

Report for:

Vincent Stokes

Seven Dials, Tower Street, Covent Garden

*Noise Impact Assessment for Air
Conditioning Units*

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Seven Dials, Tower Street, Covent Garden
Noise Impact Assessment for Air Conditioning Units

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Table of Contents

1.	INTRODUCTION.....	4
2.	THE NATURE, MEASUREMENT AND AFFECT OF NOISE.....	6
3.	NOISE ASSESSMENT CRITERIA	7
3.1.	London Borough of Camden.....	7
3.2.	British Standard 4142	8
4.	BACKGROUND NOISE MEASUREMENT SURVEY.....	9
5.	PLANT NOISE LEVELS	11
5.1.	Description of the Proposed Plant.....	11
5.2.	Noise Predictions.....	12
6.	NOISE IMPACT ASSESSMENT	13
6.1.	London Borough of Camden.....	13
6.2.	British Standard 4142	14
7.	CONCLUSION	15

List of Appendices

Appendix 1	Glossary of Acoustic Terms.....	16
Appendix 2	Plant Noise Schedule	18
Appendix 3	Summary of Noise Measurements	20

List of Tables

Table 2.1:	Typical Noise Levels	6
Table 4.1:	Summary of Noise Level Measurements.....	10
Table 5.1:	Plant Noise Levels (L_w).....	12
Table 5.2:	Predicted Noise Level	12
Table 6.1:	LBC Plant Noise Assessment – Day (0700hrs – 1900hrs).....	13
Table 6.2:	LBC Plant Noise Assessment – Evening (1900hrs – 2300hrs).....	13
Table 6.3:	LBC Plant Noise Assessment – Night (2300hrs – 0700hrs).....	13
Table 6.4:	BS 4142 Plant Noise Assessment - Day.....	14
Table 6.5:	BS 4142 Plant Noise Assessment - Night.....	14

1. INTRODUCTION

ACCON UK Limited (ACCON) has been instructed by Vincent Stokes to carry out a noise impact assessment in respect of the use of a premises at 4 – 10 Tower Street, Covent Garden as a fitness centre. The general site area is illustrated in **Figure 1.1** below. The site is located within the administrative area of the London Borough of Camden (LBC).

Figure 1.1: General Site Location



A noise impact assessment for the installation of mechanical plant is required in order to support a planning application for a change of use for the premises from A1 to a D2, gym use.

A background noise measurement survey has previously been carried out to ascertain the existing ambient noise climate in the vicinity of the nearest noise sensitive dwellings, which are located within close proximity to the proposed plant location.

There are already number of air conditioning units which serve the premises mounted externally within an existing lightwell area at the rear of the building and these will be replaced by new units. The existing plant installation and closest residential property (located on the first floor of the building) is identified in **Figure 1.2**.

Figure 1.2: Existing Lightwell



The proposed replacement mechanical plant items and associated noise data are presented in **Appendix 2**.

Utilising the manufacturer's noise specification for the proposed plant, noise level predictions have been carried out in order to ascertain the resultant level of noise at nearby noise sensitive dwellings and where appropriate, noise mitigation measures are recommended.

2. THE NATURE, MEASUREMENT AND AFFECT OF NOISE

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to characterise the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB(A), has been shown to correlate closely to the subjective human response. A short glossary of acoustic terms is provided in **Appendix 1**.

When related to changes in noise, a change of ten decibels from say 60 dB(A) to 70 dB(A) would represent a doubling in 'loudness'. Similarly, a decrease in noise from 70 dB(A) to 60 dB(A) would represent a halving in 'loudness'. A change of 3 dB(A) is generally considered to be just perceptible¹. **Table 2.1** details typical noise levels.

Table 2.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

¹ Communities & Local Government (1994). Planning Policy Guidance 24: Planning & Noise.

3. NOISE ASSESSMENT CRITERIA

3.1. London Borough of Camden

The LBC's Core Strategy contains specific advice with respect to noise and vibration. Policy DP28 which is reproduced in **Figure 3.1** below provides advice on general development policy along with detailed technical guidance.

