ZONA ACOUSTICS

52 Doughty Street London

Plant Noise Assessment

15 December 2023

For

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Summary

Zona Acoustics has been appointed to carry out a noise assessment in relation to the proposed external plant installation at 52 Doughty Street in London. Proposals are for the installation of two air source heat pump units in a newly proposed lower ground floor lightwell at the rear of the property.

The local authority, Camden Council, has requirements in relation to building services noise affecting noise sensitive properties.

A noise limit has been proposed for the plant, based on the existing background noise levels and the Camden Council requirements.

The predicted rating level of the proposed plant was found to be in line with the Camden Council requirements, subject to the units being housed within suitable acoustic enclosures. This is seen to relate to the No Observed Effect Level (NOEL), under national planning guidelines.

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1.0 Introduction

Zona Acoustics has been appointed to carry out a noise assessment in relation to the proposed external plant installation at 52 Doughty Street in London. Proposals are for the installation of two air source heat pump units in a newly proposed lower ground floor lightwell at the rear of the property.

This report presents the methodology and results of a noise survey to determine background noise levels that are representative of the nearest noise sensitive receptors, as well as an assessment of noise from the proposed plant in relation to the Camden Council requirements.

The report is technical in nature, and such, a summary of noise units and acoustic terminology are included in Appendix A for reference.

2.0 Description of Site

The site is located at 52 Doughty Street, London, WC1N 2LS.

The proposed air sour heat pump (ASHP) units will be located in a lower ground floor light well at the rear of the property.

The nearest / most exposed noise sensitive receptor is taken to be a neighbouring residential window located on the second floor of 51 Doughty Street, which will overlook the proposed lightwell area and have direct line of sight to one of the ASHP units, the second being screened from the window by the walls of the lightwell. Our assessment will also consider the neighbouring first floor level outdoor terrace, which will be considerable screened from both units by the walls of the lightwell.

Figure 2.1 shows the site extent in **red**, the approximate proposed location of the units in **green**, and the nearest noise sensitive window and outdoor terrace shown in **blue**.





3.0 Noise Policy and Guidance

3.1 Camden Council Requirements

The Camden Council typical requirements for noise from fixed external plant are included in the Camden Local Plan 2017.

The requirement is for the rating level of the plant to be at least 10 dB below the existing background noise level (15dB if tonal components are present) at the assessment location, when assessed in accordance with British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound'.

3.2 British Standard 4142: 2014

British Standard (BS) 4142: 2014 (superseded by BS 4142: 2014+A1: 2019) provides a procedure for the measurement and rating of noise levels form industrial and commercial noise sources. A methodology for predicting the likelihood of adverse impact is provided in the document.

The rating level ($L_{Ar,Tr}$) is defined in BS 4142 and is used to rate the industrial source (known as the specific noise source) at the assessment location. This level is obtained by adding a correction of between 0 and 6 dB, for tonal noise sources, and a correction of between 0 and 9 dB for impulsive sources. Additionally, corrections of 3 dB can be made for other sound characteristics and intermittency of the noise source.

The rating level is assessed in terms of $L_{Ar,Tr}$, where 'T' is a reference period of one hour during the daytime period (07:00 - 23:00) and fifteen minutes during the night-time period (23:00 – 07:00).

The method for predicting the likelihood of complaints is based on differences between the rating level and the background $L_{A90,T}$ noise level. The standard states that:

a) "Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10dB 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 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 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."

In this case, the rating level requirement is 10 dB below the existing background noise level, as required by Camden Council.

4.0 Noise Survey

4.1 Methodology

An unattended noise survey was carried out over an approximate 3-day period between 11:30 on Monday 11 December and 10:30 on Thursday 14 December 2023 to determine existing background noise levels at a position representative of the nearest noise sensitive receptors.

The measurement microphone was located on the second floor level roof terrace, 1.2m above roof level in the acoustic free field.

The measurement position is considered representative of the nearest noise sensitive receptors.

The approximate location of the measurement position is shown in orange in Figure 4.1 below.



Figure 4.1 Noise Measurement Position

The equipment used for the noise survey is summarised in Table 4.1

| Table 4.1 | Noise | Survey | Equipment |
|-----------|-------|--------|-----------|
|-----------|-------|--------|-----------|

| ltem | Make & Model | Serial Number |
|--|-------------------|---------------|
| Type 1 automated logging sound level meter | Svan 971A | 113251 |
| Type 1 ½" microphone | ACO 7152 | 80664 |
| Calibrator | Casella CEL 120-1 | 2651640 |

 $L_{\mbox{\tiny Aeq}}$ and $L_{\mbox{\tiny A90}}$ sound pressure levels were measured throughout the noise survey over continuous 15-minute intervals.

The noise monitoring equipment was calibrated before and after the noise survey period. No significant change was found. Laboratory equipment calibration certificates can be provided upon request.

Due to the nature of the noise survey, i.e. unattended, we are unable to comment on the weather conditions throughout the entire noise survey period, however at the beginning and end of the survey, there was noted to be no rainfall, dry ground, and only light wind (measured less than 5 m/s on site). Online weather history shows similar conditions throughout the survey period. Weather conditions are not considered to have had any significant effect on the measured noise levels.

