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20th October 2023

Luxury Living

Assessment of noise impact for proposed
basement apartments at Globe House, M3 1LG.

Prepared for :-

Luxury Living
Globe House 30-34
Southall Street
Manchester
M3 1LG

Prepared by :-

Andrew Raymond

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1.0 **SUMMARY**

The noise was dominated at all times by traffic on Southall Street. During the daytime there was also significant construction noise. During the evening and night time more distant traffic was also audible, along with occasional voices.

Ignoring changes to windows, ventilation, room layouts and fit out, etc. reductions of up to 27 dB are likely to be required to meet all criteria in full. Windows would need to remain shut to achieve all criteria in full and it is likely that ventilation will need to be provided which gives occupants the realistic option of doing so.

With relatively minor upgrades to basic glazing, and moderate performance acoustic vents, all criteria should be achieved.



A R Raymond



P J Durell

2.0 INTRODUCTION

ADC was asked to carry out an independent assessment of the above site with regards to its suitability for residential development from a noise perspective.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

After a brief statement of survey details we discuss basic results and the resulting assessment, along with any mitigation which might be implied. We sum-up and conclude at the end, along with brief recommendations.

3.0 ASSESSMENT STANDARDS

3.1 NPPF, NPSE and NPPG

The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) provide nothing in the way of quantitative criteria but instead provide general policy aims and statements and some guidance on how certain situations can be interpreted.

The NPPF's main statement on noise is to be found in paragraph 185:-

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life⁶⁵;
 - b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
 - c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Paragraph 187 is also relevant:-

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The NPPF refers to the NPSE which sets out the following aims:-

1. *avoid significant adverse impacts on health and quality of life;*
2. *mitigate and minimise adverse impacts on health and quality of life;*
and
3. *where possible, contribute to the improvement of health and quality of life.*

It also introduces the concepts of:

- *NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
- *LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.*
- *SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.*

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

The NPPG section on noise adds some further detail, much of it reproducing the NPPF and NPSE, but some useful qualitative guidance is provided Noise Exposure Hierarchy, as follows:-

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

It also makes the point that the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation, including the level of the noise in absolute terms and how it might compare with the underlying background noise, the impulsiveness or intermittence pattern of the noise, its spectral content, and the time of day. It discusses in very general terms the issues to consider when introducing noise sources to existing noise sensitive area, new residential development in areas affected by existing noise sources (most of which have their own specific guidance, such as BS 4142, BS 8233, etc.) and the potential impact on wildlife.

3.2 BS8233 and WHO

BS 8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations.

The criteria in Table 4 of BS 8233 are based on WHO guidance and give the desirable criteria for indoor ambient noise levels for dwellings as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,8hour}$	30 dB $L_{Aeq,8hour}$

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,8hour}$	45 dB $L_{Aeq,8hour}$

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions.

Note that the new version does not explicitly state criteria for bedroom noise in terms of dB L_{Amax} but the WHO Guidelines for Community Noise (or similar) are widely used with a recommendation that the noise inside bedrooms should not typically exceed 45 dB L_{Amax} , for instance no more than 10 to 15 times a night.

Garden area criteria are unchanged with 50 dB L_{Aeq} and 55 dB L_{Aeq} being considered desirable and reasonable respectively.

Note that the new version of BS8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

3.3 Local Authority

As far as we are aware no planning conditions have been proposed. However, Manchester City Council has produced a useful document “*Planning and Noise – Technical Guidance*”. Section 3.6.1.1 deals with criteria for internal and garden levels for residential developments.

- *Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 15 times)*
- *Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}*
- *Gardens and terraces (daytime) 55 dB L_{Aeq}*

The document gives a number of reasons for these criteria, but essentially they are at the more stringent end of the criteria suggested in BS 8233 and the WHO Guide. The document justifies the stringent end of the criteria by stating that the acoustic performance of is often less in practice than specified by manufacturers/suppliers, which is reasonable enough. They also state that glazing acoustic performance does not usually take vents into account, which again is true.

However, we must emphasise that our calculations are based on in-situ measurements. We allow for on-site performance and our calculations always include for trickle vents, unless mechanical ventilation is proposed such that there are no trickle vents proposed.

4.0 GUIDE TO MODELLING

Full details of calculations are given in Appendix 2. The basic approach is as follows.

1. The external noise break-in is based on the level of external noise just outside the façade(s), the area of the façade(s), the sound insulation properties of the façade(s) and the internal absorption of the room.
2. Measurements were made within two of the worst affected. At face value, the measured levels should be reasonably representative of the proposed internal levels. However, we also need to incorporate changes, such as room sizes and layouts, glazing, vents, carpeting, etc.
3. We begin by analysing the existing room, and then comparing it to the proposed room(s) where different. The first input to the calculation process is the area of the exposed façade. Where more than one façade is exposed, then they can all be entered. The room depth is also entered so as to derive the room volume. Where the room is not a straight forward rectangular shape, an “effective depth” is sometimes entered so as to derive the approximate room volume. Judgement may occasionally be used if the room is not simple, such as a very unusual shape or a multi-use room such as a through-kitchen/dining room/living room, or studio-style area.
4. The reverberation time (RT) is entered. Usually this is a standardised 0.5 seconds for a completed and fitted out room and represents the absorption properties of the room. For an undeveloped site it is usually longer due to the absence of carpets and furnishings.
5. Two corrections result from the above inputs. Firstly, we have the Area Correction. Put simply, the greater the exposed area, the more noise will break in. The correction is $10 \times \log(\text{Effective Area})$ and is usually a positive number. Note that the “Effective Area” takes account of the method of modelling vents – see later. The Room Correction takes account of the room absorption (more absorption reduces the noise) and the room volume (a larger volume disperses,

and so reduces, the noise). The correction is $10 \times \log(RT/0.163/\text{Volume})$ and is usually a negative number.

6. These corrections, together with the sound insulation properties of the façade(s) give us the basic outside-to-inside level difference. The sound insulation properties of the façade(s), known as the Sound Reduction Index (SRI or just R) are effectively the sound insulation of 1m^2 of material (apart from vents – see later). Of course, a façade is usually made up of more than one element – windows and walls for instance. The overall SRI or R is referred to as the Composite SRI or composite R and is related to the SRI or R of the individual elements and their respective areas. SRI or R figures are usually based on laboratory tests and therefore somewhat idealised.
7. An additional complication is that performance data for vents is generally standardised to 10m^2 . The area of a vent is therefore usually entered as 10m^2 , even though its actual area will usually be nowhere near that much.
8. So, the composite SRI or R, combined with the areas and room corrections gives us the basic level difference to be expected under perfect (laboratory) conditions. However, actual site conditions are affected by workmanship, which can never be guaranteed to be perfect, and flanking paths (noise paths other than straight through the façade(s)). Measured internal noise does not usually require a correction for this but it can be added if circumstances require it.
9. The calculated inside-to-outside level difference for the existing rooms is set against the actual measured levels when looking at the proposed rooms so that any changes (room sizes and layouts, glazing, vents, absorption (fit-out), etc.) can be taken into account and used to calculate the proposed internal levels.
10. The process is repeated in octave bands across the frequency range to derive the predicted internal levels.

5.0 SURVEY DETAILS

5.1 Site Times and Personnel

The measurements were carried out by Mark Pimlett of ADC Acoustics.

Measurements were carried out on from shortly before 15:00 on 26th September 2023 through to shortly after 11:00 the following morning. The measurements were periodically attended.

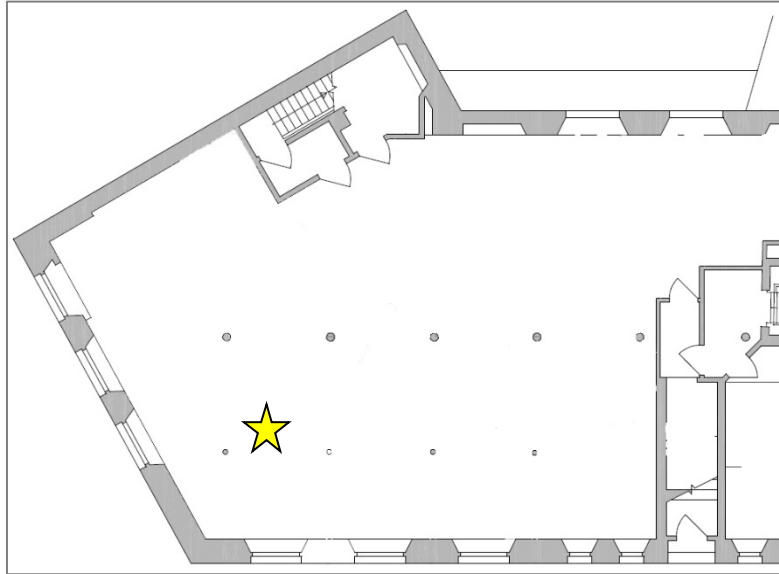
5.2 Instrumentation

Instrumentation used was a Rion NL-52 Class I sound level meter which holds a current calibration certificate and which was field-calibrated as necessary with no drift noted. The meter was set up to measure continuous 5 minute samples in terms of dB L_{eq} , dB L_{max} and dB L_{90} in

overall A-weighted terms, and in octave bands across the frequency range. See Definition of Acoustic Terms in Appendix 1.

