environmental equipment corporation

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Our Ref: tm/EC10259_42619

Date: 9th August 2009

Project : *Eastman Institute*
Grays Inn Road

BACKGROUND NOISE SURVEY AND PLANT NOISE LIMITS

Client: *Fowler Martin*
First Floor
132 Station Road
London
E4 6AB

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REPORT

ENVIRONMENTAL EQUIPMENT CORPORATION

CONTENTS

1.00 INTRODUCTION

1.01 Environmental Equipment Corporation Limited have been commissioned by Fowler Martin to undertake a background noise survey at the Eastman Institute at 123 Grays Inn Road with a view to ascertaining prevailing background noise levels for the immediate vicinity.

1.02 Proposals are being submitted to London Borough of Camden outlining the installation of new external air conditioning condensers and ventilation apertures at the rear of the building. Noise emissions from the plant need to be assessed as part of the planning application and are therefore addressed in this report.

1.03 This report is prepared solely for Fowler Martin. Environmental Equipment Corporation Ltd accepts no responsibility for its use by any third party.

2.00 SITE

2.01 The 4th floor of No. 123 Grays Inn Road is undergoing refurbishment; works that will include the installation of new air conditioning and small ventilation systems. The Eastman Institute is a five storey Dental facility on the west side of Grays Inn Road, just south of the junction with Guildford Street. To the west, the rear of the property overlooks Brownlow Mews which serves as access to a number of commercial and commercial/office properties. The property immediately to the north of No. 123 is a public house (The Blue Lion) which has a rear patio area for patrons and first/second floor residential accommodation.

2.02 The proposed new plant will be installed at high level at the rear of the property in the vicinity of a number other (existing) air conditioning condensers, some of which will be removed as part of these works. The proposed layout is indicated in Appendix A. The closest noise sensitive windows to this location are those of the pub at first floor level. These will be screened from the plant by the edge of the north west corner of the Eastman Institute building and by the existing metal spiral escape staircase that serves the building.

2.03 The background noise in the area is controlled by local road traffic and activity on Guildford Street and Grays Inn Road. Also, there are a number of existing air conditioning condensers already serving No. 123 and surrounding properties. These have a significant affect on the ambient noise levels. The pub windows are also exposed to significant levels of existing ventilation noise from an extract fan that serves their kitchens.

2.04 The following photograph indicates a view of the rear of the building:

Photo 1 : View of rear of property

3.00 MEASUREMENTS

3.01 Background noise levels have been measured on the escape stairs at the rear of the property over an extended period.

3.02 The equipment was set up to integrate sound levels over 5 minute intervals between 1615hrs, Wednesday 5th August and 100hrs Thursday 6th August 2009.

3.03 Levels were recorded as A weighted L_{eq}, L_{10} and L_{90}.

3.04 Weather conditions during the survey were calm and dry.

4.00 EQUIPMENT

4.01 Equipment for the survey was as follows:-

- Brüel & Kjær type 2238 Integrating Sound Level Meter conforming to type 1 BS EN 60804 & BS EN 60651: 1994.
- Brüel & Kjær Condenser Microphone and Connecting Leads.
- Brüel & Kjær Outdoor Microphone Kit, type UA1404.

- Tripod.

4.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter B&K2238	Serial No.	262287
	Calibration Date	28th August 2008
	Cal Certificate No.	C0806385
½" Condenser Mic. B&K4188	Serial No.	2641221
	Calibration Date	28th August 2008
	Cal Certificate No.	C0806385
Calibrator B&K4231	Serial No.	2389051
	Calibration Date	20th August 2008
	Cal. Certificate No.	4344

N.B. Copies of calibration certificates are available upon request.

4.03 The equipment was calibrated both before and after the survey with no significant difference noted in the levels.

5.00 RESULTS

5.01 A list of the levels measured is included in Appendix B and represented graphically in Appendix C.

5.02 A summary of the average ambient and lowest measured background levels is shown in Table 5.1, below.

Period	Average L_{Aeq} - dB	Minimum L_{A90} - dB
Day time (0700-1900 hrs)	58	51
Evening (1900-2300 hrs)	55	49
Night-time (2300-0700 hrs)	52	47

Table 5.1: Measured Ambient and Background Noise Levels

5.03 It should be noted from the background noise plot in Appendix C that the background noise is significantly influenced by existing plant operation during the day and evening periods. At night, the plant operation is intermittent, revealing a background noise in the absence of the plant of 47dB(A).

