ACAACOUSTICS

Acoustic assessment of proposed mechanical equipment at 2-6 Camden High Street, London

Report Reference: 180417-R001

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CONTENTS

0. SUMMARY

- ACA Acoustics Limited have been commissioned to assess the acoustic impact of proposed new mechanical equipment to be installed at 2-6 Camden High Street, Camden, NW1 8AF.

- The assessment is required to provide evidence that noise emissions from the equipment will not be detrimental to the amenity of nearby noise sensitive properties and complies with the requirements of London Borough of Camden Council. London Borough of Camden Council's requirement, applicable at this site, is that the rating level of sound from the equipment shall ideally not exceed 10dB below the existing background LA90 outside nearby noise-sensitive properties.

- Noise-sensitive receivers have been identified as windows to apartments at Bayham Place. A survey was carried out at rear flat roof level of 2 Camden Highstreet, overlooking Bayham Place to establish existing background sound levels in the vicinity.

- Representative background sound levels were measured at LAF90 54dB during the proposed operating times of the new equipment, between 07:00 – 19:00. Based on results of the sound level survey and London Borough of Camden Council's requirement, the overall rating sound level limit for the equipment to outside the nearest noise-sensitive windows is set at ≤ 44dBA.

- Calculations using manufacturer's sound level data for the new mechanical equipment, allowing for the benefit of noise mitigation treatments as set out in this report, confirm that the cumulative sound level for all the new plant operating will be not exceed the above criteria and should not be detrimental to the amenity of nearby residents.

1. INTRODUCTION

New mechanical equipment is to be installed at 2-6 Camden High Street, London.

The Planning Department of London Borough of Camden Council requires information in the form of an acoustic report regarding noise from the equipment. The report is required to demonstrate that noise emissions from the plant complies with London Borough of Camden Council's acoustic requirements applicable for mechanical services equipment affecting nearby noise-sensitive properties.

ACA Acoustics Limited has been commissioned by the client to carry out an assessment of noise from the new equipment and, where necessary, make recommendation to reduce sound levels from the equipment.

This report presents results of the sound level survey and assessment.

2. LONDON BOROUGH OF CAMDEN COUNCIL'S ACOUSTIC REQUIREMENTS

London Borough of Camden Council's policies relating to noise are set out in Appendix 2 of the Local Plan, which provides detailed noise thresholds to determine the potential acoustic impact of new developments.

In summary, London Borough of Camden requires an assessment to be carried out in accordance with British Standard 4142:2014 and the results compared against noise-related conditions set out in Table C of the Appendix, as shown in Table 1 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 57dB LAFmax	Rating level between 9dB below and 5dB above background or noise events between 57dB and 88dB LAFmax	Rating level greater than 5dB above background and/or events exceeding 88dB LAFmax

Table 1: London Borough of Camden Noise Limits

The scope of BS 4142:2014 advises that "*this British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature … to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*". BS 4142:2014 is commonly used to assess the potential for loss of amenity due to noise from mechanical services equipment and is considered appropriate for this application.

The assessment method of BS 4142:2014 corrects the specific sound level from the source under investigation to account for characteristics that could make the sound more intrusive to obtain a rating level. This rating level is compared against the prevailing background sound level outside the noise-sensitive property. Section 11 of BS 4142:2014 provides a commentary of the assessment result and advises that:

a) The greater the difference between the rating level and the background sound level, 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 +5dB is likely to be an indication of an adverse impact, depending on the context;
d) The lower the rating level is 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.

Assessment result criteria shown within Appendix A of Camden's Local Plan are significantly more stringent than those set out in the British Standard and can therefore be taken to ensure a robust assessment. Compliance with the "Green" criteria or lower half of the "Amber" range will generally ensure no loss of amenity to nearby residents, albeit, the context of the development must also be considered on a project-by-project basis which can alter the initial assessment result. This is discussed in more detail in Section 4.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is at 2-6 Camden Road, London.

A planning application is being prepared, to include the installation of 5no. air conditioning condensing units, details of which can be found in section 5 of this report. A layout drawing showing the proposed location of the units in blue is provided below in Figure 1.