5.3 Measurement Positions

The main measurement position was in the basement at a position roughly central for the proposed large Kitchen/Lounge. It was approximately as shown by the yellow star on the following plan.



The microphone was 1.3 m above ground and away from other reflective surfaces and obstacles.

5.4 Survey Conditions

We have no reason to believe that the conditions we found on the survey were anything other than representative of normal conditions. As the measurements were internal, the weather was not crucial but, for the record, there was no rain and roads were dry, and there was negligible wind.

The car park was predominantly concrete, painted brickwork and painted plasterboard, as well as three cars which did not move during the course of the survey. Windows were open to the pavement level.

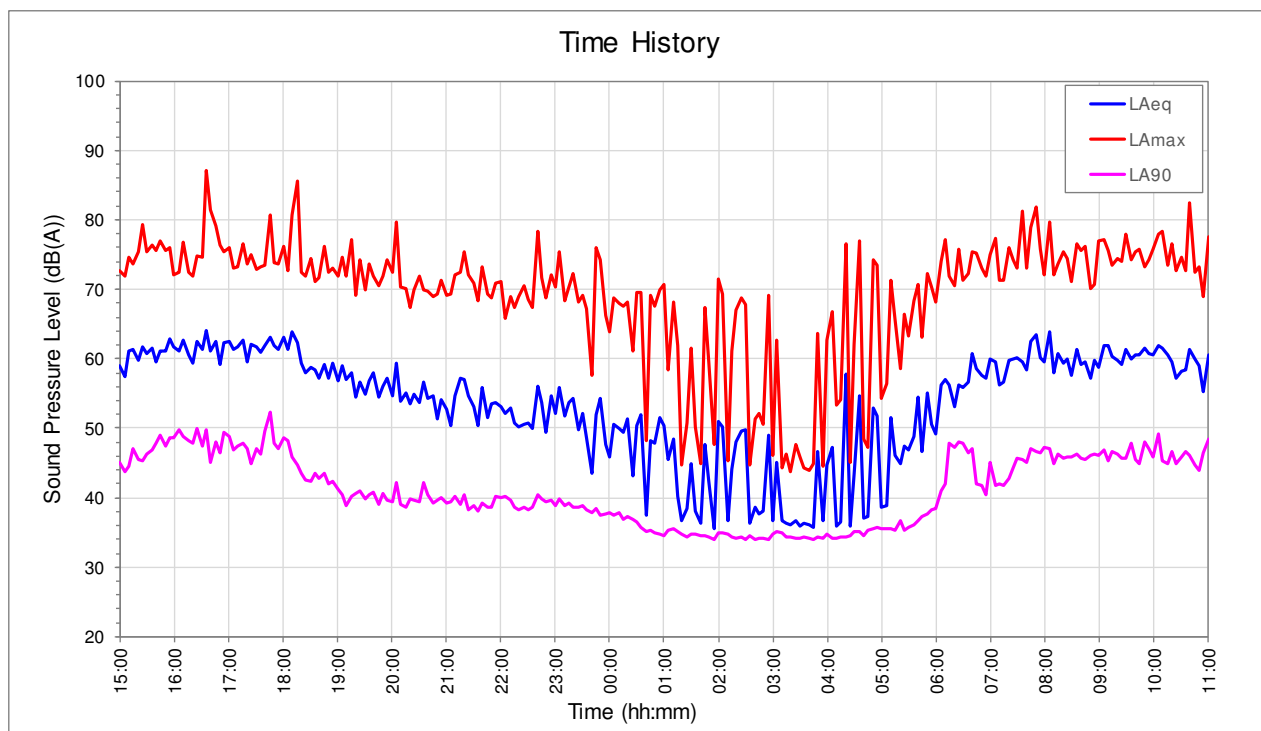


6.0 RESULTS AND DISCUSSIONS

The noise was dominated at all times by traffic on Southall Street. During the daytime there was also significant construction noise. During the evening and night time more distant traffic was also audible, along with occasional voices.

6.1 Basic Results

Results are presented graphically as follows:-



A summary of overall levels is as follows:-

Time Period	Index	dB(A)
Overall Daytime	Leq	61
	Lmax	77
	L90	47
Overall Evening	Leq	55
	Lmax	72
	L90	40
Overall Night Time	Leq	51
	Lmax*	69
	Lmax**	72
	L90	39

* Log Average

** Level Exceed 15 times (used in calcs)

6.2 Assessments

The above results give the following assessments.

In terms of BS 8233, we are mainly concerned with the dB(A) Leq values, or the dB LAeq levels. See definition of Acoustic terms in Appendix 1.

The new version of BS 8233 no longer has night time criteria in terms of dB(A) $L_{\max}$ values, or dB $L_{A\max}$ values as they have little basis in research and are rarely achieved in urban environments. They are used in MCC criteria (see discussion in 3.3 above).

The measured levels appear to suggest that sound insulation will ideally need to be designed to reduce external noise break-in as follows:

<i>Position</i>	<i>Environment</i>	<i>Reductions for BS8233 desirable* and MCC</i>	<i>Reductions for WHO-Type Criteria and MCC</i>
Main	Living Rooms	26 dB L_{Aeq}	-
	Bedrooms	21 dB L_{Aeq}	27 dB $L_{A\max}$

* BS 8233 considers a 5 dB relaxation would still provide *reasonable* conditions

So, ignoring for now changes to windows, ventilation, room layouts and fit out, etc. reductions of up to 27 dB are likely to be required to meet all criteria in full.

6.3 Modelled Levels and Mitigation

The levels suggest that windows would need to remain shut to achieve all criteria in full. In order to assume that windows are shut, it is likely that ventilation will need to be provided which gives occupants the realistic option of doing so. This can be achieved using active or passive ventilation which provides a suitable sound insulation. This could take the form of ventilation through acoustic or non-acoustic vents or a whole house-type system which does not require any wall or window vents.

Note that this assessment provides the specification for the acoustic performance of vents. Actual ventilation needs should be determined by others.

A summary of mitigation (or building elements assumed in our calculations) is as follows:-

<i>Façade</i>	<i>Room Type</i>	<i>Make-Up on Which Calculations are Based</i>
3 Bed Apartment	Kitchen / Lounge	Walls: Traditional Masonry
		Glazing: 30 dB R_w+C_{tr} eg.10+14+4
		Vents: 40 dB $D_{n,e,w}$ eg. Glidevale TVALdB 450
3 Bed Apartment	Bedroom 1	Walls: Traditional Masonry
		Glazing: 30 dB R_w+C_{tr} eg.10+14+4
		Vents: 40 dB $D_{n,e,w}$ eg. Glidevale TVALdB 450
3 Bed Apartment	Bedroom 2	Walls: Traditional Masonry
		Glazing: 30 dB R_w+C_{tr} eg.10+14+4
		Vents: 40 dB $D_{n,e,w}$ eg. Glidevale TVALdB 450
3 Bed Apartment	Bedroom 3	Walls: Traditional Masonry
		Glazing: 30 dB R_w+C_{tr} eg.10+14+4
		Vents: 40 dB $D_{n,e,w}$ eg. Glidevale TVALdB 450
1 Bed Apartment	Kitchen / Lounge	Walls: Traditional Masonry
		Glazing: 30 dB R_w+C_{tr} eg.10+14+4
		Vents: 40 dB $D_{n,e,w}$ eg. Glidevale TVALdB 450
1 Bed Apartment	Bedroom	Walls: Traditional Masonry
		Glazing: 30 dB R_w+C_{tr} eg.10+14+4
		Vents: 40 dB $D_{n,e,w}$ eg. Glidevale TVALdB 450

NB. R_w should come with a negative C_{tr} term, usually around -5 dB, eg. 35 dB R_w and -5 dB C_{tr} is 30 dB R_w+C_{tr}

Note that the table provides the acoustic specifications (such as R_w for windows) to meet appropriate criteria. The glazing build-ups and vent models which are also shown are examples and many other options achieving the same acoustic performance are available.

