AĿN
acoustic design

38 Great James Street

Plant Noise Assessment

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1 INTRODUCTION

ALN Acoustic Design has been appointed to carry out a noise assessment in relation to the installation of external plant equipment as part of a proposed renovation of 38 Great James Street in the London Borough of Camden.

This report has been prepared by Arthur Lewis-Nunes MSc who is a corporate member of the Institute of Acoustics.

2 THE SITE & DEVELOPMENT PROPOSALS

No. 38 is a residential property and part of a four-storey terrace on the western side of Great James Street.

It is proposed to renovate the property including the installation of an air-source heat pump (ASHP) located at roof level to provide heating to the building. See Section 5.1 for details.

The nearest noise sensitive receptors are the adjoining properties at 37 Great James Street and 39 Great James Street.

An aerial image of the site and surrounding area is provided in Figure 1.

Figure 1: Aerial image of site and surrounding area (Imagery ©2024 Google)

3 ASSESSMENT CRITERIA

3.1 Local Authority Planning Requirements

The site is located within the London Borough of Camden. The Camden Council Local Plan (2017) sets out the criteria for noise and vibration used to determine applications for planning permission.

Policy A4: Noise and Vibration is reproduced below:

> 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.

Appendix 3 of the Local Plan sets out the thresholds that will be considered by the council when assessing applications. The relevant section which is applicable to the assessment of plant and machinery noise at dwellings is reproduced below:

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 57dBL_{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 88dBL_{Amax}

The thresholds evaluate impact in terms of various 'effect levels' as described in the National Planning Policy Framework and Planning Practice Guidance. There are corresponding design criteria which guide applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The thresholds and design criteria are as set out below:

- 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.

Appendix 3 of the Local Plan indicates that it is expected that the BS4142:2014 assessment methodology will be used and advises that a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion.

3.2 BS4142:2014

British Standard BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' provides a well-established methodology for the assessment of the impact of noise from fixed mechanical and electrical plant and equipment.

The methodology determines the degree of adverse impact for a particular noise source based upon factors including the extent by which it exceeds the background noise level, the character of the noise and its time of occurrence.

A ‘Rating Level’ for the specific source is established, which has been corrected to account for the characteristics of the sound, including having noticeable tonality, being intermittent / impulsive, or having any other distinct characteristics which would make it more noticeable.

Levels of impact are defined in terms of the Rating Level relative to the background noise level, as set out in Table 1 below.

Rating Level relative to background level	Assessment
0dB or less than background	‘An indication of the specific sound source having a low impact, depending on context’
5dB or more than background	‘Likely to be in indication of an adverse impact, depending on context’
10dB or more than background	‘Likely to be in indication of a significant adverse impact, depending on context’

Table 1: BS4142 defined levels of impact

4 NOISE SURVEY

4.1 Methodology

Background noise levels were measured between 12:00pm on Monday 6th January 2025 and 12:00pm on the following day.

A weather-protected Class 1 sound level meter and microphone were installed at the location indicated in Figure 1 (further details of the instrumentation used are provided in Appendix B). The microphone was mounted approximately 1.4m above the flat roof level on a tripod.

The sound level meter was set up to record noise levels over consecutive 15-minute intervals throughout the survey period.

Background noise levels at the measurement position was observed to comprise mainly distant road traffic.

Noise levels at the measurement position are considered to be representative of those occurring at the nearest noise-sensitive receptors.

Local weather station data indicates that there were moderate wind speeds during the first three hours of the measurement period after which wind speeds were low or gentle and that there were intermittent periods of light rain.

4.2 Survey Results

Time history plots of the noise survey data ($L_{Aeq,15min}$ and $L_{AF90,15min}$) are presented in Appendix C.

The measured noise levels varied throughout the period with a minimum level of 41dB L_{AF90} recorded in the early hours between 03:00 to 03:30. As a conservative approach, the representative background noise level is taken to be **41dB L_{AF90}**.

5 PLANT NOISE ASSESSMENT

5.1 Plant Equipment

The proposed plant equipment as advised by the project M&E consultant is as set out in Table 2.

The equipment is to be located in a plant enclosure adjacent to the chimney stack between No 38 and 39 Great James Street (see proposed roof plan in Figure 2).

It is assumed that the ASHP may be running during the daytime and night-time, subject to heating demand.