4.2 Results

Appendix B presents a time history graph showing the sound pressure levels measured throughout the noise survey.

Due to the nature of the noise survey, i.e. unattended, we are unable to comment on the exact noise climate throughout the entire survey period. However, at the beginning and end of the survey period, the noise climate was noted to be dominated by distant road traffic noise, aircraft, and distant low-level commercial plant noise.

In accordance with BS 4142, the rating level should be assessed against a 'representative' background level.

BS 4142 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 minimum or modal value".

The proposed plant has the potential to operate at any time. Our assessment will therefore consider both the day and night-time periods.

Figures 4.2 and 4.3 below present an analysis of the measured background noise levels during the day and night-time periods of the noise survey.



Figure 4.2 Background Noise Level Analysis – Daytime

Based on the analysis above, we have considered **47 dB L_{A90 (15-minute)}** as the representative background noise level for the daytime. The measured background noise levels were at or above this level 86% of the time during the daytime periods of the survey.



Figure 4.3 Background Noise Level Analysis – Night-time

Based on the analysis above, we have considered **45 dB L**_{A90 (15-minute)} as the representative background noise level for the night-time. The measured background noise levels were at or above this level 88% of the time during the night-time periods of the survey.

Table 4.2 presents a summary of the representative background noise levels for this assessment based on the analysis above.

| Table 4.2 Backgr | ound Noise | Survey | Results |
|------------------|------------|--------|---------|
|------------------|------------|--------|---------|

| Period | Representative Background Noise Level L _{A90 (15-minute)} (dB) |
|----------------------------|--|
| Daytime (07:00 - 23:00) | 47 |
| Night-time (23:00 – 07:00) | 45 |

5.0 Plant Noise Assessment

5.1 Plant Noise Limit

Table 5.1 presents the plant noise limits for this assessment, based on the representative background noise levels determined above and the Camden Council requirements (as detailed in Section 3.1).

Table 5.1 Plant Noise Limits

| Period | Noise Limit L _{Ar,Tr} (dB) |
|----------------------------|-------------------------------------|
| Daytime (07:00 - 23:00) | 37 |
| Night-time (23:00 – 07:00) | 35 |

5.2 Proposed Plant

The proposal is for the installation of 2 no. Vaillant aroTHERM Split 12kW - Manufacture's operating Sound Power Level 60 dB $L_{WA.}$ – No manufacture's octave band noise data is available for the unit. Our calculations are therefore based noise data for a similar ASHP unit, which we would consider to provide a robust assessment.

The octave band noise levels are included in the detailed plant noise calculations in Appendix C. Noise from these types of ASHP units are generally non-tonal in character. The units may operate intermittently, however, given that the specific noise level from the plant is be controlled to a level at least 10dB below the background levels, it is considered that noise from the plant will not be generally audible at the nearest noise sensitive receptor locations.

On this basis, acoustic character corrections are not considered appropriate and the rating level requirement remains 10dB below the background levels, providing a strong indication of a low impact.

5.3 Mitigation

In order to achieve the required noise limits it is recommended that each unit be housed in an acoustic enclosure.

The acoustic enclosure should be capable of providing an overall noise reduction of at least 6 dBA. For this we recommend the Environ Sound Cover which typically provides a noise reduction of 6-8 dBA.

The manufacture's insertion loss values for the Environ Sound Cover are included in the detailed plant noise calculations in Appendix C.

An alternative acoustic enclosure may also be suitable. The successful supplier should confirm that the supplied acoustic enclosure would allow for the required noise limit to be achieved based on this assessment.

5.4 Assessment

We have carried out calculations to predict the plant noise emissions at the nearest noise sensitive receptors.

We have included an assessment of the predicted plant noise levels to the neighbouring outdoor terrace during the daytime (i.e. when the terrace would generally be in use) and to

the nearest noise sensitive window during the night-time, which provides a worst-case assessment.

A summary of the results are presented in Tables 5.2 to 5.4 below. Detailed plant noise calculations are included in Appendix C.

Table 5.2 Plant Noise Calculation Results – Outdoor Terrace – Daytime

| Element | Noise Level (dBA) |
|--|-------------------|
| Total ASHP Noise Level (L _{Ar,Tr}) | 24 |
| Noise Limit | 37 |
| Difference | -13 |

Table 5.3 Plant Noise Calculation Results – Noise Sensitive Window – Night-time

| Element | Noise Level (dB) |
|--|------------------|
| Total ASHP Noise Level (L _{Ar,Tr}) | 34 |
| Noise Limit | 35 |
| Difference | -1 |

As can be seen in Table 5.2 and 5.3 above - The predicted rating level of the proposed plant installation is in line with the Camden Council requirement, subject to the units being housed in a suitable acoustic enclosure. This is seen to relate to the No Observed Effect Level (NOEL), under national planning guidelines.

5.5 Vibration

The external ASHP units should be installed using anti-vibration fixings and rubber washings on screws/bolts, to dampen vibration transmitting through the fixings and radiating through any structures.