Full calculation details are shown in Appendix 2 and a summary of predicted internal noise levels is as follows:-

<i>Façade</i>	<i>Room Type</i>	<i>Time</i>	<i>Index</i>	<i>dB(A)</i>
3 Bed Apartment	Kitchen / Lounge	Rush	Leq	35
		Night	Leq	26
			Lmax	46
3 Bed Apartment	Bedroom 1	Rush	Leq	33
		Night	Leq	24
			Lmax	44
3 Bed Apartment	Bedroom 2	Rush	Leq	34
		Night	Leq	25
			Lmax	44
3 Bed Apartment	Bedroom 3	Rush	Leq	34
		Night	Leq	25
			Lmax	44
1 Bed Apartment	Kitchen / Lounge	Rush	Leq	34
		Night	Leq	25
			Lmax	44
1 Bed Apartment	Bedroom	Rush	Leq	34
		Night	Leq	25
			Lmax	45

All criteria would appear to be met, albeit by a small margin in some instances. However, all calculations and assumptions err on the cautious side and so the assessments should be reasonably robust.

7.0 CONCLUSIONS/RECOMMENDATIONS

Ignoring changes to windows, ventilation, room layouts and fit out, etc. reductions of up to 27 dB are likely to be required to meet all criteria in full. Windows would need to remain shut to achieve all criteria in full and it is likely that ventilation will need to be provided which gives occupants the realistic option of doing so.

Note that this assessment provides the specification for the acoustic performance of vents. Actual ventilation needs should be determined by others.

With relatively minor upgrades to basic glazing and moderate performance acoustic vents, all criteria should be achieved.

We recommend that you issue this report to Planners and we would encourage Officers to contact us directly with any queries.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but it really should be stated. The threshold of human hearing is a sound pressure of $20\mu\text{Pa}$ or a sound power of 1pW .

A sound pressure level or SPL should be expressed in dB(re. $20\mu\text{Pa}$). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to give an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq} . For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq} . The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max} . For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax} .

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceeded for a percentage of the time. L_n is the index representing the level exceeded for $n\%$ of the measurement period.

The unit is dB L_n . For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An} .

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceeded for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band from low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq} , L_{max} , L_n , etc. as defined above.

Appendix 2

Measurement and Calculation Details

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
14:30	Leq	62	68	60	60	57	59	53	44	33
	Lmax	74	88	76	72	69	70	63	56	47
	L90	48	53	48	48	45	45	39	30	18
14:35	Leq	61	63	59	59	57	58	52	45	35
	Lmax	75	81	75	71	71	71	65	61	55
	L90	49	54	50	49	46	45	40	32	18
14:40	Leq	62	65	59	60	58	60	53	46	38
	Lmax	79	82	74	76	76	73	73	70	66
	L90	51	54	51	51	48	47	42	32	21
14:45	Leq	60	63	55	56	56	57	51	41	29
	Lmax	73	85	74	69	69	71	64	54	45
	L90	46	51	47	46	43	43	37	27	16
14:50	Leq	60	68	62	59	56	57	51	42	32
	Lmax	75	85	85	74	69	70	64	57	52
	L90	46	52	47	46	43	43	37	27	16
14:55	Leq	59	57	53	54	54	56	49	39	28
	Lmax	73	71	66	68	67	72	64	59	51
	L90	45	49	46	44	42	41	35	24	15

Time Period	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
15:00	Leq	59	59	54	55	54	57	50	39	28
	Lmax	73	72	71	67	68	71	62	54	46
	L90	45	50	47	45	42	42	35	24	14
15:05	Leq	57	58	53	53	53	55	49	41	33
	Lmax	72	74	67	68	66	69	65	59	54
	L90	44	50	46	44	41	40	34	23	14
15:10	Leq	61	59	56	57	56	59	52	41	29
	Lmax	75	73	73	71	70	72	65	56	47
	L90	45	50	46	45	42	41	35	24	14
15:15	Leq	61	62	59	58	57	59	53	44	33
	Lmax	74	78	73	73	71	70	64	59	49
	L90	47	51	47	46	44	44	37	26	15
15:20	Leq	60	69	63	58	55	57	51	40	32
	Lmax	75	93	85	76	69	70	62	52	56
	L90	46	52	48	46	42	42	35	25	15
15:25	Leq	62	61	57	57	56	59	53	48	31
	Lmax	79	77	73	71	73	76	69	73	50
	L90	45	50	47	45	43	42	35	24	15
15:30	Leq	61	62	57	57	56	58	52	43	32
	Lmax	75	79	71	74	72	72	67	61	51
	L90	46	52	48	46	43	43	36	27	16
15:35	Leq	61	63	59	58	57	59	52	43	32
	Lmax	76	80	76	71	69	75	67	60	49
	L90	47	51	48	47	43	43	37	29	17
15:40	Leq	60	61	56	56	55	57	50	41	30
	Lmax	76	77	72	68	69	74	66	57	47
	L90	48	52	48	47	45	45	38	29	17
15:45	Leq	61	63	59	58	57	58	52	43	34
	Lmax	77	81	73	70	68	73	72	55	51
	L90	49	52	48	48	46	45	40	30	18
15:50	Leq	61	63	60	58	57	59	52	44	42
	Lmax	76	76	76	71	69	72	69	61	64
	L90	48	52	48	47	45	44	38	30	19
15:55	Leq	63	63	59	59	58	61	54	43	31
	Lmax	76	77	73	72	71	74	67	56	46
	L90	49	54	50	48	45	45	40	29	16
16:00	Leq	62	63	57	58	57	60	52	41	29
	Lmax	72	80	69	67	67	70	62	53	44
	L90	49	53	50	48	45	45	39	29	16
16:05	Leq	61	61	56	57	56	59	52	41	30
	Lmax	72	77	68	67	67	70	63	52	43
	L90	50	52	49	49	46	47	41	31	18
16:10	Leq	63	63	59	59	58	60	54	46	37
	Lmax	77	78	73	71	70	72	71	65	59
	L90	49	52	48	48	46	45	41	31	17
16:15	Leq	61	65	61	58	56	58	51	42	31
	Lmax	72	83	81	73	68	68	62	56	45
	L90	48	53	49	47	45	45	38	28	16
16:20	Leq	59	61	56	56	55	57	51	41	29
	Lmax	72	74	73	68	66	70	62	54	45
	L90	48	51	47	47	45	44	38	29	16
16:25	Leq	63	64	60	59	58	60	54	43	32
	Lmax	75	80	77	71	71	72	66	58	49
	L90	50	53	49	49	47	46	41	32	20
16:30	Leq	61	62	56	57	57	59	52	43	31
	Lmax	75	76	75	70	72	71	66	61	51
	L90	47	52	48	47	44	44	38	28	15
16:35	Leq	64	67	67	62	60	61	56	47	38
	Lmax	87	91	89	81	83	84	80	67	57
	L90	50	51	47	48	46	47	41	30	17
16:40	Leq	61	63	59	57	57	59	52	43	35
	Lmax	81	88	80	75	79	78	73	63	60
	L90	45	50	45	45	43	41	35	26	15
16:45	Leq	62	67	62	59	58	60	54	45	35
	Lmax	79	82	83	75	75	75	73	65	54
	L90	48	52	48	48	45	45	38	29	16
16:50	Leq	59	60	56	56	54	57	51	42	31
	Lmax	76	74	69	70	71	74	68	59	51
	L90	46	51	46	45	43	43	37	28	16
16:55	Leq	62	66	61	60	58	60	53	42	29
	Lmax	75	90	81	73	71	72	64	54	42
	L90	49	53	50	49	46	46	40	30	17

