

Report No. Maple St.R1

For: Hut Architecture

Maple St – ACOUSTIC DESIGN

ENVIRONMENTAL NOISE - PLANNING

By: Paul Gillieron Acoustic Design
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October 2006



bandstand, de la warr pavilion,
bedhill on sea

auditorium design
computer modelling
building acoustics
noise and vibration analysis/control
sound system design
electronic architecture
3D/ambisonic sound spaces
audio visual system design

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1.0 Summary

2.0 Introduction

3.0 Impact of New Plant

Figure 1 Site Plan showing Noise Measurement Location

APPENDIX

Equipment and Procedure

Environmental Noise Measurements

Site pictures showing new air conditioner location and adjacent window

Glossary of Acoustic Terms

1.0 Summary

Four new air conditioning units are proposed at Maple St situated on the rear terrace of the building.

Measurements were carried out according to the procedures set out in BS4142. Results can be found in the Appendix.

At present the nearest window in the Flat above at the side of the site, has a minimum LA90 level of 47.1dB.

The environmental department has stipulated that the resultant noise level due to the new air conditioning units should not exceed background level -10dB at all times at the nearest residential premises.

Via calculation, it has been shown that this criterion is achieved at the nearest property.

2.0 Introduction

In October 2006, Paul Gillieron Acoustic Design was asked to carry out an assessment of the noise impact from the instalment of four new air conditioning units on the rear terrace of Maple St. This report shows how the noise from the new plant will effect the local environment, concentrating on any noise sensitive areas.

Above the site is a residential flat. This is the nearest residential premises to the site, and therefore deemed to be the closest noise sensitive area.

Between 17th October and 18th October 2006, an environmental microphone and real time analyser were located at 1st Floor level of Maple St taken to be the nearest residential premises – See Figure 1.

Equipment, procedure and LA90 background data are given in the APPENDIX.

Calculations of Impact of new Plant

The new plant will be a minimum of 20dBA below background at all times due to the barrier effect to the nearest window provided by the roof edge. See figure 2 for site section.

		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	(A)
Example Level	Worst Case unit	48	54	46	40	38	37	35	30	43
Distance Attenuation	1m - 8m	18	18	18	18	18	18	18	18	
Barrier Attenuation	d = 1000mm									
	Path diff.	10	12	14	18	20	24	26	28	
	Level at 1m from facade	27	31	21	12	7	2	-2	-9	
	+3dB façade reflection	30	34	24	15	10	5	1	-6	
		30	34	24	15	10	5	1	-6	
	dBA Values	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1	
	dBA Calculation	4	18	15	11	10	6	2	-7	21
Minimum LA90	24Hr	51.3	47.8	44.4	44.1	43.1	38.4	30.6	23.8	47
	Level below background	21	14	20	30	33	33	30	30	26