Figure 3.1: LBC - Noise and Vibration Policy

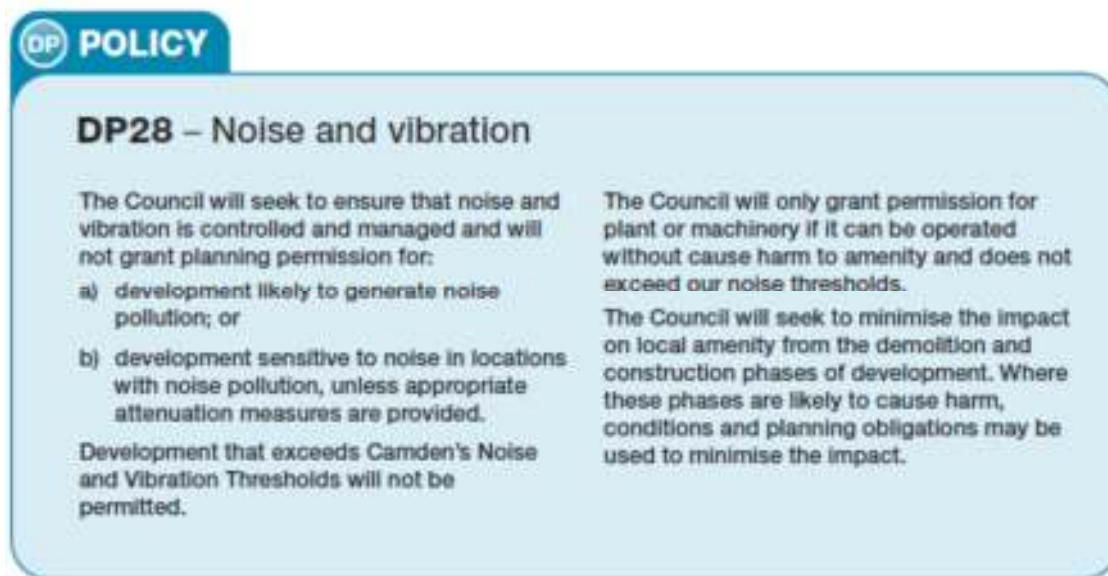


Table E of Policy DP28 provides technical guidance with respect to acceptable levels of noise from proposed fixed plant and machinery. Table E of DP28 is reproduced in **Figure 3.2** below.

Figure 3.2: LBC Noise criteria for proposed fixed plant and machinery

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB _{L_{max}}

3.2. British Standard 4142

British Standard 4142:2014 “*Methods for rating and assessing industrial and commercial sound*” provides a method for the measurement and rating of industrial type noise sources and background noise levels outside dwellings. The rating level (defined in the BS) is used to rate the noise source outside residential dwellings (this is defined as the “specific sound level”).

The rating level is determined by assessing the character of the noise and applying an acoustic feature correction if appropriate. Corrections are applied for the tonality and intermittency of the noise source which can both make noise more noticeable.

The initial assessment described in BS 4142 to determine whether an adverse impact is likely is based on establishing the difference between the rating level and the background noise level outside the residential property of interest. The British Standard states that the following points should be considered:

