

REPORT



300 Kings Road, Reading Environmental Noise Assessment

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1.0 Summary & Conclusions

Clear Acoustic Design has been appointed to carry out an environmental noise assessment in relation to the proposed development at 300 Kings Road, Reading, RG1 4FL. Proposals are for the construction of a new building to provide residential dwellings in the form of apartments.

Environmental noise levels on site are moderate, but not high - and are primarily due to road traffic noise. A full façade specification has been provided for the proposed residential units, such that an acceptable internal acoustic environment will be provided for future occupants. A review of noise levels within the proposed outdoor amenity areas has also been provided.

This assessment is in line with BS 8233: 2014 *Guidance on Sound Insulation and Noise Reduction for Buildings*, and the recommendations of the World Health Organisation. These assessment criteria are seen to be in full accordance with the requirements of the local planning authority.

The mitigation strategy provided is in line with achieving the *No Observed Effect Level* (NOEL) under national planning guidance, via compliance with the aforementioned criteria.

Based on the results of the environmental noise survey, maximum noise rating levels have been provided, which will be applicable to any items of fixed plant to be installed as part of the proposed development.

This report has been compiled by Patrick Shuttleworth and issued by Stefan Hannan of Clear Acoustic Design. Both hold full corporate membership of the Institute of Acoustics (MIOA), and 11 / 16 years of consulting experience respectively.

2.0 Performance Standards

2.1 BS 8233: 2014

BS 8233: 2014 provides a range of internal noise level targets for many building types, including residential buildings. This British Standard is commonly used by planning authorities to place design targets on new residential developments near major sources of noise, such as transportation networks. The guideline internal noise levels for residential buildings, taken from BS 8233:2014 are shown in Table 2.1 below.

Activity	Location	Day (0700-2300)	Night (2300-0700)
Resting	Living Room	35 dB $L_{Aeq, 16\text{hour}}$	---
Dining	Dining Room / Area	40 dB $L_{Aeq, 16\text{hour}}$	---
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq, 16\text{hour}}$	30 dB $L_{Aeq, 8\text{hour}}$

Table 2.1 BS8233:2014 internal noise level criteria

The 2014 version of this British Standard does not give guideline values for L_{Amax} noise levels in bedrooms at night. Maximum noise levels have the potential to cause excessive night time awakenings and it is recommended that this be considered in the assessment.

The World Health Organisation provides a guideline value of 45 dB L_{Amax} and states that this should not normally be exceeded more than 10-15 times in one night. These recommendations have therefore been used to carry out an assessment of maximum noise levels in bedrooms at night.

2.2 WHO Guidelines for Community Noise

The WHO issued a guidance document in 1999 relating to community noise. The WHO guidance document states the following with regards to residential developments and associated outdoor areas (gardens).

"To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq."

This provides a useful guide when assessing environmental noise in outdoor amenity areas. The WHO do however recognise that these values are not always achievable in urban areas, where the benefits of outdoor amenity are seen to outweigh these criteria.

3.0 Site Description and Noise Climate

The proposed residential development is to be situated at 300 Kings Road, Reading, RG1 4FL. The main source of noise affecting the site is road traffic.

With regards to road traffic noise, the dominant contribution is seen to come from Kings Road itself, to which the northern façade of the proposed development will be most exposed. Road traffic noise levels are moderate with a reduction in to the night time period. Other local roads form a secondary contribution to ambient noise levels.

The southern façade of the proposed development will face on to Muirfield Close, which carries a low volume of vehicles. As such, habitable rooms on the Muirfield Close façade will be subject to significantly lower noise levels.

4.0 Environmental Noise Survey

In order to obtain a detailed picture of the environmental noise climate on site, a noise survey has been undertaken over a typical 24 hour period, in a position representative of a worst case of environmental noise levels.

Noise levels were measured using 5-minute samples, in 1 fixed position (F1), from 24/05/2022 – 25/05/2022. Position F1 was located with clear line of sight to traffic on Kings Road. The fixed long term noise monitoring serves to provide the day and night time ambient noise levels ($L_{Aeq\ 16 / 8\ HOUR}$) and night time L_{Amax} due to general sources including road traffic.

A series of short term attended measurements were also conducted in order to establish noise variance across the site. This is seen to be required as the proposed facades facing on to Muirfield Close will be subject to significantly lower noise levels.

4.1 Measurement Equipment and Environmental Conditions

The weather was witnessed to be overcast and dry for the duration of the survey with generally light wind speeds of less than 5 mps. The following measurement equipment was used to carry out the survey.