Loss to façade – 6dB per doubling of distance

Figure 1: Site Plan showing Noise Measurement Location

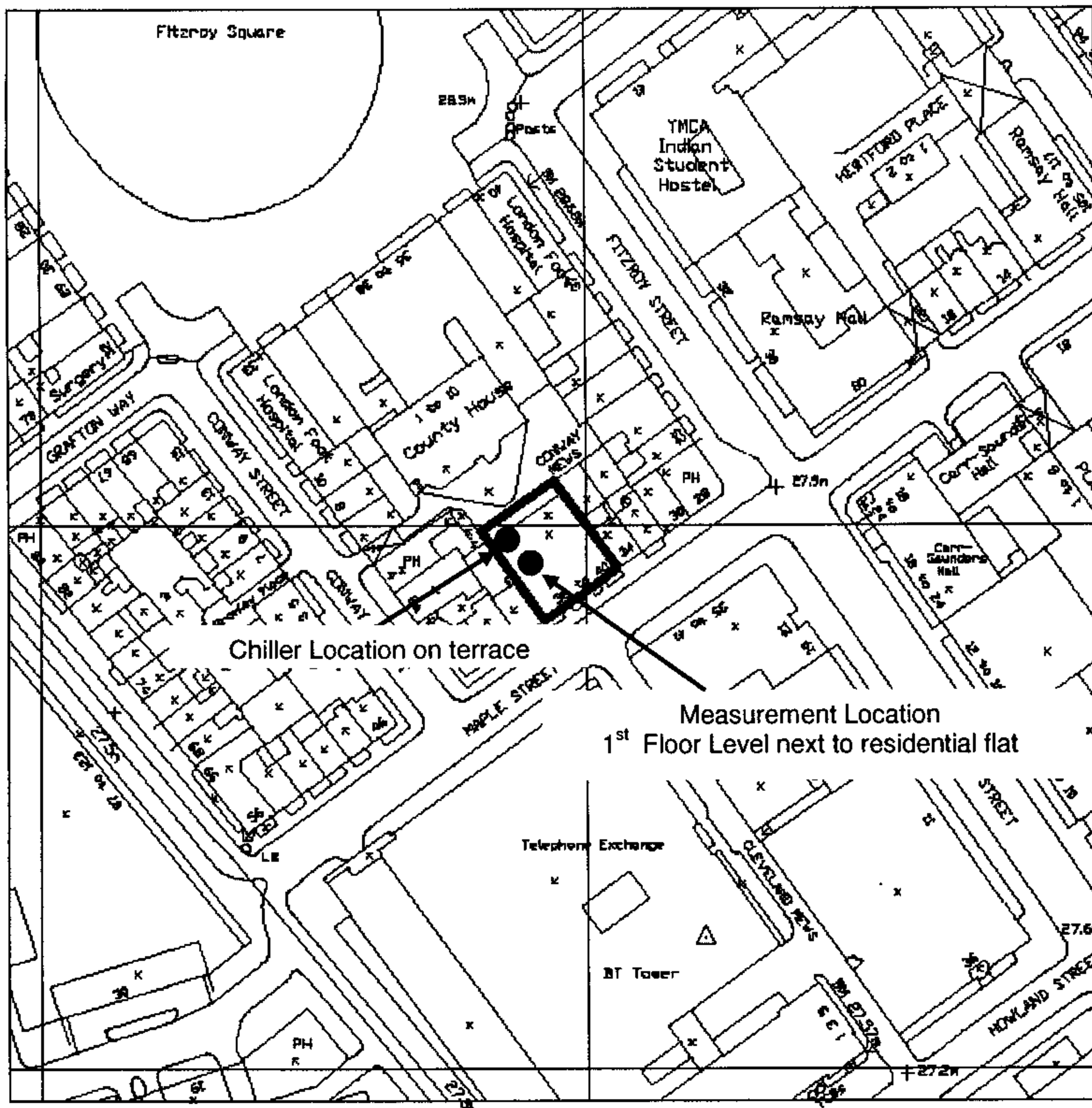
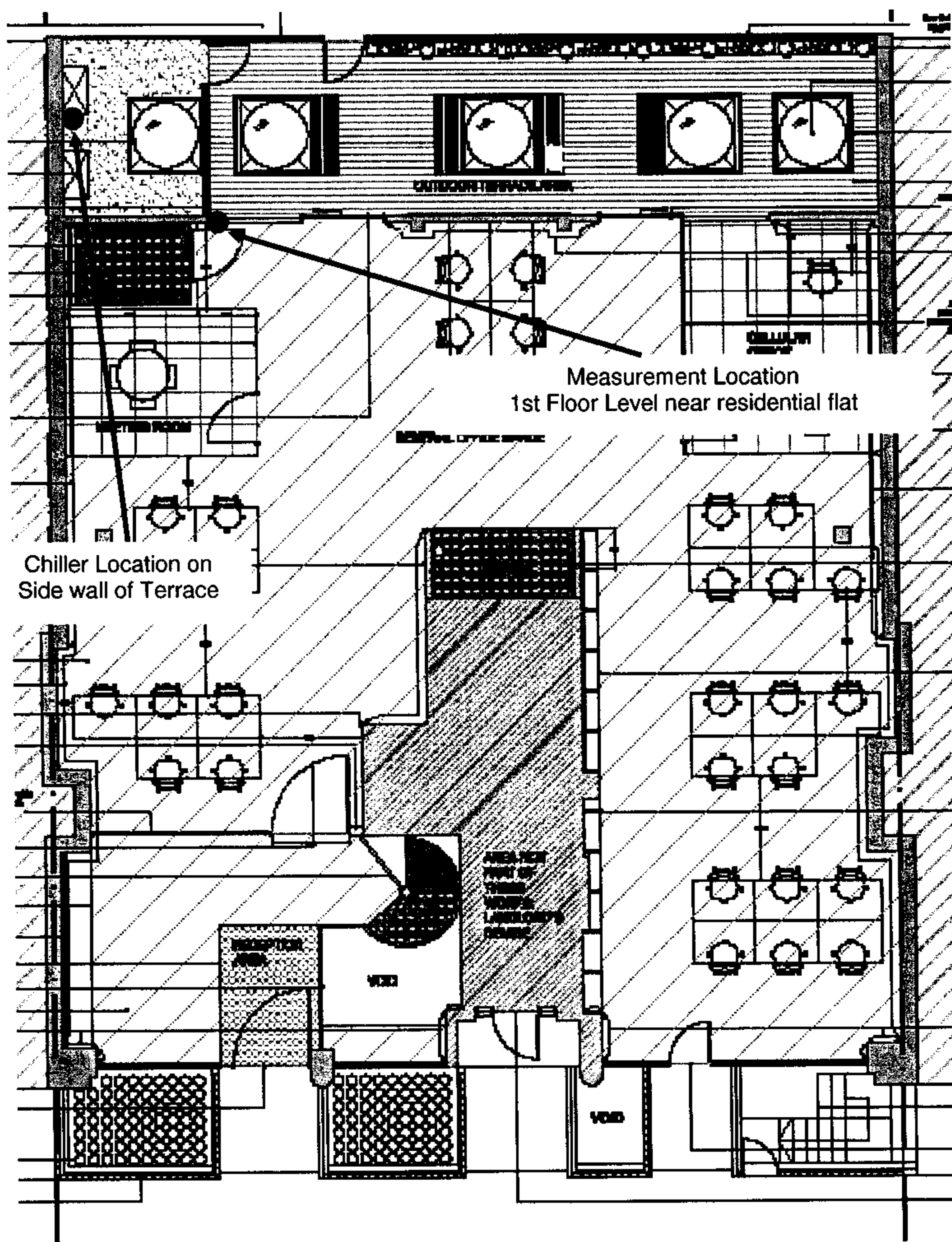
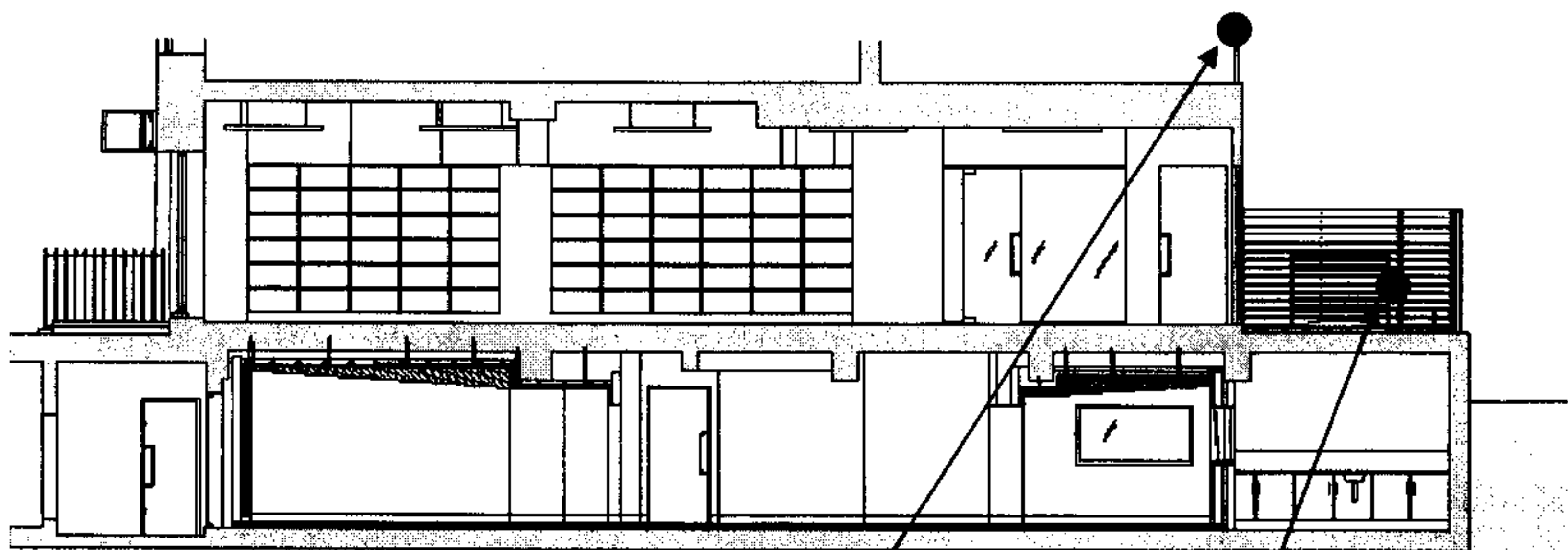


