

REPORT



Flat 1, 253 Goldhurst Terrace

Noise Impact Assessment

Date of Issue: 18/03/2024

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Revision: 0



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1.0 Introduction

Clear Acoustic Design has been appointed to carry out a noise impact assessment in relation to the proposed mechanical plant installation at Flat 1, 253 Goldhurst Terrace, London, NW6 3EP.

Proposals are for the installation of 1 external air source heat pump which will be located in the rear garden of the property.

A noise impact assessment has been requested in order to safeguard the amenity of the surrounding receptors. The noise impact assessment is in line with BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. These criteria are seen to be appropriate in assessing and mitigating noise impact from this source.

The report will show that the rating level of the proposed plant will not exceed the local authority requirements as long as a unit with a sound power level of no more than 68dBA is selected. Example calculations have also been provided.

This report has been approved and issued by Stefan Hannan of Clear Acoustic Design. Stefan is a Company Director with 17 years of acoustic consulting experience. Stefan is also a full corporate member of the Institute of Acoustics (MIOA).

2.0 Legislative and Policy Framework

2.1 Local Authority Requirements

Camden Council's Local Plan 2017 states that for assessing industrial and commercial noise sources "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 10dB below background (15dB if tonal components are present) should be considered as the design criterion)".

The noise from the proposal should therefore not exceed 10dB below the existing background noise level.

2.2 Noise Policy Statement for England (NPSE)

The NPPF refers to the Noise Policy Statement for England (NPSE), which applies to most forms of noise including environmental noise. The NPSE sets out the long-term vision of Government policy which is to "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.". It aims that "Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life."

The use of the terms "significant adverse" and "adverse" are key phrases within the NPSE. The guidance establishes the concept of how the level of adverse effect on health and quality of life can be referenced including:

- NOEL – No Observed Effect Level - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level - This is the level above which *adverse* effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level - This is the level above which *significant adverse* effects on health and quality of life occur.

Under the first aim of the NPSE (“avoid significant adverse impacts on health and quality of life”), an impact in line with SOAEL should be avoided. Under the second aim (“mitigate and minimise adverse impacts on health and quality of life”), where the impact lies somewhere between LOAEL and SOAEL, requiring that all reasonable steps are taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, but does not mean that such adverse effects cannot occur.

2.3 Planning Practice Guidance on Noise (PPG-N)

The Planning Practice Guidance on Noise (PPG-N) is part of government guidance intended to support the implementation of the policies in the NPSE. It aids in expanding on the definitions from the NPSE of NOEL, LOAEL and SOAEL, by linking these terms to ‘examples of outcomes’, i.e. changes in behaviour and/or attitude to noise. The table below summarises the guidance from PPG-N in this regard.

Perception	Examples of outcomes	Increasing effect level	Action
NOEL - No Observed Effect Level ¹			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL - Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up the volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL - Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening, and difficulty in getting back to sleep. Quality of life diminished due to a change in the acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent
¹ This line is an assumption of the adverse effect level and is not explicitly referenced by PPG-N, though this appears to be a safe assumption.			

Table 3.1: Noise exposure hierarchy based on the likely average response – adapted from PPG-N

2.4 BS 4142: 2014 + A1: 2019

BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound* is a method of assessing the noise impact of sources of industrial and/or commercial noise on sensitive receptors such as residential buildings. This is done by comparing the rating level of the industrial noise ($L_{A,rT}$) against the existing level of background noise (L_{A90}).

BS 4142: 2014 suggests that sources of noise (rating noise level) should not exceed the existing background noise level, depending on the context. If this is achieved, it is a positive indication that the noise impact will be low. Camden Council require a noise level that is 10dB below this existing background noise level.

3.0 Environmental Noise Survey

In order to assess the noise impact of the proposed air source heat pump installation, an environmental noise survey has been undertaken by Clear Acoustic Design at a location representative of the nearest noise sensitive receptors.

The unit is to be installed in the rear garden of the property towards to boundary fence. The installation location can be seen in Appendix B, Figure 1 in the site plan, marked in red.

