

Eastman Dental Institute, UCL

Plant Noise Assessment

Report 14/0064/R1

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14/0064/SP1

Site plan showing noise survey and assessment positions.

14/0064/TH01 & TH02

Noise survey results at MP1 & MP2

14/0064/CS1-9

Noise assessment calculation sheets

Glossary of Acoustic Terms



1 Introduction

- 1.1 Planning permission is being sought for the replacement of mechanical services plant items at the Eastman Dental Institute, University College London on Gray's Inn Road.
- 1.2 Cole Jarman have been appointed to conduct an assessment of the mechanical services noise in order to safeguard the amenity of nearby noise sensitive receivers.
- 1.3 This report presents the existing noise levels at the site and sets out plant noise limits to which the equipment will need to adhere. This report also describes the assessment of the proposed plant and compares the results to the noise limits set, proposing mitigation measures as necessary.

2 Site Description

2.1 Site Layout

- 2.1.1 The Eastman Dental Institute is located at 123 Gray's Inn Road, London, WC1X 8TU. This is a partner site to the other building of the Institute at 256 Gray's Inn Road. The building at 123 is terraced, and fronts Gray's Inn Road, which is a busy route through the area carrying regular traffic including buses. To the rear of the building is Brownlow Mews.
- 2.1.2 The surrounding area consists of a mixture of types of property, including commercial and residential premises. The site and surrounding area can be seen in the attached figure 14/0064/SP1.

2.2 Proposal

- 2.2.1 It is proposed to remove a significant amount of plant from various locations around the site; which includes removal of the existing chiller plant which is internally installed at 5th floor level with louvres out to the rear of the site. In place of this decommissioned plant, it is proposed to install two new air cooled liquid chiller units on the roof of the building. More information concerning the plant is presented later in the assessment.
- 2.2.2 The most potentially exposed residential windows are those on the corner of Gray's Inn road and Calthorpe Street to the front of the site; the rear façade of residences on Doughty Street to the rear of the site; and the rear façade of flats on Guilford Street which face Brownlow Mews.
- 2.2.3 We also note that some of the properties on Brownlow Mews are commercial in nature and are not considered noise sensitive. The residential properties on Brownlow Mews which are directly adjacent to the Institute are at a level significantly lower than the roof top plant and will therefore be completely screened from the plant by the building edge itself. Also, their windows face away from the Institute building.



3 Environmental Noise Survey

3.1 Methodology and Instrumentation

3.1.1 An unattended noise survey was undertaken commencing at 1000h on 27th February 2014. Measurements were carried out at two positions as indicted on attached site plan figure 14/0064/SP1 and descried as follows:

- MP1 Front of building on railing at roof edge, fronting Gray's Inn Road.
- MP2 Rear of building on 5th floor balcony, by fire escape staircase, fronting Brownlow Mews.

3.1.2 Measurements were made at approximately 1.5m above relative ground level. Measurements of the L_{Amax} , L_{Aeq} and L_{A90} indices were made over consecutive 15 minute periods until 1000h on 4th March 2014. The microphones were located as far from existing plant as possible.

3.1.3 Measurements were made using the equipment listed in table T1 below.

Item	Manufacturer	Type
Sound Level Analyser	Brüel & Kjær	2260
Acoustic Calibrator	Brüel & Kjær	4231
Weatherproof windshield	Brüel & Kjær	UA1404
Sound Level Analyser	Rion	NL-52
Acoustic Calibrator	Rion	NC-74
Weatherproof windshield	Rion	WS-15

T1 Equipment used during unattended noise survey.

3.1.4 The meters were calibrated before and after the survey to ensure consistent and acceptable levels of accuracy were maintained throughout the survey.

3.1.5 The weather conditions throughout the survey period varied. At the start of the survey it was dry and bright. Based upon publically available weather data periods of rain were recorded at the following times:

- 27th February 17.30-18.30
- 1st March 01.30-02.30; 12.30-13.30
- 2nd March scattered light showers 07.00-08.00; 11.30-12.00; 13.00-15.00; 18.00-19.00
- 3rd March 05.30-06.30

3.1.6 Winds were generally less than 5m/s; however winds do appear to have been elevated on the 2nd March.



- 3.1.7 Although there were some isolated short periods of rain throughout the survey, the majority of the time was fine and dry. With ample data covering multiple days when the weather conditions were fine, the weather is not expected to have materially affected the minimum recorded background noise levels for the site.