Figure 2: Site Plans and Elevations





Measurement Location
1st Floor Level near to residential flat

Chiller Location on
Side wall of Terrace

APPENDIX

EQUIPMENT AND PROCEDURE

Noise Measurements, building front 17th - 18th October 2006

Norsonics 118 Real Time Analyser

Norsonics 1251 Calibrator

GRAS Environmental Microphone

Conditions: Cloudy Dry, Wind 76° magnetic, 0.93m/s

After calibration, the Norsonics 118 was set to measure 15 minute samples of noise.

Results expressed LA90, 15min averages, below.

AC Unit Levels

LCS

REFRIGERATION & AIR CONDITIONING

Weald View
Loddington farm
Loddington Lane
Linton
Maidstone
Kent ME17 4AG

01622 743465 / 07931 274388

VAT No: 841 4072 51

REF: MAPLE STREET LONDON A/C TECHNICAL SPECIFICATIONS

OUTDOOR CONDENSING UNITS dB [A]

21/08/06

SRK 63 ZE sound pressure level 48 dB [A]

FDTVA 251 sound pressure level 48 dB [A]

FDEVA 402 sound pressure level 50 dB [A]

INDOOR UNITS dB [A]

SRK 63 ZE fan speed [1] 26 db [2] 33db [3] 39 db [4] 43 db

FDTVA251 fan speed [1] 31 db [2] 33 db [3] 35 db

FDEVA402 fan speed [1] 39 db [2] 41 db [3] 44 db

THESE SPECIFICATIONS HAVE BEEN GIVEN / SUPPLIED BY MITSUBISHI
HEAVY INDUSTRIES UK.

PLEASE DO NOT HESITATE TO CONTACT ME IF YOU REQUIRE ANY FURTHER
INFORMATION REGARDING THESE AIR CONDITIONERS.