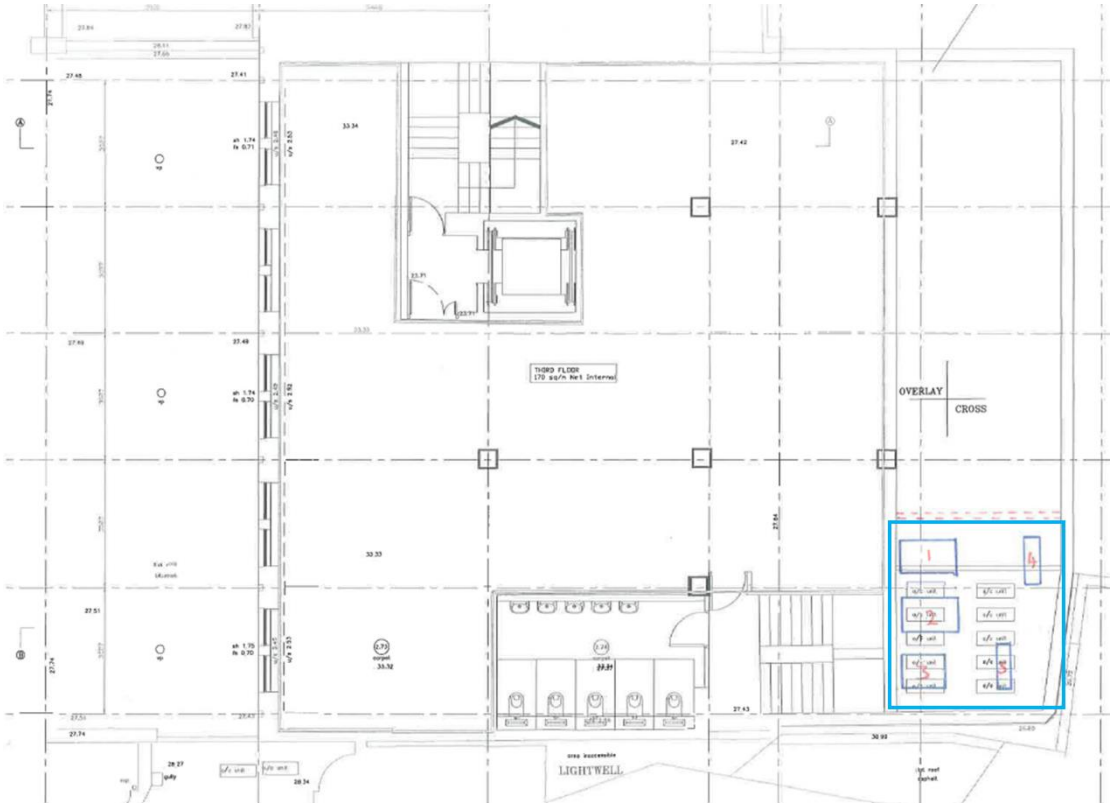

Figure 1 - Proposed equipment location

4. SOUND LEVEL SURVEY

To assess sound levels from the new mechanical equipment it is necessary to establish background sound levels in the vicinity. Details of the sound level survey carried out by ACA Acoustics Limited are provided below.

A sound level survey measurement position was selected to the flat roof, overlooking Bayham Place, equivalent to the position of the nearest residential windows. The unattended survey was carried out over a nominally 24-hour period between 25th – 26th April 2018. During the survey the weather remained dry and calm.