3.2 Results

- 3.2.1 The results of the noise survey carried out are shown in the attached time history graph figures 14/0064/TH01 and TH02 for positions MP1 and MP2 respectively.
- 3.2.2 The minimum background noise levels daytime, evening and at night are tabulated below:

Location	Minimum L_{A90} , dB Background Noise Level		
	Daytime (0700-1900)	Evening (1900-2300)	Night time (2300-0700)
MP1 Gray's Inn Road	50	52	45
MP2 Brownlow Mews	46	46	42

T2 Minimum Background Noise Levels.

- 3.2.3 The equipment was installed to be located away from existing mechanical services plant; the noise climate therefore mainly consisted of road traffic.

4 Plant Noise Limits

- 4.1 In order to minimise the risk of creating a community noise disturbance, in line with Camden's planning policy DP28 'Noise and Vibration' the plant should be designed to a combined level that is at least 5dB lower than the existing L_{A90} background noise level as measured during the relevant time period as measured 1m from the windows from noise sensitive receivers. This is consistent with technical guidance in table E of the planning policy DP28.
- 4.2 In addition, if the noise emitted has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or distinct impulse (bangs, clicks, clatters, thumps), then a 5dB penalty will be added to the assessment (i.e. a feature correction according to BS4142).
- 4.3 Based on these requirements and the results of the survey, plant noise limits for nearby properties are listed in table T3 below. They correspond to a level 5dB below the minimum existing background noise levels.



Location	Noise Emission Limit, dB		
	Daytime (0700-1900)	Evening (1900-2300)	Night time (2300-0700)
MP1: Brownlow Mews	45	47	40
MP2: Grays Inn Road	41	41	37

T3 Plant noise emission limits at the nearest noise sensitive properties.

- 4.4 Noise limits are to apply at a position 1m from the façade of the relevant noise sensitive property for the combined effect of all plant items that run during any particular period.

5 Plant Noise Assessment

5.1 Details

- 5.1.1 Our assessment is based upon information and drawings (including manufacturers noise data) provided by CPW. We understand that the units can potentially operate 24 hours a day, therefore the lowest night time noise limit applies.
- 5.1.2 It is proposed to install two external packaged air cooled Carrier chiller units. Manufacturers' noise data for the units in terms of the sound power level are illustrated in the table below.

Plant Item	Sound Power Level (dB) @ Octave Band Centred Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Carrier 30RB-262FC	-	80	82	81	78	73	66	60

T4 Sound power levels for plant items

- 5.1.3 Although we do not have $\frac{1}{3}$ octave band data, based upon the single octave band data, the plant is not considered to be obviously tonal. Therefore no feature correction applies.
- 5.1.4 At the time of writing this report the exact location of the units on the roof has not been finalised, however for the purpose of our assessment we have considered one unit to be towards the northern end of the roof (worst case location) and another towards the middle of the roof. These are reasonable assumptions for our distance losses, and any small changes in location are not expected to materially alter the results of the assessment.



5.2 Mitigation

- 5.2.1 In order to reduce noise levels from the units they will have fully louvred acoustic attenuation packages applied. This is in the form of proprietary acoustic louvred panels to the sides of the unit and attenuators over the top fans. These kits are provided by the manufacturers.
- 5.2.2 Carrier have confirmed that 'AA303' packages will be provided to both units. The manufacturer has provided spectral data for the units with and without the acoustic package at 10m distance. We have taken the difference to be the performance of the package. The details of the derived reductions for the packages are as follows:

Acoustic Package	Sound Reduction (dB) @ Octave Band Centred Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Carrier 'AA303'	-	8	13	22	24	21	18	14

T5 Performance specification for acoustic packages

5.3 Assessment

- 5.3.1 With the above mitigation measures in place, we have assessed the following noise level at the most exposed receptor position (as illustrated on attached site plan 14/0064/SP1):

Location	Assessed Noise Level (dBA)	Noise Limit (dBA)
AP1: Guilford Street / Brownlow Mews	31	37
AP2: Calthorpe Street / Grays Inn Road	29	42
AP3: Dougherty Street	27	37

T6 Assessed plant noise levels

- 5.3.2 It can be seen that the plant noise limits should be achieved. Full assessment calculations for all positions are attached in calculation sheets 14/0064/CS1-9.
- 5.3.3 As noted in section 2.2, although there are some residential receivers closer by distance to the plant, they are at much lower level than the roof plant and will be significantly screened from the equipment and therefore less exposed to noise from the plant.
- 5.3.4 We note that our assessment has not considered the removal of a number of existing plant items which would likely have a beneficial effect on the surrounding noise climate.