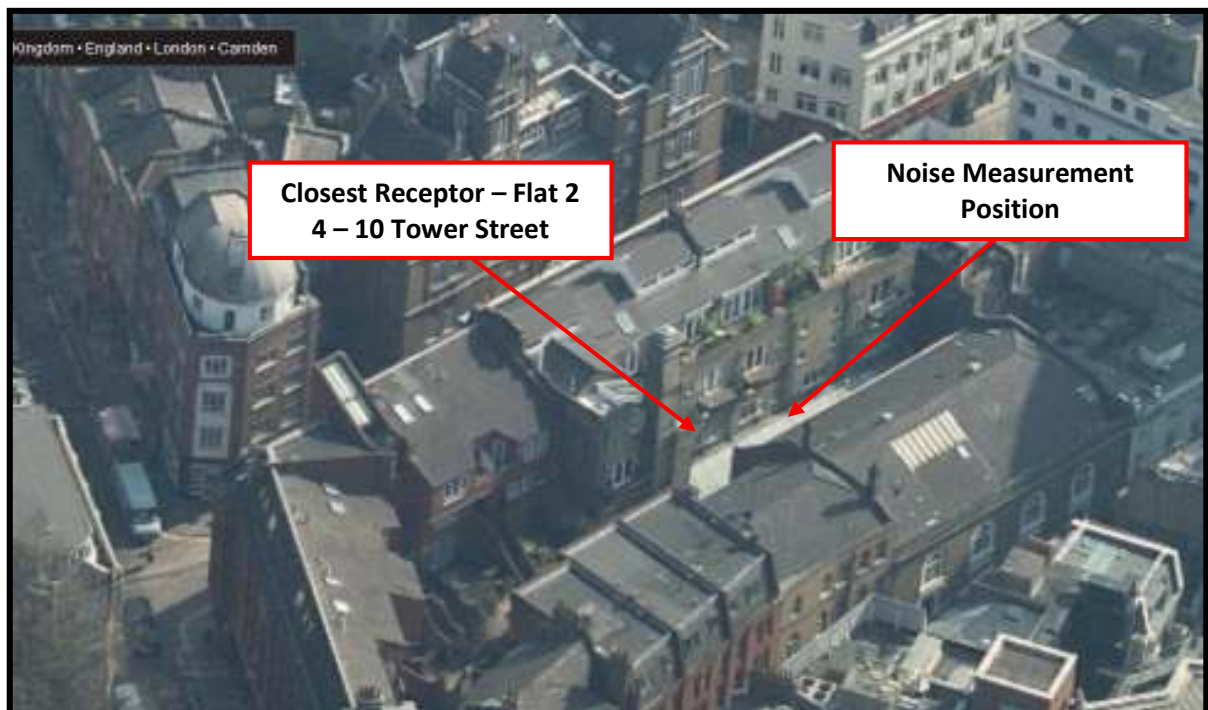
- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the 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 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.*

4. BACKGROUND NOISE MEASUREMENT SURVEY

A noise measurement survey was carried out on Thursday 16th May 2013 and Friday 17th May 2013 with the purpose of characterising the existing background and ambient noise climate at sensitive receptor locations within the immediate vicinity of the proposed plant area. The measurement period was chosen in order to capture the lowest ambient noise levels during the proposed hours of operation (0630 to 2200 hrs).

Noise measurements were carried out utilising a semi-permanent noise monitoring position on top of the first floor sub-roof at a location representative of the nearest noise sensitive receptors. The noise monitoring location and the location of the nearest noise sensitive receptors are shown in **Figure 4.1** below.

Figure 4.1: Noise Monitoring Location



A Norsonic 118 Sound Level Meter, with a current certificate of calibration, was utilised to carry out the noise measurements. Before and after the measurement periods the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (± 0.5 dB).

Noise measurements were carried out between 1330 hrs on Thursday 16th May 2013 and 1240 hrs on Friday 17th May 2013. This measurement period was chosen to ensure that noise levels are representative of those periods of the day when the proposed replacement plant will be operational and at a time when existing ambient noise levels are reduced i.e. early morning and late evening.

The weather was dry with very little cloud cover, and light winds of less than 5 m/s. The temperature during the monitoring period was approximately 13°C during the day time, dropping to around 4°C at night.

It was noted during installation of the measurement equipment that existing plant noise was dominant at the measurement position.

The noise measurement data is summarised in **Table 4.1** below. Detailed noise measurements are provided in **Appendix 3**.

Table 4.1: Summary of Noise Level Measurements

Time	L _{Aeq}	L _{AF(max)}	L _{A90}
0700 – 1900	55.0	74.1	52
1900 – 2300	54.3	71.0	53
2300 – 0700	52.6	64.6	52

Note: The average noise levels stated are logarithmic averages for L_{Aeq}, the arithmetic average of the highest hourly L_{AFmax} noise levels and the typical (most common) of the L_{A90} noise levels (the time period utilised for the typical L_{A90} is 1 hour during the day time and 15 minutes at night time, in line with the methodology identified in BS 4142:2014).

It can be seen that the background noise climate remained constant throughout the daytime and the night-time at the measurement position. This demonstrates that the background noise climate in close proximity to the nearest noise sensitive receptor is dominated by the existing plant noise.

5. PLANT NOISE LEVELS

5.1. Description of the Proposed Plant

The proposed mechanical plant comprises of ten condenser units. **Appendix 2** details a schedule of the proposed plant.

The plant is to be located externally within an existing light well at the rear of the building.

The proposed plant location is shown in **Figure 5.1** below.

