

Report No. Maple St.R1.rev1

For: Hut Architecture

Maple St – ACOUSTIC DESIGN

ENVIRONMENTAL NOISE - PLANNING

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bandstand, de la warr pavilion,
bexhill 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 10dBA 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.

(A)		
Level from 1 AC unit		48
Level from 9 AC units		57
Distance Attenuation	1m - 8m	-18
Barrier Attenuation	d = 1000mm	
	Path diff.	-16
	Level at 1m from facade	23
	+3dB façade reflection	26
Minimum LA90	24Hr	47
	Level below background	21
Loss to façade – 6dB per doubling of distance		

Figure 1: Site Plan showing Noise Measurement Location

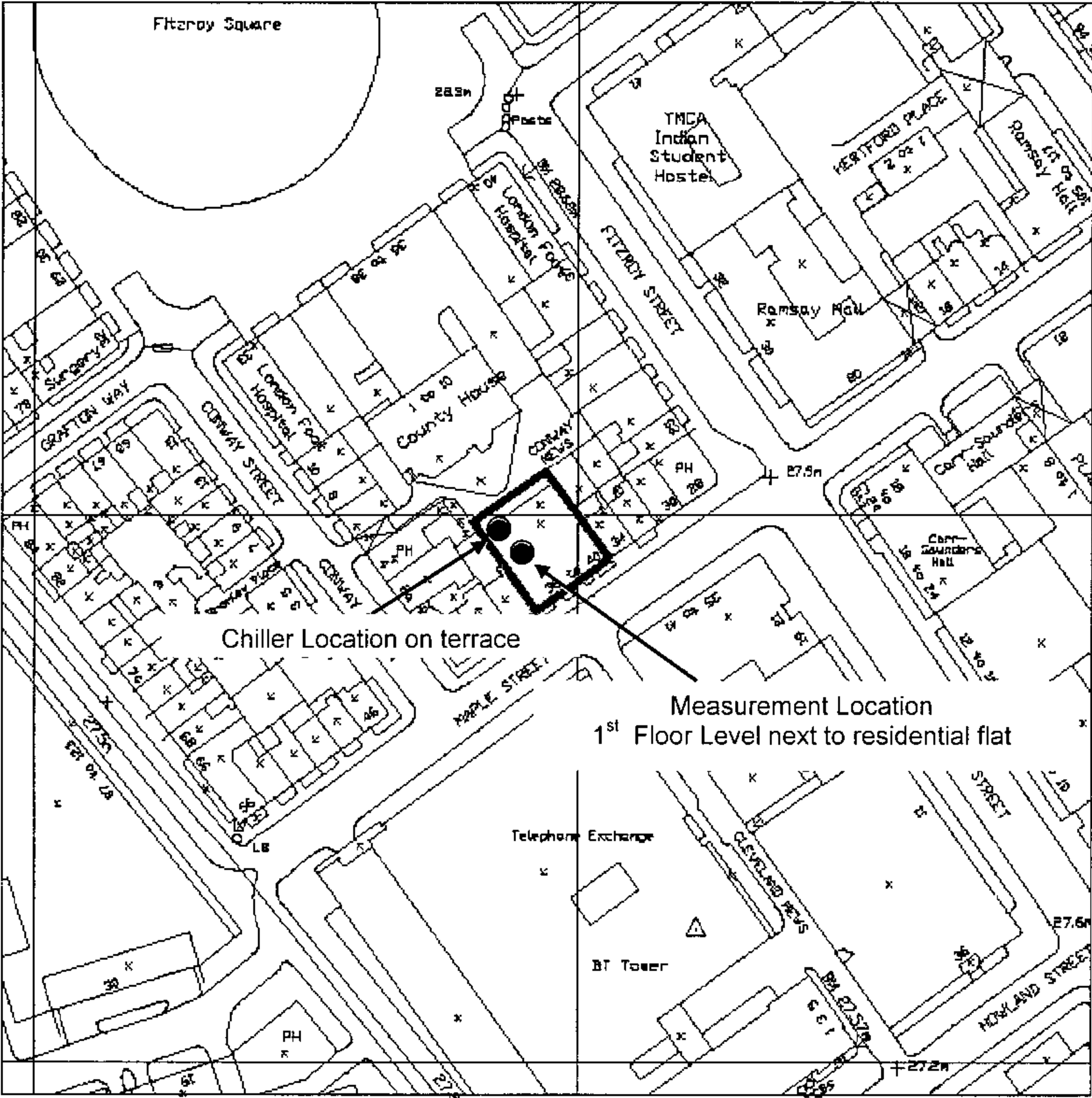
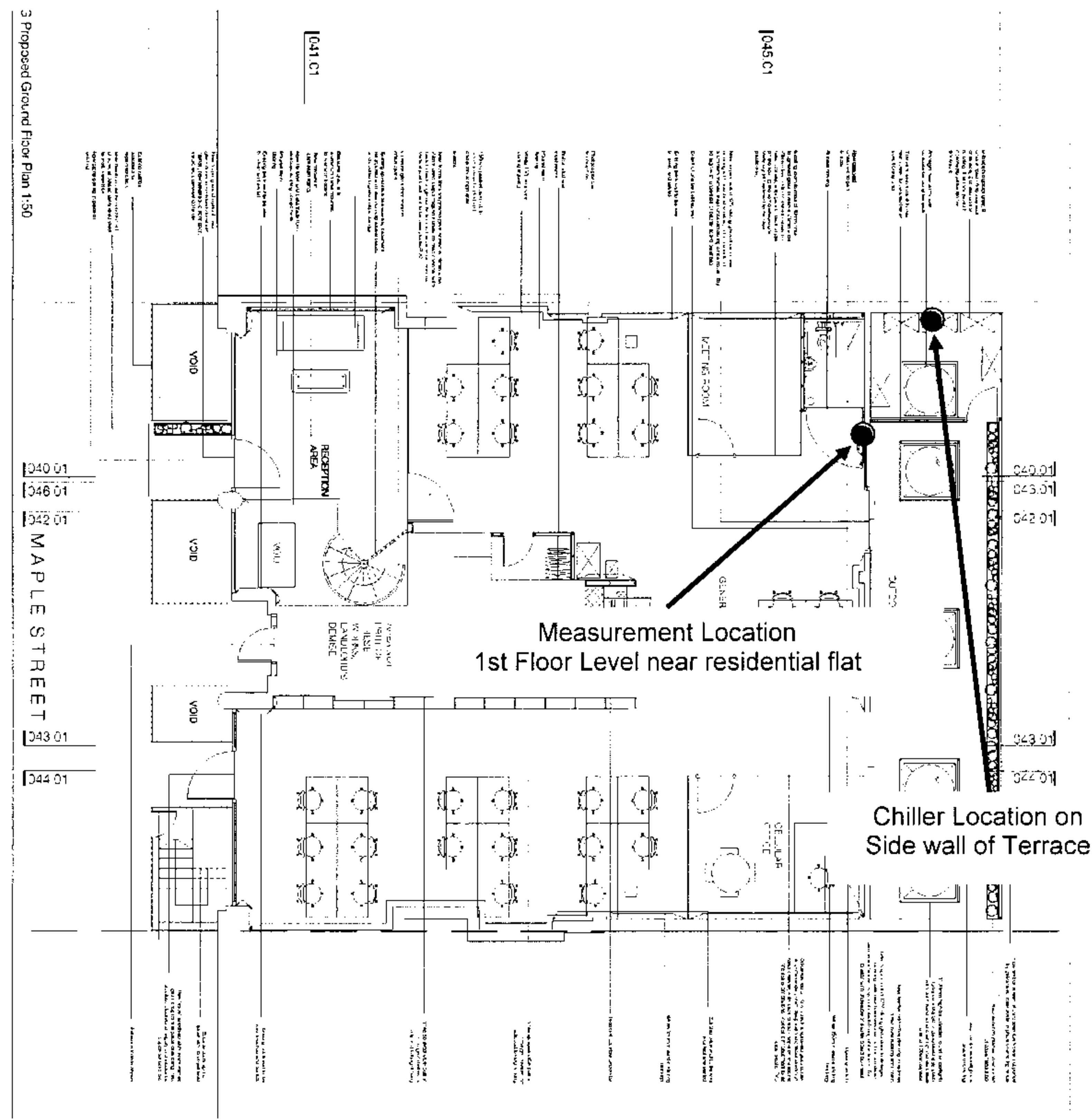
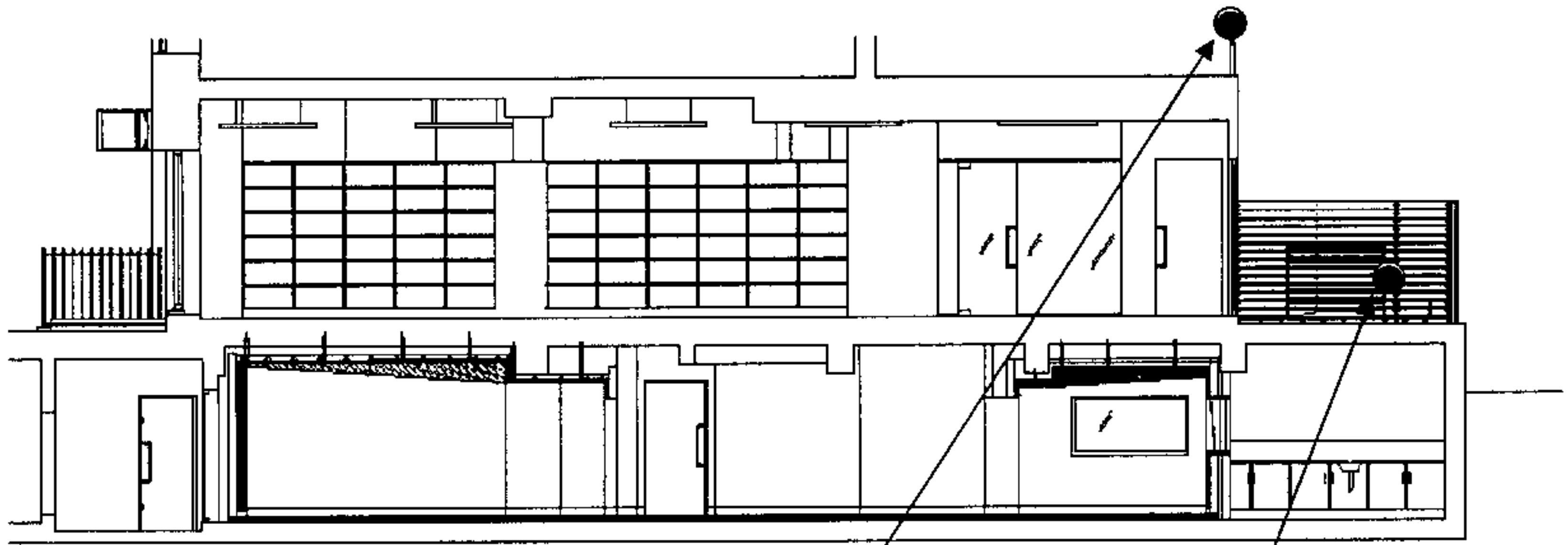