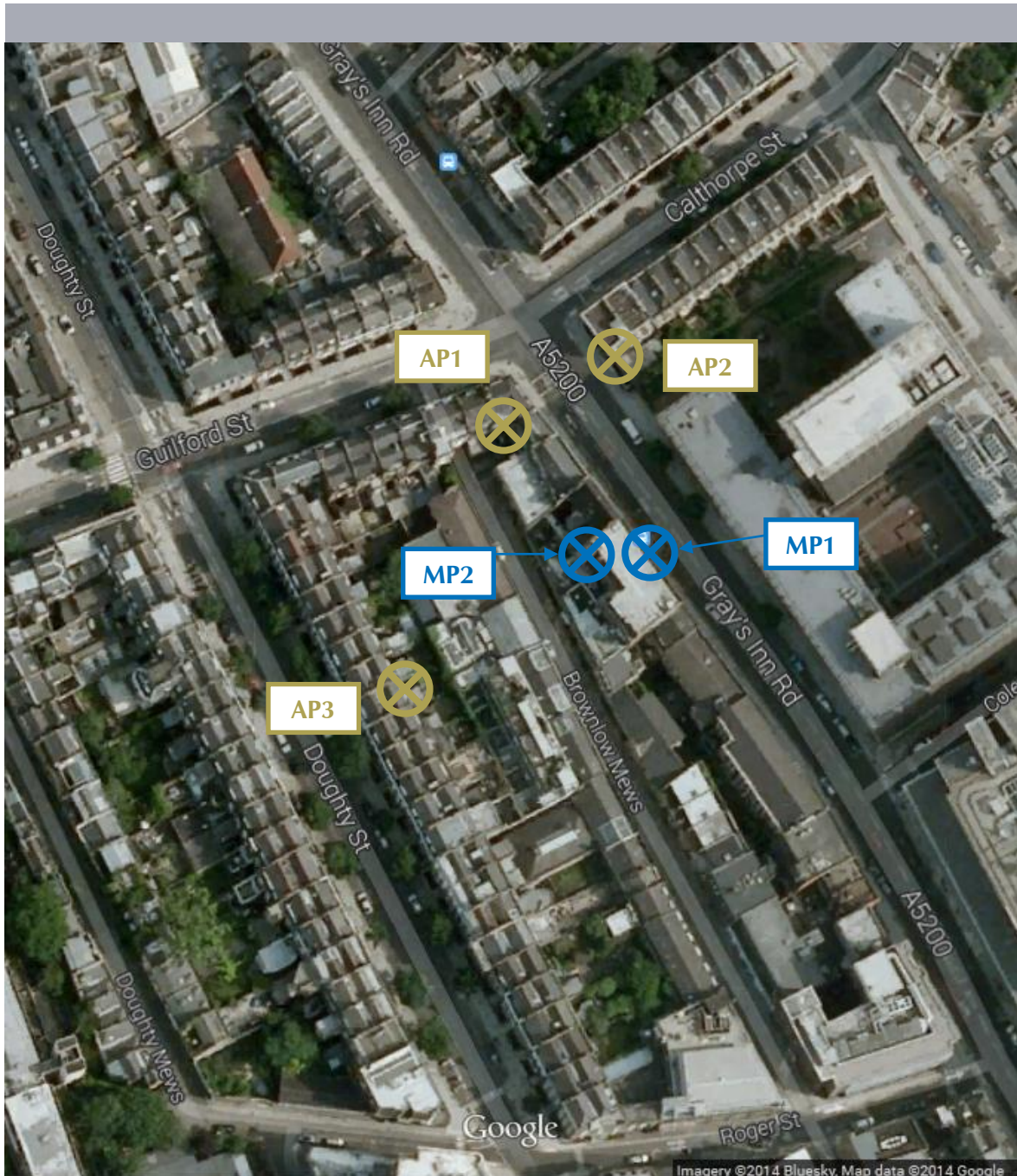


6 Conclusions

- 6.1 A noise survey has been conducted at Eastman Dental Institute, University College London at 123 Gray's Inn Road. The minimum daytime, evening and night time background noise levels have been quantified.
- 6.2 The measured levels have enabled plant noise limits to be set, to which any new mechanical services equipment will need to adhere, in order to comply with the requirements of Camden Council.
- 6.3 This report has provided details of a plant noise assessment conducted for the site. The assessment has shown that with the proposed fully louvred acoustic mitigation measures in place, the noise limits specified should be met by the plant.

