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Consultants in Acoustics, Noise & Vibration

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214 Gray's Inn Road Cycle Centre

Boiler noise assessment

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Version	Date	Comments	Author	Reviewer
A	1 Jul 15		Eugenie Sainte Cluque	Daryl Prasad

Summary

Sandy Brown Associates LLP (SBA) has been commissioned by Great Portland Estates (GPE) to provide acoustic advice in relation to the proposed development at 214 Gray's Inn Road, London WC1. An environmental noise survey has been carried out to determine the existing background sound levels in the area and setting appropriate plant noise limits in line with the requirements of the London Borough of Camden.

The noise survey was performed between 11:53 on 23 June 2015 and 16:18 on 24 June 2015.

The representative background sound levels measured during the survey were $L_{A90,5min}$ 55 dB during the day, $L_{A90,5min}$ 54 dB in the evening and $L_{A90,5min}$ 52 dB during the night.

Based on the requirements of 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 does not exceed $L_{Aeq,5min}$ 50 dB during the day, $L_{Aeq,5min}$ 49 dB in the evening and $L_{Aeq,5min}$ 47 dB during the night. These limits are cumulative, and apply with all plant operation under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

The noise emissions from the operation of the proposed boiler at 1 m to the nearest noise sensitive receivers adjacent to the site have been assessed to be compliant with London Borough of Camden requirements.

Contents

1 Introduction

Sandy Brown Associates LLP (SBA) has been commissioned by Great Portland Estates to provide acoustic advice in relation to the proposed development at 214 Gray's Inn Road, London WC1.

It is proposed to install boilers for showers as part of a new cycle change facility.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method, results of the environmental noise survey, and a discussion of acceptable limits for noise emission from building services plant. The report also presents an assessment of the plant proposed to be installed at ground level on Coley Road.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is shown in Figure 1, where 214 Gray's Inn Road is highlighted in red. The nearest noise sensitive premises are highlighted in green. In the same figure, the unattended survey location is denoted by the letter 'L'. The attended survey locations are denoted by the numbers '1' and '2'.

The main roads surrounding the proposed plant location are Coley Street to the south, Gray's Inn Road to the west, and Gough Street to the east.

Figure 1 Site map (courtesy of Google Earth Pro and The GeoInformation Group)

2.2 Adjacent premises

214 Gray's Inn Road is an office building. It is surrounded by other office premises to the south, 200 Gray's Inn Road across Coley Street, and further to the west across Gray's Inn Road. A redevelopment is known to be planned at Mount Pleasant, to the east from the site, across Gough Street.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

3.1 Unattended measurements

Unattended noise monitoring was undertaken at 200 Gray's Inn Road to determine the existing background sound levels in the vicinity of nearby noise sensitive premises.

The unattended measurements were performed over 5 minute periods between 11:53 on 23 June 2015 and 16:18 on 24 June 2015. The equipment was installed and collected by Eugenie Sainte Cluque of SBA.

The microphone was positioned on the level 6 terrace, approximately 20 m from the ground, 1.2 m from the terrace surface and 2 m from the building facade. As such, the noise levels were under the influence of the facade.

The measurement position used during the survey is indicated in Figure 2, denoted by the letter 'L'. A photograph showing the measurement location is provided Figure 2. This location was chosen to be reasonably representative of the noise levels experienced by the nearest noise sensitive premises.

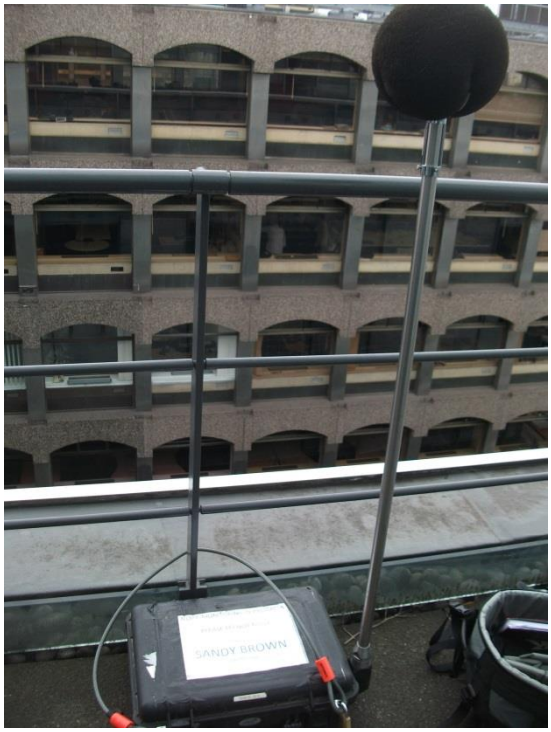


Figure 2 Unattended survey at Location L

3.2 Attended measurements

Attended sample measurements were performed by Eugenie Sainte Cluque at a two locations around the site on Coley Street and Gough Street. These are indicated in Figure 1 as positions 1 and 2. The attended measurements were carried out on 24 June 2015 over 5 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area and provide correlation to the rooftop noise logger.

