

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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William Goodenough House

Plant noise assessment

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Version	Date	Comments	Author	Reviewer
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Summary

A noise survey was carried out at William Goodenough House between 16:29 on Friday 1 June 2012 and 11:14 on Thursday 7 June 2012 to determine background noise levels.

The lowest free-field background noise levels measured during the survey were $L_{A90,15min}$ 45 dB during the daytime and $L_{A90,15min}$ 42 dB at night.

Six items of plant are to be located on the rooftop, with two items of plant to be located externally and two items to be located in each of the two rooftop plant rooms.

Based on the manufacturer's noise data, the total noise emission from the all plant units operating at the same time will comply with the London Borough of Camden's requirements for plant noise breakout.

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1 Introduction

Sandy Brown Associates LLP (SBA) has been commissioned by Ardmore Construction to undertake a noise survey and plant noise assessment for the mechanical services to be installed on William Goodenough House, 35-42 Mecklenburgh Square, London, WC1N 2AN.

The purpose of the survey was to establish the existing background noise levels in the vicinity of nearby noise sensitive premises. These background noise levels enable noise emission limits to be set regarding noise breakout from proposed building services plant. These limits are to be set in accordance with the requirements of the London Borough of Camden.

This report presents the survey method, results of the environmental noise survey, discussion of acceptable limits for noise emission from plant and an assessment of the level of plant noise from the installed unit.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1. The site has been highlighted in blue and the closest residential receptors are highlighted in red.



Figure 1 Map showing the site location (courtesy of Google Earth)

3 Method

A 7 day unattended continuous noise logging survey was undertaken at the site to determine the existing background noise levels in the vicinity of nearby noise sensitive premises.

Measurements were performed over 15 minute periods between 16:29 on Friday 1 June 2012 and 11:14 on Thursday 7 June 2012.

The unattended noise measurement position used during the survey is indicated in Figure 1 and denoted by the letter "L". Noise levels at this location were deemed to be reasonably representative those at the closest noise sensitive premises to the new plant. The microphone was located on the north-east corner of the building. The measurement was taken at approximately 1.5 m above roof level, at least 3.5 m away from and other reflective surfaces.

3.1 Equipment

A Svantek type 957 sound level meter was used to for the measurements. The calibration information for the equipment used during the survey is provided in Appendix A to this report.

The measurement system was calibrated at the beginning and end of the measurements using its dedicated sound level calibrator. No significant deviation in calibration occurred.

3.2 Noise indices

The equipment was set to record a continuous series of broadband and octave band 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.
- $L_{Amax,T}$ The A-weighted maximum sound pressure level that occurred during a given period. Measured using the fast time weighting in accordance with the requirements of BS 8233 : 1999.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background noise level.

L_{A90} is considered most representative of the background noise 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*.

3.3 Weather Conditions

During the unmanned noise measurements between on Friday 1 June 2012 and Thursday 7 June 2012, weather reports for the area indicated that temperatures varied between 7 °C at night and 21 °C during the day, and the wind speed was typically less than 5 m/s. It was reported that rain fell on four of the seven days.

These weather conditions are considered suitable for representative measurements.

4 Measurement results

4.1 Observations

The most noticeable noise sources observed at the site during the installation and removal of the equipment were local and distant road traffic. Other noise sources included construction carried out on Goodenough House and aircraft traffic.

4.2 Unattended measurement results

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

The minimum background noise levels measured during the unmanned survey are given in Table 1.

Table 1 Minimum background noise levels measured during the survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{A90,15 \text{ min}}$ (dB)	$L_{A90,15 \text{ min}}$ (dB)
Friday 1 June 2012	46*	45
Saturday 2 June 2012	46	46
Sunday 3 June 2012	46	48
Monday 4 June 2012	45	43
Tuesday 5 June 2012	45	43
Wednesday 6 June 2012	46	42
Thursday 7 June 2012	50*	-

* Measurement not made over full period due to logger start and end time

The lowest background noise levels measured during the survey were $L_{A90,15 \text{ min}}$ 45 dB during the daytime and $L_{A90,15 \text{ min}}$ 42 dB at night.

5 Noise breakout assessment

5.1 Local authority criteria

According to the London Borough of Camden Unitary Development Plan:2006, noise generated by plant shall not at any time exceed a value of 5 dB below the minimum external background noise level, at a point 1 metre outside any window of any residential property.

