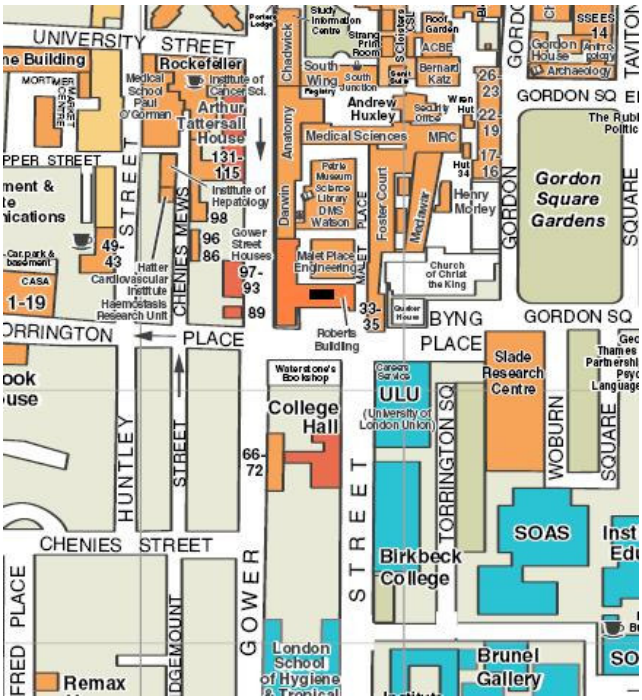
UNIVERSITY COLLEGE LONDON
ESTATES & FACILITIES DIVISION

REPLACEMENT OF COOLING TOWERS
ROBERTS BULDING
TORRINGTON PLACE, GOWER STREET, WC1



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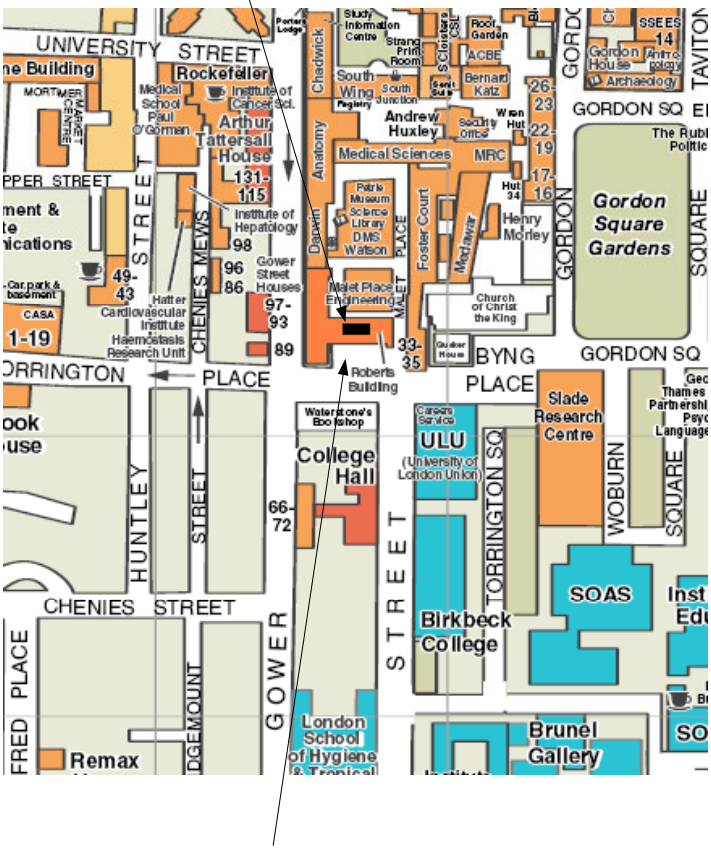
Ref: 825/71 M jag rev.T1
Date: March 2007

Introduction

The existing Cooling Towers on the roof (12th floor) level of the Roberts Building are used for process and space cooling purposes and are critical to the ongoing educational/research function of the building and its department. Unfortunately the towers, which are circa 20 years old are time expired and difficult to maintain efficiently to meet legislative needs.

As a result UCL wish to replace the Towers during the coming summer of 2007 to allow for other construction projects that are taking place nearby. This short report forms part of the supporting documentation for an application for planning permission to be submitted to Camden Council in March / April of 2007.

