C	106194 / 106191 / 106192 / 106193	106202 / 106199 / 106200 / 106201	TBC

* When combined with matching indoor unit

Nominal capacity and nominal input tested according to EN 14511 at the following conditions:

+ 44 (0) 20 3540 7179

www.environgroup .uk

DATA SHEET

EG-U94-DK33

Acoustic enclosure for AC Split Systems

04 April 2024

CUSTOMER:	SITE / LOCATION / REFERENCE
Acoustics Plus	TBC

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

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

MAKE	MODEL	AIR IN	AIR OUT
Daikin	ERLA16DV3	H - 2 Side	H - Front

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPW dB(A)
1100	460+71	870	1.42	1	48

INNER CUBE DIMENSION

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1200	600	1370
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
1.42	1.0	48

ENCLOSURE DETAIL

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1900	1200	1435
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)
1.42	1.0	22

INLET AIRWAYS

WIDTH (MM)	HEIGHT (MM)	NO.
275	1370	1

DESIGN CRITERIA

UNIT SIZE	INTLET	OUTLET
OK	OK	OK

OUTLET AIRWAYS

WIDTH (MM)	HEIGHT (MM)	NO.
275	1370	1

AIRFLOW INFORMATION

PD (NM^{-2})	INLET (MS^{-1})	OUTLET (MS^{-1})
17	3.8	3.8

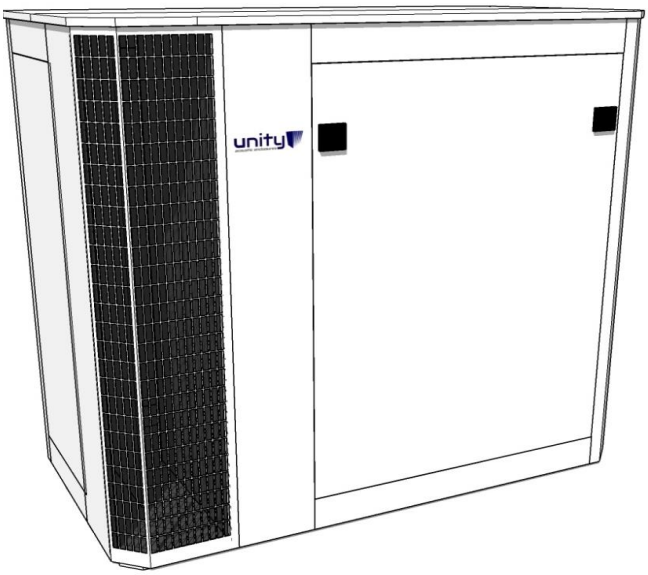
ENCLOSURE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY	275		1370
OUTLET AIRWAY	275		1370
EXTERNAL SIZE	1900	1200	1435
INDICATIVE NOISE LEVEL	22	**SPW dB(A) SOUND PRESSURE	

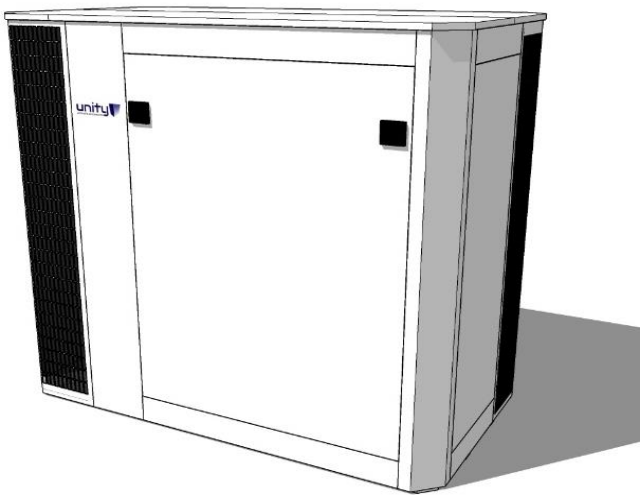
NOTES CONCERNING ENCLOSURE DESIGN

****Minimum Space Required in front of airways - 300mm****

Unity Access Panels Lift Off or Hinged for Maintenance/Service

** Noise level above based on Free Field condition - actual noise levels will be dependant on site conditions





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+ 44 (0) 1767 631026
www.environgroup .uk

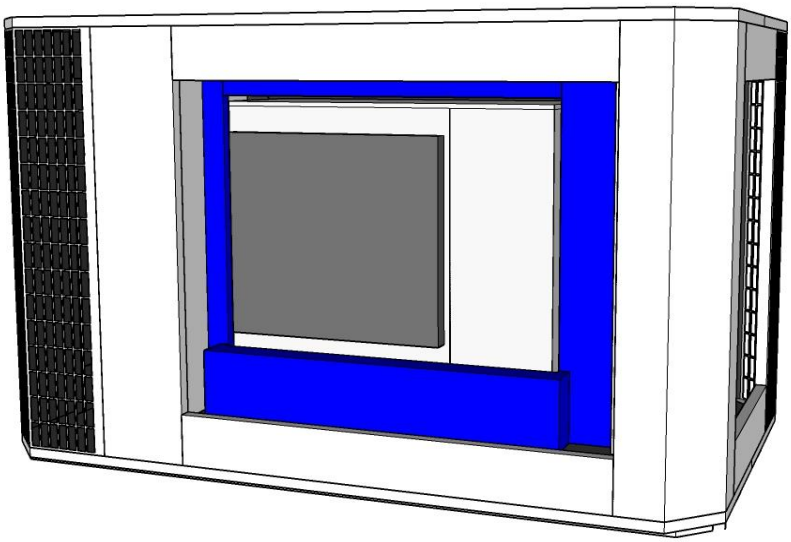
DATA SHEET

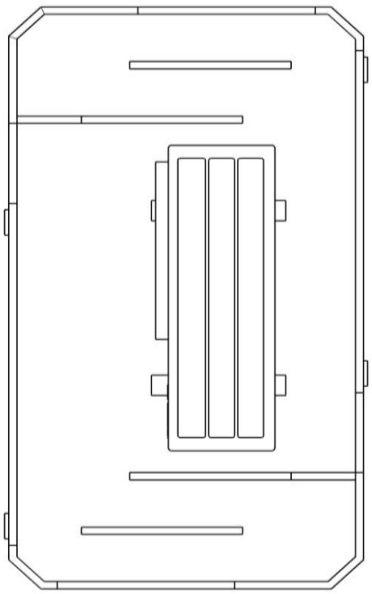
EG-U94-DK33

Acoustic enclosure for AC Split Systems

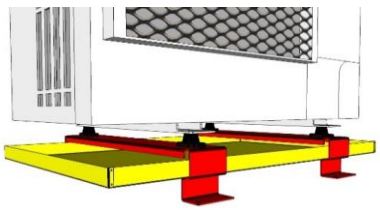
04 April 2024

Exterior Colour
Any RAL/BS Colour
Special Finishes Available





Service/Maintenance Access



OPTIONAL EXTRAS
Anti Vibration Mounts
Condensate Drain Pan
Drain Pan Heater Tape
Invisible' Wall Mounting Frame

Balanced Air Flow
Internal Plenum Seals stop
Air Recirculation