If noise generated by plant is tonal and/or intermittent, the noise shall not at any time exceed a value of 10 dB below the minimum external background noise level, at a point 1 metre outside any window of any residential property.

5.2 Plant noise limits

Free field noise levels were measured by the noise logger. Therefore the background façade noise level (1 m from the facade) is 3 dB higher than this.

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 most affected windows of the nearest noise sensitive premises should not exceed the levels given in Table 2 below.

Table 2 Plant noise limits at the nearest noise sensitive premises

Time of day	Maximum sound pressure level at noise sensitive premises (dB)
Daytime (07:00-23:00)	43
Night-time (23:00-07:00)	40

As previously stated, if the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve noise levels an additional 5 dB below those set out above.

5.3 Proposed plant

The proposed new mechanical services plant on the roof of 35-42 Mecklenburgh Square building consist of:

- 6 units of Toilet Extract Fan
- 1 Kitchen Extract Fan

The proposed arrangement for the new condenser units is presented in Figure 2. The toilet extract units TEF-01 and TEF-02 are located externally, the toilet extract units TEF-04, TEF-05, and TEF-06 and the kitchen extract fan EF-01 are located within plant rooms, with the atmosphere exhausts venting via louvres.

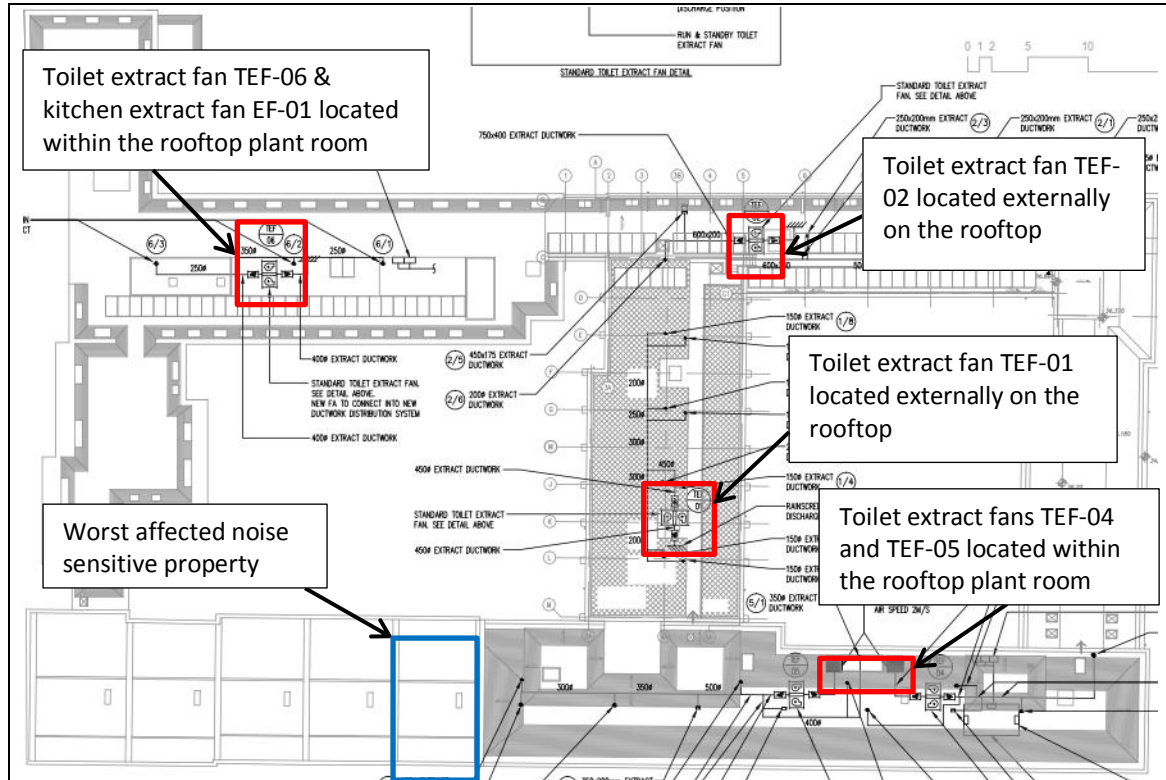


Figure 2: Plan showing the plant arrangement

The sound power levels generated by the proposed plant provided by the manufacturer are given in Table 3. The sound power levels in the table are for the specified design duty.