Due to screening around the installation site in the form of fencing to the south, east, and west, the worst affected receptor location is seen to be the residential façade of the nearest first floor window at 255 Goldhurst Terrace, which would likely have a direct line of sight to the air source heat pump which other nearby receptors (251 Goldhurst Terrace and 1 Abbey Road) do not have.

The receptor at 255 Goldhurst Terrace is seen to be approximately 37 metres away from the installation site. Due to distances and screening, compliance at the worst affected receptor location guarantees compliance at all other receptor locations.

Noise measurements were taken at a location representative of the worst affected receptor. A sound level meter was placed on a tripod at least 2.5 metres from ground level and at least 3 metres from any nearby façade. This location is seen to be representative of the receptor. The survey location (F1) can be seen in Appendix B, Figure 1, marked in blue.

The environmental noise survey has provided background noise levels representative of the receptor location, which will form the basis of the assessment in line with BS 4142. Ambient and background noise levels were measured over an approximate 24-hour period between 13/03/24 and 14/03/24 using a single fixed noise monitor (referred to as F1).

3.1 Measurement Equipment and Environmental Conditions

The weather was witnessed to be overcast and dry for the duration of the survey with light wind speeds. The following measurement equipment was used for the survey.

Equipment	Serial Number	Calibration Date
Svantek SV 971A Type 1 Sound Level Meter	113218	15/09/23
Svantek SV 18A Preamplifier	113711	15/09/23
ACO 7152 Microphone	80617	15/09/23

Table 2.1 Measuring Equipment Used for Survey

3.2 Fixed Noise Monitoring Graph – F1

Figure 2.1 below provides a graph of the measured noise levels at Location F1. The ambient (L_{Aeq}) and background (L_{A90}) noise levels are shown.

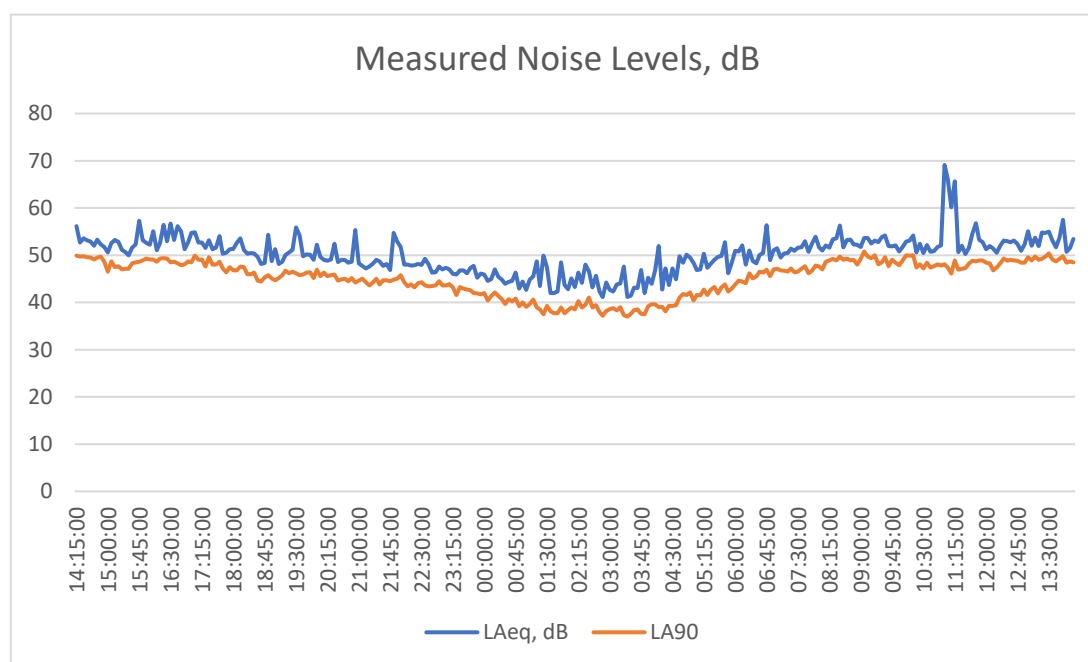


Figure 2.1 Long Term Measurement Graph – F1

3.3 Assessment Background Noise Level

To conduct an assessment in line with BS 4142: 2014, it is necessary to extrapolate the representative background noise levels from the long-term survey data. These background daytime and night-time noise levels are presented in Table 2.2 below.

