SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Lupus House

Acoustic planning report

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Version	Date	Comments	Author	Reviewer
A	20 Mar 19		Artem Khodov	Robert Burrell
B	13 May 19		Artem Khodov	Robert Burrell
C	9 July 19	Added plant noise assessment	Artem Khodov	Robert Burrell

Summary

Sandy Brown has been commissioned by Davis Brown to provide acoustic advice in relation to the proposed development at Lupus House, 11-13 Macklin Street, London.

An environmental noise survey has been carried out at the site between 13 March 2019 and 18 March 2019.

The representative background sound levels measured during the survey were $L_{A90,15\ minutes}$ 52 dB during the daytime and $L_{A90,15\ minutes}$ 46 dB at night.

Based on the requirements of the London Borough of Camden and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises on the front of the site (Macklin St windows of 1-7 Macklin St) does not exceed L_{Aeq} 42 dB during the daytime and L_{Aeq} 36 dB during the night.

Plant must also be designed such, that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises at the rear of the site (Stukeley St windows of 1-7 Macklin St) does not exceed L_{Aeq} 38 dB during the daytime and L_{Aeq} 32 dB during the night.

An assessment of noise from the proposed heat rejection equipment has been undertaken. The cumulative noise level from all plant operating at the worst affected residential receptor is L_{Aeq} 29 dB and is compliant with the London Borough of Camden's plant noise criteria.

The average ambient noise levels measured during the survey were $L_{Aeq,16h}$ 58 dB during the daytime and $L_{Aeq,8h}$ 53 dB at night.

An initial assessment has been carried out to determine required acoustic performances for the facades and provide guidance on the ventilation strategy. The highest facade sound insulation performance required is R_w+C_{tr} 23 dB. This can be achieved using standard double glazing, which typically achieves sound insulation performance of around R_w+C_{tr} 28 dB. It is understood that double glazing is proposed in the scheme.

Proposal includes a solid screen for the eastern outdoor terrace to reduce potential annoyance from the existing neighbouring plant. With this screen, the ambient noise level on all outdoor terraces are expected to be less than L_{Aeq} 50 dB and therefore align with the BS 8233 recommended criteria.

Contents

1 Introduction

Sandy Brown has been commissioned by Davis Brown to provide a noise assessment in relation to the proposed mixed-use development at Lupus House, 11 -13 Macklin Street, London.

Environmental noise survey has been carried out to establish:

- background sound levels around the site and by nearby noise sensitive premises
- ambient and maximum noise levels at the site

The background sound levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of London Borough of Camden.

Ambient sound levels are used to assess building envelope sound insulation requirements to achieve appropriate internal noise levels for residences. These follow standards set in accordance with London Borough of Camden guidelines and relevant British Standards.

Ambient sound levels are also used to establish whether noise levels on the proposed external amenity spaces will be in accordance with relevant British Standard guidance.

This report provides details of the noise survey, measurement results, and recommendations.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in red Figure 1. The site is a mixed-use building, with ground to third floor containing offices, and top floor having residential accommodation.

The site is bound by Macklin Street to south east, Drury Lane to south west and Stukeley Street to north west.

Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is located in predominantly commercial area, with various commercial premises around the site highlighted in blue in Figure 1.

The nearest noise sensitive receptors are understood to be the residential properties at 1-7 Macklin Street, shown in yellow in Figure 1.

3 Development proposals

The proposal includes an extension to the rear of the site, which will increase the area of the commercial premises and will result in rearrangement of residential properties on the fourth floor and building an additional floor with residential units above. The extension does not introduce any additional residential premises, however, the change in layouts and partial extensions will create a new residential facade at the rear of the property.

The extension will also introduce a new terrace on the north west of the side, two outdoor terraces on level four: on the east and on the west of site, as well as another outdoor terrace on the west of proposed level five.

Location of the proposed extension is shown in red in Figure 2 and the left hand side image of Figure 3.

The location of the proposed fifth floor extension is highlighted in yellow in Figure 2. The image of proposed fifth floor extension is shown on the right image of Figure 3.

The locations of the rooftop terraces are highlighted in green in the central and right images of Figure 3.

The proposal includes provision for new external plant.