Table 3 Extract fan unit sound power level

Condenser model	Octave band sound power level (dB)							
	63	125	250	500	1k	2k	4k	8k
Toilet extract fan TEF-01 exhaust	86	81	74	69	66	63	61	56
Toilet extract fan TEF-01 casing breakout	72	71	64	61	58	56	53	51
Toilet extract fan TEF-02 exhaust	91	86	80	84	80	76	74	70
Toilet extract fan TEF-02 casing breakout	72	71	64	61	58	56	53	51
Toilet extract fan TEF-04 exhaust	91	85	76	81	75	73	69	66
Toilet extract fan TEF-05 exhaust	92	86	81	85	81	77	75	71
Toilet extract fan TEF-06 exhaust	86	81	75	70	67	64	62	57
Kitchen extract fan EF-01 exhaust	80	75	66	62	64	64	61	56

It is assumed that the proposed units may operate at any time during the day or night, seven days a week.

5.4 Calculation

The calculation has assumed that all plant items operate at the same time and at their normal design duty.

The calculation took into account distance attenuation and barrier attenuation due to a single building edge where it obscures the direct line of sight from the new fan locations to the receivers. The barrier attenuation was calculated using Maekawa's equation.

The proposed attenuation to all toilet extract fans was assumed to be the corresponding circular long padded attenuator model specified in manufacturer's data. The attenuation used for the Kitchen Extract Fan was also specified in the same document.

The noise level at 1 m from the worst affected window is calculated to be L_{Aeq} 39 dB. The calculated noise level is 6 dB below the lowest measured background noise level.

The calculation is shown in Appendix C.

6 Conclusion

Based on the manufacturer's noise data, the total noise emission from the all plant units will comply with the requirements of London Borough of Camden.

Appendix A

Calibration information

Table A1 Equipment calibration data

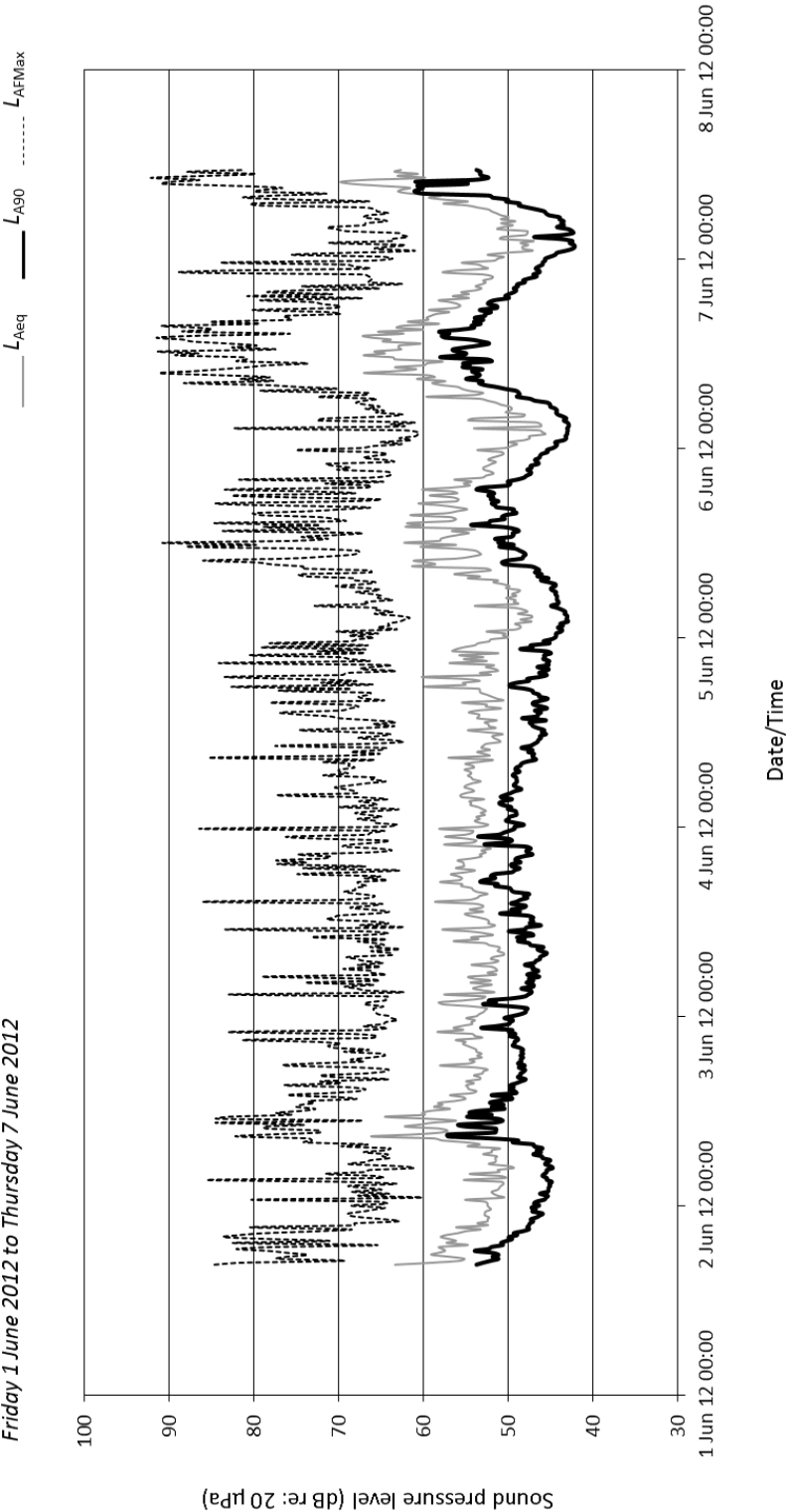
Equipment	Type/serial number	Calibration expiry	Calibration certification number
Sound level meter	Svantek 957 / 12326	08/12/13	1112579
Microphone	ACO Pacific 7052H / 36733	08/12/13	1112579
Pre amplifier	Svantek SV12L / 13571	08/12/13	1112579
Calibrator	Svantek SV30A / 10931	08/12/13	1112575