The proposed unit will likely operate during the day and night, therefore the background noise level at night of 39dBA will be used in this assessment as it is the lower of these background noise levels.

Time period	Assessment Background Noise Level, L_{A90} dB,
Day (0700-2300)	49
Night (2300-0700)	39

Table 2.2: Assessment Background Noise Levels

4.0 Noise Impact Assessment

4.1 Noise Source

The exact model of air source heat pump has yet to be confirmed. It will therefore be necessary to set the maximum rating level of the proposed mechanical plant, as well as calculate the maximum permitted sound power level allowed when selecting a suitable unit. This can be seen in Table 3.1 below.

Background Noise Level at Receptor, dBA	Permitted maximum Rating Level at Receptor, dB ($L_{A,rT}$)	Equivalent maximum sound power level from proposed unit, dBA
39	29	68

Table 3.1: Maximum Rating Level of Proposed Mechanical Plant

Camden Council require the noise level from new sources of mechanical plant be 10dB below the existing background noise level at the receptor, in line with methodology for rating levels of BS 4142: 2014. This means that the sound pressure level at the receptor from the new air source heat pump should not exceed 29dB.

Calculations have been undertaken to determine the maximum sound power level that is permitted when selecting an air source heat pump for the specified installation site to ensure this noise level is not exceeded at the receptor. This equates to a maximum sound power level of 68dBA, as shown in Table 3.1.

Supporting calculations can be seen in Appendix A, Figure 1.

4.2 Rating Penalties and Source Directivity

Rating penalties and the source directivity of the noise from the proposed unit have been taken into consideration when determining the maximum sound power level of the unit.

BS 4142: 2014 states that penalties can be applied to the rating level if the noise is deemed to be tonal or impulsive. The noise from air source heat pumps is typically broadband in nature and is not seen to be tonal or impulsive. No rating penalties have been applied to the final rating level.

Due to the position of the air source heat pump when installed at ground level, the sound will radiate in a hemispherical pattern. To account for this type of acoustic propagation, a source directivity correction of 3dB has been added to the final calculations.

4.3 Noise Levels of an Example Air Source Heat Pump

It is understood that a range of Daikin air source heat pumps are under consideration. Calculations have been undertaken to show that the noise from these potential units will meet the local authority criteria of 10dB below the existing background noise level.

Each potential unit is seen to have a sound power level of 62dBA, as shown in the datasheet in Appendix A, Figure 3.

The typical spectrum is assumed, based on similar units, as the spectrum has not been made available by Daikin.

The noise of proposed unit is not seen to be tonal or impulsive in nature and so no rating penalties need be applied to the final rating level, according to BS 4142: 2014.

Type	63 Hz	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	dBA (SWL)
Daikin EBLA09DW1	68	66	61	60	58	51	46	62

Table 3.1: Noise Source, Sound Power Level (SWL), dBA

4.4 Assessment Outcome

With a sound power level of 62dBA radiating from the unit, the sound pressure level at the receptor will be 23dBA, providing the unit is installed in the proposed installation site.

Calculations of the noise level at the façade of the receptor can be seen in Appendix A Figure 2. As noted previously, a source directivity correction of 3dB has been added to this calculation due to the unit's proposed installation site against the ground.

The resulting noise level at the façade of the receptor will be 16dB below the background noise level at night and 26dB below the background noise level during the day when the proposed unit is operating at full capacity. This meets the local authority criteria of 10dB below the existing background noise level.

As the rating level of the proposed mechanical plant is below that of the background noise level, this is seen to have a low impact on the nearest noise sensitive receptor, according to BS 4142: 2014. This noise level is also consistent with the NOEL (No Observed Effect Level), according to the Noise Policy Statement for England.

5.0 Conclusion

Clear Acoustic Design has been appointed to carry out a noise impact assessment in relation to the proposed mechanical plant installation at Flat 1, 253 Goldhurst Terrace, London, NW6 3EP. Proposals are for the installation of 1 air source heat pump which will be installed at the rear of the property at ground level.

A noise impact assessment has been requested in order to safeguard the amenity of the surrounding receptors. The noise impact assessment is in line with BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. These criteria are seen to be appropriate in assessing and mitigating noise impact from this source.