The following equipment was used during the survey; the sound level meter was calibrated before and checked after the survey measurements with no change noted:

Equipment	Serial Number	Calibration Certificate
NTi Audio sound level meter type XL2-TA Class 1 complete with weatherproof and lockable outdoor environmental kit	A2A-12174-E0	43182
Castle calibrator type 4226. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	1551589	044039/68679

Table 2: Equipment used

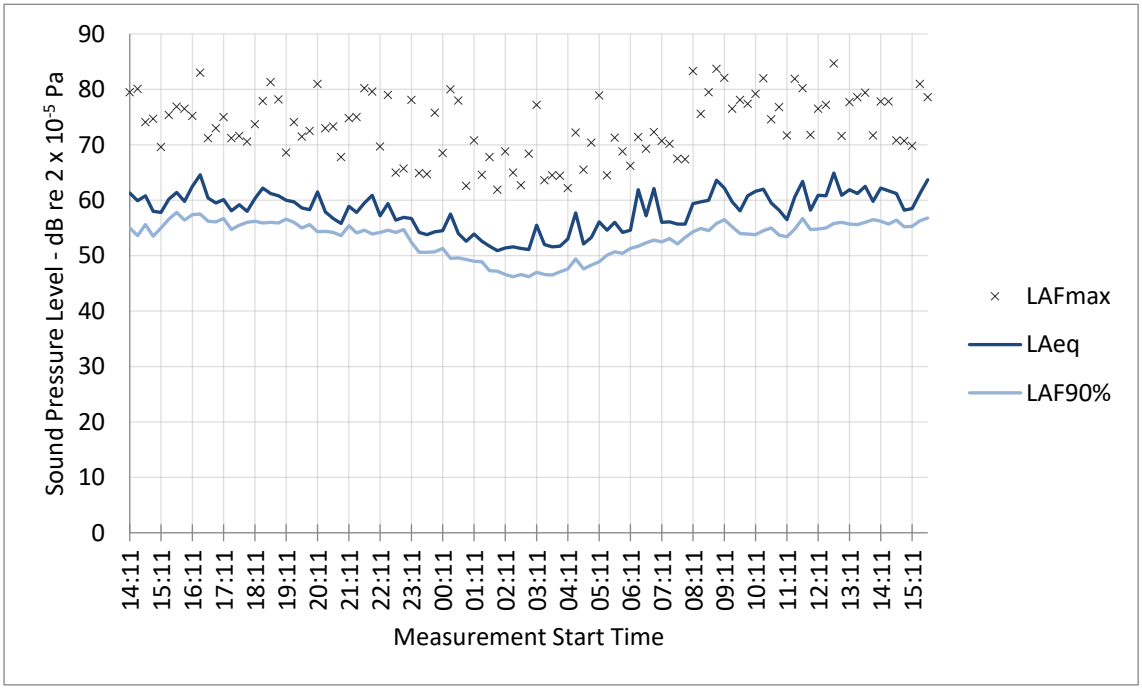

Figure 2: 24-hour sound level survey results at 2 Camden Street

In accordance with BS 4142:214, the prevailing background sound level is not necessarily taken to be the lowest recorded values, but rather the level that best represents the typical background sound level during a defined period. The author has been advised that the units are likely to be operating during office hours, between 07:00 and 19:00 on weekdays.

A statistical analysis of the measured sound levels has been carried out, generally following suggested guidance contained in Section 8 of the Standard. Distribution of the measured LA90 sound levels over the proposed operating times of the equipment are shown in Figure 3 below.