Location of cooling tower replacement UCL Roberts Building



New extension not part of this project in front Roberts Building

General Description of the Site

The two existing cooling towers are located in an open top roof plant enclosure on Roberts Building. This enclosure which also contains a number of fume extract fans and cooling plant obscures the view of approximately the lower third of the cooling towers and the view of the other fans and machinery. The rest of the cooling towers protrude above the building line (see photo below).

Photo of existing roof taken from the roof on an adjacent UCL building

Surrounding, and higher than, the cooling towers are a number of fume cupboard exhausts.

The new cooling towers will occupy a similar location to the existing cooling towers and will be of similar size, appearance and performance.

See drawing No.825 PLA 01 rev.P3 - "Roof" and No.45/50/121 - "Record Drawing of Existing" appended to this report.

During the selection and review of the new replacement plant a number of refinements have been incorporated to reduce the risks associated with legionnaires disease to comply with associated health and safety legislation. As a result these improvements have generated a number of minor differences between the old and new units, which are listed below for reference purposes.

Summary of visible changes and finishes

Item	New Cooling Towers	Existing Cooling Towers	Remark
Cooling Tower Finish/ Material	Stainless Steel	Black glass reinforced plastic (GRP).	*Stainless steel is a more robust material less susceptible to corrosion, pitting, damage, wear that can lead to proliferation of legionnaires disease.* *Can be more easily cleaned.*
Service platform/ gantry	Service platform around the top of the two cooling towers. The platform will be of fabricated steel construction with handrails and hooped ladder. Finish – Galvanised.	Hooped ladder protruding above the top of the existing cooling towers. Finish – Galvanised.	*A service platform is provided to allow inspection and maintenance of the top of the cooling towers.* *Necessary to comply with Health and Safety Legislation.*
Heat Exchanger	Heat Exchangers mounted at roof level below the line of the enclosure	Not provided in the original installation	*Improved opportunity for cleaning and maintenance. Operatives will not need to climb to high level on the towers as previously*

Noise and Acoustics

An acoustic report has been prepared by Allaway Acoustics and is appended to this document. See Appendix 1.

The replacement cooling towers have been selected to be no noisier than the existing cooling towers. The nearest residential buildings are about 70m away. The acoustic specialist has determined that noise from the cooling towers is:-

- Significantly below the normal daytime background noise levels at the nearest residential building.
- No nosier than the acoustic performance of the cooling towers being replaced.

  Acoustic treatment to improve the acoustic environment was considered, however this was rejected by the Design Team on the basis of increased risk of Legionella owing to increased difficulties for maintenance and greater visual impact as the height of the new units would be increased by approximately 1.0m.

For further details on acoustics refer to the Allaway Acoustics noise survey report in the appendices.

Alternative solutions to replacing Cooling Towers were considered.

The cooling towers are used for process cooling for experiments and space cooling. Because of the issues associated with legionaires disease the Cooling Towers UCL have carefully considered the possible use of alterative system before the decision to replace the towers like for like..

The alternatives considered, included Adiabatic and air cooled chillers, mounted on the Roberts Building roof and possibly on the roofs of other adjacent buildings.

After condsideration the proposed alternatives were rejected on the basis of:

- Greater risk of Legionella then with Cooling Towers as Adiabatics are generally unproven technology.
- Increased Energy use and carbon emissions owing to the greater quantity of plant required.
- Greater visual impact as a result of the need to locate the new alternatives on adjacent buildings.

Conclusion

UCL have taken great care to examine the possibilities for replacing the existing Cooling Towers at the Roberts Building. The have decided to carry out a like for like replacement with newer, State of the Art Technology that reflects the need for regular and good maintenance. This approach will mean that the replacement units will result in very minor visual changes to the current installation with no changes to the acoustic performance of the current installation.

APPENDIX 1

Allaway Acoustics Report

Our Ref: 20696C/HA

ALLAWAY ACOUSTICS
LIMITED

Client: University College London

**Project: Cooling Tower Replacement,
UCL Roberts Building, Torrington Place**

**Acoustic Survey & Analysis
of Replacement Plant**

Date of Surveys: 1st March 2007 & 14th March 2007

Prepared By: Chris Williams BSc (Hons) MIOA

ALLAWAY ACOUSTICS
LIMITED

Cooling Tower Replacement, UCL Roberts Building
Existing Environmental Noise Levels

1. Introduction

1.1 Prior to the replacement of 2no. cooling towers at the above site, Allaway Acoustics Ltd have carried out a noise survey to determine the existing noise levels within the rooftop plant enclosure.