The local authority require noise from new mechanical plant to be 10dB below the existing background noise level at the most affected receptor.

The noise level at the façade of the receptor will be 16dB below the background noise level at night and 26dB below the background noise level during the day based on the example Daikin unit, which has a sound power level of 62dBA.

Calculations have been undertaken to determine the maximum sound power level that is permitted when selecting an air source heat pump for the specified installation site. This equates to a maximum sound power level of 68dBA. This level must not be exceeded when selecting a unit.

At this sound power level, the rating level of the proposed mechanical plant is below that of the background noise level by 10dB. The proposal is therefore meets the local authority requirement and is seen to have a low impact on the nearest noise sensitive receptor, according to BS 4142: 2014. This is seen to be a satisfactory outcome.

Supporting calculations are provided in Appendix A.

Appendix A – Specific Noise Level Calculations

	dB(A)
SWL Radiating from ASHP	68.0
Louver / breakout losses	0
Other losses (screening, etc)	0
Radiation Directivity	3
@ Distance (m)	37
SPL @ Residence	28.7

Figure A.1: Noise Levels at Receptor with Mechanical Plant Operational (Maximum SWL)

	Octave Band Centre Frequencies, Hz							dB(A)
	63	125	250	500	1000	2000	4000	
SWL Radiating from ASHP	68	66	61	60	58	51	46	62
Louver / breakout losses	0	0	0	0	0	0	0	
Other losses (screening, etc)	0	0	0	0	0	0	0	
Radiation Directivity	2	(1 = free space, 2 = hemispherical, 4 = 1/4-sphere, 8= 1/8 sphere)						
@ Distance (m)	37							
SPL @ Residence	29	27	22	21	19	12	7	23

Figure A.2: Noise Levels at Receptor with Proposed Mechanical Plant Operational (Example)



Daikin Altherma low temperature monobloc •

2 Specifications

2 - 1 Specifications

Technical specifications				EBLA09DW1		EBLA11DW1		EBLA14DW1	
Safety devices	Item	01			High pressure switch				
		02			Low pressure switch				
		03			Fan driver overload protector				
		04			Fuse				
Safety devices	Item	05			Compressor motor thermal protector				
Pump	Quantity			1					
	Nr of speeds			PWM					
	Nominal ESP Heating unit	kPa		106.5		102.9		97.6	
	Cooling	kPa		106.6		99.2		94.1	
Water side Heat exchanger	Power input			W					
	Type			Plate heat exchanger					
	Quantity			1					
	Water volume			l					
	Water flow rate	Heating	Nom.	l/min	26.9 (1) / 25.8 (2)		30.3 (1) / 28.2 (2)		34.4 (1) / 35.7 (2)
	Cooling	Nom.	l/min	26.8 (3) / 26.1 (4)		33.2 (3) / 33.0 (4)		36.8 (3) / 36.3 (4)	
	Insulation material			EPDM type					
Expansion vessel	Heater			W					
	Volume			l					
	Max. water pressure			bar					
	Pre pressure			bar					
Water filter	Heater			W					
	Diameter perforations			mm					
Water circuit	Material			Stainless steel					
	Piping connections diameter			inch					
	Piping			inch					
	Piping length	Max.	OU - Tank	m		10			
	Level difference	Max.		m		5			
	Safety valve			bar					
	Drain valve / fill valve								
	Shut off valve								
	Air purge valve			Yes (Manually)					
	Minimum water volume in the system			l					
General	Heater			W					
	Supplier/ Manufacturer details	Name and address			Daikin Europe N.V. - Zandvoordestraat 300, 8400 Oostende, Belgium				
		Name or trademark			Daikin Europe N.V.				
	Product description	Air-to-water heat pump			Yes				
		Brine-to-water heat pump			No				
		Heat pump combination heater			No				
		Low-temperature heat pump			No				
Supplementary heater integrated			No						
Water-to-water heat pump			No						
LWA Sound power level (according to EN14825)				dB(A)					
				62.0					
Sound condition Ecodesign and energy label				Sound power in heating mode, measured according to the EN12102 under conditions of the EN14825					
Space heating general	Air to water unit	Rated airflow (outdoor)		m³/h		2,880	3,350		4,220
		Other				Inverter			
	Capacity control				0.000				
	Pck (Crankcase heater mode)		kW		0.023				
	Poff (Off mode)		kW		0.023				
	Psb (Standby mode)		kW		0.023				
Pto (Thermostat off)		kW		0.023					