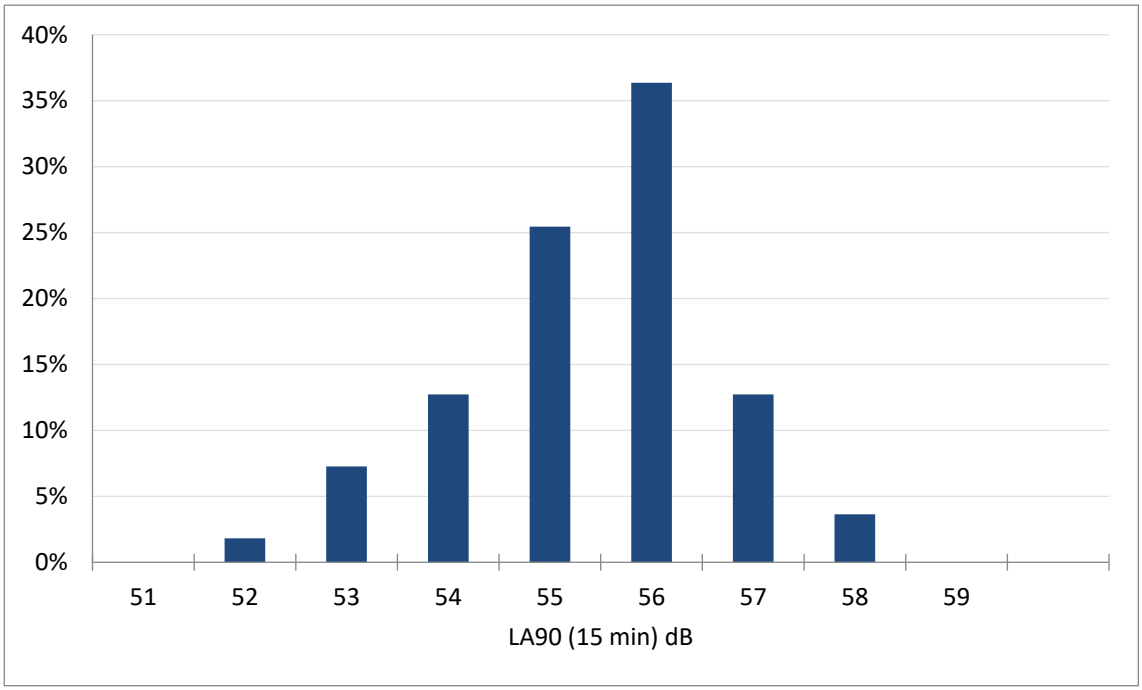

Figure 3: Statistical analysis of measured LA90 levels between 07:00 – 19:00

The values recorded by ACA Acoustics Limited are used as basis for acoustic design such that rating levels from the proposed new equipment are ≤44dBA outside the closest noise sensitive windows during the proposed operating times of the equipment; this is at least 10dBA below the representative night time background sound level. Confirmation of the background sound level used in the assessment is shown in Table 3 below.

Survey Date	Location	Existing Measured Background LA90, 15 min
25th – 26th April 2018	Bayham Place	54dBA

Table 3: Summary background sound level survey results

5. ACOUSTIC ASSESSMENT

The development includes the installation of 5no. air conditioning condensing units. Confirmation of the equipment model used in the assessment is provided in Table 4 below.

Description	Equipment Model
CU1	Mitsubishi PURY-P300YLM-A
CU2	Mitsubishi PURY-P300YLM-A
CU3	Mitsubishi PURY-P200YLM-A1
CU4	Mitsubishi PUMY-P200YKM
CU5	Mitsubishi PUMY-P112YKM

Table 4: Proposed new mechanical equipment

Sound emissions from the mechanical equipment can be determined from manufacturer's published data. Note that alterations in equipment selections may be possible, so long as sound power levels for the new item does not exceed levels used in the calculation model as shown in Appendix A.

A computer model has been used to calculate the noise contribution from the proposed plant to outside nearest noise-sensitive windows. The model incorporates environmental corrections set out in ISO 9613-2:1996.

The calculated specific sound level from the equipment to outside the closest noise sensitive windows is shown in Table 5. Summary print-outs from the calculation models are included in Appendix A.

Receptor Location	Calculated Equipment Sound Levels
Windows to properties on Bayham Place	44dBA

Table 5: Calculated cumulative equipment sound levels at 1m outside noise-sensitive windows

Assessment of the calculated specific sound levels in accordance with BS 4142:2014 is provided in Table 6 below.

Description	Assessment location:	Relevant Clause	Commentary
Calculated specific sound level to closest noise-sensitive windows	LAeq 44dB	7.1 7.3.6	Refer calculation sheets in Appendix A.
Background sound level	LA90 54dB	8.1.3 8.3	Representative night time background sound level.
Acoustic feature correction	0dB	9.2	The calculated specific sound level is at least 10dBA below the representative measured background sound level during operating hours. Sound emissions from the equipment are likely to be inaudible to outside nearby noise-sensitive properties and therefore, as discussed in Example 6 of BS 4142:2014 Appendix A, where it is not possible to clearly define the specific sound source above the prevailing background sound level then no penalty for acoustic features is required.
Rating level	LAr 44dB		
Excess of rating level over background sound level	**-10dBA**	**11**	**Assessment indicates negligible likelihood of adverse impact**

Table 6: BS 4142:2014 Assessment for all plant operating simultaneously

Table 6 shows that the overall rating level of the proposed new equipment will be at least 10dBA below the background LA90 sound level to outside the closest noise-sensitive properties.