Unit	**ASHP**
Manufacturer	Samsung
Heating Capacity (max)	18kW
Model	AM060 DVM S Eco Heat Recovery
No. of Units	2
Noise Output (heating)	55dB(A) at 1m
Location	38 Great James Street roof
Noise Control	Bespoke Acoustic Enclosure

Table 2: Proposed plant equipment

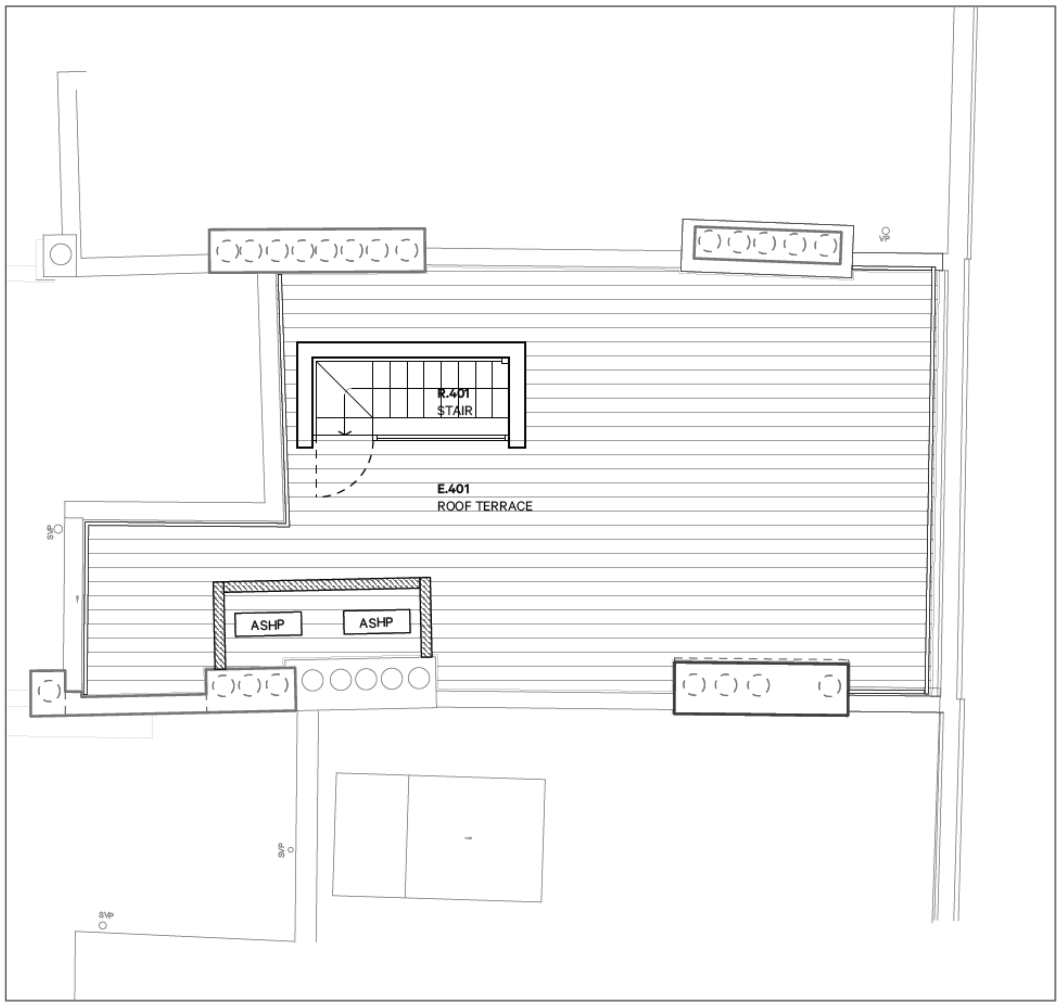

Figure 2: Proposed roof plan

5.2 Plant Noise Calculation

The resultant noise level due to the operation of the ASHP unit has been calculated at the windows of the nearest noise sensitive receptors (37 and 39 Great James Street).

The resultant noise levels have been calculated based on the equipment manufacturer's acoustic data with appropriate corrections applied to account for source directivity, distance attenuation and screening where applicable. Table 3 and Table 4 set out the calculation procedure.

The chimney stack behind the ASHPs will provide a degree of screening to the windows at 39 Great James Street. This has been accounted for by applying a modest -5dB correction to the calculated noise levels.

The chimney stack will also increase noise levels somewhat at No.37 which has been accounted for by applying a +3dB directivity factor.

The calculations indicate noise from the ASHPs will need to be reduced in order to meet local authority planning criteria. This is to be achieved by housing the ASHP within a bespoke acoustic enclosure.

Modern ASHPs do not generally exhibit significant tonality, therefore the calculated plant noise level may be taken as being equal to the BS4142:2014 plant noise rating level.