Figure A.3: Datasheet for Proposed Options of Air Source Heat Pumps

Appendix B – Noise Survey Location

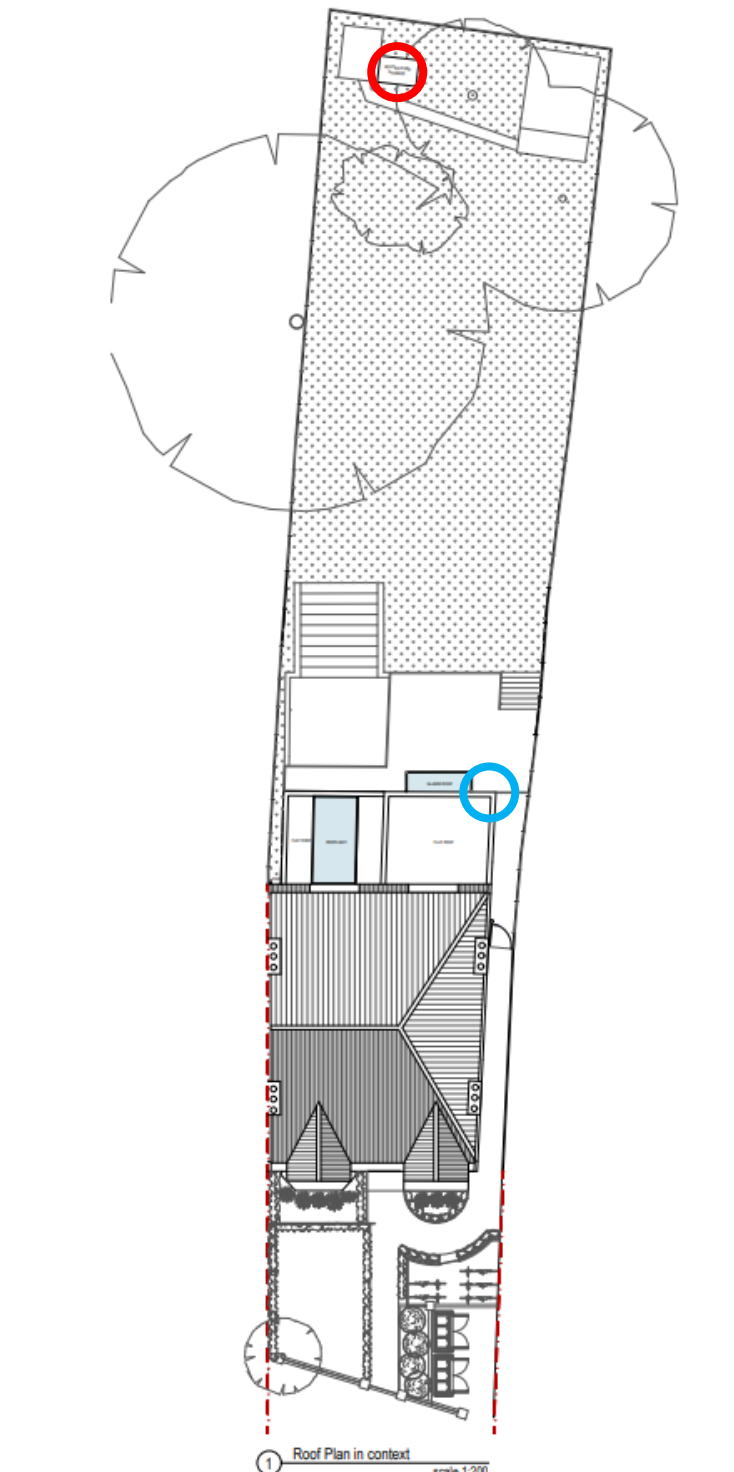


Figure B.1: Proposed Installation Site (Red), F1 (Blue)



Figure B.2: Receptor Location (Green)