Figure 2: Site Plans and Elevations





Measurement Location
1st Floor Level near to residential flat

Chiller Location on
Side wall of Terrace

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

50dBA Max

TOSHIBA

Outdoor unit Digital Inverter RAV-SM802AT-E

Technical specifications

Heat pump		
Power supply	(V)	230
Dimensions (H/W/D)	(mm)	550/780/290
Net weight	(kg)	42
Air flow volume	(m ³ /h)	2700
Air flow volume	(l/s)	750
Power output of fan motor	(W)	43
Sound pressure level, cooling	(dB(A))	48
Sound pressure level, heating	(dB(A))	50
Sound power level	(dB(A))	65/67
Compressor power output	(W)	1600
Pipe diameter liquid	(mm/")	9,5 (3/8")
Pipe diameter gas	(mm/")	15,9 (5/8")
Pipe connections		Bördei
Pipe length, maximum	(m)	30
Pipe length, pre-charged	(m)	20 (1,7kg + 40g/m)
Height difference (outdoor unit higher/lower)	(m)	30/30
Outdoor temperature, cooling	(°C)	-15 - +43
Outdoor temperature, heating	(°C)	-15 - +15

Subject to misprints and typesetting errors!



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

Proposed Chiller Location



Proposed
Chiller
Location

GLOSSARY OF ACOUSTIC TERMS

DECIBEL (dB) - A unit of sound pressure measurement
Sound Pressure Level in dB (Lp) = 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)

$$R = L1 - L2 + 10 \log S/A$$

L1 – Average sound pressure level in source room (averaged from 100Hz –
3150Hz)

L2 - receiving

S – Wall Area (m²)

A – Total absorption in receiving room (m² units)

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

AVERAGE ROOM TO ROOM LEVEL DIFFERENCE – D, dB = L1 – L2,
averaged 1/3 octave bands from 100Hz – 3150kHz.

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

DnTw – Dw 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.