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>	63	125	250	500	1k	2k	4k	8k
17:00	Leq	62	65	57	58	58	60	53	43	33
	Lmax	76	82	70	70	72	74	67	56	50
	L90	49	54	48	48	46	45	40	30	17
17:05	Leq	61	62	57	58	56	59	52	42	31
	Lmax	73	76	73	70	69	70	64	57	47
	L90	47	52	47	46	44	44	37	27	16
17:10	Leq	62	61	56	57	57	60	53	41	28
	Lmax	73	73	67	68	69	71	63	53	47
	L90	47	53	49	47	44	44	38	27	14
17:15	Leq	63	63	59	59	58	60	54	44	33
	Lmax	77	79	74	72	73	74	67	60	53
	L90	48	52	47	47	45	44	39	29	16
17:20	Leq	60	58	54	56	55	57	51	39	27
	Lmax	74	72	66	70	68	71	65	53	43
	L90	47	50	47	46	44	44	37	27	16
17:25	Leq	62	61	57	58	57	60	53	42	29
	Lmax	75	75	72	72	71	73	65	57	46
	L90	45	50	45	44	41	42	36	25	15
17:30	Leq	62	60	55	58	56	60	53	41	28
	Lmax	73	73	67	69	68	71	65	55	43
	L90	47	51	47	46	43	44	38	27	14
17:35	Leq	61	62	57	58	56	59	52	42	33
	Lmax	73	76	70	69	68	71	65	55	57
	L90	46	52	46	46	43	43	36	26	14
17:40	Leq	62	61	57	58	57	60	53	43	33
	Lmax	73	74	69	69	68	71	64	54	46
	L90	50	52	49	48	45	46	42	32	17
17:45	Leq	63	65	65	61	58	61	54	43	32
	Lmax	81	87	87	82	78	76	70	56	53
	L90	52	52	48	50	48	50	44	34	22
17:50	Leq	62	61	58	60	58	60	52	41	29
	Lmax	74	77	74	73	68	72	64	53	43
	L90	48	51	47	47	44	45	37	25	15
17:55	Leq	61	61	58	58	56	59	52	42	30
	Lmax	74	78	78	72	69	71	63	57	44
	L90	47	51	46	45	43	44	38	26	16
18:00	Leq	63	62	59	60	59	61	55	45	31
	Lmax	76	82	76	75	74	72	67	62	52
	L90	49	52	48	47	45	46	40	27	15
18:05	Leq	61	63	56	57	56	59	52	42	29
	Lmax	73	77	68	69	68	70	63	56	42
	L90	48	52	47	46	43	46	39	26	15
18:10	Leq	64	68	67	61	59	61	55	46	37
	Lmax	81	86	85	79	78	77	71	65	58
	L90	46	50	45	44	41	43	37	25	17
18:15	Leq	62	65	59	57	57	60	54	44	33
	Lmax	86	90	79	79	82	83	78	64	52
	L90	45	50	45	43	40	42	35	24	15
18:20	Leq	59	58	55	56	54	57	50	39	27
	Lmax	72	70	73	69	66	71	63	51	39
	L90	44	50	45	42	40	41	33	22	14
18:25	Leq	58	58	51	53	53	56	49	40	28
	Lmax	72	75	66	66	67	70	62	55	44
	L90	42	48	43	41	39	40	33	23	15
18:30	Leq	59	57	54	54	54	57	50	40	29
	Lmax	74	72	73	69	70	72	66	58	49
	L90	42	48	43	41	38	40	32	21	14
18:35	Leq	58	55	51	54	53	56	50	39	29
	Lmax	71	72	66	69	65	69	61	56	47
	L90	44	49	43	42	40	41	34	22	14
18:40	Leq	57	57	53	53	52	55	49	37	26
	Lmax	72	73	71	68	66	69	64	54	44
	L90	43	49	43	42	39	40	33	23	15
18:45	Leq	59	66	56	56	55	57	50	42	31
	Lmax	76	92	77	73	71	73	66	64	48
	L90	44	48	44	43	40	41	34	23	14
18:50	Leq	57	58	52	53	52	55	48	37	27
	Lmax	72	79	70	66	64	71	62	55	48
	L90	42	47	44	41	39	39	32	22	14
18:55	Leq	59	57	54	55	54	57	51	39	30
	Lmax	73	72	70	68	67	71	65	52	59
	L90	42	48	44	42	39	39	32	21	14

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
19:00	Leq	57	59	53	53	52	54	48	40	30
	Lmax	72	75	67	66	67	69	63	59	51
	L90	41	49	43	40	38	38	32	22	15
19:05	Leq	59	60	56	55	54	57	50	40	28
	Lmax	75	80	77	69	70	72	65	57	46
	L90	40	48	43	40	36	37	31	21	14
19:10	Leq	57	55	51	52	52	55	49	38	27
	Lmax	72	68	67	66	67	70	62	54	42
	L90	39	47	41	38	35	36	28	20	16
19:15	Leq	58	58	54	54	52	56	49	37	26
	Lmax	77	76	74	72	70	76	67	55	41
	L90	40	48	42	39	37	37	30	20	14
19:20	Leq	54	55	51	51	50	52	46	37	26
	Lmax	69	72	69	64	64	66	62	53	44
	L90	41	49	43	40	37	37	30	22	14
19:25	Leq	57	57	51	51	51	55	48	36	24
	Lmax	74	73	65	68	68	73	65	53	40
	L90	41	48	43	41	38	38	30	20	14
19:30	Leq	55	59	49	50	49	53	46	35	24
	Lmax	70	81	67	64	63	68	62	50	36
	L90	40	46	42	39	36	37	29	20	15
19:35	Leq	57	59	53	53	52	55	48	37	28
	Lmax	74	81	75	71	67	72	64	56	51
	L90	40	46	42	39	36	38	30	20	14
19:40	Leq	58	57	52	54	53	56	49	38	30
	Lmax	72	71	66	67	67	70	63	53	59
	L90	41	47	42	41	37	38	30	19	14
19:45	Leq	55	55	50	51	49	53	45	35	26
	Lmax	71	72	66	66	64	69	60	52	44
	L90	39	46	42	38	35	36	29	18	13
19:50	Leq	56	60	53	52	51	53	48	38	27
	Lmax	72	77	70	69	67	69	65	55	46
	L90	41	47	43	39	36	38	30	20	14
19:55	Leq	57	57	55	52	52	55	48	37	30
	Lmax	74	75	80	68	70	71	64	57	53
	L90	40	46	42	39	36	37	29	19	14
20:00	Leq	55	57	51	50	50	52	47	38	29
	Lmax	72	75	71	67	68	70	64	57	51
	L90	39	47	42	39	36	36	29	18	13
20:05	Leq	59	61	56	55	53	58	50	39	27
	Lmax	80	77	73	77	73	78	69	55	43
	L90	42	47	43	41	38	40	32	21	15
20:10	Leq	54	50	47	49	48	52	46	33	19
	Lmax	70	62	64	66	66	68	62	50	36
	L90	39	45	40	38	35	37	29	17	13
20:15	Leq	55	57	49	51	49	53	47	35	23
	Lmax	70	75	66	65	64	68	63	52	37
	L90	39	45	40	38	35	36	28	17	13
20:20	Leq	53	56	51	50	49	51	45	34	23
	Lmax	67	78	68	63	62	65	59	50	39
	L90	40	46	41	39	36	37	30	18	13
20:25	Leq	55	59	53	51	49	53	46	35	24
	Lmax	70	76	69	66	64	68	59	47	36
	L90	40	45	40	38	36	37	30	19	14
20:30	Leq	54	49	47	48	49	52	45	31	18
	Lmax	72	62	60	66	68	70	62	48	34
	L90	40	45	40	39	36	37	29	17	13
20:35	Leq	57	55	51	53	52	54	48	36	24
	Lmax	70	73	67	69	65	67	60	50	40
	L90	42	46	42	41	39	40	32	20	14
20:40	Leq	54	56	48	50	49	52	46	34	21
	Lmax	70	75	63	65	65	68	60	49	39
	L90	40	46	41	39	36	38	30	18	13
20:45	Leq	55	56	49	51	49	52	46	35	22
	Lmax	69	73	63	64	63	67	61	51	39
	L90	39	46	41	38	35	37	29	18	13
20:50	Leq	51	54	49	48	47	49	42	37	26
	Lmax	69	71	65	63	64	67	61	58	48
	L90	40	46	41	39	36	37	29	19	14
20:55	Leq	54	53	48	49	48	52	46	37	26
	Lmax	71	70	67	65	65	69	64	56	45
	L90	40	46	41	39	36	37	29	19	13