BS 4142:2014 requires an assessment to consider the context of the development, rather than simply adhering to numerical figures. The specific sound level of the new plant has been calculated to be at least 10dBA below the representative background sound level outside these closest noise-sensitive properties. At these levels noise from the new equipment should be inaudible to nearby occupants.

Although the proposed residential properties are screened from Camden High Street, existing levels in the vicinity are dominated by traffic noise, and it is anticipated that the addition of the proposed

equipment at a rating level of 10dB below the prevailing background sound level is highly unlikely to cause disturbance to nearby residential occupiers.

Considering the specific numerical value, allowing for a reduction of 15dBA through partially open windows, as described in BS 8233:2014, this equates to a maximum level inside closest residential properties from the new equipment of 29dBA. This is below the guideline sound level to bedrooms of LAeq 30dB set out in BS 8233:2014 and at a level that would be significantly below internal ambient sound levels from sources within the property itself.

The author considers that the context of the assessment does not alter the initial estimate of the impact, and, following installation of mitigation treatments as detailed in section 6 below, that sound levels from the new mechanical equipment should not be detrimental to the amenity of any residential occupiers in the vicinity and no further noise mitigation measures will be required.

6. RECOMMENDATIONS FOR NOISE AND VIBRATION CONTROL TREATMENTS

Note that consideration of non-acoustic aspects including, but not limited to structural calculations, airflow and pressure drop and construction material are outside the scope of ACA Acoustics Limited and should be considered by others accordingly. Alternative methods of attenuation to those detailed below may be acceptable, for example relocation of noisy equipment to other, less sensitive, areas of the development. Full details of any alternative scheme, including working drawings and expected attenuation should be submitted and approved prior to manufacture.

6.1 Acoustic Enclosure

It is recommended that the condensing units be installed behind an acoustic screen, with an acoustic louvre to the top.

It is advised that suitable acoustic panels would typically be formed from 2m high 50mm thick acoustic panels incorporating 18swg steel outer casing, 50mm mineral wool insulation and perforated steel inner casing. Apertures in the panels for pipework penetrating the enclosure should be sealed airtight with foam strips and a non-hardening flexible mastic. The panels should provide screening from the units to windows with line of sight and extend down to touch the floor with no gaps. Suggested layout of the panels can be seen in blue in Figure 3 below.

It is advised that an acoustic louvre is applied to the top of the screen, covering the condensing units. A single louvre may be installed over all the condensers, with no gaps at the edges. A suitable louvred enclosure would typically be formed from 150mm deep acoustic louvres such as Allaway Acoustic's AL1515 model or equivalent. Minimum insertion loss performance for the louvres is shown on the schedule in Appendix B. Suggested layout of the louvre can be seen in green in Figure 4 below.

Structural supports/steelwork and access panels or doors may be required and should be determined by the successful supplier accordingly.