PAUL SHEPPARD

07931 274388



ENVIRONMENTAL NOISE MEASUREMENTS

Date	LA90	125 Hz	250 Hz	500 Hz	1.0 k	2.0 k	4.0 k	8.0 k
(2006/10/18 00:00:00.00)	48	49.9	45.8	44.8	44.1	39.1	30.9	24
(2006/10/18 00:15:00.00)	48.7	50.6	46.2	45.2	44.8	39.7	30.9	24
(2006/10/18 00:30:00.00)	48.9	50.7	46.3	45.6	45	39.8	31.7	24.5
(2006/10/18 00:45:00.00)	48.4	49.8	45.6	44.9	44.5	39.4	31.1	24.2
(2006/10/18 01:00:00.00)	48.3	50	45.8	45.1	44.3	39.2	30.9	23.9
(2006/10/18 01:15:00.00)	48.9	50.1	46.1	45.5	45.2	39.9	31.8	24.5
(2006/10/18 01:30:00.00)	49	50.5	46.2	45.6	45	40.1	32.7	25.1
(2006/10/18 01:45:00.00)	47.9	48.9	44.8	44.5	44.3	38.9	30.6	23.7
(2006/10/18 02:00:00.00)	48	49.1	45	44.8	44.3	38.9	30.9	24.1
(2006/10/18 02:15:00.00)	48.3	49	45.3	45.1	44.6	39.2	30.7	23.7
(2006/10/18 02:30:00.00)	48	48.9	45	44.6	44.4	39.1	30.9	24.1
(2006/10/18 02:45:00.00)	48.2	49.6	45.4	44.7	44.5	39.2	31.3	24.1
(2006/10/18 03:00:00.00)	48.2	49.1	45.5	44.9	44.4	39.2	31	24.1
(2006/10/18 03:15:00.00)	48.4	49	45.5	45.1	44.6	39.3	30.7	23.9
(2006/10/18 03:30:00.00)	48.2	49.1	45.4	45.1	44.3	39.2	31.2	24.2
(2006/10/18 03:45:00.00)	48.3	48.8	45.2	45	44.5	39.3	31	23.9
(2006/10/18 04:00:00.00)	47.6	47.9	44.6	44.4	43.9	38.6	30.2	23.5
(2006/10/18 04:15:00.00)	47.9	48.8	44.9	44.5	44.2	38.9	30.2	23.5
(2006/10/18 04:30:00.00)	47.7	48.3	44.9	44.6	43.8	38.8	30.7	23.9
(2006/10/18 04:45:00.00)	47.3	48.3	44.8	44.2	43.3	38.4	30.6	23.8
(2006/10/18 05:00:00.00)	47.1	47.8	44.4	44.1	43.1	38.4	30.6	23.8
(2006/10/18 05:15:00.00)	47.4	48.2	44.7	44.3	43.3	38.4	30.6	23.8
(2006/10/18 05:30:00.00)	47.3	48.2	44.9	44.3	43.2	38.3	30.4	23.7
(2006/10/18 05:45:00.00)	47.4	48.4	45.1	44.5	43.2	38.4	30.4	23.7
(2006/10/18 06:00:00.00)	47.7	48.7	45.2	44.7	43.6	38.8	30.7	23.7
(2006/10/18 06:15:00.00)	47.8	49.2	45.6	44.6	43.6	38.8	30.6	23.9
(2006/10/18 06:30:00.00)	48.1	49.2	45.4	44.9	43.9	39.1	31.3	24.2
(2006/10/18 06:45:00.00)	47.8	49.4	45.9	44.9	43.6	38.5	30.5	24
(2006/10/18 07:00:00.00)	48.4	50.1	46.4	45.3	44.3	39.3	31.1	24.1
(2006/10/18 07:15:00.00)	48.4	50.2	46.4	45.5	44.1	39.3	31.3	24.3
(2006/10/18 07:30:00.00)	48.9	50.7	46.9	45.9	44.7	39.6	31.6	24.4
(2006/10/18 07:45:00.00)	49	51.1	47.1	45.9	45	39.7	31.5	24.6
(2006/10/18 08:00:00.00)	49.2	50.7	47.1	46.2	45.1	39.9	31.6	24.4
(2006/10/18 08:15:00.00)	49.5	51.5	47.6	46.6	45.3	40.3	32.1	24.6
(2006/10/18 08:30:00.00)	49.4	51.3	47.5	46.5	45.2	40.2	31.9	24.9
(2006/10/18 08:45:00.00)	49.5	51.2	47.4	46.3	45.6	40.1	31.4	24.5
(2006/10/18 09:00:00.00)	49.9	51.5	47.7	46.8	45.7	40.7	32.8	24.9
(2006/10/18 09:18:00.00)	49.4	51.2	47.3	46.4	45.2	40.2	32.6	25
(2006/10/18 09:30:00.00)	49.8	51.6	47.4	46.7	45.7	40.6	32.5	24.8
(2006/10/18 09:45:00.00)	50.2	52.3	48	47	46.1	40.8	32.6	24.9
(2006/10/18 10:00:00.00)	50.3	52.1	48.1	47.2	45.8	41.1	34	26.8
(2006/10/18 10:15:00.00)	50.6	52.3	47.9	47.4	46.4	41.3	33.5	26.5
(2006/10/18 10:30:00.00)	51	52.8	48.4	47.5	46.8	41.6	33.8	27.6
(2006/10/18 10:45:00.00)	51.3	53.1	48.6	48.1	46.9	41.6	34.1	26.7
(2006/10/18 11:00:00.00)	52.1	54.1	48.9	49.2	47.7	42.4	34.9	27.3
(2006/10/18 11:15:00.00)	51.1	53.7	49	48.2	47	41.8	33.9	26.2
(2006/10/18 11:30:00.00)	51.6	53.9	49.3	48.5	47.6	42.3	34.6	26.3
(2006/10/18 11:45:00.00)	51.7	54.2	49.1	48.4	47.5	42.3	33.9	26.1
(2006/10/18 12:00:00.00)	51.8	54.5	49.7	48.6	47.5	42.3	34.7	26.7
(2006/10/18 12:15:00.00)	51.6	53.8	49	48.4	47.4	42.5	35.4	27.5
(2006/10/18 12:30:00.00)	51.9	54	49.5	48.7	47.5	42.7	35.3	27.8
(2006/10/18 12:45:00.00)	51.7	54.3	49.5	48.4	47.2	42.4	34.4	26.3
(2006/10/17 13:00:00.00)	52.1	56.5	51.5	48.9	46.4	42.8	36.4	28
(2006/10/17 13:15:00.00)	52.5	57.1	52.3	49.5	46.7	43.4	37.6	29.5
(2006/10/17 13:30:00.00)	53.7	57.4	52.7	50.3	47.9	45	40.1	34
(2006/10/17 13:45:00.00)	53.8	57.2	52.9	50.7	48	44.7	40.4	33.3
(2006/10/17 14:00:00.00)	53.7	56.9	52.6	50.2	47.9	44.8	40.7	34.9
(2006/10/17 14:15:00.00)	53.4	57.3	52.8	50.2	47.8	44.7	40	31.5
(2006/10/17 14:30:00.00)	53.5	57.6	53.1	50.8	47.8	44.3	38.7	30.9
(2006/10/17 14:45:00.00)	53	56.5	52.1	49.7	47.3	44.2	39.2	30.7
(2006/10/17 15:00:00.00)	51.7	55.2	50.8	48.2	46.4	43.1	37.8	28.2