6.00 DISCUSSION

6.01 The site is located within the London Borough of Camden. The Borough policy for noise from fixed plant is for it to be designed to be 5dB less than the minimum background noise level at all periods of the day. Where the plant exhibits tonal characteristics or distinct impulses, it should be designed to be at least 10dB less than the minimum

background noise level. In this case, the proposed plant is not expected to exhibit such characteristics and thus the appropriate design criteria for the day, evening and night periods will be 5dB less than the background noise.

6.02 The following table outlines suitable limits for the noise emissions from the proposed plant:

Period	L_{Aeq} - dB
Day time (0700-1900 hrs)	46
Evening (1900-2300 hrs)	44
Night-time (2300-0700 hrs)	42

Table 6.1: Noise limits for new plant (to be achieved outside Blue Lion windows)

7.00 PLANT NOISE ASSESSMENT

7.01 The proposed external condensers are as follows:

3 off Daikin model RXS50G 62dB(A) sound power level

7.02 These units will be located 10m from the closet window of the Blue Lion pub accommodation areas and will be screened by the structure of the escape staircase serving the Eastman Institute. This will offer a minimum of 5dB(A) barrier attenuation. The condenser noise is also subject to reflections from two reflective surfaces (directivity Q = 4). The noise levels from the condenser reaching these windows are calculated thus:

$SPL_{at\ Blue\ Lion\ Window}$ = SWL + 10 log (3 units) – 20 log (10m) – 11 + 10 log (Q) – 5dB
= 62 +5 – 20 – 11 + 6 -5 dB
= 37dB(A)

7.03 The scheme will also include provision for two small internally mounted heat recovery ventilation systems. Full details of these are included in Appendix A. The ventilation systems intake and discharge from the building façade in the vicinity of the proposed condensers and will include in-line duct mounted attenuators (EEC model reference AS40/10).

7.04 Noise reaching the closest noise sensitive residential window from the vent apertures has been calculated using the published fan noise data in Appendix A, standard ductwork calculation techniques and the specified in-duct attenuator performance. These levels are summarised below along with the calculated condensing unit noise

levels from section 7.02 above, to give the total cumulative noise reaching the noise sensitive windows:

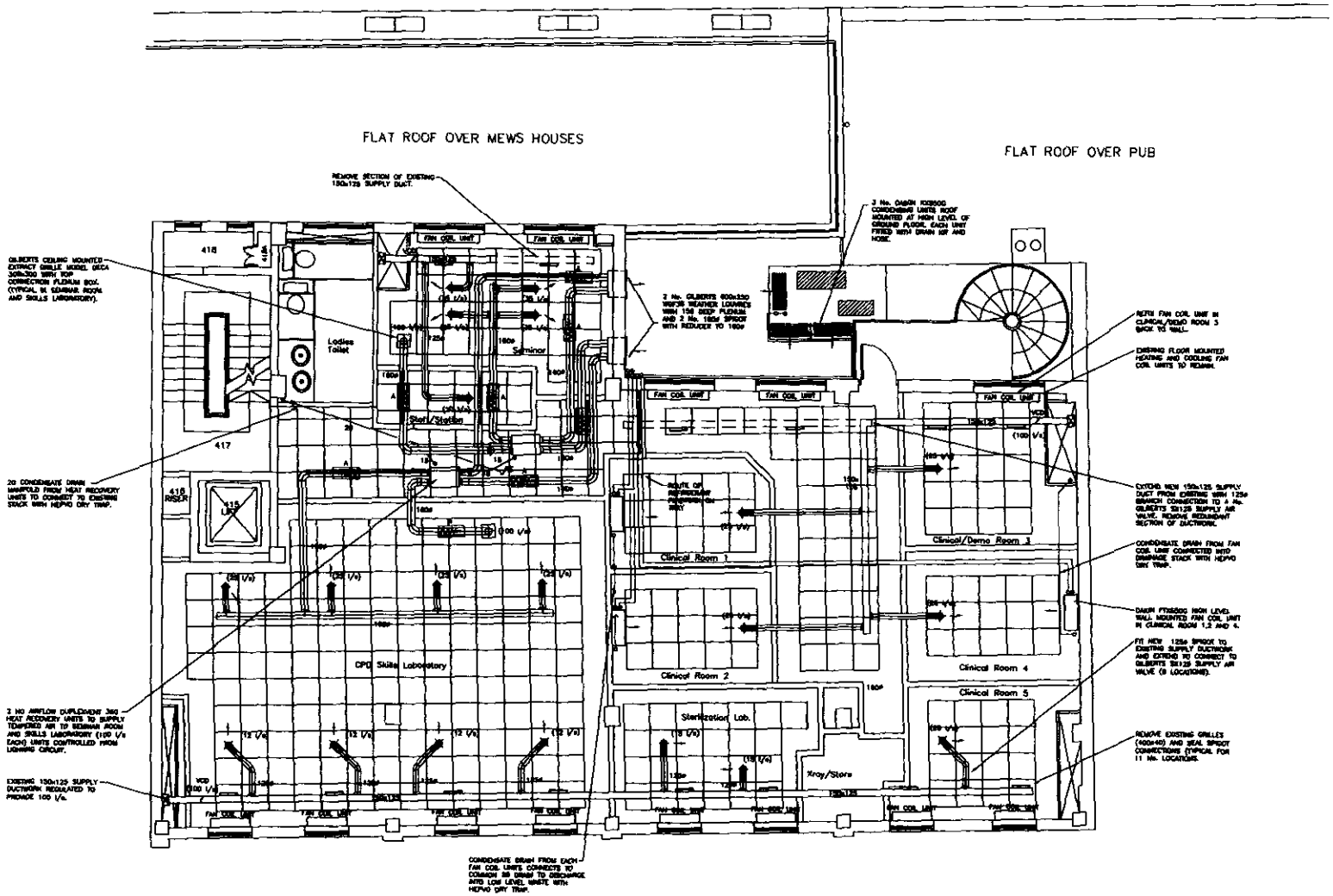
Duplex vent unit inlet	=	25dB(A)	2 off	=	28dB(A)
Duplex vent unit exhaust	=	31dB(A)	2 off	=	34dB(A)
Condenser noise (from section 7.02)				=	37dB(A)
TOTAL				=	**39dB(A)**