Figure 2 Proposed extension location

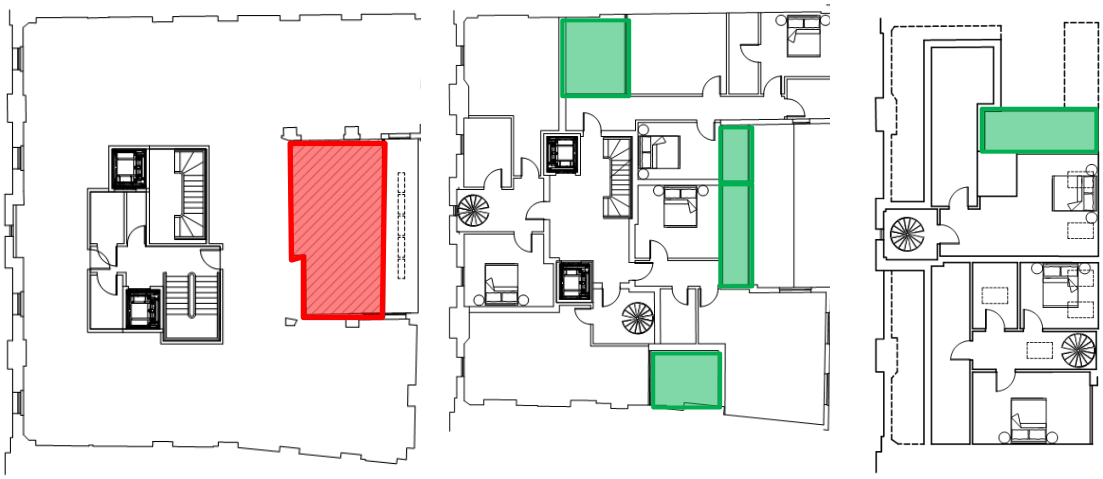


Figure 3 Proposed extension location on ground to Level 3 (left), terraces on Level 4 (centre), fifth floor extention and terrace (right).

4 Noise survey method

The survey included both unattended and attended noise measurements.

Details of the equipment used, and the noise indices measured are provided in Appendix A.

4.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 5 days. The unattended measurements were taken over 15-minute periods between 16:00 on 13 March 2019 and 17:00 on 18 March 2019. The equipment was installed by Mollie Mitchell and Artem Khodov and collected by Alexander Green.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. A photograph showing the measurement location is provided in Figure 4. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises on the front of the site.

Noise monitor was located out of the site window, at about a meter from the facade.

Figure 4 Unattended monitor installed on site

There was not a suitable location for conducting unattended noise measurements at the rear of the site, however, attended measurements were taken at the rear of the site, as well as on the terrace to support the long-term unattended measurements at the front of the site.

4.2 Attended measurements

Attended sample measurements were taken by Alexander Green at 3 locations around the site. These are indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out on 18 March 2019, over 5-minute periods. One additional 15-minute measurement was taken on the rooftop terrace, at position 3 which was time synchronised with the unattended measurements.

At each position the microphone was mounted on a tripod approximately 1.5 m above the ground level. At positions 1 and 3 measurements were taken 3 m from any other reflective surface. At position 2 measurements were taken at facade (1 m away from the facade). Details of the equipment used, and the measured noise indices are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.

Photographs of the sound level meter at each measurement position are in Figure 5.

Figure 5 Attended measurement positions 1, 2 and 3 (left to right)

5 Observations

5.1 Front of the site

The dominant noise sources observed at the site during the survey were traffic on Drury lane, located west of the site, aircraft fly-bys and plant noise from the louvres of the commercial building across the road. Location of the louvres is marked up in green in Figure 1.

Less significant noise sources included pedestrians on Macklin St, plant noise from other buildings and construction noise on other sites around Lupus House.

5.2 Rear of the site

Dominant sources at the rear of the site include traffic noise from Drury lane and aircraft fly-bys.

Less significant noise sources include pedestrians and construction from nearby sites.

5.3 Rooftop terrace

As the terrace is completely screened from any roads, traffic noise was not dominant.

Dominant noise sources included rooftop plant on top of International House, located to the north of site, highlighted in green in Figure 1, and aircraft fly-bys.

Less significant noise sources included distant traffic and distant construction.

5.4 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Measurement results

6.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Wednesday 13 March 2019	56*	53
Thursday 14 March 2019	58	54
Friday 15 March 2019	59	52
Saturday 16 March 2019	58	53
Sunday 17 March 2019	55	52
Monday 18 March 2019	60*	N/A
Average	58	53

* Measurement not made over full period due to monitoring start and end time (the measurement on 13 March 2019 was over 7 hours, and on 18 March 2019 over 10 hours); not included in the average.

In line with BS 4142:2014, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night time statistical analysis of representative values for the site are given in Figure 6 and Figure 7.

