HEPWORTH
ACOUSTICS
Noise and Vibration Consultants

SENATE HOUSE, MALET STREET, LONDON

NOISE ASSESSMENT OF PROPOSED MECHANICAL SERVICES PLANT

On behalf of:

Hitek Consultants Ltd

Report No. 31061.1v2
September 2011

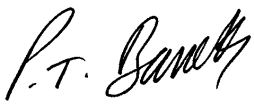
SENATE HOUSE, MALET STREET, LONDON

NOISE ASSESSMENT OF PROPOSED MECHANICAL SERVICES PLANT

Report prepared by:
Hepworth Acoustics Ltd
First Floor Aztec Centre
Aztec West
Almondsbury
Bristol
BS32 4TD

On behalf of:
Hitek Consultants Ltd
Barn A
The Stables
Parsonage Farm
Hollow Hill Lane
Iver
Bucks
SL0 0JW

Report prepared by: Graham Bowland BSc MIOA - Principal Consultant 

Report checked by: Paul Bassett BSc MSc FIOA - Technical Director 

CONTENTS

1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd has been commissioned by Hitek Consultants Ltd to carry out a noise impact assessment of proposed mechanical services plant at Senate House, Malet Street, London WC1E 7HU.

1.2 The assessment is required in connection with the planning application for the proposed installations, in line with the requirements of the London Borough of Camden.

1.3 This assessment has considered the most noise-sensitive time during the proposed operational period of the plant.

1.4 The assessment has included:

- A site inspection to identify the location of the nearest noise-sensitive location;
- A background noise survey at a best available location representing the nearest noise-sensitive location;
- An assessment of the noise impact from proposed plant at the nearest noise-sensitive location.

1.5 Noise levels referred to in the text of this report have been rounded to the nearest decibel, as fractions of decibels are imperceptible. A description of noise units and noise characteristics is provided in Appendix I.

2.0 SITE DESCRIPTION

2.1 Senate House is a large building fronting on to Malet Street, owned and occupied by The University of London.

2.2 Following an inspection of the site and surroundings, it was determined that the nearest non-associated noise-sensitive locations are high-level windows to offices within the Montague Place elevation of the British Museum premises, at approximately 40m from the closest proposed item of plant. It proved difficult to identify any nearby buildings in residential use, however the closest possible residential buildings appear to be those located towards the junction of Montague Place and Gower Street, at approximately 125m from the closest proposed item of plant.

2.3 The proposed plant comprises the following:

- 1 No. T-Line 120 TLL500/42-3 kitchen extract fan unit and outlet, to be mounted on the 4th floor flat roof of Senate House, ducted downwards along an inner facing lightwell to ground-floor level, penetrating the building via openings formed within existing windows.
- 1 No. internally mounted Myflo 50/4 kitchen supply system with inlet openings formed within existing windows of a ground-floor lightwell (adjacent to aforementioned kitchen extract duct penetrations).
- Up to 4 No. cold store chiller /deep freeze condenser/compressor units mounted at basement level of an inner facing lightwell (proximate to aforementioned kitchen extract/supply penetrations).

2.5 We have been advised by the client that the proposed kitchen extract and supply plant will have the potential to operate over the period 0700-2200hrs daily, and that the proposed cold store chiller /deep freeze condenser/compressor will have the potential to operate over a full 24-hour day.

3.0 ACOUSTIC CRITERIA

3.1 A copy of Table E of Appendix 2 of the London Borough of Camden Unitary Development Plan, which establishes noise levels from plant and machinery above which planning permission will not be granted, is presented in Table 1.

Table 1 – Table E of Appendix 2 of the London Borough of Camden UDP

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	00:00-24:00	5dB(A)<L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	00:00-24:00	10dB(A)<L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	00:00-24:00	10dB(A)<L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90}>60dB	Day, evening and night	00:00-24:00	55dB L_{Aeq}

4.0 BACKGROUND NOISE SURVEY

4.1 A survey of prevailing background noise levels has been undertaken at the site.

4.2 At the time of undertaking the survey work, extensive and prolonged road works were found to be in progress in the vicinity of the site. This involved the full closure to traffic of Montague Place, with one-way traffic only along the section of Malet Street immediately outside the façade of Senate House, which, as an apparent result of the works and consequent surrounding road closures, was carrying limited traffic only.