1.2 A noise survey has been carried out on Gower Street to determine daytime background noise levels.

1.3 This report describes the survey and details the results obtained.

1.4 On the basis of the survey results, the noise levels of the proposed cooling towers will be assessed and any noise mitigation requirements specified.

2. Site Description

2.1 The site is located on Torrington Place, W1CE.

2.2 An open top plant enclosure is located at the 12th floor roof level. The enclosure is approximately 20m long, 3m wide and extends approximately 3m above the roof level.

2.3 The enclosure contains 2no. cooling towers, 9no. fume extract fans and a condenser unit. Please see Appendices C & D for internal and external photographs of the plant area.

2.4 The existing plant dominates the noise level within the enclosure.

2.5 The nearest affected residential premises are three storey properties on Gower Street. There is another UCL building between Roberts Building and Gower Street. This building is lower than Roberts Building and also has a number of items of plant located on its roof.

2.6 The residential premises are therefore at least 70m from the Roberts Building plant enclosure.

2.7 The plant will operate during normal office hours of 9am – 5pm, 5 days a week.

3. Survey

3.1 The rooftop survey was carried out between the hours of 8am and 1:30pm on Thursday 1st March 2007.

3.2 The weather during the survey period was cold with little wind and no rain. This was deemed not to have any significant effect on the measured noise levels.

3.3 Noise levels were measured for 15-minute periods within the enclosure at two positions:

- Position 1 – 1.5m from the existing cooling tower fans.
- Position 2 – At the North end of the enclosure.

3.4 Noise levels were measured at each of the positions with the cooling tower turned off and turned on.

3.5 The Gower Street survey was carried out between the hours of 12:15pm and 15:00 on Wednesday 14th March 2007.

3.6 The weather during the survey period was warm with little wind and no rain. This was deemed not to have any significant effect on the measured noise levels.

3.7 Noise levels were measured for 20-minute periods at the junction of Gower Street and Torrington Place.

3.8 There were no roadworks in the vicinity which may have affected the readings.

3.9 Of the parameters measured, the LA90 gives the closest representation of the background level, as it is the level exceeded for 90% of the measurement period. The LAEQ is an energy-averaged value, and the LA10 is indicative of traffic noise.

3.6 In addition to the A-weighted levels referred to above, representative octave-band spectra were also recorded so that the frequency distribution of the noise could be assessed.

4. Instrumentation

4.1 All measurements were obtained using a Rion NA27 Precision Integrating Sound Level Meter. This instrument conforms to IEC651 and 60804 Type 1 specifications.

4.2 Before commencing the readings, the meter was checked for correct calibration with both the internal reference signal and an acoustic calibrator. The calibration was rechecked after the survey with no change noted.

4.3 To minimise environmental effects, the microphone was fitted with a windshield at all times.

5. Results

5.1 Full details of the results obtained are attached to this Report.

5.2 The minimum background noise levels measured at roof level were:

- Position 1 (cooling towers off) 67dB(A)
- Position 2 (cooling towers off) 66dB(A)
- Position 1 (cooling towers on) 76dB(A)
- Position 1 (cooling towers on) 68dB(A)

5.3 The minimum background noise level measured on Gower Street was 66dB(A).

6. Discussion

6.1 It has been confirmed that the new cooling towers will not exceed the noise level of the existing cooling towers within the enclosure in order to not increase existing plant noise levels outside of the enclosure.

6.2 To this end, the limiting noise level of the new cooling towers should be 76dB(A) when measured at 1.5m from the fan housing.

7. Assessment

7.1 The proposed cooling tower is a Carter model No. 24 BSB Balmoral B/5X.

7.2 The manufacturer publishes the following sound power spectrum for this unit:

	63	125	250	500	1k	2k	4k	8k	dB(A)
Lw	91	86	82	79	77	73	68	64	82

7.3 Additionally, the manufacturer states that the sound pressure level of the unit at 10m is 53dB(A).

7.4 Allowing for a correction to 1.5m, the location within the plant enclosure and for the fact that there will be two units in close proximity, the total noise at 1.5m from the cooling towers will be 75dB(A).

7.5 This noise level meets the criteria proposed above.

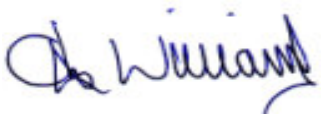
7.6 The total noise level from the cooling tower discharges will be 31dB(A) at a distance of 70m (the nearest residential properties).