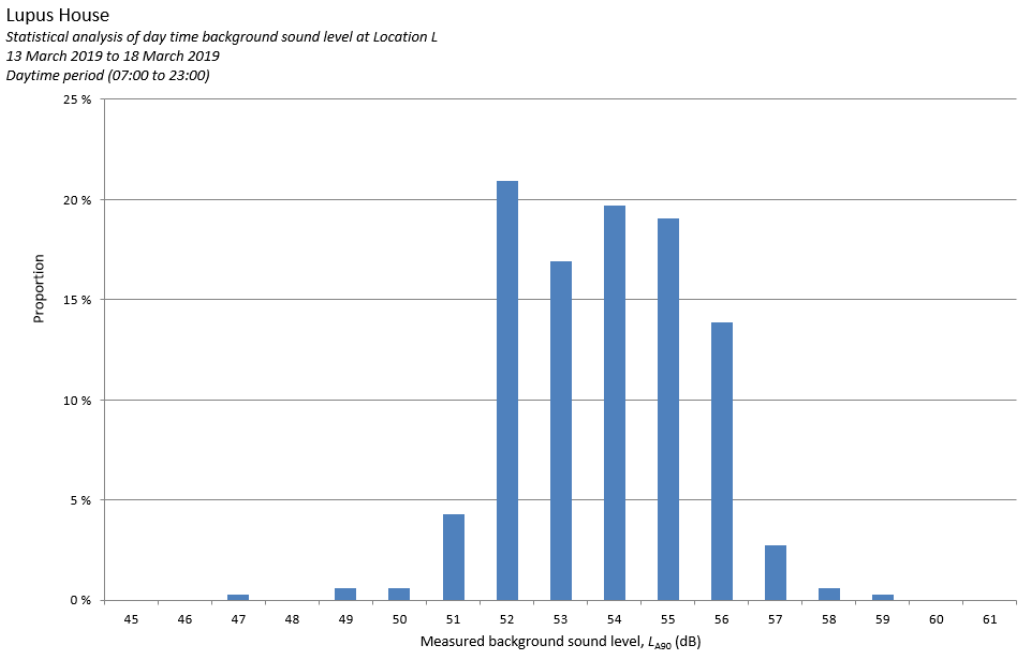


Figure 6 Statistical analysis of day time background sound level

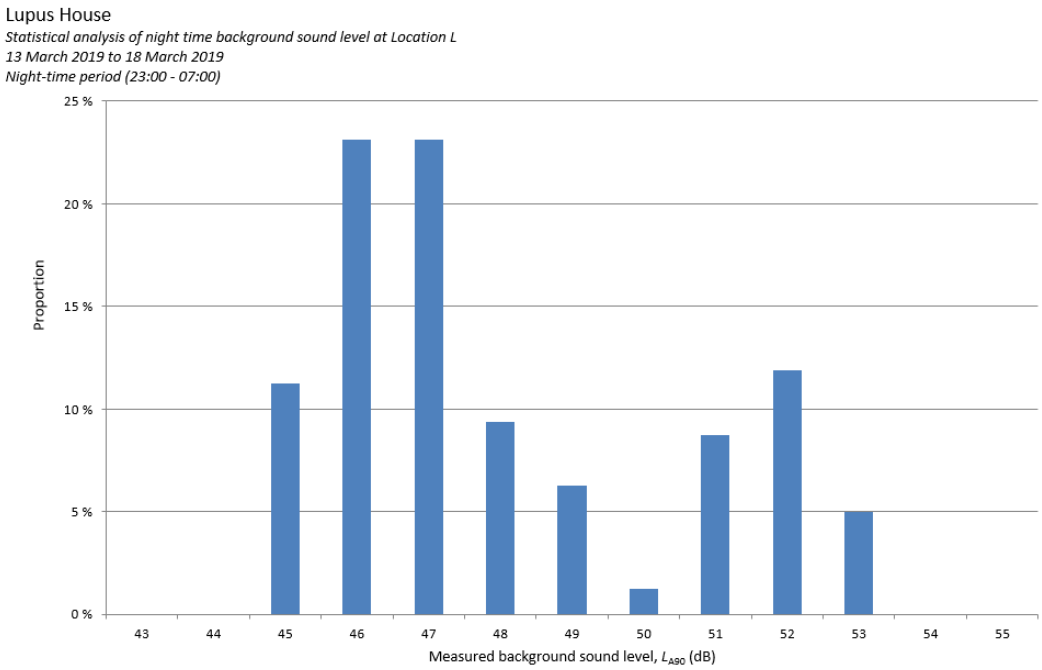


Figure 7 Statistical analysis of night time background sound level

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 52 dB during the daytime and $L_{A90,15min}$ 46 dB at night.

6.2 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 2.

Table 2 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5\ min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
Position 1 (rear of site)	15:27	58	78	48	Pedestrians, aircraft, construction
	15:39	57	71	49	Pedestrians, aircraft, construction, minor traffic
	15:50	55	67	50	Aircraft, pedestrians, minor traffic, police siren
Position 2 (front of site on Macklin Street)	16:01	58	68	57	Aircraft, plant, minor traffic, construction
	16:07	58	70	57	Aircraft, plant, minor traffic, construction
	16:13	57	70	56	Aircraft, plant, minor traffic, construction
Position 3 (roof)	16:23	44	55	43	Plant, aircraft, minor construction
	16:45	48	61	44	Plant, aircraft, minor construction
	16:51	49	65	44	Plant, aircraft, minor construction

An additional 15-minute measurement was taken on the terrace at the rear of the site (position 3). The results are shown in Table 3.

Table 3 Time synchronized measurement results

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15\ min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
3	16:30	45	57	42	Plant, aircraft, distant construction and distant traffic

Due to inability to gain access to a suitable location at the rear of the site to install a long term noise monitor, attended measurement data, taken at the position most representative of noise levels incident on the nearest receiver at the rear of the site (Position 1), is used to correct representative background noise measured at the front of the site for the back of site. Position 1 is equidistant to the facade of the site and the facade of the nearest noise sensitive premises.

Measurements at Position 1 were taken between 15:27 and 15:55 and show consistent results. Average of those measurements and data from the long-term noise monitor recorded over same time period is presented in Table 4.

Table 4 Comparison between position 1 and position L

Position	Duration	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{AFmax}	L_{A90}	
L	15:27 – 15:55	59	73	56	Plant, aircraft, distant construction and distant traffic
1	15:27 – 15:55	57	72	49	Plant, aircraft, distant construction and distant traffic

It should be noted that measurements at Position 1 were taken in the free-field. As a result, a facade L_{90} at position 1 would be 52 dB.

Background noise at the front facade of the development at the time of the measurements is $L_{90,15\ min}$ 56 dB. Background noise at the rear facade of the development at the time of the measurements is $L_{90,5\ min}$ 52 dB, averaged over three five-minute-long measurements.