4.3 As a result of the above situation, background noise measurements were undertaken at 1m laterally from the outside of the Malet Street façade of Senate House at 3rd floor level. This location was chosen as the best available location representing the nearest-sensitive locations to the proposed plant. Whilst not directly comparable to the nearest-sensitive location, due to the orientation of the site and surrounding buildings and roads, it is considered reasonable to conclude that background noise levels at the nearest noise-sensitive locations under usual conditions (i.e. in the absence of road closures) will be typically no lower than those measured at the adopted measurement location, and more likely usually somewhat higher. Accordingly, subsequent assessment of the proposed plant based on background noise levels at the adopted measurement location will represent a very robust 'worst-case' noise impact scenario.

4.4 Noise measurements were undertaken at the adopted measurement location over a period commencing at 1500hrs on 15th September 2011 and concluding at 0930hrs on Friday 16th September 2011.

4.5 Noise measurements were measured in sequential 5-minute sample periods undertaken using a Norsonic 118 type 1 integrating sound level meter (Serial no. 31617) calibrated using a Norsonic 1251 class 1 acoustical calibrator (Serial no. 20804). Calibration checks were carried out on all equipment before and after the surveys, and no variation in the calibration levels was noted.

4.6 The weather during the survey was dry and calm with wind speeds generally below 5m/s. A windshield was fitted to the microphone during all noise measurements.

4.7 All measured noise levels are detailed in Appendix II. The lowest background noise level measured over the period of operation of the kitchen extract and supply systems (0700-2200hrs) was found to be 47dB $L_{A90,5min}$, whereas the lowest background noise level measured over the full night-time period was found to be 44dB $L_{A90,5min}$.

5.0 NOISE ASSESSMENT

5.1 Based on manufacturers' noise output data for the proposed plant items, the resultant noise levels at the nearest noise-sensitive location (i.e. high-level windows to offices within the Montague Place façade of the British Museum premises, at approximately 40m from the closest proposed plant item) have been determined. This has taken account of attenuation over distance, directivity and reverberant effects and acoustic screening attenuation provided by elements of the Senate House structure.

5.2 It is understood that the proposed roof-top mounted T-Line 120 TLL500/42-3 kitchen extract fan unit and outlet generates a noise level of 69dBA at 3m from the outlet in free-field conditions and that the proposed outlet ductwork will be horizontally mounted, parallel to Montague Place. Accounting for a +3dBA correction for surface directivity, and conservative attenuation factors of -3dBA for source directivity, -22dBA for additional distance and -6dBA for acoustic screening provided by the parapet wall extending from the Montague Place facade of Senate House, a resultant noise level of 41dBA attributable to this plant item is predicted at the nearest noise-sensitive location.

5.3 It is understood that the proposed Myflo 50/4 kitchen supply system generates a noise level of 62dBA at 3m from the inlet in free-field conditions. Accounting for a +3dBA correction for surface directivity and a precautionary +5dBA correction to account for additional reverberant build-up within the lightwell, and conservative attenuation factors of -22dBA for additional distance and -25dBA for the substantial acoustic screening provided by the 5-storey inner lightwell, a resultant noise level of 23dBA attributable to this plant item is predicted at the nearest noise-sensitive location.

5.4 It is understood that the proposed cold store condenser/compressor units will comprise up to 2 chiller condenser/compressor units generating a noise level of 36dBA at 10m (free-field conditions assumed) and up to 2 deep freeze condenser/compressor units generating a noise level of 39dBA at 10m (free-field conditions assumed). For reference, the combined noise level of all possible condenser/compressor units will be 54dBA at 3m in free-field conditions. Accounting for a possible +6dBA correction for surface directivity and a precautionary +5dBA correction to account for additional reverberant build-up within the lightwell, and conservative attenuation factors of -22dBA for additional distance and -25dBA for the substantial acoustic screening provided by the 5-storey inner lightwell, a resultant noise level of 18dBA attributable to these plant items is predicted at the nearest noise-sensitive location.