(2006/10/17 15:15:00.00)	51.7	54.3	50.4	47.8	46	43.2	39.4	28.7
(2006/10/17 15:30:00.00)	51.7	54.5	50.6	48.3	46.3	43.1	38.9	28.8
(2006/10/17 15:45:00.00)	51.1	54.5	50.3	47.7	45.7	42.1	35.5	25.5
(2006/10/17 16:00:00.00)	50.3	54.1	49.9	47.4	45.2	41.1	34.1	24.4
(2006/10/17 16:15:00.00)	51.1	53.9	50.4	48.1	45.9	42.2	35.4	25.4
(2006/10/17 16:30:00.00)	51.3	54	50.7	48.5	46.1	42	34.9	24.9
(2006/10/17 16:45:00.00)	50.8	54.2	50.4	47.8	45.6	41.7	35	24.7
(2006/10/17 17:00:00.00)	51	55.4	50.8	47.9	45.6	41.6	34.7	24.7
(2006/10/17 17:15:00.00)	52.4	57.2	53	50.4	46.2	42.5	35.9	26.4
(2006/10/17 17:30:00.00)	51.6	57	52.5	48.8	45.8	41.8	35.2	25.7
(2006/10/17 17:45:00.00)	51.4	56.3	52	48.7	45.6	41.3	35.2	33.7
(2006/10/17 18:00:00.00)	51	55.4	51.6	48	45.3	41.4	35.4	31.4
(2006/10/17 18:15:00.00)	51.6	57	52.1	48.8	45.7	41.5	34.8	26.9
(2006/10/17 18:30:00.00)	51.5	57.1	51.9	48.6	45.8	41.7	34.6	26.6
(2006/10/17 18:45:00.00)	51.1	57	52	48	45.3	41.3	33.9	25.5
(2006/10/17 19:00:00.00)	51.3	56.7	52.1	48.7	45.6	41.1	34	25.6
(2006/10/17 19:15:00.00)	51	56.6	51.9	48.5	45.3	40.9	33.8	25.7
(2006/10/17 19:30:00.00)	50.7	55.5	51.5	48.3	45.1	40.7	33.6	25
(2006/10/17 19:45:00.00)	50.7	55.5	51.4	47.9	45	41.1	34.4	26.5
(2006/10/17 20:00:00.00)	50.3	55.2	50.2	46.8	44.8	41.2	34.4	26.4
(2006/10/17 20:15:00.00)	50.9	55.5	51.4	47.9	45.2	41.4	34.9	27.1
(2006/10/17 20:30:00.00)	50.9	55.7	51.5	48.1	45.2	41.1	34.1	25.6
(2006/10/17 20:45:00.00)	50.6	55.6	51.3	47.5	44.9	41	34.4	27.6
(2006/10/17 21:00:00.00)	50.6	55.9	51.2	47.5	44.9	40.9	33.8	25.6
(2006/10/17 21:15:00.00)	49.1	54.5	49.1	45.9	43.6	40.1	32.9	24.5
(2006/10/17 21:30:00.00)	49.1	53.3	49.8	47.2	43.3	38.5	30.8	23.3
(2006/10/17 21:45:00.00)	49	51.1	46.7	45.7	45.1	39.6	31.2	24.1
(2006/10/17 22:00:00.00)	49.2	51	46.8	45.8	45.3	39.9	31.8	24.2
(2006/10/17 22:17:00.00)	48.8	51	46.4	45.6	44.9	39.6	31.4	24.4
(2006/10/17 22:30:00.00)	48.6	50.7	46	45.1	44.6	39.4	30.9	24.1
(2006/10/17 22:45:00.00)	48.5	50.4	46.1	45.1	44.6	39.1	30.8	23.9
(2006/10/17 23:00:00.00)	48.1	50.2	45.7	44.9	44.1	39	30.9	23.7
(2006/10/17 23:17:00.00)	47.8	49.6	45.2	44.6	44	39	30.7	23.8
(2006/10/17 23:30:00.00)	47.5	49	44.8	44.3	43.6	38.6	30.6	23.6
(2006/10/17 23:45:00.00)	47.4	48.8	44.6	44	43.4	38.4	30.1	23.7