Frequency, Hz			63	125	250	500	1000	2000	4000	8000	A
ASHPs: Samsung AM060 DVM	2	units									
SPL 1m, dB:			60	60	57	54	47	41	34	27	55
Distance attenuation, dB:	10.0	m	-20	-20	-20	-20	-20	-20	-20	-20	
Directivity Effects, dB:			3	3	3	3	3	3	3	3	
Enclosure Insertion Loss, dB:			-6	-6	-8	-10	-14	-18	-16	-15	
SPL receptor, dB:			40	40	35	30	19	9	4	-2	31
Total SPL at receptor, dB			40	40	35	30	19	9	4	-2	31

Table 3: Noise level calculation (37 Great James Street)

Frequency, Hz			63	125	250	500	1000	2000	4000	8000	A
ASHPs: Samsung AM060 DVM	2	units									
SPL 1m, dB:			60	60	57	54	47	41	34	27	55
Distance attenuation, dB:	5.0	m	-14	-14	-14	-14	-14	-14	-14	-14	
Screening Loss, dB:			-5	-5	-5	-5	-5	-5	-5	-5	
Enclosure Insertion Loss, dB:			-6	-6	-8	-10	-14	-18	-16	-15	
SPL receptor, dB:			38	38	33	28	17	7	2	-4	29
Total SPL at receptor, dB			38	38	33	28	17	7	2	-4	29

Table 4: Noise level calculation (39 Great James Street)

The main body of the acoustic enclosures will comprise solid acoustic panels, with 150mm deep acoustic louvres for the air intake at the sides and air discharge at the front. The minimum required enclosure insertion loss is as set out in Table 5.

Frequency, Hz	63	125	250	500	1000	2000	4000	8000
Insertion Loss, dB:	6	6	8	10	14	18	16	15

Table 5: Acoustic enclosure minimum insertion loss requirements

Suppliers of suitable ASHP enclosures include:

- Sound Planning (https://www.soundplanning.co.uk/acoustic-enclosures/)
- Environmental Equipment Corporation (http://eec.co.uk/products/)
- Environ (https://www.environ.co.uk/)

5.3 Assessment

The representative background noise level at the receptors neighbouring 38 Great James Street is 41dB $L_{AF90,15min}$ (see Section 4). A plant noise rating level of 31dB(A) or lower can be achieved at these receptors with suitable noise control measures.

The plant noise rating level is therefore 10dB below the background noise level. This meets the Local Authority noise criteria.

BS4142:2014 states the following:

"*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*."

This provides a clear indication that the proposed plant equipment noise will have minimal impact on the residential receptors.

6 SUMMARY

The operational noise level from two proposed air-source heat pumps has been calculated based on the manufacturer's acoustic data. Corrections to account for source directivity, distance attenuation and the proposed acoustic enclosure have been applied.

The noise impact has been assessed by comparing the calculated plant noise rating level to the representative background noise level as established by an unattended environmental noise survey.

It has been established that by housing the heat pump within a suitable acoustic enclosure, the resultant plant noise rating level will be at least 10dB lower than the representative background noise level.

This would meet the London Borough of Camden planning policy requirement and is indicative of a low impact when assessed according to BS4142:2014.

APPENDIX A - GLOSSARY OF ACOUSTIC TERMINOLOGY

SOUND PRESSURE LEVEL, SPL or L_P

A measure of the pressure caused by a sound wave at a point in space, given by:

$SPL(dB)=20.\log_{10}(\text{Sound Pressure (Pa)}/P_0)$

P_0 is the reference sound pressure of 20μPa, which corresponds to the approximate threshold of hearing at 1kHz.

SOUND POWER LEVEL, SWL or L_W

A measure of is the total sound energy radiated by a source in all directions, given by

$SWL(dB)=10.\log(\text{Sound Power(W)}/W_0)$

W_0 is the reference sound power of 1pW.

EQUIVALENT CONTINUOUS A-WEIGHTED, $L_{Aeq,T}$

The level of a notional continuous sound that contains the same sound energy as the actual fluctuating sound over the time period, T. Weighted over frequencies to approximate the sensitivity curve of human hearing (A-weighted).

BACKGROUND NOISE LEVEL, $L_{AF90,T}$

The A-weighted sound pressure level of a fluctuating sound that is exceed for 90% of the time interval, T.

A-WEIGHTED MAXIMUM NOISE LEVEL, L_{AFmax}

The maximum A-weighted sound pressure level in a given period, measured using the “fast” time constant.

SOUND REDUCTION INDEX, R

The quantity which describes the level by which a material or building element reduces noise transmission at a given frequency, derived from laboratory measurement.

WEIGHTED SOUND REDUCTION INDEX, R_W

Single Integer number found by comparing the measured Sound Reduction Index spectrum with the 'standard' curves for airborne sound insulation, according to a weighting method described in BS EN ISO 717-1.