7.05 As can be seen, the cumulative noise from the condensers and vent plant will be at least 5dB less than the minimum requirements of Camden's noise policy and will thus comply with their Planning guidelines.

APPENDIX A

SITE DRAWINGS & VENTILATION DETAILS

NOTES

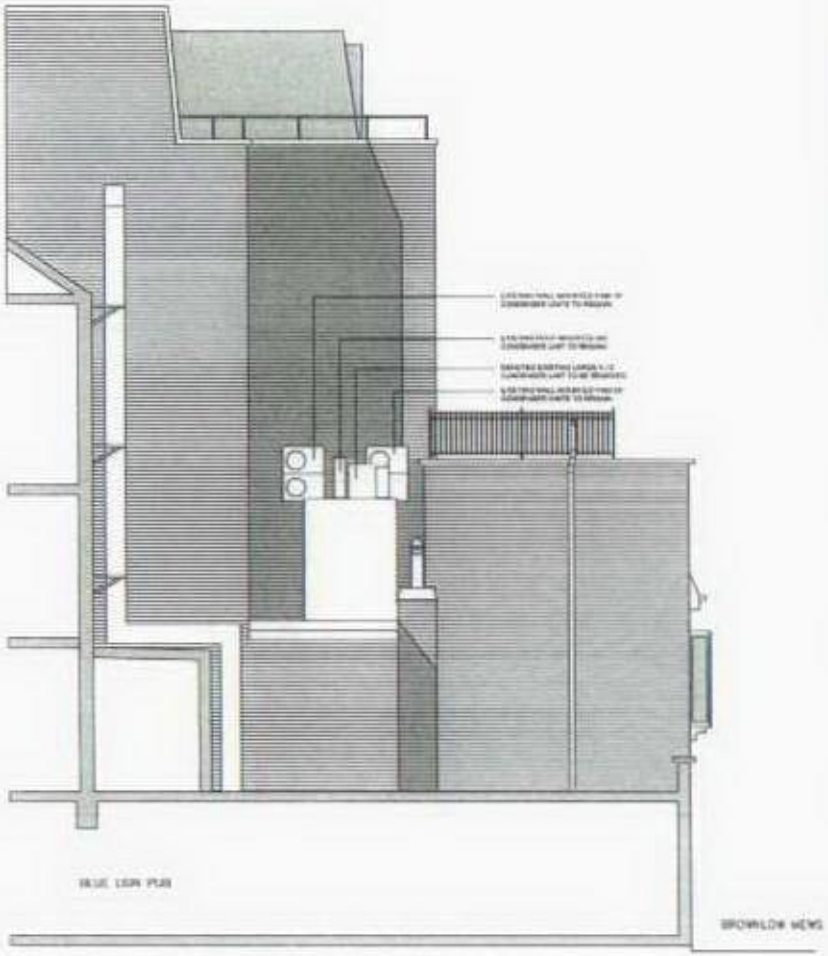


UCL

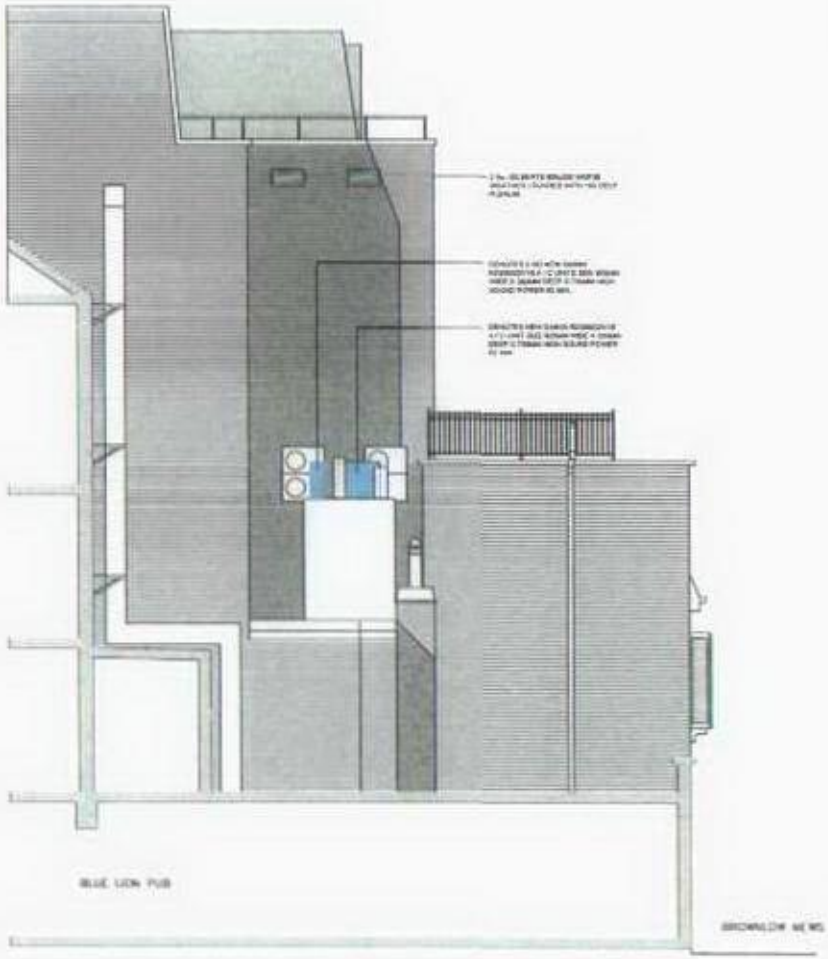
EASTMAN DENTAL INSTITUTE
123 GRAYS INN ROAD

FOURTH FLOOR
LAYOUT OF VENTILATION
AND A / C SYSTEM

NOTES



EXISTING ELEVATION WITH SPIRAL STAIRCASE REMOVED TO SHOW ELEVATION BEYOND



PROPOSED ELEVATION

UCL

EASTMAN DENTAL INSTITUTE
123 GRAY'S INN ROAD

EXISTING & PROPOSED
NORTH WEST ELEVATIONS
BEYOND SPIRAL STAIRCASE

APPENDIX B

SURVEY RESULTS
(TABULAR)

