PLANT NOISE ASSESSMENT

2 GLENILLA ROAD, LONDON

EXTENSION ARCHITECTURE

OCTOBER 2017

PLANT NOISE ASSESSMENT
2 GLENILLA ROAD, LONDON

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REVISION HISTORY

Version	Comments	Changes made by	Approved by
1.0	First issued version	DM	JB
2.0	Second issued version – updated drawings	DM	JB

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CONTENTS

1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Extension Architecture to undertake a noise impact assessment for the operation of a new air conditioning system at the 2 Glenilla Road, London.

The noise assessment is required to support a planning application for two new condenser units serving the residential property.

An assessment of the impact of noise at the nearest noise sensitive premises from the proposed condenser units has therefore been conducted in accordance with the requirements of the London Borough of Camden (LBC) and is reported herein.

2 NOISE UNITS AND CRITERIA

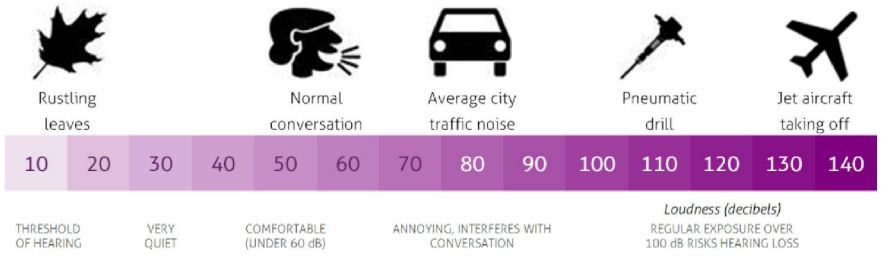
2.1 Noise Units

There is a million to one ratio between the threshold of hearing and the highest tolerable sound pressure. Noise is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB). Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz, however its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure noise is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady noise levels of 3 dB, whilst a change of 10 dB is perceived as a doubling or halving of the noise level. An indication of the range of noise levels commonly found in the environment is given below.

Figure 2.1: Typical noise levels



A number of different indices are used to describe the fluctuations in noise level over certain time periods. The main indices include:

$L_{A90,T}$ This is the noise level exceeded for 90% of the measurement period and provides a measurement of the quieter 'lull' periods in between noise events. It is often referred to as the background noise level.

$L_{Aeq,T}$ This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of noise in the environment, which can be referred to as the ambient noise.

$L_{Amax,F}$ This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response.

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 metres. A façade measurement is undertaken, or calculated to a position 1 metre from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

2.2 Noise Policy and Criteria

2.2.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) [1] was published on 15 March 2010. It sets out the long term vision of the Government's noise policy, which is to promote good health and a good quality of life through the management of noise within the context of sustainable development.

The NPSE sets out the following aims:

"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 NPSE describes a number of effect levels that may be used to define effects in the context of noise policy, as follows:

- **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

In March 2014 further guidance on interpreting the effect levels was published on the Government's Planning Practice Guidance. This includes a table that summarises noise exposure hierarchy, noting this is based on the likely average response of a population. This table is reproduced below:

Table 2.1 Noise exposure hierarchy and effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
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
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 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
Significant Observed Adverse Effect Level			

Perception	Examples of Outcomes	Increasing Effect Level	Action
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 change in 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 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

2.2.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) [2] was published on 27 March 2012. Along with the introduction of this document, a number of detailed planning policy guidance notes were withdrawn, including PPG24, on planning and noise.

The NPPF sets out how the Government's planning policies should be applied. In terms of the detail of policies on environmental issues such as noise, the intention is for Local Planning Authorities to set their own guidance. This will form part of or be referred to in the relevant Local Plan.

2.3 Local Authority Requirements

It is understood that LBC require that the Rating Level, measured or calculated at 1 m from the façade of the nearest existing noise sensitive premises, should not exceed a level 10 dB(A) below the existing L_{A90} background noise level. They advise that the Rating Level and existing background noise levels should be determined as per the guidance provided BS 4142:2014 [3].

2.3.1 British Standard 4142

Guidance on the rating of noise from fixed installations and sources of an industrial nature is provided in British Standard (BS) 4142. This standard was substantially updated in 2014. This standard provides a procedure for the measurement and rating of noise levels outside dwellings in mixed residential and industrial areas. A methodology for predicting the likelihood of adverse impact is also provided in this document although the assessment of nuisance explicitly falls outside the scope of this British Standard.

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) outside residential dwellings. 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 corrections for other sound characteristics, and intermittency of the noise source.

Reference time intervals, T_r, of 1 hour and 15 minutes are specified for the determination of rating levels during the day and night, respectively.