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

Appendix B

Noise logging survey results

William Goodenough College
Results of noise logging survey
Friday 1 June 2012 to Thursday 7 June 2012



Appendix C

Plant noise calculations

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Octave band centre frequency (Hz)										Comments
Plant item 1 - TEF 01 Breakout	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	72	71	64	61	58	56	53	51	64	From manufactures data sheet, Fan code: EST9H-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-28	-28	-28	-28	-28	-28	-28	-28	-28	Point source distance attenuation
Barrier Attenuation	0	0	0	0	0	0	0	0	0	
Facade correction	3	3	3	3	3	3	3	3	3	
Attenuation required	0	0	0	0	0	0	0	0	0	
Total sound pressure level	39	38	31	28	25	23	20	18	32	

Octave band centre frequency (Hz)										Comments
Plant item 1 - TEF 01 Atmosphere side exhaust	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	86	81	74	69	66	63	61	56	73	From manufactures data sheet, Fan code: EST9H-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-28	-28	-28	-28	-28	-28	-28	-28	-28	Point source distance attenuation
Barrier Attenuation	0	0	0	0	0	0	0	0	0	
Facade correction	3	3	3	3	3	3	3	3	3	
Silencer attenuation	0	-7	-12	-25	-32	-26	-21	-17	-17	Option CA50L
Total sound pressure level	53	41	29	11	1	4	7	6	30	

Octave band centre frequency (Hz)										Comments
Plant item 2 - TEF 02 Breakout	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	86	79	75	75	67	60	55	48	75	From manufactures data sheet, Fan code: EST17C-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-32	-32	-32	-32	-32	-32	-32	-32	-32	Point source distance attenuation
Barrier Attenuation	-5	-5	-5	-5	-5	-6	-6	-7	-7	
Facade correction	3	3	3	3	3	3	3	3	3	
Attenuation required	0	0	0	0	0	0	0	0	0	
Total sound pressure level	44	37	33	33	25	17	12	4	32	