7.7 This is well below the background noise level of 67dB(A) measured on Gower Street.

8.0 Conclusion

8.1 This report has shown the proposed Carter Balmoral cooling towers have noise levels that do not exceed those of the existing cooling towers.

8.2 This report has shown that noise from the replacement cooling towers will be significantly lower than the prevailing background noise levels at the nearest noise sensitive receptor point.



Chris Williams BSc (Hons) MIOA
16 March 2007

ALLAWAY ACOUSTICS LIMITED

APPENDIX A

SCHEDULE OF RESULTS

Date of Survey: 1st March 2007

RE: UCL Roberts Building - Roof

Table 1 - L_{EQ}

Time	Position	63	125	250	500	1k	2k	4k	8k	dB(A)
8:05 AM	1 - coolers off	70.9	66.6	66.2	64.9	63.1	61.5	59.4	54.9	68.7
8:25 AM	2 - coolers off	74.0	72.8	65.7	62.7	59.9	61.1	54.2	49.8	67.0
8:45 AM	1 - on	75.2	72.4	74.3	72.1	71.6	69.6	68.3	61.3	76.8
9:05 AM	2 - on	74.6	73.6	66.9	65.0	62.2	62.4	56.1	51.7	68.6
9:22 AM	1 - off	71.9	67.6	66.0	62.3	62.5	61.0	59.0	54.4	67.9
9:40 AM	2 - off	72.4	71.8	65.6	63.5	60.7	60.9	54.5	50.6	67.1
10:00 AM	1 - on	75.2	72.5	74.4	72.1	71.8	69.9	67.2	60.2	76.8
10:20 AM	2 - on	71.5	72.1	66.4	64.7	61.9	62.9	54.9	51.8	68.3
10:40 AM	1 - off	72.8	68.5	66.1	62.5	62.3	60.8	58.8	54.3	67.8
10:56 AM	2 - off	71.9	71.1	65.1	64.0	60.4	62.5	54.1	51.5	67.6
11:15 AM	1 - on	76.3	73.0	74.3	71.8	71.9	69.7	66.3	60.5	76.6
11:34 AM	2 - on	74.0	73.1	66.9	65.2	62.0	62.7	56.2	52.6	68.7
12:20 PM	1 - off	71.7	67.9	66.2	62.6	62.4	60.8	58.5	54.0	67.8
12:37 PM	2 - off	70.4	70.5	65.5	62.3	59.4	61.1	55.3	52.3	66.7
12:55 PM	1 - on	75.8	72.6	74.1	71.9	71.6	69.7	66.0	60.2	76.5
1:15 PM	2 - on	75.0	73.6	67.1	64.7	62.2	61.9	55.0	51.8	68.4

Table 2 – L_{90}

Time	Position	63	125	250	500	1k	2k	4k	8k	dB(A)
8:05 AM	1 - coolers off	68.9	65.2	64.3	61.4	61.7	60.4	58.7	54.2	67.4
8:25 AM	2 - coolers off	72.9	71.8	64.9	62.0	59.3	60.2	53.5	49.1	66.5
8:45 AM	1 - on	72.7	70.9	73.2	71.3	70.8	68.8	67.6	60.9	76.3
9:05 AM	2 - on	73.1	72.3	66.0	64.2	61.6	61.7	55.6	50.9	68.2
9:22 AM	1 - off	69.4	68.8	67.4	63.1	63.1	61.5	59.5	54.9	67.4
9:40 AM	2 - off	71.3	70.6	64.7	62.7	60.2	60.4	54.8	51.4	66.8
10:00 AM	1 - on	72.5	73.7	75.4	72.8	72.5	70.7	67.8	61.2	76.2
10:20 AM	2 - on	70.1	70.7	65.4	63.7	61.3	61.5	54.4	51.2	67.7
10:40 AM	1 - off	69.0	66.6	64.5	61.7	61.7	60.3	58.4	53.8	67.4
10:56 AM	2 - off	70.7	69.8	63.9	63.0	59.3	60.9	53.1	50.7	66.7
11:15 AM	1 - on	72.9	71.3	73.1	71.0	71.1	68.8	65.8	60.1	76.0
11:34 AM	2 - on	72.5	71.7	65.9	64.4	61.1	61.7	55.6	52.0	68.1
12:20 PM	1 - off	69.1	66.3	64.6	61.7	61.8	60.2	58.0	53.4	67.4
12:37 PM	2 - off	69.2	64.3	61.4	58.8	58.8	60.3	54.8	51.6	66.3
12:55 PM	1 - on	72.5	71.0	73.0	71.1	70.8	68.6	65.4	59.6	75.8
1:15 PM	2 - on	73.4	72.2	66.2	63.9	61.6	60.9	54.5	50.7	67.8