Figure 5.1: Proposed ground floor layout and location of plant



In order to determine whether the potential noise levels emanating from the proposed plant are within acceptable noise limits, it is necessary to predict the worst case noise levels emanating from the units. Noise data for the plant has been obtained from the manufacturers which includes overall noise levels and octave band frequency data. **Table 5.1** details the octave frequency data for the plant and overall noise levels.

Table 5.1: Plant Noise Levels (L_w)

Plant Number	Type of Plant	Frequency (Hz)								Overall 'A' Weighted
		63	125	250	500	1k	2k	4k	8k	
4	Mitsubishi PUHZ-ZRP71YKA	53	52	52	44	42	38	32	26	48
4	Mitsubishi PUHZ-ZRP71YKA	53	52	52	44	42	38	32	26	48
1	Mitsubishi PUHZ-ZRP125YKA2	62	55	50	48	44	42	35	27	50
5	Mitsubishi PUHZ-ZRP140YKA	58	56	55	49	46	42	36	29	52
4	Mitsubishi PUHZ-ZRP71YKA	53	52	52	44	42	38	32	26	48
9	Mitsubishi PUHZ-ZRP100YKA2	54	54	53	49	46	42	36	29	51
9	Mitsubishi PUHZ-ZRP100YKA2	54	54	53	49	46	42	36	29	51
8	Mitsubishi PUHZ-ZRP100YKA2	54	54	53	49	46	42	36	29	51
7	Mitsubishi PUHZ-ZRP100YKA2	54	54	53	49	46	42	36	29	51
6	Mitsubishi PUHZ-ZRP100YKA2	54	54	53	49	46	42	36	29	51
Noise Level		66	64	63	58	55	51	45	38	-
Overall L_w for the condenser units		70								-
Overall L_{WA} for the condenser units		61								-

5.2. Noise Predictions

ACCON have utilised the CadnaA noise modelling software in order to determine the level of plant noise at the nearest noise sensitive receptor. CadnaA is a three dimensional noise model developed by DataKustik and has been extensively used by ACCON and others to develop noise models for a wide variety of situations and noise sources. CadnaA implements the noise propagation methodology detailed in ISO 9613 "Attenuation of sound during propagation outdoors".

The predicted noise level at the nearest noise sensitive receptor is detailed in **Table 5.2**.

Table 5.2: Predicted Noise Level

Receptor	Specific Noise Level (dBA)
Flat 2, 4-10 Tower Street	43

6. NOISE IMPACT ASSESSMENT

6.1. London Borough of Camden

The predicted plant noise levels are compared with the London Borough of Camden's (LBC) assessment criteria policy DP28 Table E for fixed plant and machinery as detailed in **Section 3.1** above and the assessment is detailed in **Tables 6.1, 6.2** and **6.3** below for the daytime, evening and night-time respectively.

Table 6.1: LBC Plant Noise Assessment – Day (0700hrs – 1900hrs)

Receptor	Background Noise Level L _{A90,1hr}	Predicted Noise Level	Difference between Predicted Noise Level & Background Noise Level	Compliance with LBC Assessment Criteria
Flat 2, 4 – 10 Tower Street	52	43	-9	Yes

Table 6.2: LBC Plant Noise Assessment – Evening (1900hrs – 2300hrs)

Receptor	Background Noise Level L _{A90,1hr}	Predicted Noise Level	Difference between Predicted Noise Level & Background Noise Level	Compliance with LBC Assessment Criteria
Flat 2, 4 – 10 Tower Street	53	43	-10	Yes

Table 6.3: LBC Plant Noise Assessment – Night (2300hrs – 0700hrs)

Receptor	Background Noise Level L _{A90,15min}	Predicted Noise Level	Difference between Predicted Noise Level & Background Noise Level	Compliance with LBC Assessment Criteria
Flat 2, 4 – 10 Tower Street	52	43	-9	Yes

Tables 6.1 to 6.3 demonstrates that at Flat 2, 4 – 10 Tower Street, predicted noise levels from the proposed plant are 9 dB below the typical background noise level during the daytime and night-time periods and 10 dB below the typical background noise level during the evening time period. This demonstrates that the proposed plant will achieve the requirements of LBC.

6.2. British Standard 4142

The predicted plant noise levels are compared against the background noise level in line with methodology set out in BS 4142 and the assessment is detailed in **Tables 6.4** and **6.5** below. The difference between the activity noise and the typical background sound level gives an initial estimate of the likelihood of adverse impact.