EC 10259 - Eastman Institute

Fowler Martin

Ambient Noise data

Time	L_Aeq	L_A10	L_A90
16:15	70	66	55
16:20	58	59	56
16:25	58	60	56
16:30	59	62	55
16:35	58	60	55
16:40	56	57	55
16:45	61	59	55
16:50	57	58	55
16:55	57	59	55
17:00	57	58	56
17:05	58	60	56
17:10	59	62	54
17:15	56	58	54
17:20	56	57	54
17:25	56	57	54
17:30	55	56	54
17:35	55	57	54
17:40	56	57	54
17:45	56	58	54
17:50	56	58	54
17:55	56	57	54
18:00	57	59	55
18:05	57	59	54
18:10	59	61	55
18:15	58	60	54
18:20	57	58	55
18:25	56	58	54
18:30	56	57	54
18:35	59	60	54
18:40	62	63	55
18:45	57	58	55
18:50	57	58	54
18:55	55	56	54
19:00	55	56	54
19:05	55	56	54
19:10	55	56	54
19:15	57	59	54
19:20	55	56	54
19:25	55	57	54
19:30	57	59	54
19:35	55	57	54
19:40	55	56	54
19:45	55	57	54
19:50	54	56	53
19:55	55	56	54
20:00	55	56	54
20:05	55	56	54
20:10	55	56	54

Time	L_Aeq	L_A10	L_A90
20:15	55	56	54
20:20	55	56	54
20:25	55	56	54
20:30	54	55	53
20:35	54	55	53
20:40	54	55	53
20:45	53	54	52
20:50	56	58	52
20:55	55	57	53
21:00	53	54	52
21:05	57	60	52
21:10	53	54	52
21:15	55	58	52
21:20	53	54	52
21:25	53	54	51
21:30	54	55	52
21:35	53	55	52
21:40	60	62	52
21:45	53	54	52
21:50	55	56	52
21:55	53	54	52
22:00	53	54	51
22:05	53	55	52
22:10	54	55	52
22:15	58	57	52
22:20	52	53	52
22:25	53	54	51
22:30	52	53	51
22:35	51	53	49
22:40	51	52	49
22:45	53	54	51
22:50	62	55	52
22:55	52	53	51
23:00	56	58	51
23:05	53	55	51
23:10	51	52	50
23:15	51	52	49
23:20	50	51	49
23:25	51	52	51
23:30	52	53	50
23:35	51	52	50
23:40	51	52	50
23:45	53	54	50
23:50	52	53	50
23:55	51	52	49
00:00	50	53	49
00:05	50	51	49
00:10	51	52	50

EC 10259 - Eastman Institute

Fowler Martin

Ambient Noise data

Time	L_Aeq	L_A10	L_A90
00:15	51	53	50
00:20	51	52	50
00:25	51	52	50
00:30	51	52	50
00:35	50	51	48
00:40	50	51	49
00:45	50	51	49
00:50	52	52	51
00:55	51	52	50
01:00	51	52	50
01:05	51	52	50
01:10	52	53	50
01:15	51	52	50
01:20	55	52	50
01:25	52	52	48
01:30	50	51	48
01:35	50	51	48
01:40	51	52	51
01:45	52	53	50
01:50	51	52	50
01:55	51	52	48
02:00	48	49	47
02:05	49	50	48
02:10	51	51	50
02:15	51	52	50
02:20	52	52	50
02:25	51	52	50
02:30	50	51	48
02:35	49	50	48
02:40	49	51	48
02:45	51	52	50
02:50	51	51	50
02:55	51	52	50
03:00	50	51	50
03:05	49	50	48
03:10	48	49	47
03:15	50	51	48
03:20	51	52	50
03:25	51	52	50
03:30	51	52	50
03:35	51	51	50
03:40	49	50	48
03:45	48	49	47
03:50	52	52	49
03:55	52	54	50
04:00	51	51	50
04:05	51	51	50
04:10	50	51	47

Time	L_Aeq	L_A10	L_A90
04:15	49	51	47
04:20	49	51	48
04:25	51	52	50
04:30	51	52	50
04:35	51	52	50
04:40	52	53	50
04:45	49	51	48
04:50	49	52	48
04:55	50	52	48
05:00	51	52	50
05:05	52	53	50
05:10	51	52	50
05:15	50	52	48
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05:25	50	53	48
05:30	51	53	50
05:35	52	53	51
05:40	52	53	51
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06:00	54	56	51
06:05	55	56	53
06:10	54	55	52
06:15	54	55	53
06:20	53	54	51
06:25	56	58	52
06:30	55	59	52
06:35	54	56	53
06:40	55	56	53
06:45	62	56	52
06:50	55	57	52
06:55	53	55	51
07:00	54	56	52
07:05	54	55	52
07:10	55	56	53
07:15	60	66	53
07:20	55	57	52
07:25	53	54	51
07:30	53	55	51
07:35	54	55	52
07:40	55	57	52
07:45	53	55	52
07:50	52	54	51
07:55	55	57	51
08:00	56	59	52
08:05	54	56	52
08:10	57	58	53