ALLAWAY ACOUSTICS
LIMITED

Date of Survey: 14th March 2007

RE: UCL Roberts Building – Gower Street

Table 3 - L_{EQ}

Time	63	125	250	500	1k	2k	4k	8k	dB(A)
12:15 PM	82.9	77.7	72.8	70.3	69.4	67.0	62.3	56.7	74.4
12:40 PM	82.5	78.1	73.3	70.8	69.0	66.7	62.6	58.0	74.4
13:03 PM	81.1	79.0	74.6	71.6	69.5	67.0	63.2	57.3	75.0
13:25 PM	81.5	79.5	73.0	70.2	68.6	66.1	61.8	55.1	73.9
13:48 PM	82.4	78.7	74.0	70.9	69.5	67.6	63.8	59.1	75.0
14:10 PM	81.3	76.9	72.6	70.6	69.1	66.4	61.7	55.1	74.1
14:30 PM	82.7	80.0	74.9	70.4	68.5	66.1	61.5	58.3	74.3
14:53 PM	82.0	77.6	72.1	70.9	73.8	69.3	67.3	67.0	77.7

Table 4 – L_{10}

Time	63	125	250	500	1k	2k	4k	8k	dB(A)
12:15 PM	85.9	81.3	75.8	73.2	72.6	70.2	65.5	59.0	77.6
12:40 PM	85.5	81.5	75.4	72.9	72.0	69.4	63.6	58.3	77.0
13:03 PM	84.2	81.7	76.5	74.1	72.3	69.8	65.2	58.6	77.6
13:25 PM	84.4	81.7	75.7	72.5	71.4	69.0	64.5	57.7	76.9
13:48 PM	85.4	81.7	77.0	73.5	72.1	69.7	65.3	58.4	77.3
14:10 PM	84.9	80.4	75.1	73.2	72.2	69.5	65.0	58.1	77.1
14:30 PM	85.8	81.7	76.5	72.8	71.6	69.2	64.7	58.9	77.6
14:53 PM	85.3	80.1	74.5	72.2	71.3	68.9	64.0	57.5	76.5