 End of Section

Figure 14/0064/SP1



Title: Site plan showing noise survey and assessment positions

Project: Eastman Dental Institute, UCL

Date: March 2014

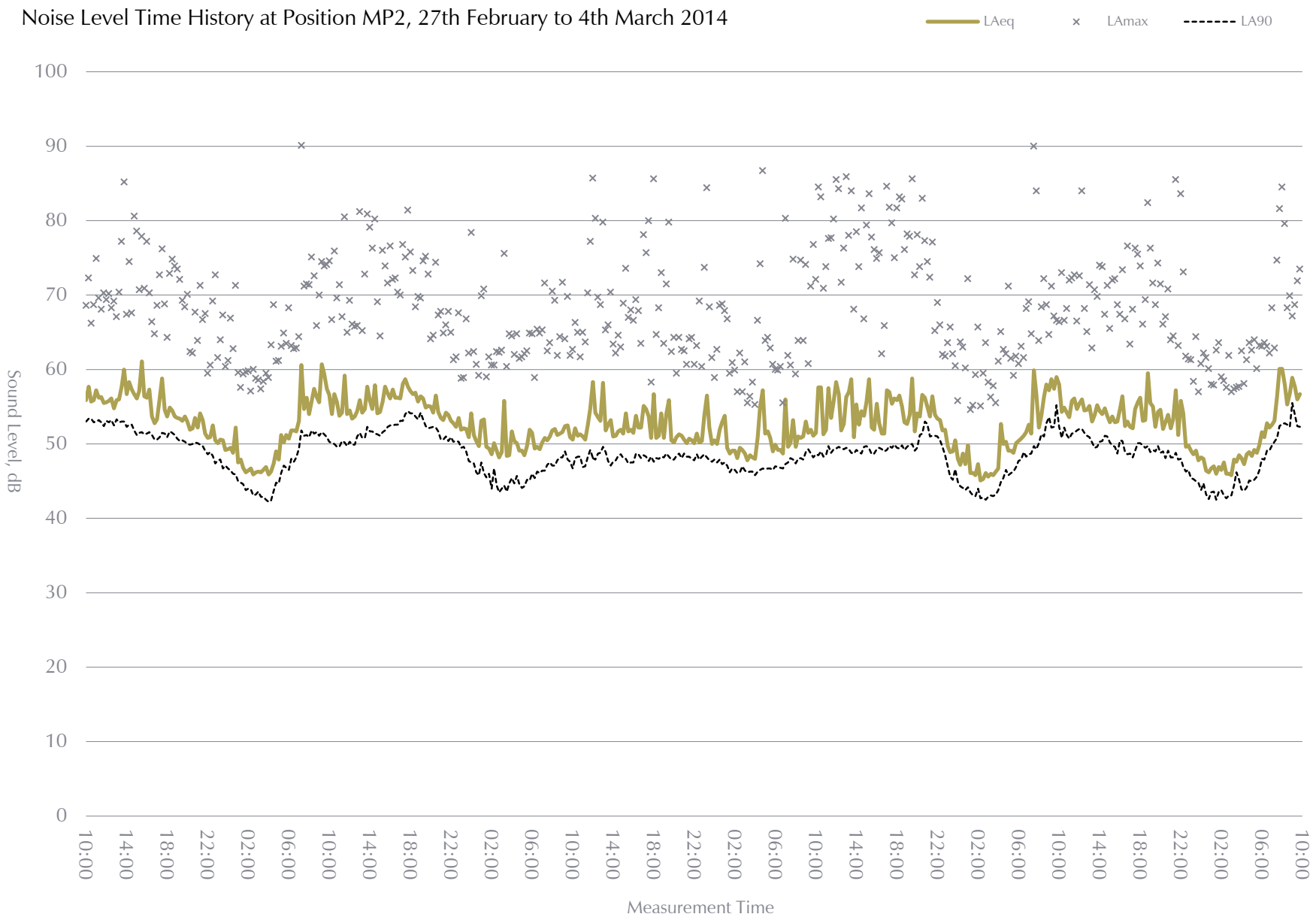
Scale: Not to scale

Noise Level Time History at Position MP1, 27th February to 4th March 2014





Figure 14/0064/TH02





Calculation Sheet

14/0064/CS1

C1 to AP1: C1 to AP1

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C1	80	80	82	81	78	73	66	60	83
Carrier Chiller									
Radiation Loss	-8	-8	-8	-8	-8	-8	-8	-8	
Hemi-Spherical Radiation									
Distance Loss	-30	-30	-30	-30	-30	-30	-30	-30	
33 metres Distance Loss									
Facade Correction	3	3	3	3	3	3	3	3	
Facade Correction									
Misc Correction	-8	-8	-13	-22	-24	-21	-18	-14	
AA303 Acoustic Package									
Total	37	37	34	24	19	17	13	11	29