Following the assessment above, the representative background noise at the rear of the site is 4 dB below the representative background noise level at the front of the site.

7 Assessment criteria

7.1 NPPF and NPSE

The National Planning Policy Framework, February 2019 (NPPF) sets out the UK government's planning policies for England. It supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

> *'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> - *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*
> - *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.'*

and

> *'Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'*

The NPSE states that its aims are as follows:

> *'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.'*

As such, neither document sets out specific acoustic criteria for new residential developments, but they require consideration of the effect of existing noise on the new development and the effect of noise from the development on the surroundings.

7.2 ProPG

ProPG *Planning & Noise (Professional Practice Guidance on Planning & Noise), New Residential Development, 2017* provides guidance to the management of noise within the planning system in England. It is restricted to consideration of new residential developments that will be exposed predominantly to airborne noise from transport sources.

The two stages of the approach are given below

- Stage 1 – Initial noise risk assessment of the proposed development site
- Stage 2 – Systematic consideration of four key elements
    - Element 1 – Demonstrating a ”Good Acoustic Design Process”
    - Element 2 – Observing internal “Noise Level Guidelines”
    - Element 3 – Undertaking an “External Amenity Area Noise Assessment”
    - Element 4 – Consideration of “Other Relevant Issues”.

Following this approach, there are four possible recommendations, the choice of recommendation is as follows:

- Grant without conditions
- Grant with conditions
- Avoid
- Prevent.

Guidance provided in ProPG has been used to assess the proposed development site and recommend mitigation measures to reduce noise levels.

7.3 Noise egress

7.3.1 Standard guidance

BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains ‘attention catching features’ such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

7.3.2 Local Authority criteria

In relation to noise egress from industrial and commercial noise sources, London Borough of Camden's local plan (June 2017) states:

"*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 (15 dB if tonal components are present) should be considered as design criterion."*

Based on the extract from Camden Local Plan, all external plant must be such that the cumulative noise 1 m away from the windows of the nearest noise sensitive receptors is 10 dB below the representative measured background level ($L_{A90,\ 15\ min}$).

7.4 Noise ingress

7.4.1 British Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS 8233:2014 *Sound insulation and noise reduction for buildings*. The guidance limits are shown in Table 5.

These internal levels are based on annual average data and do not have to be achieved in all circumstances. It is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Table 5 Internal noise criteria for sleeping/resting

Internal space	Indoor ambient noise level, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
Living rooms	35	-
Dining room	40	-
Bedrooms	35	30[1]

[1] BS 8233 notes that individual noise events can cause sleep disturbance, and that a guideline value may be set depending on the character and number of events per night, although no specific limit is provided. For regular events, such as scheduled aircraft or passing trains, a guideline value may be set in terms of SEL or $L_{Amax,F}$. Sporadic noise events could require separate values.

The standard states that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

For external amenity areas, such as gardens and patios, the standard states:

> *'it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.'*

7.4.2 ProPG

Internal noise ingress criteria in ProPG are the same as in BS 8233:2014 but additional guidance is provided. In relation to regular individual noise events the following additional guidance is provided:

> *'In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events*.'

7.4.3 Local Authority requirements

Camden Local Plan sets out noise thresholds in terms of 'effect levels' described in the NPPF and PPG:

- NOEL – No Observed Effect Level
- LOAEL – Lowest Observed Adverse Effect Level
- SOAEL – Significant Observed Adverse Effect Level

According to Camdel Local Plan, three design criteria have been set for proposed development, as below:

- Green – where noise is considered to be at 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

Bedroom internal criteria, set out in Camden Local Plan in accordance with three design criteria, is duplicated in Table 6.

Table 6 Noise thresholds in accordance with Camden Local Plan

Design period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Day	$L_{Aeq\ 16\ hr}$<35 dB	$L_{Aeq\ 16\ hr}$ 35-45 dB	$L_{Aeq\ 16\ hr}$>45 dB
Night	$L_{Aeq\ 8\ hr}$<30 dB	$L_{Aeq\ 8\ hr}$ 30-40 dB	$L_{Aeq\ 8\ hr}$>40 dB
	L_{AFmax} 42 dB	L_{AFmax} 40-73 dB	L_{AFmax} >73 dB

The Camden Local Plan does not specify specific criteria for NOEL category.

The proposed development facade will be designed to achieve the criteria set out in BS 8233 and WHO which is in general agreement with the Camden LOAEL (Green) criteria.

8 Plant noise limits – noise egress

8.1 Basic limits

Based on the criteria set out in Section 7.3.2 and the results of the noise surveys, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 7.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises at front and rear facade of the development and are presented as facade levels.

Table 7 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m $L_{Aeq,15min}$ (dB) at	
	premises on Macklin St	premises on Stukeley St
Daytime (07:00-23:00)	42	38
Night-time (23:00-07:00)	36	32

The limits set out in Table 7 do not include any attention catching features. Any item of plant that has the potential to generate attention catching features will need to be designed such that the single contribution from that item of plant is at least 5 dB below the limits set out above.

8.2 Assessment

An assessment of noise egress from the proposed external plant has been undertaken.