Table 5 – L_{90}

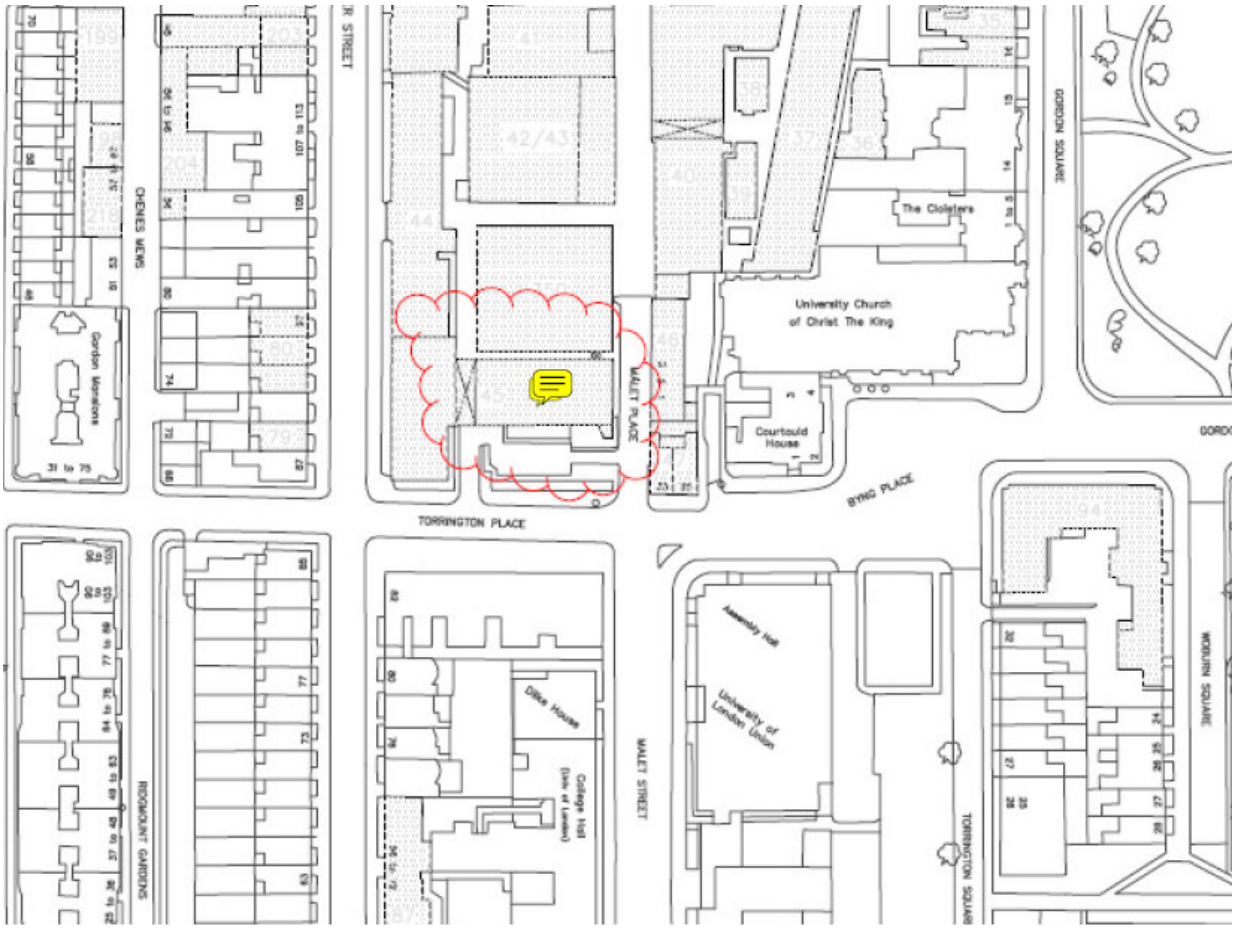
Time	63	125	250	500	1k	2k	4k	8k	dB(A)
12:15 PM	73.2	68.6	65.4	64.4	63.6	60.6	54.9	46.1	68.5
12:40 PM	73.7	68.4	64.2	63.3	62.1	59.6	55.3	46.4	67.3
13:03 PM	72.2	68.1	63.8	63.4	61.5	59.0	53.7	44.8	67.0
13:25 PM	71.8	68.0	63.7	62.2	60.9	58.4	53.2	44.0	66.1
13:48 PM	74.1	69.7	64.6	63.3	61.8	59.8	54.5	46.7	67.7
14:10 PM	72.3	67.9	64.0	62.7	61.3	58.6	62.9	44.0	66.8
14:30 PM	73.2	68.6	64.4	62.5	61.6	58.9	53.4	44.4	66.8
14:53 PM	72.1	67.4	63.7	62.3	61.3	58.8	52.5	43.8	66.5

Notes; All readings sound pressure level dB re: $2x10^{-5}$ Nm^{-2}.

ALLAWAY ACOUSTICS
LIMITED

APPENDIX B

SITE LOCATION



ALLAWAY ACOUSTICS
LIMITED

APPENDIX C

PLANT ENCLOSURE (Internal)

ALLAWAY ACOUSTICS
LIMITED

APPENDIX D

PLANT ENCLOSURE (External)

ACOUSTIC TERMINOLOGY

DECIBEL (dB) - The Decibel is a logarithmic unit used to express ratios of quantities such as sound pressure level or sound power. The logarithmic nature of the unit means that decibel values cannot be added or subtracted in the usual way.

dBA or LA - The A weighted scale is used to take account of the fact that the human ear is more sensitive to sounds at high frequencies than sounds at low frequencies. "A" weighted sound pressure level (sound level) measurements correspond roughly to the subjective impression of loudness of the average listener.

LAEQ - The LAEQ index is used as a method of averaging temporally or spatially varying sound levels. At a given position, it may be defined as the notional sound level which contains the same amount of acoustical energy as the actual (time varying) sound level over the same measurement period. The LAEQ is gaining acceptance for many types of noise assessment, and is now referred to within BS4142 (used to assess the likelihood of justifiable environmental noise complaints), and also within the Noise at Work Regulations 1989.

LAMAX - The LAMAX is the maximum sound pressure level (sound level) recorded during any given measurement period.

LA10 - The LA10 is the sound level that is exceeded for 10% of the measurement period and is commonly used to describe road traffic noise, since it has been found to correlate reasonably well with complaint thresholds.

LA90 - The LA90 is the sound level that is exceeded for 90% of the measurements period, and is generally considered to describe the background noise, since it inherently excludes the sounds of transient events.