Table 6.4: BS 4142 Plant Noise Assessment - Day

Receptor	Background Noise Level (dB)	Specific Noise Level (dB)	Rating Level ⁽¹⁾ (dB)	Difference between Rating Level & Background Sound Level	Initial Estimate of Impact
Flat 2, 4 – 10 Tower Street	52	43	43	-9	Indication of a low impact

Note: (1) No penalty for acoustic features or intermittency is required for the proposed plant units.

Table 6.5: BS 4142 Plant Noise Assessment - Night

Receptor	Background Noise Level (dB)	Specific Noise Level (dB)	Rating Level ⁽¹⁾ (dB)	Difference between Rating Level & Background Sound Level	Initial Estimate of Impact
Flat 2, 4 – 10 Tower Street	52	43	43	-9	Indication of a low impact

Note: (1) No penalty for acoustic features or intermittency is required for the proposed plant units.

Tables 6.1 and **6.2** demonstrates that at Flat 2, 4 – 10 Tower Street, predicted noise levels from the proposed plant indicate that there will be a low impact when assessed in line with BS 4142.

7. CONCLUSION

A detailed noise measurement survey was previously carried out to determine existing background noise levels at noise sensitive dwellings in close proximity to the proposed location of the proposed plant at 4 – 10 Tower Street, Covent Garden.

Predictions of plant noise levels at the closest receptor location has been undertaken utilising manufacturers noise data for the proposed plant.

An assessment in line with the methodology set out in BS 4142 has shown that the noise levels from the proposed plant will have a low impact. A separate assessment has shown that this will also achieve the requirements of LBC.

Appendix 1

Glossary of Acoustic Terms

Appendix 1: Glossary of Acoustic Terms

Term	Description
'A'-Weighting	<i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci) of a bel. Decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
L_{A10}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.</i>
L_{A50}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.</i>
L_{A90}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>

Appendix 2 Plant Noise Schedule

Appendix 2: Schedule of Plant

Unit Number	Manufacturer	Noise Level (dB) @ 1m for Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
1	Mitsubishi PUHZ-ZRP125YKA2	62	55	50	48	44	42	35	27
4	Mitsubishi PUHZ-ZRP71YKA	53	52	52	44	42	38	32	26
5	Mitsubishi PUHZ-ZRP140YKA	58	56	55	49	46	42	36	29
6, 7, 8 and 9	Mitsubishi PUHZ-ZRP100YKA2	54	54	53	49	46	41	36	29

Appendix 3

Summary of Noise Measurements

Appendix 3: Summary of Measured Noise Levels

Time	L _{Aeq}	L _{AF(max)}	L _{A90}
07:00-08:00	55.6	77.7	52.3
08:00-09:00	54.8	75.1	52.2
09:00-10:00	53.6	69.8	52.4
10:00-11:00	53.6	63.5	52.3
11:00-12:00	54.3	75.7	52.4
12:00-13:00 ¹	55.8	78.8	52.7
13:00-14:00 ¹	57.8	90.9	52.4
14:00-15:00	54.3	71.4	52.8
15:00-16:00	54.3	68.0	52.7
16:00-17:00	57.2	76.6	54.2
17:00-18:00	54.4	67.9	52.9
18:00-19:00	54.2	74.1	52.4
19:00-20:00	53.9	70.7	52.6
20:00-21:00	54.8	73.0	52.5
21:00-22:00	54.9	67.8	52.6
22:00-23:00	53.5	72.6	52.0
23:00-00:00	52.9	62.8	52.0
00:00-01:00	52.9	70.3	51.9
01:00-02:00	52.4	62.6	51.8
02:00-03:00	52.9	62.4	52.1
03:00-04:00	52.4	62.4	51.8
04:00-05:00	52.0	60.3	51.5
05:00-06:00	52.2	63.5	51.5
06:00-07:00	53.2	72.5	52.0
07:00-19:00	55.0	74.1	52.6
19:00-23:00	54.3	71.0	52.4
23:00-07:00	52.6	64.6	51.8

Note: (1) Noise measurements were not available over a full hour during the 1200hrs-1300hrs and the 1300hrs-1400hrs time periods due to the start and finish time of the noise measurement survey.



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