Time Period	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
21:00	Leq	53	52	48	49	47	51	44	32	21
	Lmax	69	75	65	65	61	67	60	48	39
	L90	39	45	39	38	35	37	29	18	13
21:05	Leq	50	54	47	47	45	47	42	40	23
	Lmax	69	70	62	60	60	63	58	66	40
	L90	39	45	41	39	36	37	29	18	13
21:10	Leq	55	53	49	51	51	52	45	36	27
	Lmax	72	71	63	67	69	70	61	53	46
	L90	40	46	40	39	36	38	30	18	13
21:15	Leq	57	57	53	53	52	55	49	38	29
	Lmax	72	73	69	67	68	70	64	55	54
	L90	39	46	41	38	35	36	28	17	13
21:20	Leq	57	54	51	52	52	55	48	37	25
	Lmax	75	70	68	71	69	74	66	54	47
	L90	40	46	41	39	36	38	31	19	13
21:25	Leq	55	54	48	49	49	53	45	33	22
	Lmax	72	72	67	65	67	70	63	52	42
	L90	38	45	39	38	34	35	28	17	13
21:30	Leq	53	52	48	49	49	51	45	36	27
	Lmax	71	72	66	67	67	69	62	54	49
	L90	39	46	40	39	35	36	29	17	13
21:35	Leq	50	49	44	46	45	48	41	30	21
	Lmax	68	64	64	65	63	67	59	48	36
	L90	38	45	40	38	34	35	28	20	14
21:40	Leq	56	60	59	54	52	53	46	35	26
	Lmax	73	83	79	70	69	70	63	52	47
	L90	39	45	40	38	35	37	29	19	14
21:45	Leq	52	57	50	48	46	49	43	33	30
	Lmax	69	71	67	65	63	67	60	51	60
	L90	39	45	39	38	35	36	28	17	13
21:50	Leq	53	55	50	49	48	51	44	35	24
	Lmax	69	73	68	63	63	67	59	51	41
	L90	39	46	40	39	35	36	28	19	14
21:55	Leq	54	55	49	50	48	51	46	36	25
	Lmax	71	75	64	63	64	69	63	52	43
	L90	40	46	41	40	36	37	29	18	14
22:00	Leq	53	55	50	50	49	50	45	39	28
	Lmax	71	72	68	66	64	68	63	62	51
	L90	40	47	40	39	36	37	30	19	14
22:05	Leq	52	55	47	49	49	49	44	35	28
	Lmax	66	70	64	62	60	63	58	49	55
	L90	40	48	41	40	36	38	29	17	13
22:10	Leq	53	57	49	49	48	51	44	34	23
	Lmax	69	78	68	63	65	67	59	50	40
	L90	40	46	39	38	35	37	30	18	14
22:15	Leq	51	49	44	46	45	49	41	32	19
	Lmax	67	61	58	63	61	66	57	49	38
	L90	39	45	39	37	34	36	29	18	14
22:20	Leq	50	51	45	46	45	48	41	29	19
	Lmax	69	67	61	63	64	67	59	47	41
	L90	38	46	40	38	34	35	28	18	13
22:25	Leq	51	51	46	45	45	49	42	31	20
	Lmax	70	68	64	64	65	69	61	50	37
	L90	39	46	40	38	35	36	28	17	13
22:30	Leq	51	57	50	48	46	48	42	33	24
	Lmax	69	78	71	66	65	65	60	52	43
	L90	38	46	40	38	34	35	28	18	13
22:35	Leq	50	52	45	46	45	48	42	31	19
	Lmax	67	69	63	62	62	65	59	49	38
	L90	39	46	40	38	35	36	29	18	13
22:40	Leq	56	55	50	51	50	54	48	36	24
	Lmax	78	76	71	72	73	77	70	57	44
	L90	40	46	41	39	36	38	30	19	14
22:45	Leq	54	55	49	49	48	52	45	35	23
	Lmax	72	78	66	66	66	70	63	53	41
	L90	40	46	40	38	35	37	30	19	14
22:50	Leq	49	52	47	46	45	47	41	31	21
	Lmax	69	72	66	64	65	66	60	51	40
	L90	40	46	40	38	35	37	30	19	14
22:55	Leq	55	55	49	49	49	53	46	34	23
	Lmax	72	75	70	65	66	70	63	53	41
	L90	40	45	40	38	36	37	29	18	13

Time Period	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
23:00	Leq	52	49	44	47	46	50	45	33	20
	Lmax	70	63	64	66	65	68	62	51	39
	L90	39	45	39	38	35	36	28	18	13
23:05	Leq	56	52	46	49	50	54	47	34	22
	Lmax	75	71	62	65	69	74	65	53	39
	L90	40	45	40	39	36	37	30	18	13
23:10	Leq	52	48	45	47	46	50	43	31	18
	Lmax	68	63	62	63	63	66	59	48	34
	L90	39	44	39	38	35	36	28	17	13
23:15	Leq	54	57	49	50	48	52	45	35	23
	Lmax	70	79	69	65	65	68	61	53	43
	L90	39	45	40	39	36	36	29	18	13
23:20	Leq	54	54	53	55	49	51	45	35	23
	Lmax	72	74	71	76	67	68	60	53	45
	L90	39	45	40	38	35	36	28	18	13
23:25	Leq	50	51	45	46	45	47	41	31	22
	Lmax	68	69	61	64	62	66	59	53	47
	L90	39	44	39	38	35	36	28	18	13
23:30	Leq	52	53	52	49	48	49	44	34	29
	Lmax	69	76	73	66	65	66	60	51	54
	L90	39	45	40	38	35	36	29	18	13
23:35	Leq	49	52	47	45	43	46	40	28	17
	Lmax	67	73	66	60	61	65	58	48	34
	L90	38	44	39	37	34	35	28	18	13
23:40	Leq	43	48	43	44	39	40	34	26	21
	Lmax	58	64	60	61	52	53	46	38	33
	L90	38	43	39	37	34	35	28	17	13
23:45	Leq	52	50	45	54	46	49	43	31	20
	Lmax	76	64	62	84	63	65	59	48	37
	L90	38	44	39	37	34	36	28	17	13
23:50	Leq	54	53	53	52	51	51	46	39	31
	Lmax	74	71	76	71	72	70	66	60	51
	L90	37	43	39	37	34	35	27	17	13
23:55	Leq	48	47	42	45	44	45	38	26	17
	Lmax	66	61	59	64	62	64	56	44	31
	L90	38	43	38	36	34	35	28	17	13
00:00	Leq	46	48	44	44	41	43	37	26	17
	Lmax	64	64	58	62	58	62	55	46	34
	L90	38	43	38	36	34	35	27	17	13
00:05	Leq	51	50	46	48	46	48	41	30	21
	Lmax	69	70	61	65	64	66	60	46	37
	L90	38	43	39	37	34	35	27	16	13
00:10	Leq	50	52	45	46	44	48	42	35	26
	Lmax	68	71	64	63	62	66	59	54	49
	L90	38	43	39	37	34	35	27	17	13
00:15	Leq	49	50	45	45	44	47	41	29	19
	Lmax	68	66	64	65	62	66	57	46	35
	L90	37	43	38	35	33	34	27	16	13
00:20	Leq	51	61	53	50	47	49	41	28	19
	Lmax	68	84	72	70	64	64	56	46	40
	L90	37	42	38	36	33	35	27	16	13
00:25	Leq	43	45	41	42	39	41	32	21	15
	Lmax	61	59	60	62	57	58	49	39	29
	L90	37	42	37	35	32	34	27	16	13
00:30	Leq	50	52	45	45	45	49	41	29	18
	Lmax	70	72	63	63	63	68	60	48	34
	L90	36	42	37	35	32	34	27	16	13
00:35	Leq	52	52	46	47	47	50	44	33	22
	Lmax	69	70	64	64	64	67	61	52	43
	L90	36	42	37	35	31	33	26	16	13
00:40	Leq	37	44	38	35	33	35	28	20	16
	Lmax	48	57	47	44	45	43	41	37	32
	L90	35	41	36	34	31	32	25	16	13
00:45	Leq	48	44	40	43	42	47	39	26	15
	Lmax	69	57	58	65	62	67	60	46	33
	L90	35	41	36	34	31	33	26	16	13
00:50	Leq	48	47	42	46	42	45	40	29	17
	Lmax	68	63	61	66	61	65	59	49	36
	L90	35	41	37	34	31	32	25	16	13
00:55	Leq	52	53	44	47	48	48	44	35	28
	Lmax	70	74	65	66	68	66	62	54	47
	L90	35	42	36	34	30	32	25	16	13