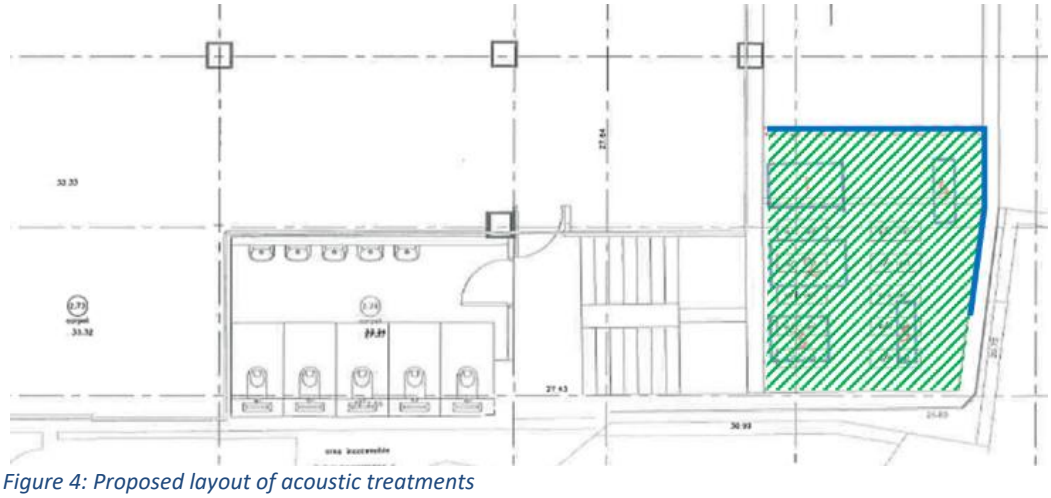

Figure 4: Proposed layout of acoustic treatments

7. CONCLUSION

New mechanical equipment associated with offices at 2 Camden High Street, Camden are to be installed.

ACA Acoustics have undertaken a background sound level survey in the vicinity and calculated maximum permissible source sound emissions from the new equipment.

Calculated cumulative rating levels with new equipment operating will be designed to be at least 10dBA below the prevailing background sound level to outside the closest noise-sensitive properties. At this level, the new equipment will fully comply with London Borough of Camden's requirements and will not be detrimental to the amenity of nearby residents.

APPENDIX A

Acoustic Calculations

Calculation Sheet

CU1 to Nearest residential properties on Bayham Place

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - CU1									
Sound Power Levels		**90.0**	**85.0**	**81.0**	**78.0**	**72.0**	**64.0**	**57.0**	**53.0**
Noise Control Treatments									
Treatment - Acoustic Louvred Enclosure		*-4.0*	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
ISO 9613 Calculation									
Horiz. Distance (m)	15.0								
Source Height (m)	13.7								
Receiver Height (m)	9.0								
Q Factor - Junction									
Direct Lp		**60.1**	**52.0**	**47.1**	**41.0**	**31.0**	**18.9**	**12.6**	**9.2**
ISO 9613 Barrier Attenuation									
		-8.8	*-6.6*	*-8.0*	*-9.9*	*-12.2*	*-14.7*	*-17.5*	*-20.0*
External Receiver									
External Receiver - Nearest residential properties on Bayham Place									
Sound Pressure, Lp:		**51.2**	**45.4**	**39.0**	**31.2**	**18.9**	**4.2**	**-5.0**	**-10.8**

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Calculation Sheet

CU2 to Nearest residential properties on Bayham Place

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - CU2									
Sound Power Levels		**90.0**	**85.0**	**81.0**	**78.0**	**72.0**	**64.0**	**57.0**	**53.0**
Noise Control Treatments									
Treatment - Acoustic Louvred Enclosure		*-4.0*	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
ISO 9613 Calculation									
Horiz. Distance (m)	15.0								
Source Height (m)	13.7								
Receiver Height (m)	9.0								
Q Factor - Junction									
Direct Lp		**60.1**	**52.0**	**47.1**	**41.0**	**31.0**	**18.9**	**12.6**	**9.2**
ISO 9613 Barrier Attenuation									
		-8.8	*-6.6*	*-8.0*	*-9.9*	*-12.2*	*-14.7*	*-17.5*	*-20.0*
External Receiver									
External Receiver - Nearest residential properties on Bayham Place									
Sound Pressure, Lp:		**51.2**	**45.4**	**39.0**	**31.2**	**18.9**	**4.2**	**-5.0**	**-10.8**