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.*
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 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."*

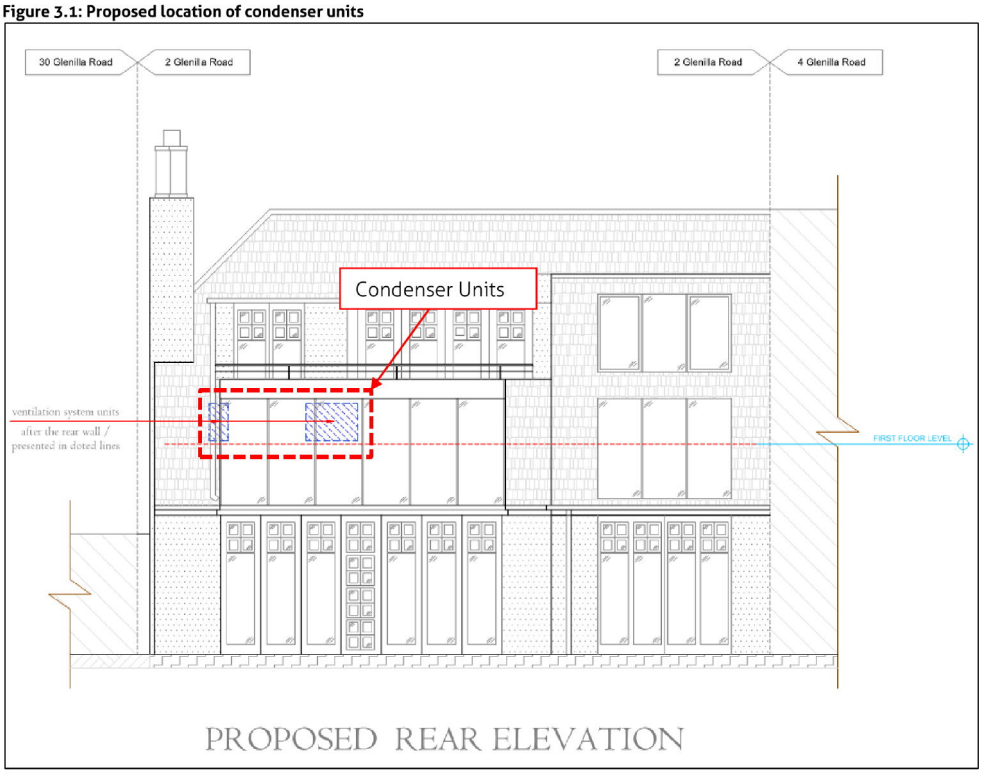
The BS4142 2014 standard also looks at the local acoustic environment and context into which the sound sources are being introduced.

3 SITE DESCRIPTION

The development is located at 2 Glenilla Road, London. The location of the site, the proposed condenser units and nearest noise sensitive receptor are presented in Figure A1 of Appendix A.

It is understood that two condenser units will be serving the development and will be situated to the rear of the property fitted to the external façade at first floor level, shown in the drawing provide by Extension Architecture below.

Figure 3.1: Proposed location of condenser units



It is understood the plant has the potential to operate at any time throughout the day and night.

The nearest noise sensitive receptor is considered to be the residential property at 1rd floor level to the east – the nearest window is approximately 15m away and has direct line of site to the condenser units.

4 NOISE MEASUREMENTS

4.1 Survey and Measurement Procedure

Continuous unattended noise measurements were obtained over an approximate 2-day period to obtain data on the variation in noise levels at the site.

The continuous monitoring of ambient noise levels was undertaken at approximately 1.5 m above ground level under 'facade' conditions in a location representative of the nearest noise sensitive receptor indicated on Figure A1 of Appendix A.

Noise levels were measured using a Rion NL-32 precision integrating sound level meter. The microphone was fitted with a weatherproof windshield. The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box.

Fifteen-minute consecutive sound level measurements of $L_{Amax,F}$, $L_{Aeq,T}$, and $L_{A90,T}$ were obtained using the 'F' time weighting and A-weighting frequency network between approximately 09:30 hrs on Tuesday 26th and 08:45 on Thursday 28rd September 2017.

The equipment was calibrated before and after the survey using a Rion NC-74 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed. Noise levels were measured.

At the time of set-up and collection of the equipment, ambient noise levels were considered to be low with no particular source being dominant.

4.2 Equipment Details

Equipment	Make & Model	Serial No	Date Calibrated	Calibration Certification Number[1]
Sound Level Meter	Rion NL-32	01030567	7 June 2016	UCRT16/1182
Calibrator	Rion NC-74	34625646	10 November 2016	UCRT16/1329

[1]Certificates available on request

4.3 Weather Conditions

Weather conditions during the unattended survey period have been obtained from internet sources www.wunderground.com (Weather station at Heathrow) which indicates wind speeds were moderate throughout (< 5m/s) and conditions were predominantly dry during the first day of monitoring with heavy showers on the second. Consequently, noise levels measured during this period (27/09/17) have been excluded from our analysis.

At the time of set-up and collection of the noise monitor the weather conditions were dry with negligible wind.

4.4 Noise Survey Results

The results of the continuous noise monitoring survey are presented in graphical form in Figure A2 of Appendix A. The noise levels measured at the unattended measurement location (ref: UA) are considered to be representative to that of the nearest noise sensitive receptor.

A summary of the daytime ambient $L_{Aeq,16hr}$ and night-time ambient $L_{Aeq,8hr}$ noise levels is presented below in Table 4.1 along with the average background $L_{A90,T}$ noise levels .