The locations of the measurements are indicated in Figure 3 (location 1) and Figure 4 (location 2). In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level. At location 1, the microphone was approximately 1 m from the building facade; as such, the noise levels were under the influence of the facade. At location 2 the microphone was placed away from any reflective services besides the ground; as such it was placed in free-field conditions.

Figure 3 Attended noise level measurements at location 1

Figure 4 Attended noise level measurements at location 2

4 Measurement results

4.1 Observations

The dominant noise sources observed at the site during the attended survey consisted of:

- Location 1: dominant noise source from road traffic on Coley Street and Gray's Inn Road, and street level AHU on Coley Street. Secondary noise sources were construction works, helicopters and pedestrians.
- Location 2: dominant noise source from road traffic on Gough Street and Coley Street, construction noise and street level AHU on Coley Street. Secondary noise sources were road traffic from Gray's Inn Road, aeroplanes and pedestrians.

During the installation and the collection of the logging sound level meter, the dominant noise sources observed at the location L were road traffic noise from Gray's Inn Road and Coley Street, and the AHU at street level. Secondary noise sources were aeroplanes and construction works.

4.2 Unattended measurement results

The results of the unattended noise measurements are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B.

The day, evening and night-time ambient noise levels measured during the unattended survey are presented in Table 1.

At location L, the level measured include the influence of the facade.

Table 1 Ambient noise levels measured during the survey

Date	Day	Evening	Night
	$L_{Aeq,T}$ (dB)	$L_{Aeq,4h}$ (dB)	$L_{Aeq,8h}$ (dB)
23 Jun 2015 (11:53 – 18:58)	60	-	-
23 Jun 2015 (19:03 – 22:58)	-	59	-
23 Jun 2015 (23:03 – 06:58)	-	-	56
24 Jun 2015 (07:03 – 16:18)	61	-	-
Average	61	59	56

The minimum background sound levels measured during the unattended survey are given in Table 2.

Table 2 Minimum background sound levels measured during the survey

Date	Day	Evening	Night
	$L_{A90,5min}$ (dB)	$L_{A90,5min}$ (dB)	$L_{A90,5min}$ (dB)
23 Jun 2015 (11:53 – 18:58)	56	-	-
23 Jun 2015 (19:03 – 22:58)	-	54	-
23 Jun 2015 (23:03 – 06:58)	-	-	52
24 Jun 2015 (07:03 – 16:18)	55	-	-

The lowest background sound levels measured during the survey were $L_{A90,5min}$ 55 dB during the daytime, $L_{A90,5min}$ 54 dB during the evening and $L_{A90,5min}$ 52 dB at night.

4.3 Attended measurement results

The sound pressure levels recorded during the attended measurements are summarised in Table 3 Sound pressure levels from attended measurements. The dominant noise sources noted during the measurements are also described in the table. All the attended measurements were performed over 5 minute periods.

Table 3 Sound pressure levels from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	15:35	65	77	61	Dominant: Road traffic, AHU
1	15:59	64	73	62	Dominant: Road traffic, construction works, AHU
2	15:49	60	70	56	Dominant: Road traffic, AHU
2	16:09	59	69	55	Dominant: Road traffic, construction works, AHU

5 Building services noise egress limits

5.1 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive.

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.

5.2 Local Authority criteria

London Borough of Camden states in *Camden Development Policies – Section 3, DP 28* noise levels from plant and machinery above which planning permissions will not be granted. They apply to any time of the day, evening and night. These noise levels are presented in Table 4.

Table 4 London Borough of Camden, noise levels from plant and machinery above which planning permission will not be granted – day, evening and night

Noise description and location of measurement	Noise level
Noise at 1 m external to sensitive facade	5 dB(A) < L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 m external to a sensitive facade	10 dB(A) < L_{A90}
Noise that has distinct impulse (bangs, clicks, clatters, thumps) at 1 m external to a sensitive facade	10 dB(A) < L_{A90}

5.3 Limits

5.3.1 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits are set out in Table 5

Table 5 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Highest sound pressure level at 1 m from noise sensitive premises ($L_{Aeq,T}$ dB)
Daytime (07:00-19:00)	50
Evening (19:00-23:00)	49
Night-time (23:00-07:00)	47

The limits set out in Table 5 do not include any attention catching features. The penalties for attention catching features may be significant, and will need to be considered as the building services design progresses.

5.4 Hours of operation

It is understood that the proposed boiler is to operate at design duty at all times.

5.5 Assessment

5.5.1 Nearest sensitive premises

The nearest noise sensitive premises are the lower levels of 200 Gray's Inn Road office building, approximately 8 m from the external flues.