8.2.1 Proposed plant

The proposal includes installing 4 Daykin RXYSCQ4 condensers on the roof and one REYQ36 condenser on the first floor. The proposed locations for the plant are indicated in Figure 8 to Figure 10.

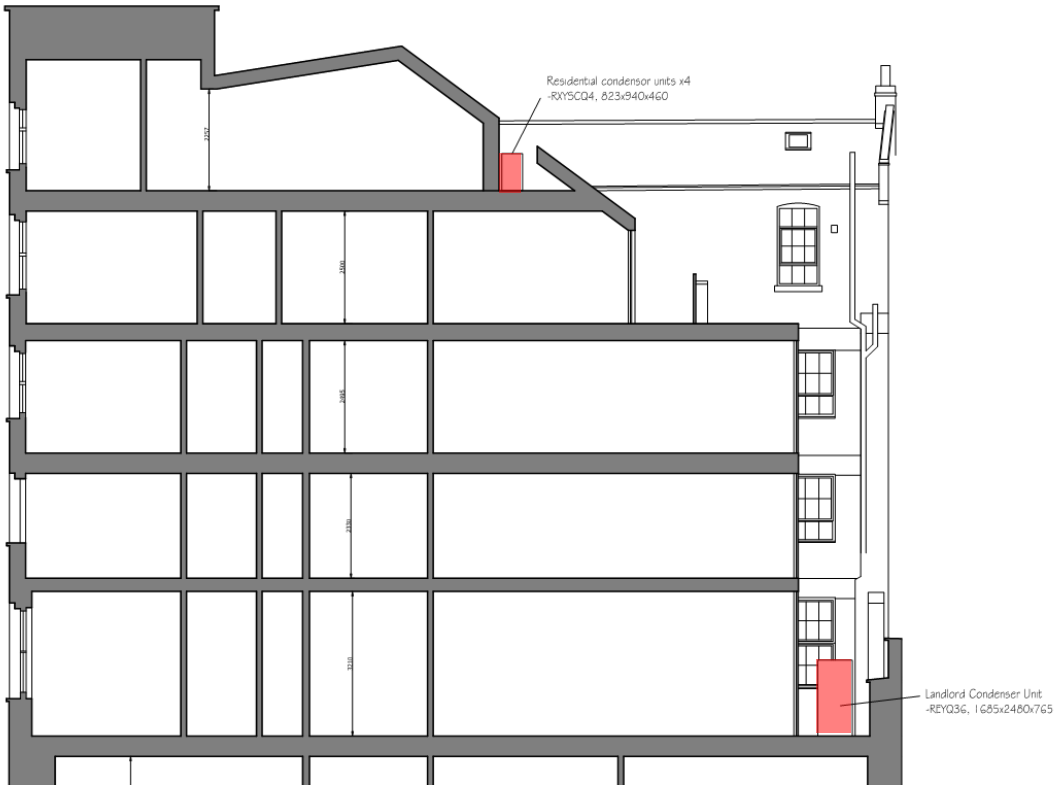


Figure 8 Proposed plant locations

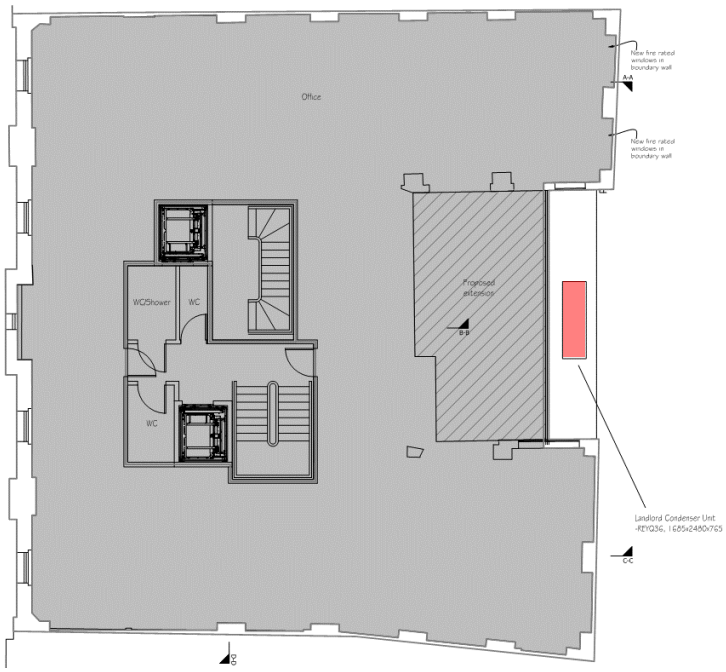


Figure 9 Proposed first floor plant location

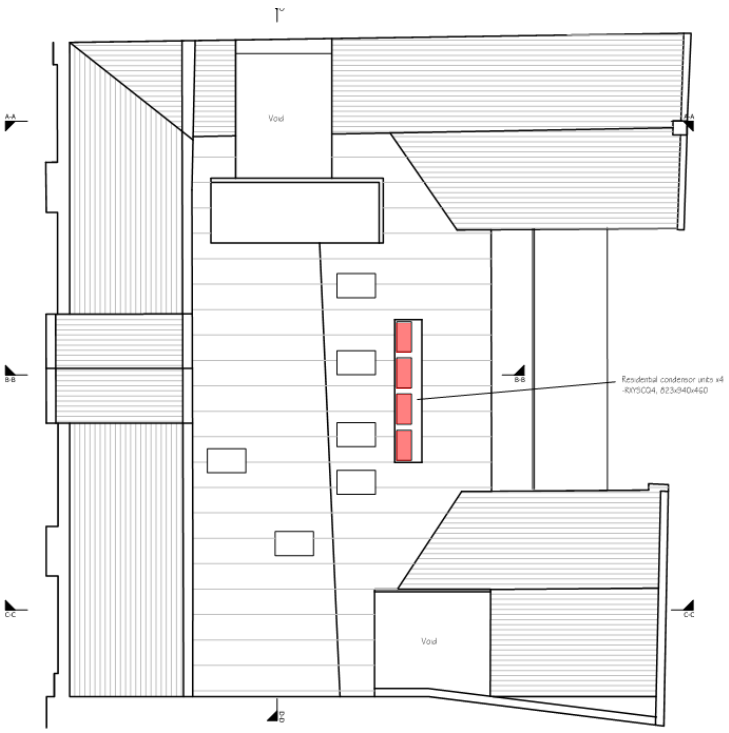


Figure 10 Proposed rooftop plant locations

The spectral sound pressure levels measured 1m away from the unit were provided by the manufacturer and are quoted in Table 8

Table 8 Sound pressure levels provided by manufacturer (dB, at 1m)

Unit	Octave band centre frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
RXYSCQ4	44	53	44	52	47	39	33	25	52
REYQ36T	65	65	67	65	60	57	53	46	66

8.2.2 Sound pressure level 1 m from nearest noise sensitive receptor

The nearest noise sensitive receptor to the proposed plant are north side windows of 1-7 Macklin St.

An assessment has been conducted, based on the data provided by the manufacturer, screening provided by building elements and neighbouring building and distance to the nearest windows of 1-7 Macklin St. Breakdown of the calculations can be seen in Appendix C

The cumulative noise level generated by all the proposed plant 1 m from the worst affected windows of the nearest noise sensitive premises is L_{Aeq} 29 dB. This is compliant with the daytime and night-time limits established in this report and is compliant with London Borough of Camden's criteria.

9 Facade sound insulation – noise ingress

This section describes an assessment of facade sound insulation to control noise ingress. The required facade specification largely depends on the external noise levels and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended in BS 8233:2014 and by London Borough of Camden, which are set out in Section 7.4.