Figure 4.1:Unattended noise survey results

Monitoring Period	Daytime (07:00 to 23:00)		Night-time (23:00 to 07:00)	
	$L_{Aeq,16hr}$	$L_{A90,15min}$	$L_{Aeq,8hr}$	$L_{A90,15min}$
Tue 26/09/2017	47	37	41	32
Wed 27/09/2017[1]	50	41	51	41
Thu 28/09/2017[2]	46	39	-	-
Average Free-field Level	**47**	**37**	**41**	**32**

Notes:0
1. Data obtain during this period have been omitted from average calculations due to excessive rainfall
2. Data obtained during the daytime Wednesday 27th September was not full a 16-hour measurement period and is not considered representative and has therefore not been included in the average calculations.

The unattended noise survey results indicate that daytime and night-time façade background noise levels were 37 and 32 dB $L_{A90,T}$ respectively at the unattended position 'UA'.

5 NOISE IMPACT ASSESSMENT & MITIGATION

5.1 Design Criteria

LBC requires that the Rating Level of the proposed plant at the nearest noise sensitive receptor is at least 10 dB lower than the existing background noise level.

As the plant may operate at any time through the day/night the lowest measured night-time background noise level of 32dB(A) $L_{A90,15min}$ has been selected to determine the design limit. With this in mind a limit of 22dB(A) at the window of the nearest noise sensitive receptor will be set to meet the requirements defined by LBC.

5.2 Assessment

Calculations have been carried out based on manufacturer's noise data for the proposed Daikin RXS25G condenser units.

BS4142 requires that a correction is applied to the Rating Level if there are any tonal, impulsive or other irregular characteristics likely to attract attention present in the noise source. Based on the sound power data it is considered that the proposed air conditioning units are non-tonal in acoustic character. Therefore a 'Character Correction' has not been applied in this assessment.

The noise emitted from the condenser units serving the property has been calculated at one metre from the nearest sensitive windows using manufacturers' sound power data. Calculated levels have been assessed against background levels (as set out in Section 4).

The calculations presented below in Figure 5.1 show the combined noise levels incident at the nearest noise sensitive window.

Table 5-1: Predicted noise level at the nearest noise sensitive receptor – condenser units

Description	Noise levels dB(A)
Daikin RXS25G sound pressure level at 1m	47
2 x Daikin RXS25G combined sound pressure level at 1m	50
Distance Correction - 20LOG(1/15) (distance is 15m)	-24
Façade correction	+3
Total noise level at 1m from window (Rating level)	29
Target Level (based on LBC Criteria)	22
Rating level relative to LBC Criteria	+7

The assessment determined that the level of noise emitted by air conditioning plant is 7 dB (A) above LBC's criteria at the façade of the nearest noise sensitive receptor.

5.3 Mitigation

In order to control the noise emitted by the air conditioning plant to satisfy LBC's criteria, we recommend the condenser units be housed in a louvered acoustic enclosure providing 7 dB attenuation. The rating level factoring the attenuation provided by the enclosure relative to LBC's criteria is summarised in Table 5.2 below.

Table 5-2: Predicted noise level at the nearest noise sensitive receptor – Enclosed condenser units

Description	Noise levels dB(A)
Rating Level (L_{ArTr})	29
Rating Level (L_{ArTr}) with enclosure	22
Background Noise Level (L_{A90})	32
LBC Criteria	22
Rating Level relative to LBC Criteria	**0**

These results indicate that the predicted noise level from the plant is within the LBC criteria during operation at the nearest residential window.

6 CONCLUSION

Anderson Acoustics has completed an impact noise assessment on the proposed air conditioning plant that will be serving the residential property at 2 Glenilla Road, London.

An assessment of the noise impact from the operation of the proposed air conditioning system has been undertaken in accordance with LBC criteria which require that the Rating Level from the plant is at least 10 dB below the existing background noise level at the nearest noise sensitive premises.

An unattended noise survey has been conducted at the rear of the property which has established the existing background noise level to be 32 dB $L_{A90,T}$.therefore setting a target level of 22dB (A) at the nearest noise sensitive premises when considering LBC's criteria.

With no mitigation in place, noise levels from the proposed plant are predicted to exceed LBC criteria by 7 dB. To achieve compliance, it is recommended the unit be housed within a louvered enclosure.

With the proposed measures in place conditions for neighbouring occupants should equate to No Observed Adverse Effect.

It is therefore considered that provided the proposed the recommended mitigation is incorporated, planning permission should not be refused on noise grounds.

7 REFERENCES

1 Noise Policy Statement for England (NPSE). 15 March 2010

2 National Planning Policy Framework (NPPF). 27 March 2012

3 British Standard BS 4142: 2014. Methods for Rating and Assessing Industrial and Commercial Sound

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APPENDIX A

FIGURES

Figure A1: Site location, nearest noise sensitive receptor location and unattended monitoring position

Figure A2: Unattended Noise Monitoring Results (data omitted highlighted)