A redevelopment is known to be planned at Mount Pleasant car park, to the east from the site, across Gough Street. The edge of the proposed redevelopment site is approximately 12 m from the external flues.

5.5.2 Proposed plant

A boiler is proposed to be installed at 214 Gray's Inn Road, with flues terminating in the bicycle cage as shown in Figure 5, and approximately 3 m above the ground.

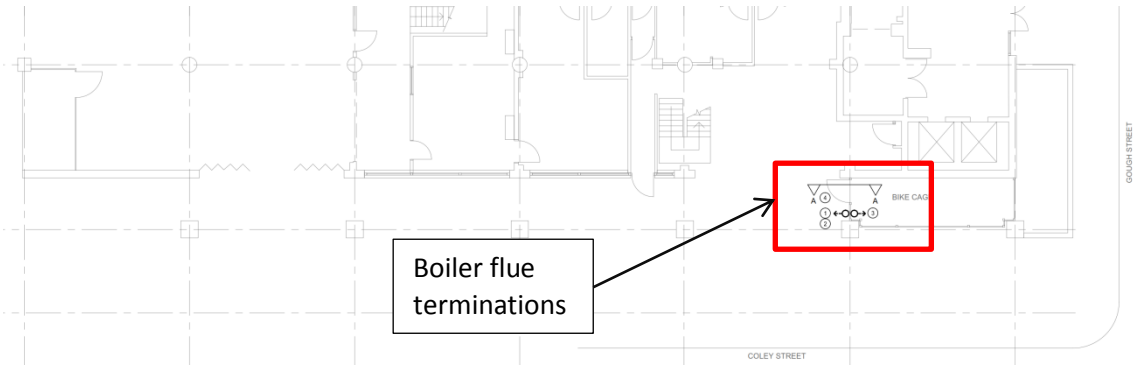


Figure 5 Boiler flue terminations - ground level Coley Street

The proposed boiler is an ECOflo EC 230/700. The manufacturer's noise data are presented in Table 6.

Table 6 Boiler manufacturer data - sound pressure level at 2 m (SPL dB ref $2x10^{-5}$Pa)

Item	Sound pressure level, dB(A)
ECOflo EC 230/700 (dB)	51

5.5.3 Assessment results

We have carried an assessment of the proposed boiler noise level emission at 1 m from the ground level facade of 200 Gray's Inn Road opposite the flue terminations. The calculation tables are presented in Appendix C.

The predicted noise levels at 200 Gray's Inn road are 37 dB, and below the limits set out in Table 5. They are therefore compliant with London Borough of Camden requirements.

6 Conclusion

A noise survey has been carried out to determine the existing background sound levels in the vicinity of the site and surrounding noise sensitive premises of 214 Gray's Inn Road. The representative background sound levels were $L_{A90,5min}$ 55 dB during the day, $L_{A90,5min}$ 54 dB in the evening and $L_{A90,5min}$ 52 dB during the night.

On the basis of the requirements of the Local Authority, the relevant plant noise limits at the worst affected existing noise sensitive premises would be $L_{Aeq,T}$ 50 dB during the day, $L_{Aeq,T}$ 49 dB in the evening and $L_{Aeq,T}$ 47 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 than those set out above. If plant items contain tonal or attention catching features, a 5 dB penalty will be applied, and the limits will be more stringent than those set out above.

An initial assessment of the proposed boilers has been carried out. The noise levels are compliant with London Borough of Camden without mitigation.

Appendix A

Survey details

Equipment

A Rion NL-32 sound level meter was used to undertake the unattended measurements. The attended measurements were carried out using a Rion NL-52 sound level meter. The calibration data for the equipment used during the survey is provided in

Table A1 and Table A2.

Table A1 Equipment calibration data – unattended survey

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-32/00623769	Rion	18 Sep 15	1309425
Microphone	UC-53A/319244	Rion	18 Sep 15	1309425
Pre-amp	NH-21/36677	Rion	18 Sep 15	1309425
Calibrator	NC-74/34336009	Rion	12 Sep 15	1309410

Table A2 Equipment calibration data – attended survey

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00242702	Rion	4 Jun 17	1506331
Microphone	UC-59/06185	Rion	4 Jun 17	1506331
Pre-amp	NH-25/32730	Rion	4 Jun 17	1506331
Calibrator	CAL200/4499	Larson Davis	4 Jun 17	1506327

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

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. 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 with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