ELEMENT NORMALIZED LEVEL DIFFERENCE, $D_{n'e'w}$

A measure of the sound reduction of a particular element, with the equivalent area of acoustic absorption in the receiver room normalized to the reference absorption area ($10m^2$).

SPECTRUM ADAPTATION TERMS, C and C_{tr} (dB)

These are the values to be added to D_w, R_w or $D_{n'e'w}$ values to take account of the characteristics of a particular sound spectra. C corresponds to pink noise spectra and C_{tr} corresponds to typical urban traffic noise spectra.

APPENDIX B - NOISE MONITORING EQUIPMENT

The measurements were made with an NTi XL2 acoustic analyser, using a GRAS weather protection kit. This equipment complies with BS EN IEC 61672 class 1. The meter used a NTi MC230 free-field response microphone and NTi MA220 microphone pre-amplifier.

The calibration of the sound level meter was checked at the beginning and end of measurements with a Larson David CAL200 sound calibrator, complying with BS EN IEC 60942 class 1. No significant calibration deviation occurred.

The table below lists the serial numbers and last calibration dates of the equipment used.

Description	Serial No.	Calibration Date
NTi XL2 Sound Level Meter	A2A-16249-E0	19/12/2024
NTi MC230A Condenser Microphone	A17342	19/12/2024
NTi MA220 Pre-Amplifier	8450	19/12/2024
Larson David CAL200 Sound Calibrator	16795	19/12/2024

Figure 2: Equipment Installation

APPENDIX C - NOISE SURVEY DATA

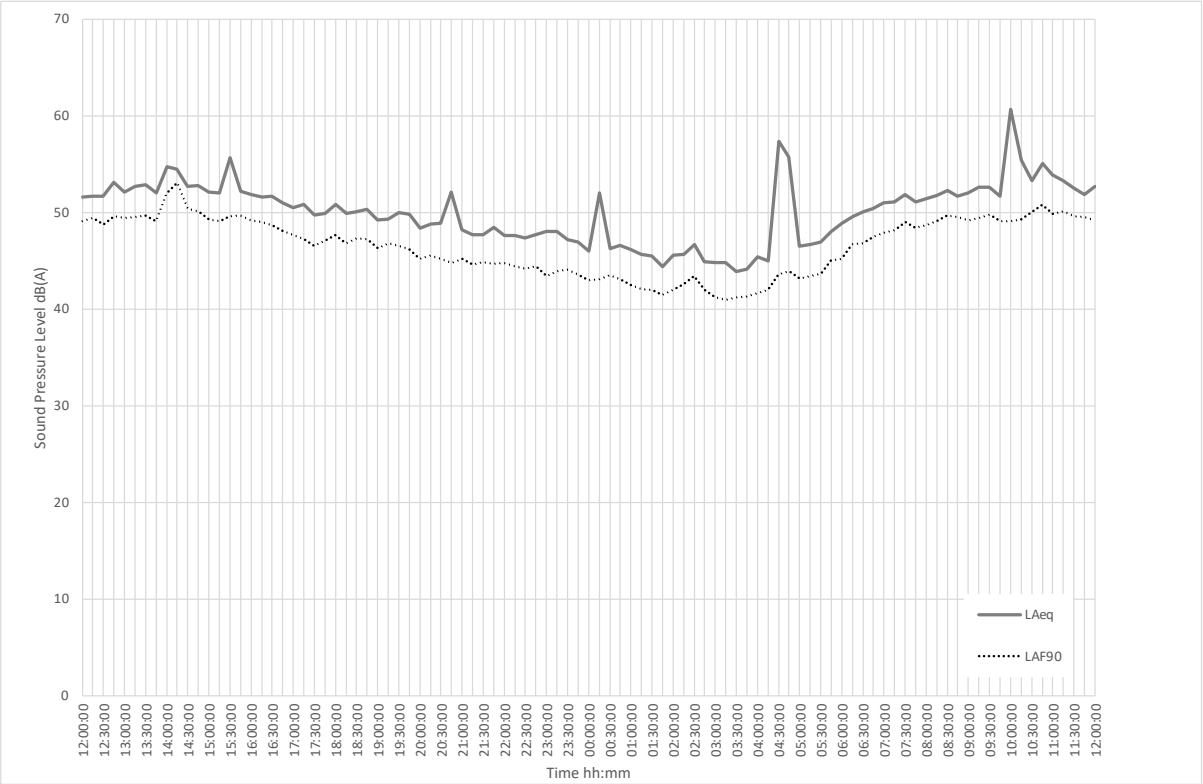

Figure 3: Noise survey time history