Calculation Sheet

14/0064/CS2

C2 to AP1: C2 to AP1

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C2	80	80	82	81	78	73	66	60	83
Carrier Chiller									
Radiation Loss	-8	-8	-8	-8	-8	-8	-8	-8	
Hemi-Spherical Radiation									
Distance Loss	-33	-33	-33	-33	-33	-33	-33	-33	
43 metres Distance Loss									
Facade Correction	3	3	3	3	3	3	3	3	
Facade Correction									
Misc Correction	-8	-8	-13	-22	-24	-21	-18	-14	
AA303 Acoustic Package									
Total	34	34	31	21	16	14	10	8	26



Calculation Sheet

14/0064/CS3

Resultant Noise Levels at AP1 - Guilford Street

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C1 to AP1	37	37	34	24	19	17	13	11	29
C1 to AP1									
C2 to AP1	34	34	31	21	16	14	10	8	26
C2 to AP1									
AP1 Total	39	39	36	26	21	19	15	13	31



Calculation Sheet

14/0064/CS4

C1 to AP2: C1 to AP2

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C1	80	80	82	81	78	73	66	60	83
Carrier Chiller									
Radiation Loss	-8	-8	-8	-8	-8	-8	-8	-8	
Hemi-Spherical Radiation									
Distance Loss	-32	-32	-32	-32	-32	-32	-32	-32	
41 metres Distance Loss									
Facade Correction	3	3	3	3	3	3	3	3	
Facade Correction									
Misc Correction	-8	-8	-13	-22	-24	-21	-18	-14	
AA303 Acoustic Package									
Total	35	35	32	22	17	15	11	9	27



Calculation Sheet

14/0064/CS5

C2 to AP2: C2 to AP2

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C2	80	80	82	81	78	73	66	60	83
Carrier Chiller									
Radiation Loss	-8	-8	-8	-8	-8	-8	-8	-8	
Hemi-Spherical Radiation									
Distance Loss	-34	-34	-34	-34	-34	-34	-34	-34	
49 metres Distance Loss									
Facade Correction	3	3	3	3	3	3	3	3	
Facade Correction									
Misc Correction	-8	-8	-13	-22	-24	-21	-18	-14	
AA303 Acoustic Package									
Total	33	33	30	20	15	13	9	7	25



Calculation Sheet

14/0064/CS6

Resultant Noise Levels at AP2 - Calthorpe Street

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C1 to AP2	35	35	32	22	17	15	11	9	27
C1 to AP2									
C2 to AP2	33	33	30	20	15	13	9	7	25
C2 to AP2									
AP2 Total	37	37	34	24	19	17	13	11	29



Calculation Sheet

14/0064/CS7

C1 to AP3: C1 to AP3

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C1	80	80	82	81	78	73	66	60	83
Carrier Chiller									
Radiation Loss	-8	-8	-8	-8	-8	-8	-8	-8	
Hemi-Spherical Radiation									
Distance Loss	-34	-34	-34	-34	-34	-34	-34	-34	
52 metres Distance Loss									
Facade Correction	3	3	3	3	3	3	3	3	
Facade Correction									
Misc Correction	-8	-8	-13	-22	-24	-21	-18	-14	
AA303 Acoustic Package									
Total	33	33	30	20	15	13	9	7	25



Calculation Sheet

14/0064/CS8

C2 to AP3: C2 to AP3

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C2	80	80	82	81	78	73	66	60	83
Carrier Chiller									
Radiation Loss	-8	-8	-8	-8	-8	-8	-8	-8	
Hemi-Spherical Radiation									
Distance Loss	-35	-35	-35	-35	-35	-35	-35	-35	
55 metres Distance Loss									
Facade Correction	3	3	3	3	3	3	3	3	
Facade Correction									
Misc Correction	-8	-8	-13	-22	-24	-21	-18	-14	
AA303 Acoustic Package									
Total	32	32	29	19	14	12	8	6	24



Calculation Sheet

14/0064/CS9

Resultant Noise Levels at AP3 - Doughty Street

Octave Band Centre Frequency, Hz									
	63	125	250	500	1k	2k	4k	8k	dB(A)
C1 to AP3	33	33	30	20	15	13	9	7	25
C1 to AP3									
C2 to AP3	32	32	29	19	14	12	8	6	24
C2 to AP3									
AP3 Total	36	36	33	23	18	16	12	10	27



Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90} :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