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
01:00	Leq	50	46	41	43	43	48	43	32	21
	Lmax	71	65	61	64	63	69	63	52	40
	L90	35	41	36	34	31	32	25	16	13
01:05	Leq	46	51	45	43	41	42	38	30	22
	Lmax	58	70	61	56	54	55	51	40	35
	L90	35	43	38	35	31	32	26	16	13
01:10	Leq	48	45	42	44	42	46	41	29	20
	Lmax	68	59	60	64	62	66	60	50	39
	L90	36	42	38	35	32	32	25	16	13
01:15	Leq	40	45	43	42	38	36	30	21	14
	Lmax	62	61	67	66	60	53	49	40	26
	L90	35	42	37	34	31	32	25	16	13
01:20	Leq	37	44	39	36	33	34	27	19	15
	Lmax	45	53	49	43	44	39	34	30	22
	L90	35	41	37	34	31	32	25	16	13
01:25	Leq	38	44	38	36	34	36	30	22	16
	Lmax	51	54	46	49	45	49	40	35	30
	L90	34	41	36	34	30	31	25	16	13
01:30	Leq	45	50	45	43	41	41	37	31	21
	Lmax	62	67	63	60	58	58	53	49	38
	L90	35	42	37	34	31	32	25	16	13
01:35	Leq	38	44	38	36	32	34	31	25	20
	Lmax	50	57	47	45	45	45	45	38	32
	L90	35	41	36	34	31	32	25	16	13
01:40	Leq	36	43	38	35	32	34	26	17	13
	Lmax	45	51	47	42	44	40	34	31	28
	L90	35	41	36	34	30	32	25	16	13
01:45	Leq	48	48	41	43	41	46	38	25	15
	Lmax	67	69	62	65	61	66	58	46	33
	L90	35	41	36	33	30	32	25	16	13
01:50	Leq	42	45	39	39	37	40	34	24	16
	Lmax	60	60	55	55	55	57	51	39	34
	L90	34	41	36	33	30	31	25	16	13
01:55	Leq	35	43	37	34	31	32	26	18	14
	Lmax	48	50	49	47	47	43	34	31	23
	L90	34	41	36	33	30	31	24	16	13
02:00	Leq	51	47	42	44	45	49	43	32	19
	Lmax	72	66	63	65	65	70	63	53	40
	L90	35	41	36	34	31	32	25	16	13
02:05	Leq	50	44	41	45	44	48	41	29	18
	Lmax	69	59	60	66	64	68	60	48	32
	L90	35	40	36	34	31	32	25	16	13
02:10	Leq	37	42	38	35	32	34	26	17	13
	Lmax	45	48	43	42	45	41	35	28	20
	L90	35	40	36	33	30	32	25	16	13
02:15	Leq	44	48	41	41	39	42	35	23	15
	Lmax	61	64	58	57	56	59	53	40	30
	L90	34	40	36	34	30	31	25	16	13
02:20	Leq	48	49	42	44	42	46	38	27	19
	Lmax	67	70	61	61	59	66	57	47	41
	L90	34	41	36	33	30	31	24	16	13
02:25	Leq	50	45	42	44	43	48	41	27	16
	Lmax	69	62	63	63	62	67	60	47	33
	L90	34	40	36	33	30	31	25	16	13
02:30	Leq	50	47	44	46	44	48	42	32	22
	Lmax	68	65	62	64	62	66	58	50	49
	L90	34	41	36	33	30	31	24	16	13
02:35	Leq	36	43	37	35	32	34	26	17	13
	Lmax	45	52	43	44	39	42	34	31	22
	L90	34	41	36	33	31	32	24	16	13
02:40	Leq	39	46	43	41	35	34	28	18	13
	Lmax	51	60	57	56	49	43	40	32	20
	L90	34	41	37	33	30	31	24	16	13
02:45	Leq	38	43	39	37	34	35	28	17	13
	Lmax	52	58	55	49	47	50	42	30	19
	L90	34	40	36	33	30	31	24	16	13
02:50	Leq	38	44	39	37	34	35	28	18	13
	Lmax	51	56	54	51	46	47	41	33	21
	L90	34	41	36	34	30	31	24	16	13
02:55	Leq	49	46	41	45	44	47	40	28	16
	Lmax	69	66	61	65	64	67	60	49	37
	L90	34	40	36	33	30	31	24	16	13

Time Period	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
03:00	Leq	37	43	39	35	32	34	27	20	16
	Lmax	46	55	46	43	38	41	40	37	33
	L90	35	41	37	34	30	32	24	16	13
03:05	Leq	45	46	43	45	40	42	37	30	21
	Lmax	63	67	59	64	59	58	56	50	43
	L90	35	41	37	33	30	33	25	16	13
03:10	Leq	37	43	38	34	32	35	26	18	14
	Lmax	44	49	45	39	41	42	30	30	22
	L90	35	41	37	33	30	32	25	16	13
03:15	Leq	36	42	38	35	32	33	28	18	14
	Lmax	46	49	42	40	37	40	43	31	19
	L90	34	40	36	33	30	31	25	16	13
03:20	Leq	36	42	37	35	32	33	26	20	14
	Lmax	44	49	43	41	40	41	32	32	22
	L90	34	40	36	33	30	31	25	16	13
03:25	Leq	37	42	39	35	33	34	27	19	15
	Lmax	48	52	55	49	45	43	37	28	25
	L90	34	40	36	33	30	31	25	16	13
03:30	Leq	36	42	37	34	32	33	26	17	13
	Lmax	46	49	43	42	46	40	37	31	22
	L90	34	40	36	33	30	31	25	16	13
03:35	Leq	36	42	37	35	32	34	26	17	14
	Lmax	44	50	43	45	38	42	32	29	22
	L90	34	40	36	33	30	31	25	16	13
03:40	Leq	36	44	38	35	32	33	26	16	13
	Lmax	44	53	44	40	39	42	35	24	17
	L90	34	41	36	34	30	31	25	16	13
03:45	Leq	36	43	37	34	32	33	26	17	13
	Lmax	45	49	44	41	45	39	34	29	20
	L90	34	40	36	33	30	31	24	16	13
03:50	Leq	47	47	42	44	41	44	38	27	17
	Lmax	64	65	58	61	58	62	55	45	33
	L90	34	40	36	33	30	31	25	16	13
03:55	Leq	37	43	38	35	32	34	27	19	15
	Lmax	45	53	47	41	40	42	33	31	24
	L90	34	40	36	33	30	31	25	16	13
04:00	Leq	45	46	42	43	40	42	36	27	17
	Lmax	63	59	58	62	57	60	52	44	29
	L90	35	41	37	34	30	32	25	17	14
04:05	Leq	47	45	42	44	42	45	38	28	18
	Lmax	67	62	64	64	63	64	58	49	38
	L90	34	41	36	34	30	31	24	16	13
04:10	Leq	36	42	38	34	31	33	26	21	16
	Lmax	53	47	45	42	46	47	46	48	42
	L90	34	40	36	33	29	31	24	16	13
04:15	Leq	37	43	38	35	32	34	27	23	18
	Lmax	54	56	43	39	46	45	48	49	44
	L90	34	41	36	33	30	32	24	16	13
04:20	Leq	58	59	52	54	55	55	48	38	31
	Lmax	77	81	72	74	75	73	65	57	52
	L90	34	41	36	34	30	31	24	16	13
04:25	Leq	36	43	37	35	32	33	26	16	13
	Lmax	45	53	44	42	45	38	35	30	21
	L90	35	40	36	33	30	32	25	16	13
04:30	Leq	43	45	40	40	38	41	36	25	16
	Lmax	62	58	57	60	57	59	55	45	31
	L90	35	41	36	34	31	32	25	16	13
04:35	Leq	55	56	56	54	51	50	46	42	38
	Lmax	77	81	79	76	72	72	69	66	61
	L90	35	41	36	34	31	32	25	16	13
04:40	Leq	37	44	38	36	33	34	26	17	14
	Lmax	48	56	51	50	47	43	36	31	23
	L90	35	41	36	33	31	32	25	16	13
04:45	Leq	37	44	38	36	33	35	27	18	14
	Lmax	47	53	47	42	40	46	34	28	21
	L90	35	41	37	34	31	32	25	16	13
04:50	Leq	53	51	51	55	48	48	45	41	33
	Lmax	74	70	72	78	67	70	64	63	56
	L90	36	42	37	35	32	32	26	17	13
04:55	Leq	52	50	44	45	47	50	43	31	21
	Lmax	73	68	68	68	69	72	64	52	42
	L90	36	42	37	34	32	33	26	16	13