9.1 External noise levels

Predicted external noise levels at the facades of the proposed development are L_{Aeq} 58 dB at the front and rear of the development during the day and L_{Aeq} 53 at night.

Predicted external level on the open terrace and incident on the proposed new facade of the residential accommodation is L_{Aeq} 45 dB.

9.2 Facade sound insulation

In order to achieve the internal noise criteria, front and rear facades need to achieve sound insulation performance of at least R_w+C_{tr} 23 dB. The new facade at the rear of the development will need to achieve a sound insulation performance of at least R_w+C_{tr} 15 dB.

It is understood that double glazing is proposed in the scheme. Standard double glazing achieves a sound insulation performance of around R_w+C_{tr} 28, which will satisfy the above requirements.

At this site, the facade performance requirements are driven by the daytime and night time ambient noise levels, as well as night time maximum noise levels. The facade specification has been determined to ensure that $L_{AFmax\ 15\ min}$ criteria set out by London Borough of Camden is exceeded on no more than 8 occasions based on the worst affected night during the survey.

10 External amenity areas

There are four external terraces proposed in the scheme. Those areas are marked up in red on Figure 11. Their approximate locations in relation to existing buildings surrounding the site are also shown in Figure 11.

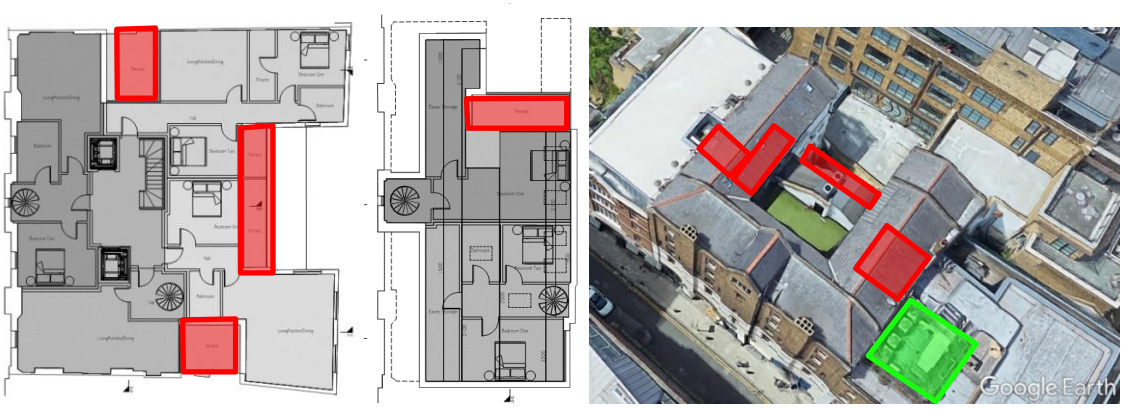


Figure 11 External amenity spaces

The ambient noise level on existing outdoor terrace ranged between L_{Aeq} 44-49 dB. The ambient noise level at this location aligns with the BS 8233 recommended criteria.