Octave band centre frequency (Hz)										Comments
Plant item 2 - TEF 02 Atmosphere side exhaust	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	91	86	80	84	80	76	74	70	85	From manufactures data sheet, Fan code: EST17C-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-32	-32	-32	-32	-32	-32	-32	-32	-32	Point source distance attenuation
Barrier Attenuation	0	0	0	0	0	0	0	0	0	
Facade correction	3	3	3	3	3	3	3	3	3	
Silencer attenuation	0	-8	-13	-26	-34	-25	-22	-18	-18	Option CA63LP
Total sound pressure level	54	41	30	21	9	14	15	15	31	

Octave band centre frequency (Hz)										Comments
Plant item 4 - TEF 04 Atmosphere side exhaust	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	91	85	76	81	75	73	69	66	82	From manufactures data sheet, Fan code: EST17C-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-32	-32	-32	-32	-32	-32	-32	-32	-32	Point source distance attenuation
Barrier Attenuation	-5	-5	-5	-5	-5	-5	-5	-5	-5	
Facade correction	3	3	3	3	3	3	3	3	3	
Silencer attenuation	0	-3	-4	-10	-14	-13	-10	-7	-7	Option CA50L
Total sound pressure level	49	40	30	29	19	18	17	17	31	

Octave band centre frequency (Hz)										Comments
Plant item 7 - EF 01 Atmosphere side exhaust	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	80	75	66	62	64	64	61	56	70	From manufactures data sheet
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-29	-29	-29	-29	-29	-29	-29	-29	-29	Point source distance attenuation
Barrier Attenuation	0	0	0	0	0	0	0	0	0	
Facade correction	3	3	3	3	3	3	3	3	3	
Silencer attenuation	0	-3	-7	-14	-18	-16	-11	-8	-8	Option CA40SP (only one option)
Total sound pressure level	46	38	25	14	12	14	16	14	26	

Octave band centre frequency (Hz)										Comments
Plant item 5 - TEF 05 Atmosphere side exhaust	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	92	86	81	85	81	77	75	71	86	From manufactures data sheet, Fan code: EST18C-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-31	-31	-31	-31	-31	-31	-31	-31	-31	Point source distance attenuation
Barrier Attenuation	-5	-5	-5	-5	-5	-5	-5	-5	-5	
Facade correction	3	3	3	3	3	3	3	3	3	
Silencer attenuation	0	-8	-13	-26	-34	-25	-22	-18	-18	Option CA63L
Total sound pressure level	51	37	27	18	6	11	12	12	28	

Octave band centre frequency (Hz)										Comments
Plant item 6 - TEF 06 Atmosphere side exhaust	63	125	250	500	1K	2K	4K	8K	(A)	
Sound power level	86	81	75	70	67	64	62	57	74	From manufactures data sheet, Fan code: EST17C-X
Correction for number of plant	0	0	0	0	0	0	0	0	0	1 unit
SWL >SPL correction	-8	-8	-8	-8	-8	-8	-8	-8	-8	Hemi-spherical radiation
Distance Attenuation	-30	-30	-30	-30	-30	-30	-30	-30	-30	Point source distance attenuation
Barrier Attenuation	0	0	0	0	0	0	0	0	0	
Facade correction	3	3	3	3	3	3	3	3	3	
Silencer attenuation	0	-7	-12	-25	-32	-26	-21	-17	-17	Option CA63L
Total sound pressure level	51	39	28	10	0	3	6	5	28	

Octave band centre frequency (Hz)										Comments
Plant item	63	125	250	500	1K	2K	4K	8K	(A)	
Plant item 1 - TEF 01 Breakout	39	38	31	28	25	23	20	18	32	
Plant item 1 - TEF 01 Atmosphere side exhaust	53	41	29	11	1	4	7	6	30	
Plant item 2 - TEF 02 Breakout	44	37	33	33	25	17	12	4	32	
Plant item 2 - TEF 02 Atmosphere side exhaust	54	41	30	21	9	14	15	15	31	
Plant item 4 - TEF 04 Atmosphere side exhaust	49	40	30	29	19	18	17	17	31	
Plant item 7 - EF 01 Atmosphere side exhaust	46	38	25	14	12	14	16	14	26	
Plant item 5 - TEF 05 Atmosphere side exhaust	51	37	27	18	6	11	12	12	28	
Plant item 6 - TEF 06 Atmosphere side exhaust	51	39	28	10	0	3	6	5	28	
Sum of all plant items	60	48	39	36	29	26	24	23	39	