5.5 Based on the above, a cumulative plant noise level of 41dBA is predicted at the nearest noise-sensitive location. This is wholly due to noise from the proposed roof-top kitchen extract fan. Noise emissions from the other proposed plant items do not influence the overall predicted noise level.

5.6 Considering the various noise criteria set out in the London Borough of Camden Unitary Development Plan, which establishes noise levels from plant and machinery above which planning permission will not be granted, as presented in Table 1 of this report, based on frequency spectrum data for the proposed plant, it is not expected that the plant noise will have any distinguishable characteristics (discrete continuous note or distinct impulses), such that a criterion of 5dBA<L_{A90} (i.e. plant noise 5dBA below the lowest L_{A90}) is appropriate.

5.7 Without any additional noise control measures installed, the predicted cumulative plant noise level of 41 dB L_{Aeq} is therefore 6dBA below the lowest background noise level measured over the period of operation of the kitchen extract and supply systems (0700-2200hrs) of 47dB $L_{A90,5min.}$ Outside of these hours, the predicted noise level of the proposed cold store condenser/compressor units of 18dBA will prevail, which is therefore 26dBA below the lowest background noise level measured over the full night-time period of 44dB $L_{A90,5min}$.

5.8 In summary of the above, predicted noise emissions associated with the proposed plant will be in compliance with the London Borough of Camden's criteria without the need for any additional noise control measures.

5.9 Notwithstanding the above, the option may be taken by the Client to incorporate additional noise control measures to the proposed kitchen supply system and cold store condenser/compressor units to mitigate the potential for any noise impact from the new plant within rooms of Senate House itself with windows overlooking the inner lightwell plant area. This will not influence the above assessment of noise at the nearest non-associated noise-sensitive location.

6.0 SUMMARY AND CONCLUSIONS

6.1 This report has assessed the noise impact of proposed mechanical services plant at Senate House, Malet Street, London WC1E 7HU.

6.2 A background noise survey has been undertaken at a best available location representing the nearest noise-sensitive location.

6.3 The predicted noise level from the proposed plant has been assessed at the nearest noise-sensitive location and compared with the lowest measured background noise level at times appropriate to the proposed operation of the plant.

6.4 The assessment has demonstrated that predicted noise emissions associated with the proposed plant will be in compliance with the London Borough of Camden's criteria without the need for any additional noise control measures.

Appendix I – Noise units and indices

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

b) Frequency and hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20,000 Hz. However, the upper frequency limit gradually reduces as a person gets older.

c) Glossary of Terms

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, LAeq is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.

L_{A10} This the A-weighted noise level exceeded for 10% of the time period. L_{A10} is used as a measure of traffic noise.

L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II – Noise Survey Results

Dates: Thursday 15th - Friday 16th September 2011

Equipment: Norsonic 116 Type 1 integrating sound level meter (S/N 31270)

Weather: Dry and calm

Time		Noise Level dB			
Start	**End**	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
15:00	15:05	59	74	61	54
15:05	15:10	60	80	62	51
15:10	15:15	56	70	58	53
15:15	15:20	56	71	58	52
15:20	15:25	57	77	59	52
15:25	15:30	56	63	58	53
15:30	15:35	56	64	59	51
15:35	15:40	56	64	59	53
15:40	15:45	57	64	59	55
15:45	15:50	60	82	60	54
15:50	15:55	59	68	60	56
15:55	16:00	56	65	59	52
16:00	16:05	59	70	63	53
16:05	16:10	59	70	63	54
16:10	16:15	58	67	60	54
16:15	16:20	63	80	65	54
16:20	16:25	56	68	58	53
16:25	16:30	62	75	64	58
16:30	16:35	60	71	63	55
16:35	16:40	58	68	61	54
16:40	16:45	55	63	57	53
16:45	16:50	58	71	60	53
16:50	16:55	58	70	59	54
16:55	17:00	57	68	60	52
17:00	17:05	59	68	63	54
17:05	17:10	56	69	60	52
17:10	17:15	59	74	62	54
17:15	17:20	59	75	59	54
17:20	17:25	59	78	60	52
17:25	17:30	59	74	60	52
17:30	17:35	56	65	59	53
17:35	17:40	57	68	60	52