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
05:00	Leq	39	45	41	38	35	36	27	17	18
	Lmax	54	59	57	56	53	49	39	25	28
	L90	36	42	37	34	31	33	25	16	13
05:05	Leq	39	46	42	40	35	35	29	20	14
	Lmax	56	57	58	57	52	47	52	41	29
	L90	36	42	37	35	32	32	26	16	13
05:10	Leq	52	57	48	47	48	49	44	34	22
	Lmax	71	77	67	64	67	69	63	53	42
	L90	36	42	38	35	32	32	25	16	13
05:15	Leq	46	48	41	41	41	44	37	25	15
	Lmax	66	66	57	59	62	64	56	46	33
	L90	35	42	37	34	32	32	25	16	13
05:20	Leq	45	47	44	43	41	42	35	26	18
	Lmax	59	60	62	58	56	55	49	44	39
	L90	37	42	37	35	33	34	26	16	13
05:25	Leq	47	47	43	47	42	45	37	28	17
	Lmax	66	68	63	69	60	63	55	48	36
	L90	35	42	37	35	32	32	25	16	13
05:30	Leq	47	47	43	44	42	45	37	27	18
	Lmax	63	64	61	61	60	61	53	45	37
	L90	36	42	37	35	32	33	25	16	13
05:35	Leq	49	48	41	43	43	47	40	27	16
	Lmax	68	65	58	62	62	67	59	47	33
	L90	36	43	38	35	32	33	26	16	13
05:40	Leq	55	54	49	50	49	52	46	36	25
	Lmax	71	70	68	65	65	69	62	51	40
	L90	37	43	38	36	33	34	26	17	13
05:45	Leq	47	50	44	44	42	44	39	28	18
	Lmax	63	73	61	62	58	60	54	45	36
	L90	37	43	38	36	33	35	27	17	13
05:50	Leq	55	51	47	49	49	53	46	35	24
	Lmax	72	65	65	66	66	71	63	53	46
	L90	38	44	39	37	34	35	27	17	13
05:55	Leq	51	59	47	49	47	48	41	34	22
	Lmax	70	80	68	69	67	67	61	55	43
	L90	38	45	39	37	34	36	27	17	13
06:00	Leq	49	51	44	45	45	47	41	31	21
	Lmax	68	67	62	63	64	66	59	50	40
	L90	38	45	40	38	35	35	28	17	13
06:05	Leq	56	56	49	50	51	54	48	35	22
	Lmax	74	78	71	68	70	72	66	54	41
	L90	41	45	40	39	37	39	31	18	13
06:10	Leq	57	69	55	53	52	54	49	42	32
	Lmax	77	93	73	71	73	74	68	60	52
	L90	42	47	42	41	38	39	32	21	14
06:15	Leq	56	62	54	55	52	53	48	41	37
	Lmax	72	74	69	67	67	67	63	62	66
	L90	48	58	49	51	45	42	37	29	17
06:20	Leq	53	64	52	52	48	50	44	33	22
	Lmax	70	79	65	63	63	69	62	52	41
	L90	47	60	49	51	45	41	37	29	17
06:25	Leq	56	68	55	55	51	54	47	37	26
	Lmax	76	79	68	68	69	74	67	55	47
	L90	48	60	50	51	46	42	38	31	19
06:30	Leq	56	62	53	55	52	53	46	36	26
	Lmax	71	73	66	68	68	69	61	51	42
	L90	48	59	49	51	45	42	38	29	18
06:35	Leq	57	66	56	54	52	54	48	40	30
	Lmax	72	78	66	68	64	67	67	61	53
	L90	46	61	50	48	43	41	36	27	16
06:40	Leq	61	67	59	59	57	58	52	44	33
	Lmax	75	77	70	76	71	72	65	61	52
	L90	47	58	52	49	44	42	37	29	18
06:45	Leq	59	63	63	56	54	55	50	45	39
	Lmax	75	81	83	72	70	71	65	66	63
	L90	42	48	44	41	38	39	32	24	15
06:50	Leq	58	59	55	54	52	55	49	40	28
	Lmax	73	76	72	66	66	71	65	53	50
	L90	42	49	43	41	38	39	32	21	15
06:55	Leq	57	58	54	54	52	55	48	36	25
	Lmax	72	74	73	66	66	70	64	53	43
	L90	40	48	42	40	37	37	30	19	14

Time Period	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
07:00	Leq	60	62	58	55	54	58	51	41	30
	Lmax	75	85	81	70	68	73	66	59	49
	L90	45	50	45	44	42	42	36	27	17
07:05	Leq	59	57	57	58	54	57	51	42	32
	Lmax	77	74	75	77	70	75	68	60	51
	L90	42	48	43	41	39	39	31	21	14
07:10	Leq	56	57	54	53	52	54	48	39	30
	Lmax	71	73	72	68	65	69	63	54	49
	L90	42	49	44	42	39	38	32	22	15
07:15	Leq	57	58	53	53	51	54	48	38	28
	Lmax	71	79	69	67	65	69	62	54	48
	L90	42	49	43	41	39	38	31	24	15
07:20	Leq	60	59	54	54	54	58	51	41	30
	Lmax	76	76	70	68	69	75	67	55	46
	L90	43	51	46	43	40	39	32	22	14
07:25	Leq	60	61	53	55	54	58	52	40	30
	Lmax	74	79	67	67	67	72	66	55	50
	L90	44	50	45	44	42	41	35	25	17
07:30	Leq	60	60	55	56	55	58	52	43	34
	Lmax	73	78	69	70	67	70	64	60	55
	L90	46	51	46	45	43	42	36	27	16
07:35	Leq	59	60	58	55	55	57	51	44	36
	Lmax	81	87	77	75	79	78	72	65	59
	L90	45	51	47	46	42	42	36	29	19
07:40	Leq	58	57	52	54	53	56	50	39	29
	Lmax	73	73	64	67	66	71	64	52	55
	L90	45	50	46	45	42	41	36	26	15
07:45	Leq	63	61	69	60	58	60	53	41	31
	Lmax	79	80	90	79	73	74	67	59	51
	L90	47	51	47	47	44	44	38	28	17
07:50	Leq	63	71	65	60	59	60	56	47	39
	Lmax	82	88	84	79	78	79	73	64	61
	L90	47	52	48	47	44	43	37	29	18
07:55	Leq	60	60	57	58	57	57	51	42	29
	Lmax	76	78	75	74	73	72	67	62	48
	L90	46	51	48	46	43	43	36	27	16
08:00	Leq	60	59	54	55	54	58	51	39	27
	Lmax	72	78	69	67	67	70	62	51	43
	L90	47	51	48	46	44	44	38	29	16
08:05	Leq	64	60	56	57	57	62	55	43	30
	Lmax	80	78	72	70	72	78	71	58	46
	L90	47	52	48	47	44	43	38	30	18
08:10	Leq	58	61	53	54	52	56	50	38	27
	Lmax	72	76	65	66	66	70	64	53	40
	L90	45	52	47	45	42	41	36	26	14
08:15	Leq	61	61	56	56	55	59	52	41	29
	Lmax	74	80	71	68	69	72	64	55	45
	L90	46	52	47	46	43	43	37	27	15
08:20	Leq	59	59	54	54	54	57	50	38	25
	Lmax	75	76	67	67	70	74	65	53	40
	L90	46	51	47	45	43	42	36	26	14
08:25	Leq	60	59	55	56	55	58	51	39	42
	Lmax	74	74	72	69	71	71	63	53	66
	L90	46	51	46	45	43	42	36	27	14
08:30	Leq	58	58	54	54	53	55	49	38	27
	Lmax	71	74	69	64	65	69	63	50	41
	L90	46	51	47	46	43	43	36	25	15
08:35	Leq	61	59	57	59	58	58	52	44	36
	Lmax	77	75	75	77	75	72	67	63	59
	L90	46	51	47	46	43	43	36	25	14
08:40	Leq	59	66	58	59	54	55	51	44	44
	Lmax	76	84	76	74	70	69	66	65	71
	L90	46	51	46	45	43	42	35	25	14
08:45	Leq	60	62	56	55	55	57	51	40	33
	Lmax	76	81	72	68	71	75	67	54	55
	L90	46	52	47	45	43	42	35	26	15
08:50	Leq	57	59	54	54	52	55	48	38	26
	Lmax	70	80	66	65	65	68	60	51	42
	L90	46	52	48	47	44	42	35	25	14
08:55	Leq	60	60	55	55	55	57	51	40	29
	Lmax	71	77	73	66	67	68	61	52	42
	L90	46	51	47	46	43	43	37	27	14