EC 10259 - Eastman Institute

Fowler Martin

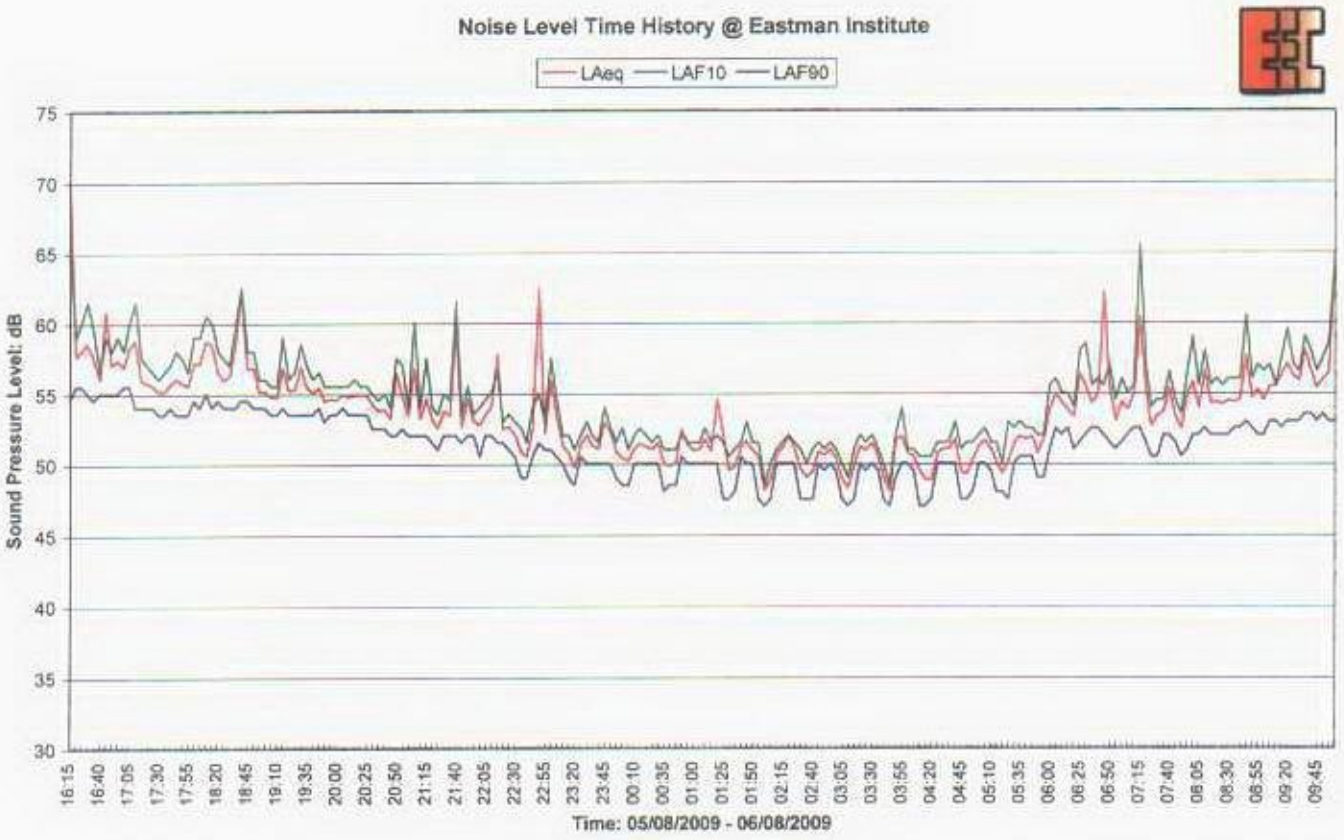
Ambient Noise data

Time	$L_A$eq	L_A10	L_A90
08:15	54	56	52
08:20	54	56	52
08:25	54	56	52
08:30	54	56	52
08:35	54	56	53
08:40	55	56	53
08:45	58	61	53
08:50	55	56	53
08:55	55	57	52
09:00	54	57	52
09:05	55	57	53
09:10	55	56	53
09:15	56	58	53
09:20	57	60	53
09:25	56	57	53
09:30	56	57	53
09:35	58	59	54
09:40	57	58	54
09:45	55	57	53
09:50	56	58	54
09:55	56	59	53
10:00	65	65	53