The background noise level, which was dominated by plant from the neighbouring buildings, was $L_{A90,15mins}$ 42 dB. Whilst the background noise level is dominated by plant the absolute noise level is considered to be unlikely to cause annoyance based on the urban location.

It was not possible to measure noise level representative of the proposed western terraces. From its proposed location, it will likely be screened from most sources affecting the surrounding noise climate, therefore the noise levels on the proposed western terrace are expected to be similar to the noise levels on the existing terrace.

It was not possible to measure noise levels representative of the proposed eastern terrace. However, its proposed location is in close proximity to existing external plant of a neighbouring building as highlighted in green in Figure 11. It is understood that the proposal includes a solid 2 m high barrier along the site boundary, as shown in Figure 12. The barrier will reduce noise level at this terrace from the local plant to an absolute level that is unlikely to cause annoyance.

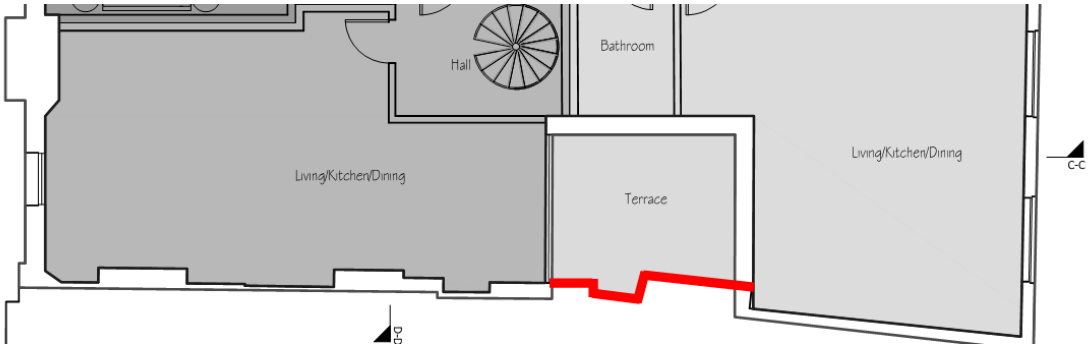


Figure 12 Proposed screening location

11 Conclusion

The representative measured background sound levels were $L_{A90,15min}$ 52 dB during the day, and $L_{A90,15min}$ 46 dB during the night. Based on the requirements of London Borough of Camden, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises on the front of the site (Macklin St windows of 1-7 Macklin St) does not exceed L_{Aeq} 42 dB during the daytime and L_{Aeq} 36 dB during the night.

Plant must also be designed such, that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises at the rear of the site (Stukeley St windows of 1-7 Macklin St) does not exceed L_{Aeq} 38 dB during the daytime and L_{Aeq} 32 dB during the night. These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent.

An assessment of noise from the proposed heat rejection equipment has been undertaken. The cumulative noise level from all plant operating at the worst affected residential receptor is L_{Aeq} 29 dB and is compliant with the London Borough of Camden's plant noise criteria.

An initial assessment has been carried out to determine required acoustic performances for the facades and provide guidance on the ventilation strategy. The highest facade sound insulation performance required is R_w+C_{tr} 23 dB. This can be achieved using standard double glazing, which typically achieves sound insulation performance of around R_w+C_{tr} 28 dB.

A solid screen is proposed for the eastern outdoor terrace to reduce potential annoyance from the existing neighbouring plant. The screen is expected to ensure the ambient noise level on all outdoor terraces are less than L_{Aeq} 50 dB therefore and align with the BS 8233 recommended criteria.

Appendix A - Survey details

Equipment

The unattended and attended noise measurements were taken using a Rion NL-52 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00242702	Rion	30 Jan 21	TCRT19/1091
Microphone	UC-59/06185	Rion	30 Jan 21	TCRT19/1091
Pre-amp	NH-25/32730	Rion	30 Jan 21	TCRT19/1091
Calibrator	CAL200/4499	Larson Davis	30 Jan 21	TCRT19/1090
Sound level meter	NL-52/00375679	Rion	6 Jul 19	TCRT17/1440
Microphone	UC-59/11168	Rion	6 Jul 19	TCRT17/1440
Pre-amp	NH-25/65806	Rion	6 Jul 19	TCRT17/1440
Calibrator	SV30A/10576	Svan	3 Jul 19	TCRT17/1418