Time Period	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
09:00	Leq	59	63	55	55	53	56	52	40	29
	Lmax	77	83	72	66	64	68	75	55	42
	L90	46	51	47	46	43	43	36	26	14
09:05	Leq	62	62	60	60	58	59	53	44	37
	Lmax	77	85	76	76	74	74	67	63	56
	L90	47	52	48	46	45	43	37	27	14
09:10	Leq	62	60	57	58	56	59	55	43	30
	Lmax	76	80	72	70	68	73	69	57	45
	L90	45	52	47	46	43	42	35	26	15
09:15	Leq	60	59	55	56	56	58	53	40	29
	Lmax	73	76	71	68	70	70	66	57	47
	L90	47	51	47	46	44	43	37	27	14
09:20	Leq	60	59	57	59	56	57	50	42	33
	Lmax	74	75	71	77	70	71	63	58	52
	L90	46	51	46	45	44	43	36	27	14
09:25	Leq	59	65	57	55	55	57	51	41	30
	Lmax	74	85	74	68	71	71	64	56	49
	L90	46	52	47	46	43	42	36	26	14
09:30	Leq	61	59	54	56	57	59	53	41	30
	Lmax	78	75	68	69	70	76	70	58	47
	L90	46	51	46	45	43	42	35	26	14
09:35	Leq	60	60	56	56	56	57	51	43	33
	Lmax	74	74	73	71	71	71	65	60	53
	L90	48	51	47	47	45	44	38	28	16
09:40	Leq	61	59	58	57	57	58	51	42	31
	Lmax	75	77	77	74	75	71	64	58	53
	L90	46	51	46	45	43	42	36	26	14
09:45	Leq	61	60	58	57	58	58	51	40	30
	Lmax	76	75	73	72	74	73	65	57	52
	L90	45	51	46	45	42	41	35	25	15
09:50	Leq	62	60	57	58	57	59	52	42	31
	Lmax	73	72	75	73	70	70	63	55	53
	L90	48	52	49	48	45	45	38	27	15
09:55	Leq	61	60	56	57	57	58	52	42	28
	Lmax	74	78	70	74	70	71	65	59	44
	L90	47	52	48	46	45	43	37	28	16
10:00	Leq	60	58	54	56	55	58	52	40	27
	Lmax	76	73	67	72	71	74	67	56	41
	L90	46	51	47	46	43	42	36	26	15
10:05	Leq	62	62	60	59	59	59	54	47	38
	Lmax	78	77	79	77	77	72	68	64	56
	L90	49	52	49	48	47	45	40	30	16
10:10	Leq	61	63	58	59	58	58	53	47	38
	Lmax	78	80	74	77	78	71	70	66	57
	L90	45	51	47	46	42	42	35	25	14
10:15	Leq	60	59	57	57	57	57	52	45	34
	Lmax	73	73	72	71	71	68	66	61	51
	L90	45	50	46	45	42	41	35	24	14
10:20	Leq	59	62	56	56	55	57	51	42	31
	Lmax	77	85	73	72	71	71	72	64	53
	L90	47	51	47	46	44	43	38	26	14
10:25	Leq	57	59	55	55	53	54	49	40	29
	Lmax	73	76	74	72	70	68	64	59	48
	L90	45	51	46	45	43	41	35	25	14
10:30	Leq	58	58	54	55	55	56	49	40	29
	Lmax	75	74	70	70	69	73	66	55	46
	L90	46	51	46	45	44	42	36	27	15
10:35	Leq	58	57	54	55	55	56	50	39	28
	Lmax	73	73	72	69	71	69	63	53	44
	L90	47	51	46	46	45	43	37	28	16
10:40	Leq	61	62	59	61	58	59	51	42	31
	Lmax	82	82	77	81	77	80	72	64	51
	L90	46	51	46	46	44	42	37	27	15
10:45	Leq	60	59	54	56	55	58	52	42	32
	Lmax	72	78	67	67	68	70	63	56	49
	L90	45	50	46	45	42	41	35	25	15
10:50	Leq	59	61	57	57	55	56	50	41	30
	Lmax	73	77	72	71	70	70	63	57	46
	L90	44	50	45	44	41	40	34	25	16
10:55	Leq	55	55	51	52	51	53	46	36	26
	Lmax	69	70	65	63	64	67	59	50	45
	L90	47	49	46	46	45	42	36	28	15
11:00	Leq	61	64	58	60	57	57	53	43	38
	Lmax	78	82	73	77	76	71	70	59	59
	L90	48	51	48	49	46	44	39	30	18
11:05	Leq	55	58	54	52	52	51	48	41	33
	Lmax	72	70	73	67	68	67	67	61	52
	L90	48	51	47	47	45	44	38	30	17

<i>Time Period</i>	<i>Index</i>	<i>dB(A)</i>	63	125	250	500	1k	2k	4k	8k
Overall Daytime	Leq	61	62	59	57	56	58	52	42	33
	Lmax	77	82	78	73	72	74	68	61	56
	L90	47	51	47	46	44	43	37	28	16
Overall Evening	Leq	55	56	51	51	50	53	46	36	26
	Lmax	72	75	70	67	67	70	63	55	49
	L90	40	46	41	39	36	37	29	19	14
Overall Night Time	Leq	51	56	49	49	46	49	42	34	26
	Lmax*	69	76	68	68	64	66	60	54	50
	Lmax**	72	75	68	68	67	69	63	53	47
	L90	39	48	41	40	35	35	29	20	14

* Log Average

** Level Exceed 15 times

Measurement Summary

Position	Time	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Main	Overall Daytime	Leq	61	62	59	57	56	58	52	42	33
		Lmax	77	82	78	73	72	74	68	61	56
		L90	47	51	47	46	44	43	37	28	16
	Overall Night Time	Leq	51	56	49	49	46	49	42	34	26
		Lmax	72	75	68	68	67	69	63	53	47
		L90	39	48	41	40	35	35	29	20	14

Required Reductions for BS 8233 Guidelines

Position	Environment	Reductions for BS8233 desirable* and MCC	Reductions for WHO-Type Criteria and MCC
Main	Living Rooms	26 dB L _{Aeq}	-
	Bedrooms	21 dB L _{Aeq}	27 dB L _{Amax}

* BS 8233 considers a 5 dB relaxation would still provide *reasonable* conditions

Mitigation Summary

Façade	Room Type	Make-Up on Which Calculations are Based
3 Bed Apartment	Kitchen / Lounge	Walls: Traditional Masonry
		Glazing: 30 dB Rw+Ctr eg.10+14+4
		Vents: 40 dB Dn,e,w eg. Glidevale TVALdB 450
3 Bed Apartment	Bedroom 1	Walls: Traditional Masonry
		Glazing: 30 dB Rw+Ctr eg.10+14+4
		Vents: 40 dB Dn,e,w eg. Glidevale TVALdB 450
3 Bed Apartment	Bedroom 2	Walls: Traditional Masonry
		Glazing: 30 dB Rw+Ctr eg.10+14+4
		Vents: 40 dB Dn,e,w eg. Glidevale TVALdB 450
3 Bed Apartment	Bedroom 3	Walls: Traditional Masonry
		Glazing: 30 dB Rw+Ctr eg.10+14+4
		Vents: 40 dB Dn,e,w eg. Glidevale TVALdB 450
1 Bed Apartment	Kitchen / Lounge	Walls: Traditional Masonry
		Glazing: 30 dB Rw+Ctr eg.10+14+4
		Vents: 40 dB Dn,e,w eg. Glidevale TVALdB 450
1 Bed Apartment	Bedroom	Walls: Traditional Masonry
		Glazing: 30 dB Rw+Ctr eg.10+14+4
		Vents: 40 dB Dn,e,w eg. Glidevale TVALdB 450

NB. R_w should come with a negative C_{ir} term, usually around -5 dB, eg. 35 dB R_w and -5 dB C_{ir} is 30 dB R_w+C_{ir}

Predicted Summary

Façade	Room Type	Time	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
3 Bed Apartment	Kitchen / Lounge	Rush	Leq	35	50	40	40	30	29	19	5	-2
		Night	Leq	26	44	31	31	21	19	9	-4	-10
			Lmax	46	62	50	50	41	39	30	16	11
3 Bed Apartment	Bedroom 1	Rush	Leq	33	48	37	37	30	27	19	5	-2
		Night	Leq	24	42	28	28	20	17	10	-3	-9
			Lmax	44	60	47	47	40	38	31	16	11
3 Bed Apartment	Bedroom 2	Rush	Leq	34	47	37	37	30	29	19	3	-4
		Night	Leq	25	41	28	28	21	19	10	-5	-12
			Lmax	44	59	47	48	41	39	31	14	9
3 Bed Apartment	Bedroom 3	Rush	Leq	34	47	37	38	30	28	19	3	-4
		Night	Leq	25	41	28	29	20	18	9	-5	-12
			Lmax	44	59	47	48	40	39	30	14	9
1 Bed Apartment	Kitchen / Lounge	Rush	Leq	34	48	38	37	30	28	19	3	-4
		Night	Leq	25	42	28	28	20	19	10	-6	-12
			Lmax	44	60	48	47	41	39	31	14	9
1 Bed Apartment	Bedroom	Rush	Leq	34	48	38	38	31	29	19	4	-3
		Night	Leq	25	42	29	30	21	19	10	-5	-11
			Lmax	45	60	48	49	41	40	31	15	10