Such mounts would usually be made of a resilient material such as rubber and should be supplied by the manufacturer (as standard) and then applied to any connection with the structure, including floors, walls, and soffits.

Appendix A – Acoustic Terminology

| Parameter | Description |
|--|--|
| Decibel (dB) | A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing (20×10^{-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. |
| Sound Power Level (L_w) | A measure of the acoustic energy emitted from a source of noise, expressed in decibels. |
| A-weighting (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. |
| L _{Aeq,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. |
| LA90 (15 min) | The noise level exceeded for 90% of the time (also referred to as the background noise level), measured over a 15-minute period |



Appendix B – Time History Graph

| 52 Doughty Street | | | | 2 | | 70N | | | |
|--|------|-----|-----|-----|-----|-----|-----|------|-----|
| Plant Noise Calculations - Outdoor Terrace - Day | | | | | | 201 | | 0031 | 105 |
| Vaillant aroTHERM Split 12kW - Unit 1 | dBA | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Typical ASHP Sound Power Levels | 60 | 63 | 62 | 60 | 58 | 55 | 51 | 44 | 38 |
| Acoustic Enclosure (Environ Sound Cover) | | -3 | -3 | -4 | -6 | -7 | -9 | -10 | -10 |
| Acoustic Reflections | | +9 | +9 | +9 | +9 | +9 | +9 | +9 | +9 |
| Distance Attenuation (11m) | | -29 | -29 | -29 | -29 | -29 | -29 | -29 | -29 |
| Screening (Lightwell Walls) | | -8 | -9 | -11 | -13 | -16 | -19 | -20 | -20 |
| Sound Pressure Level at Nearest Noise Sensitive Receptor | 22 | 33 | 30 | 25 | 19 | 13 | 3 | 0 | 0 |
| | 15.4 | | 105 | 050 | 500 | | | | |
| Vaillant aro I HERM Split 12kW - Unit 2 | dBA | 63 | 125 | 250 | 500 | 1k | ZK | 4K | 8ĸ |
| Typical ASHP Sound Power Levels | 60 | 63 | 62 | 60 | 58 | 55 | 51 | 44 | 38 |
| Acoustic Enclosure (Environ Sound Cover) | | -3 | -3 | -4 | -6 | -7 | -9 | -10 | -10 |
| Acoustic Reflections | | +9 | +9 | +9 | +9 | +9 | +9 | +9 | +9 |
| Distance Attenuation (8m) | | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| Screening (Lightwell Walls) | | -11 | -13 | -15 | -18 | -20 | -20 | -20 | -20 |
| Sound Pressure Level at Nearest Noise Sensitive Receptor | 20 | 33 | 29 | 24 | 17 | 11 | 5 | 0 | 0 |
| | | | | | | | | | |
| Total Sound Pressure Level at Nearest Noise Sensitive Receptor | 24 | 36 | 33 | 28 | 21 | 15 | 7 | 0 | 0 |
| Daytime Noise Limit | 37 | | | | | | | | |
| Difference | -13 | | | | | | | | |

Appendix C – Detailed Plant Noise Calculations

| 52 Doughty Street | | | | | - | ZON | A AC | OUST | ICS |
|--|-----|-----|-----|-----|-----|-----|------|------|-----|
| Plant Noise Calculations - Noise Sensitive Window - Night | | | | | | | | | |
| Vaillant aroTHERM Split 12kW - Unit 1 | dBA | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Typical ASHP Sound Power Levels | 60 | 63 | 62 | 60 | 58 | 55 | 51 | 44 | 38 |
| Acoustic Enclosure (Environ Sound Cover) | | -3 | -3 | -4 | -6 | -7 | -9 | -10 | -10 |
| Acoustic Reflections | | +9 | +9 | +9 | +9 | +9 | +9 | +9 | +9 |
| Distance Attenuation (12m) | | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 |
| Sound Pressure Level at Nearest Noise Sensitive Receptor | 33 | 40 | 38 | 36 | 31 | 28 | 21 | 13 | 8 |
| | | | | | | | | | |
| Vaillant aroTHERM Split 12kW - Unit 2 | dBA | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Typical ASHP Sound Power Levels | 60 | 63 | 62 | 60 | 58 | 55 | 51 | 44 | 38 |
| Acoustic Enclosure (Environ Sound Cover) | | -3 | -3 | -4 | -6 | -7 | -9 | -10 | -10 |
| Acoustic Reflections | | +9 | +9 | +9 | +9 | +9 | +9 | +9 | +9 |
| Distance Attenuation (10m) | | -28 | -28 | -28 | -28 | -28 | -28 | -28 | -28 |
| Screening (Lightwell Walls) | | -5 | -6 | -7 | -8 | -10 | -12 | -15 | -20 |
| Sound Pressure Level at Nearest Noise Sensitive Receptor | 27 | 36 | 34 | 30 | 25 | 19 | 11 | 1 | 0 |
| | | | | | | | | | |
| Total Sound Pressure Level at Nearest Noise Sensitive Receptor | 34 | 41 | 39 | 37 | 32 | 28 | 22 | 14 | 8 |
| Night-time Noise Limit | 35 | | | | | | | | |
| Difference | -1 | | | | | | | | |