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

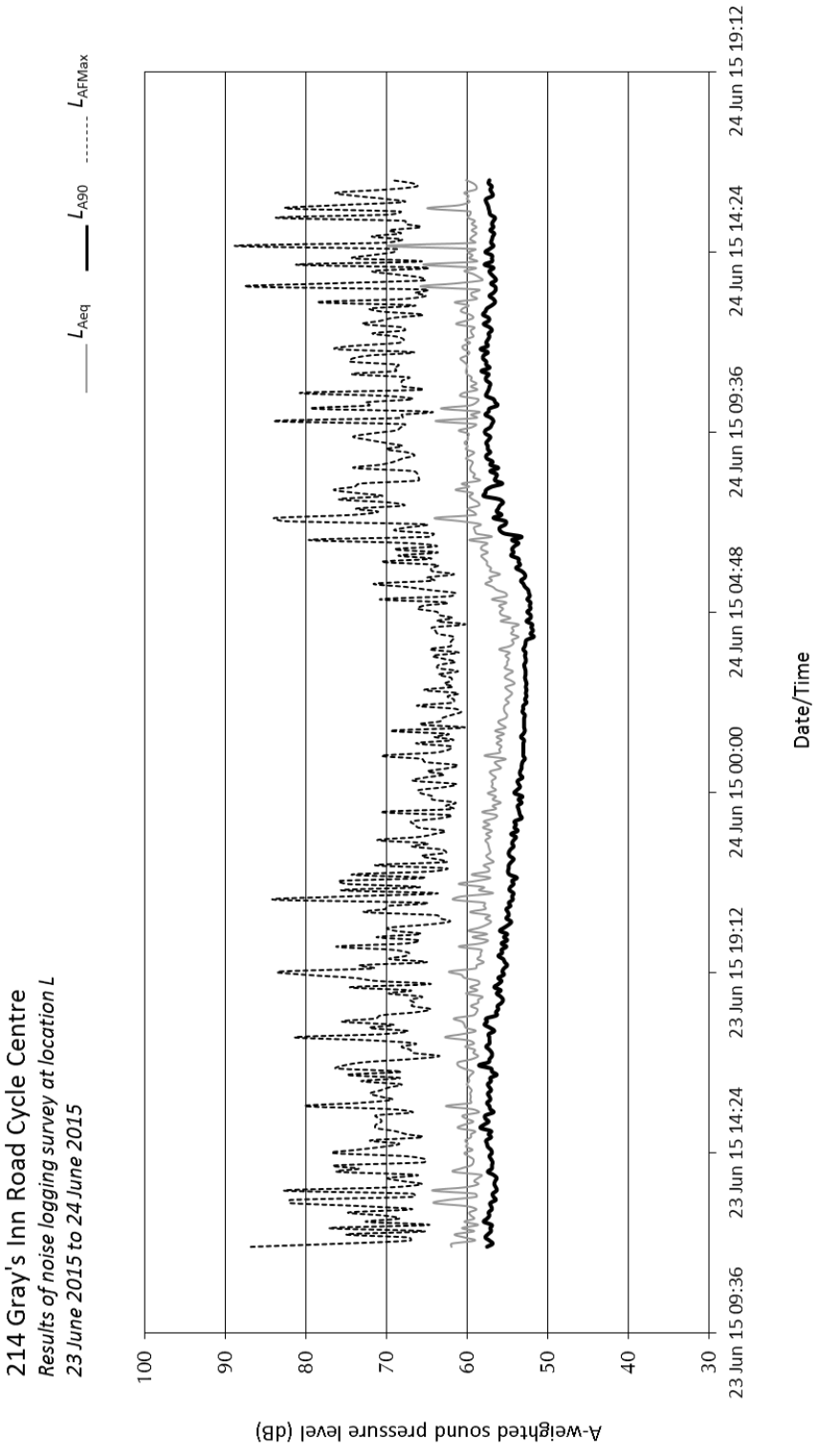
During the attended measurements carried out on 24 June 2015, the weather was generally clear and dry and no rain occurred. Wind speeds were approximately 0 m/s.

During the unattended noise measurements between 23 June 2015 and 24 June 2015, weather reports for the area indicated that temperatures varied between 10°C at night and 18°C during the day, and the wind speed were not reported.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location L


214 Gray's Inn Road Cycle Centre
Results of noise logging survey at location L
23 June 2015 to 24 June 2015
L_{Aeq}
L_{A90}
L_{AFMax}
A-weighted sound pressure level (dB)
100
90
80
70
60
50
40
30
23 Jun 15 09:36
23 Jun 15 14:24
23 Jun 15 19:12
24 Jun 15 00:00
24 Jun 15 04:48
24 Jun 15 09:36
24 Jun 15 14:24
24 Jun 15 19:12
Date/Time

Appendix C

Calculation tables

Table C1 Calculation of boiler noise emissions at 1 to the nearest window at 200 Gray's Inn Road – sound pressure level (SPL dB ref $2x10^{-5}$Pa)

	Sound pressure level (dBA)
Boiler SPL at 2 m	51
Distance attenuation 7 m	-17
Facade correction	+ 3
Total SPL at 200 Gray's Inn Road	37