Equipment	Serial Number	Calibration Date
NTi XL2 sound level meter – Class 1	A2A-16925-E0	Dec 2020
NTi Microphone Capsule - MC230A	A17732	Dec 2020
NTi Preamplifier - MA220	8657	Dec 2020

Table 4.1 Measuring Equipment used for Survey

4.2 Long Term Results – F1 - Graph

Figure 4.1 below provides a graph of the measured noise levels over approximately 24 hours. The ambient (L_{Aeq}) and maximum (L_{Amax}) noise levels are shown.

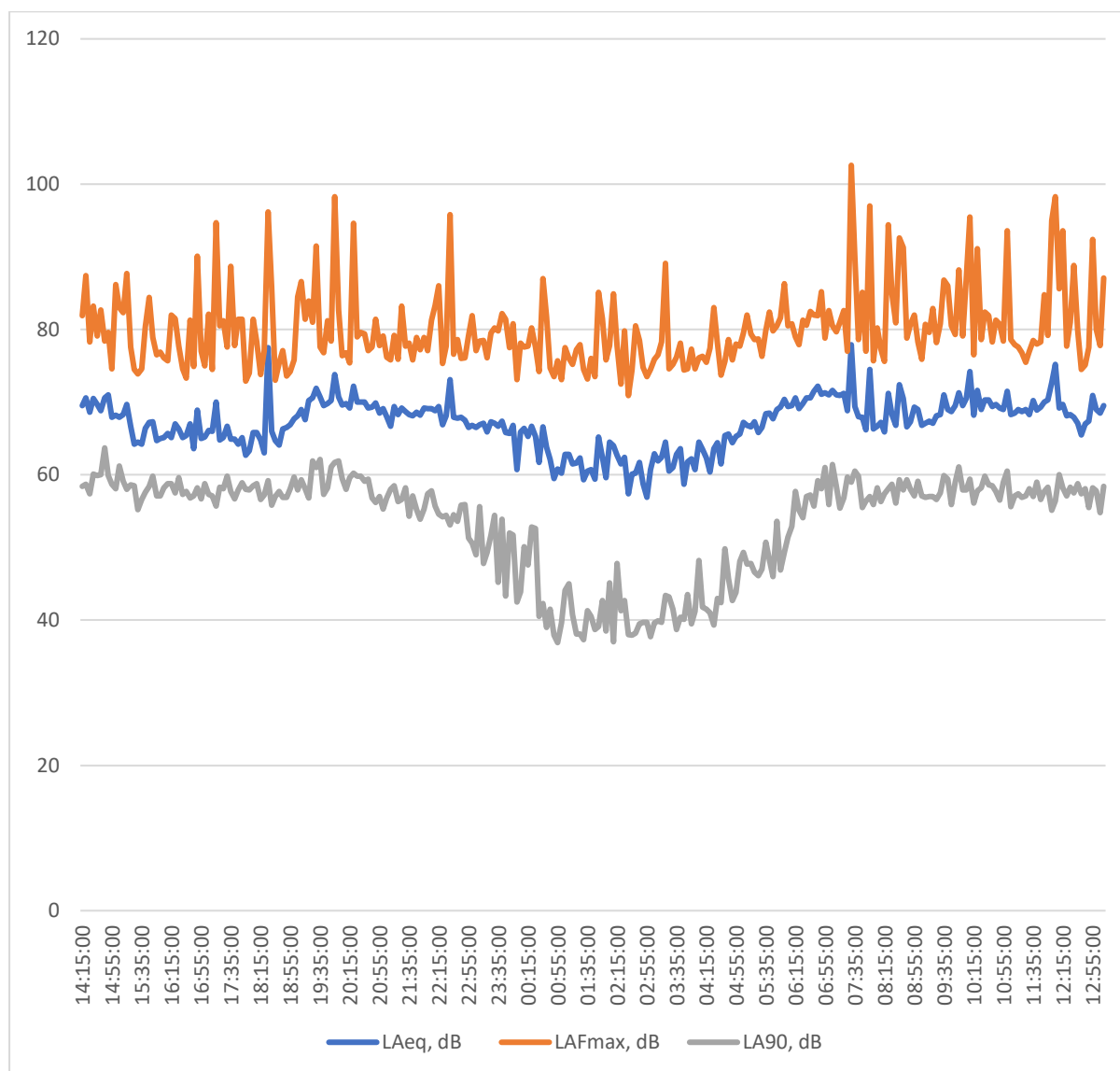


Figure 4.1 Long Term Measurement Graph – F1

4.3 Long Term Results – F1 - Summary

Based on the results of the fixed noise monitoring, the following noise levels will form the basis of the assessment in line with BS 8233: 2014. The L_{Amax} value shown is the 11th highest, in line with the recommendations of the WHO.