Time	$L_A$eq	L_A10	L_A90

APPENDIX C

SURVEY RESULTS (GRAPHICAL)


Noise Level Time History @ Eastman Institute
LAeq
LAF10
LAF90
Sound Pressure Level: dB
75
70
65
60
55
50
45
40
35
30
16:15
16:40
17:05
17:30
17:55
18:20
18:45
19:10
19:35
20:00
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04:20
04:45
05:10
05:35
06:00
06:25
06:50
07:15
07:40
08:05
08:30
08:55
09:20
09:45
Time: 05/08/2009 - 06/08/2009

APPENDIX D

GLOSSARY OF TECHNICAL TERMS

TECHNICAL TERMS AND UNITS

Decibel (dB) - This is the unit used to measure sound. The human ear has an approximately logarithmic response to sound over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). We therefore use a logarithmic scale to describe sound pressure levels, intensities and power levels. The logarithms used are to base 10; hence, an increase of 10 dB in sound pressure level corresponds to a doubling in perceived loudness of the sound.

Sound Power Level (PWL) - This is a function of the noise source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) - This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. For example, a sound pressure level measured at 1 metre from a sound source of certain sound power in reverberant room will not be the same as the sound pressure level a 1 metre from the sound source measured in open space.

Octave and One-Third Octave Bands - The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For finer analysis, each octave band may be split into three one-third octave bands.

"A" Weighting - A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

Noise Rating (NR) Curves - The "A" weighted sound pressure level cannot be used to define a spectrum or to compare sounds of different frequencies. NR curves convey frequency information in a single-figure index. This is done by defining the maximum permissible sound pressure level at each frequency for each curve. To measure the noise rating of a given environment, the SPL is measured in octave or one-third octave bands and the noise rating is then the highest NR curve touched by the measured levels.

Typical NR levels for various environments are shown below:

Workshops	NR 60-70
Mechanised Office	NR 50-55
Gymnasium, Sport Halls, Swimming Baths	NR 40-50
Restaurants, Bars, Cafeterias	NR 35-45
Cinemas, Hospitals, Churches, Small Conference Rooms	NR 25-35
Concert Halls, Theatres	NR 20-25
Diagnostic Clinics, Audiometric Rooms	NR 10-20
Broadcasting Studios	NR 5-15

Intermittency and Time-Weighting - The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:-

L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{10} This is the sound pressure level exceeded for 10% of the measurement period. It is widely used to measure traffic noise. For a given measurement period, the L_{10} level is by definition greater than or equal to the L_{90} level.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.

QUOTATION EQUIPMENT SCHEDULE

PROJECT Eastman Institute
QUOTATION REF EC 10259_42877
DATE 27/08/2009

SHT 1 OF 1

environmental equipment corporation

[redacted]

Richmond House, Churchfield Road, Walton-on-Thames, Surrey KT12 2TP
Tel: 01932 230940 Fax: 01932 230941 Email: info@eecnoisecontrol.co.uk

ITEM	LOCATION	MODEL	DESIGN CRITERIA	DIMENSIONS mm W	H	L1	L2	VOL m^3/s	PD Pa	PRICE EACH	QTY	PRICE TOTAL
AT01	Duplex 360 FAI	AS 40/10	dBA 33	300	200	1000	-	0.10	4	192.00	2	384.00
AT02	Duplex 360 Exhaust	AS 40/10	dBA 33	300	200	1000	-	0.10	4	192.00	2	384.00
AT03	Duplex 360 supply	AS 25/10	NR 38	300	225	1000	-	0.10	10	201.00	2	402.00
AT04	Duplex 360 extract	AS 25/10	NR 38	300	225	1000	-	0.10	10	201.00	2	402.00

Notes:- All items complete with 160mm dia spigot connections

Delivery 2 - 3 weeks

Connections 160mm dia spigots

L1=overall unit length
L1&L2=outside leg dimension for bend attenuators
The Attenuator's quoted aerodynamic performance has, unless otherwise stated, assumed straight lengths of duct either side of the Attenuator in line with BS 4718 - 1971.

EEC Standard Terms and Conditions apply
Registered No. 2568740 E&OE

PAGE TOTAL	£ 1,572.00
GOODS TOTAL	£ 1,572.00
CARRIAGE	£ 95.00
TOTAL PRICE	**£ 1,667.00**