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Calculation Sheet

CU3 to Nearest residential properties on Bayham Place

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - CU3									
Sound Power Levels		**99.0**	**89.0**	**86.0**	**82.0**	**75.0**	**69.0**	**63.0**	**57.0**
Noise Control Treatments									
Treatment - Acoustic Louvred Enclosure		*-4.0*	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
ISO 9613 Calculation									
Horiz. Distance (m)	15.0								
Source Height (m)	13.7								
Receiver Height (m)	9.0								
Q Factor - Corner									
Direct Lp		**72.1**	**59.0**	**55.1**	**48.0**	**37.0**	**26.9**	**21.6**	**16.2**
ISO 9613 Barrier Attenuation									
		-8.8	*-6.6*	*-8.0*	*-9.9*	*-12.2*	*-14.7*	*-17.5*	*-20.0*
External Receiver									
External Receiver - Nearest residential properties on Bayham Place									
Sound Pressure, Lp:		**63.2**	**52.4**	**47.0**	**38.2**	**24.9**	**12.2**	**4.0**	**-3.8**

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Calculation Sheet

CU4 to Nearest residential properties on Bayham Place

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - CU4									
Sound Power Levels		**78.0**	**75.0**	**75.0**	**72.0**	**71.0**	**66.0**	**63.0**	**56.0**
Noise Control Treatments									
Treatment - Acoustic Louvred Enclosure		*-4.0*	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
ISO 9613 Calculation									
Horiz. Distance (m)	15.0								
Source Height (m)	12.7								
Receiver Height (m)	9.0								
Q Factor - Plane									
Direct Lp		**45.2**	**39.1**	**38.2**	**32.2**	**27.2**	**18.1**	**15.7**	**9.4**
ISO 9613 Barrier Attenuation									
		-11.1	*-9.8*	*-12.2*	*-14.8*	*-17.6*	*-20.0*	*-20.0*	*-20.0*
External Receiver									
External Receiver - Nearest residential properties on Bayham Place									
Sound Pressure, Lp:		**34.1**	**29.3**	**26.0**	**17.4**	**9.6**	**-1.9**	**-4.3**	**-10.6**

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Calculation Sheet

CU5 to Nearest residential properties on Bayham Place

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - CU5									
Sound Power Levels		**78.0**	**66.0**	**65.0**	**63.0**	**60.0**	**55.0**	**49.0**	**44.0**
Noise Control Treatments									
Treatment - Acoustic Louvred Enclosure		*-4.0*	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
ISO 9613 Calculation									
Horiz. Distance (m)	15.0								
Source Height (m)	12.7								
Receiver Height (m)	9.0								
Q Factor - Corner									
Direct Lp		**51.2**	**36.1**	**34.2**	**29.2**	**22.2**	**13.1**	**7.7**	**3.4**
ISO 9613 Barrier Attenuation									
		-11.1	*-9.8*	*-12.2*	*-14.8*	*-17.6*	*-20.0*	*-20.0*	*-20.0*
External Receiver									
External Receiver - Nearest residential properties on Bayham Place									
Sound Pressure, Lp:		**40.1**	**26.3**	**22.0**	**14.4**	**4.6**	**-6.9**	**-12.3**	**-16.6**

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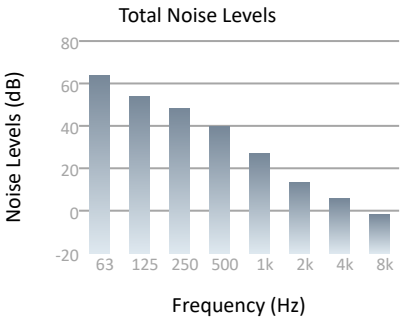
2-6 Camden High Street

Project Name	2-6 Camden High Street
Project Reference	180417
Reference	Nearest residential properties on Bayham Place
Description	
Noise Limit	44
dBA	44



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
CU1	1	51	45	39	31	19	4	-5	-11
CU2	1	51	45	39	31	19	4	-5	-11
CU3	1	63	52	47	38	25	12	4	-4
CU4	1	34	29	26	17	10	-2	-4	-11
CU5	1	40	26	22	14	5	-7	-12	-17

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APPENDIX B

Noise Control Treatments

Schedule of Noise Control Treatments

Reference	Location	Description	Insertion Losses (dB)							
			63	125	250	500	1k	2k	4k	8k
Acoustic Louvred Enclosure		AL1515	4	4	5	8	12	16	15	13

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