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

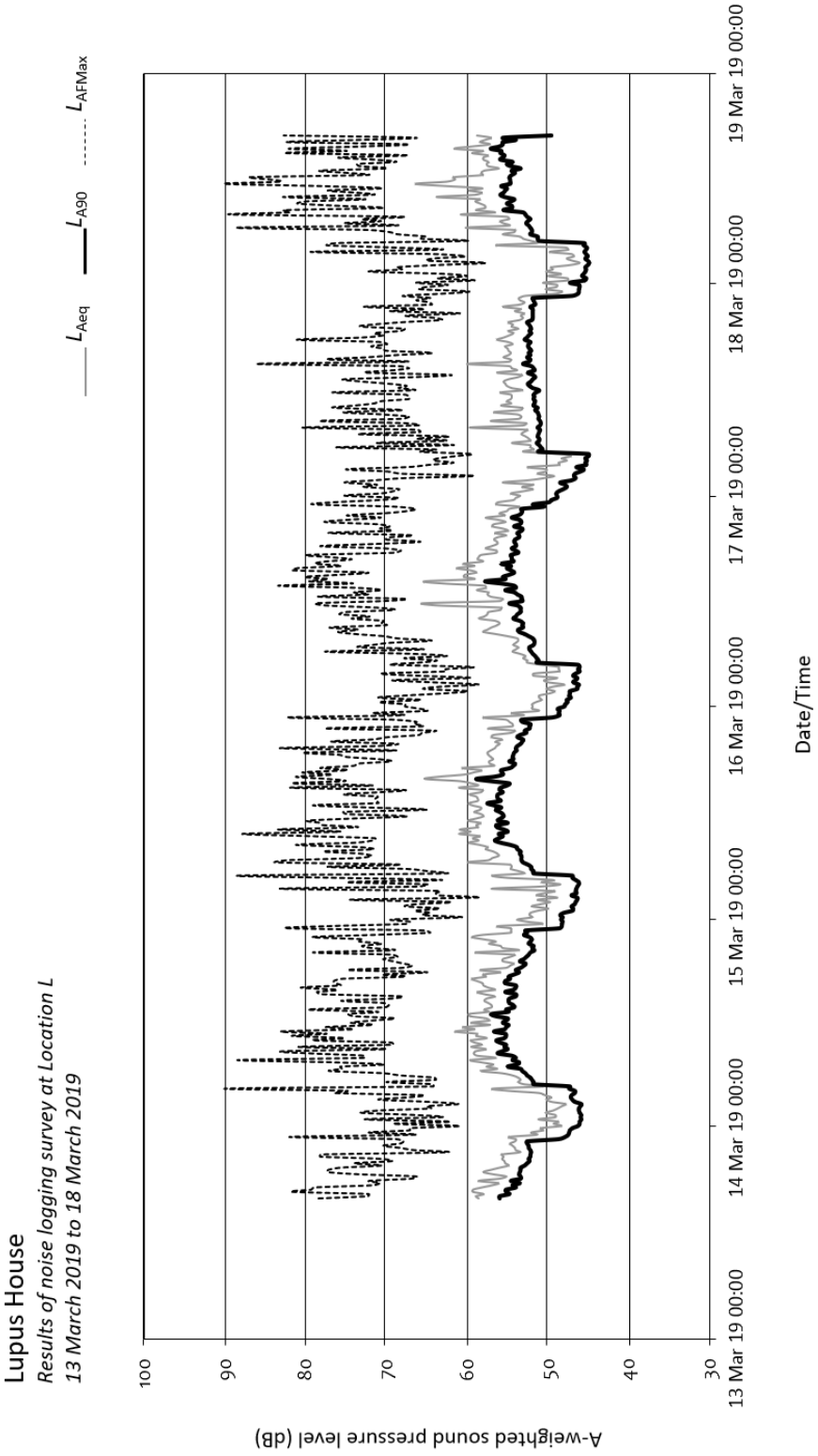
Weather conditions

During the attended noise measurements, the weather was generally clear and dry and no rain occurred. Wind speeds were measured at each position and varied between 0 m/s and 5 m/s.

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 5°C at night and 12°C during the day, and the wind speed was mostly less than 5 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B - Results of unattended measurements at Location L


Lupus House
Results of noise logging survey at Location L
13 March 2019 to 18 March 2019
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
100
90
80
70
60
50
40
30
13 Mar 19 00:00
14 Mar 19 00:00
15 Mar 19 00:00
16 Mar 19 00:00
17 Mar 19 00:00
18 Mar 19 00:00
19 Mar 19 00:00
Date/Time

Appendix C – Plant noise assessment breakdown

Comments	Octave band centre frequency (Hz)								Rating 1	Rating 2
	63	125	250	500	1k	2k	4k	8k		

19088 - Lupus house

Plant noise assessment

Criteria										
Daytime									L_A=	**38.0**
Nightime									L_A=	**32.0**
Result										
SPL (dB) 1m from windows									L_A=	**29**
Calc										
Rooftop condensers										
RXYSCQ4 SPL @1m (dB)	44	53	44	52	47	39	33	25	L_A=	**52**
4 units (10*log(n))	6	6	6	6	6	6	6	6	n=	4
20log(r1/r2), r1=1, r2=20	-26	-26	-26	-26	-26	-26	-26	-26		
Barrier atten (PD = 0.2m)	-6	-7	-9	-11	-14	-17	-20	-23		
Result 1m from receptor	18	26	15	21	13	2	-7	-18	L_A=	**20**
Landlord condensor										
REYQ20T SPL @1m (dB)	65	65	67	65	60	57	53	46	L_A=	**66**
20log(r1/r2), r1=1, r2=20	-26	-26	-26	-26	-26	-26	-26	-26		
Barrier atten (PD = 0.2m)	-6	-7	-9	-11	-14	-17	-20	-23		
Result 1m from receptor	33	32	32	28	20	14	7	-3	L_A=	**29**
Combined result at receptor	33	33	32	29	21	15	7	-3	L_A=	**29**