Time		Noise Level dB			
Start	**End**	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
17:40	17:45	62	77	65	52
17:45	17:50	57	68	59	53
17:50	17:55	56	66	58	51
17:55	18:00	55	70	57	51
18:00	18:05	58	72	60	53
18:05	18:10	58	70	60	53
18:10	18:15	58	70	61	53
18:15	18:20	59	72	63	51
18:20	18:25	57	71	60	51
18:25	18:30	61	74	64	54
18:30	18:35	54	64	56	51
18:35	18:40	57	76	58	51
18:40	18:45	55	68	56	50
18:45	18:50	53	60	55	49
18:50	18:55	64	87	61	52
18:55	19:00	55	66	57	50
19:00	19:05	57	63	59	53
19:05	19:10	61	80	61	50
19:10	19:15	58	78	59	50
19:15	19:20	56	71	59	51
19:20	19:25	55	67	58	51
19:25	19:30	56	65	59	51
19:30	19:35	56	70	60	49
19:35	19:40	52	62	55	49
19:40	19:45	53	62	55	48
19:45	19:50	55	70	58	49
19:50	19:55	54	66	57	50
19:55	20:00	56	69	58	50
20:00	20:05	53	64	56	49
20:05	20:10	55	66	58	48
20:10	20:15	55	68	58	48
20:15	20:20	52	62	55	47
20:20	20:25	53	66	56	49
20:25	20:30	62	74	67	51
20:30	20:35	63	74	68	53
20:35	20:40	63	72	67	57
20:40	20:45	54	63	56	51
20:45	20:50	51	63	54	47
20:50	20:55	53	64	56	48
20:55	21:00	52	66	55	47
21:00	21:05	53	64	56	48

Time		Noise Level dB			
Start	**End**	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
21:05	21:10	53	66	56	47
21:10	21:15	57	70	61	47
21:15	21:20	70	81	77	49
21:20	21:25	54	66	57	49
21:25	21:30	58	79	57	49
21:30	21:35	59	71	64	49
21:35	21:40	54	65	58	48
21:40	21:45	52	61	55	48
21:45	21:50	53	61	56	48
21:50	21:55	53	64	56	47
21:55	22:00	52	65	55	48
22:00	22:05	55	73	57	49
22:05	22:10	55	69	57	48
22:10	22:15	53	66	56	48
22:15	22:20	52	63	55	47
22:20	22:25	52	63	55	48
22:25	22:30	53	67	56	47
22:30	22:35	52	64	55	47
22:35	22:40	54	67	57	48
22:40	22:45	52	66	55	47
22:45	22:50	54	65	57	47
22:50	22:55	52	65	55	47
22:55	23:00	52	60	55	46
23:00	23:05	55	76	54	47
23:05	23:10	53	66	55	47
23:10	23:15	51	59	54	46
23:15	23:20	51	67	54	47
23:20	23:25	55	74	57	48
23:25	23:30	51	60	55	46
23:30	23:35	52	68	55	47
23:35	23:40	57	73	59	47
23:40	23:45	50	58	54	46
23:45	23:50	52	64	55	47
23:50	23:55	69	79	74	48
23:55	00:00	55	70	57	47
00:00	00:05	51	59	54	46
00:05	00:10	56	72	59	46
00:10	00:15	55	75	57	45
00:15	00:20	51	62	54	46
00:20	00:25	52	63	56	46
00:25	00:30	50	59	54	46