GLOSSARY OF ACOUSTIC TERMS

DECIBEL (dB) - A unit of sound pressure measurement
Sound Pressure Level in dB (L_p) = Measured sound pressure/Reference sound pressure (ref.pressure = 20micropascals)

dB(A) - The A -weighted sound pressure level, the weighting network reduces low frequency sound in a similar way to the human ear.

REVERBERATION TIME (RT) – decay of sound in rooms
The time taken for a sound, once terminated, to fall through 60dB i.e. to one millionth of its original sound intensity.

HERTZ (Hz) - a unit of frequency measurement. The normal range of hearing is from 20Hz to about 15kHz.

ABSORPTION COEFFICIENT – degree to which a material absorbs sound.
The ratio of reflected to incident sound energy (perfect absorber =1)

SOUND REDUCTION INDEX (R,dB) – quantity which describes a material's ability to reduce the sound pressure level across it (e.g. a wall or floor)

$$R = L_1 - L_2 + 10 \log S/A$$

L_1 – Average sound pressure level in source room (averaged from 100Hz – 3150Hz)

L_2 - receiving

S – Wall Area (m^2)

A – Total absorption in receiving room (m^2 units)

R_w – weighted sound reduction index, usually 2 – 3dB higher

AVERAGE ROOM TO ROOM LEVEL DIFFERENCE – D, dB = $L_1 - L_2$,
averaged 1/3 octave bands from 100Hz – 3150kHz.

D_w – weighted value of D (usually 2 - 3dB higher)

D_{nTw} – D_w corrected for reverberation time of receiving room

NOISE RATING CURVES (NR CURVES) – set of curves used to describe optimum background noise levels for different tasks.

L10/90 LEVEL (dB) - The level in dB of a time varying sound pressured level (e.g. traffic) exceeded for 10%/90% of the time of measurement.
L90 is usually called the **BACKGROUND NOISE LEVEL**.

Leq AVERAGE SOUND PRESSURE LEVEL – level dB of a time varying sound pressure level with equal amounts of energy above and below it, for the time of measurement.

TONAL NOISE – noise which is tonal (single frequency or narrow band of frequencies), audible above the broad band noise background.
Noise which is at least 5dB above the average of the 1/3 octave band sound pressure levels immediately on either side of it.