Time		Noise Level dB			
Start	**End**	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
00:30	00:35	51	60	55	46
00:35	00:40	50	61	54	46
00:40	00:45	50	60	54	45
00:45	00:50	50	58	54	46
00:50	00:55	50	63	54	45
00:55	01:00	51	68	54	45
01:00	01:05	50	60	54	46
01:05	01:10	51	64	55	46
01:10	01:15	59	83	56	46
01:15	01:20	51	63	53	45
01:20	01:25	50	66	53	45
01:25	01:30	51	62	55	45
01:30	01:35	50	60	54	45
01:35	01:40	50	63	54	45
01:40	01:45	60	80	58	46
01:45	01:50	50	61	54	45
01:50	01:55	51	70	54	45
01:55	02:00	50	59	54	44
02:00	02:05	50	62	54	45
02:05	02:10	50	61	53	45
02:10	02:15	51	68	54	44
02:15	02:20	50	61	55	45
02:20	02:25	49	62	54	44
02:25	02:30	50	61	53	44
02:30	02:35	51	65	54	45
02:35	02:40	49	61	53	45
02:40	02:45	49	59	52	45
02:45	02:50	51	64	54	44
02:50	02:55	50	63	54	45
02:55	03:00	48	61	51	44
03:00	03:05	50	63	54	45
03:05	03:10	50	61	54	45
03:10	03:15	51	68	55	45
03:15	03:20	49	65	53	45
03:20	03:25	50	60	54	45
03:25	03:30	50	62	53	44
03:30	03:35	50	67	53	45
03:35	03:40	50	61	54	45
03:40	03:45	49	60	52	45
03:45	03:50	51	64	54	45
03:50	03:55	49	64	52	45

Time		Noise Level dB			
Start	**End**	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
03:55	04:00	49	62	52	45
04:00	04:05	49	60	53	45
04:05	04:10	52	65	56	45
04:10	04:15	52	68	54	45
04:15	04:20	49	63	53	44
04:20	04:25	52	71	55	45
04:25	04:30	53	69	54	45
04:30	04:35	52	64	55	45
04:35	04:40	50	65	53	44
04:40	04:45	50	62	54	44
04:45	04:50	50	62	53	45
04:50	04:55	48	60	52	44
04:55	05:00	54	67	57	45
05:00	05:05	51	63	54	45
05:05	05:10	53	64	57	45
05:10	05:15	50	60	53	45
05:15	05:20	51	68	54	45
05:20	05:25	50	64	52	45
05:25	05:30	52	62	56	46
05:30	05:35	50	63	53	45
05:35	05:40	51	68	55	45
05:40	05:45	50	65	53	45
05:45	05:50	53	64	56	46
05:50	05:55	52	65	56	45
05:55	06:00	52	64	56	46
06:00	06:05	55	77	57	47
06:05	06:10	56	69	58	54
06:10	06:15	54	64	57	47
06:15	06:20	53	63	57	46
06:20	06:25	52	68	56	46
06:25	06:30	54	69	57	46
06:30	06:35	53	62	56	47
06:35	06:40	55	69	58	50
06:40	06:45	57	72	60	48
06:45	06:50	53	66	56	47
06:50	06:55	52	63	56	47
06:55	07:00	54	65	56	48
07:00	07:05	54	67	57	47
07:05	07:10	53	64	56	47
07:10	07:15	56	67	59	48
07:15	07:20	57	66	60	53

Time		Noise Level dB			
Start	**End**	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
07:20	07:25	59	69	61	54
07:25	07:30	62	77	63	57
07:30	07:35	60	74	63	53
07:35	07:40	56	68	59	50
07:40	07:45	60	69	63	53
07:45	07:50	60	70	63	55
07:50	07:55	64	75	68	54
07:55	08:00	61	72	65	53
08:00	08:05	60	71	63	53
08:05	08:10	60	72	62	54
08:10	08:15	57	67	60	52
08:15	08:20	59	71	62	53
08:20	08:25	59	64	60	57
08:25	08:30	61	73	64	56
08:30	08:35	63	73	67	56
08:35	08:40	62	72	65	59
08:40	08:45	60	68	62	57
08:45	08:50	61	72	64	53
08:50	08:55	62	72	65	58
08:55	09:00	60	67	62	58
09:00	09:05	59	69	61	55
09:05	09:10	59	69	62	54
09:10	09:15	59	72	61	54
09:15	09:20	58	74	61	53
09:20	09:25	60	75	63	55
09:25	09:30	60	74	64	55