Time Period	Measured Ambient Noise Level, dB L_{Aeq} 16 / 8 HOUR	Representative Maximum Level, dB L_{Amax}
Day (0700-2300)	69	--
Night (2300-0700)	66	82

Table 4.2 Summary of Ambient and Maximum Noise Levels – F1

4.4 Attended Short Term Results

In order to establish the noise variance between the northern Kings Road façade and the southern Muirfield Close facades, attended short term measurements were undertaken by Clear Acoustic Design on 25/05/22. These measurements were undertaken in Muirfield Close, in a location fully screened from Kings Road. The results are presented in Table 4.3 below.

Time Period	Measured Ambient Noise Level, dB L_{Aeq}
13:20 – 13:25	53
13:25 – 13:30	57

Table 4.3 Summary of Attended Short Term Measurements

5.0 Façade Specification

In order to control noise ingress to the proposed residential dwellings, it will be necessary to provide building envelope sound insulation in line with the following specification. The façade specification for this development has been designed to reduce general environmental noise (including road traffic) to within the recommendations of BS 8233: 2014. This is seen to relate to the *No Adverse Effect Level* (NOEL) under national planning guidance.

The attended short term measurements in Table 4.3 have been used to assess the reduction in noise for the south façade. This results in a reduction to the ambient day and night time noise levels of 12 dBA.

Supporting calculations can be found in Appendix A. Calculations have been based on typical room and window dimensions of the proposed development, as shown on the architectural drawings. Note that the calculated internal noise levels are with closed windows.

Based on the measured noise levels, it will be necessary to provide habitable rooms on all facades with mechanical ventilation. It is recommended that openable windows are not relied upon for mitigation of overheating, such that occupants need not rely on open windows for thermal comfort. Short term purge ventilation via opening of windows is allowable and noise ingress does not need to be considered in this scenario.

5.1 External Wall and Roof

The acoustic performance requirements for the external wall and roof in all areas of the development are provided in Table 6.1 below. These sound reduction values will therefore need to be met by the façades and roof. This level of performance can be met with either masonry or lightweight façade types.

If a lightweight façade type is to be employed, it is recommended that the inner skin of the façade (room side) is formed from 2 layers of dense plasterboard to provide a surface mass of at least 20 Kg/m². It is also recommended that the ceiling at roof level is formed from 2 layers of dense plasterboard to provide a surface mass of at least 20 Kg/m².

Cavities / voids in the façade or roof should be filled with Rockwool / mineral wool insulation of 10-60 Kg/m³. This should not be tightly packed within voids.

Element	Type	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz
External Wall and Roof	R, dB	43	46	52	52	54	55

Table 6.1 Required Acoustic Performance of External Wall and Roof

5.2 Windows / Glazing

The following acoustic performance will be applicable for all windows and glazed doors (including frames). These sound reduction values will therefore need to be met when choosing specific glazing systems. The supplier should provide an acoustic test certificate to demonstrate that these criteria are met.

Façade	Room Type	Type	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz
North, East, West	Living Rooms	R, dB	23	24	34	42	43	52
	Bedrooms	R, dB	25	31	41	46	46	58
South	Living Rooms and Bedrooms	R, dB	19	20	27	37	39	40

Table 6.2 Required acoustic performance of windows and trickle vents

Note that the specification for bedrooms is dictated by the maximum (L_{Amax}) levels. The maximum noise criteria are only applicable to bedrooms during the night. As such, a reduced window specification has been provided for living rooms on the north, east and west facades.

The sound reduction indices provided above will reduce general sources of environmental noise on site (including road traffic) to within the recommendations of BS 8233: 2014. Supporting calculations demonstrating this compliance are provided in Appendix A.

6.0 Outdoor Amenity Areas

For this development, outdoor amenity is to be provided in the form of balconies / terraces. It is seen that all of the balconies / terraces are located on the south façade of the proposed building. This is seen to be suitable location, as the south façade is significantly screened from Kings Road.

The measured noise levels at street level in Muirfield Close are around 57 dB $L_{Aeq, 16 \text{ HOUR}}$. Given that the balconies themselves will provide a degree of screening, noise levels for the occupants / users of these amenity areas will be within the 50 – 55 dBA range recommended by the World Health Organisation.

7.0 Plant Noise Emission Limits

The proposed development may introduce items of mechanical plant. In order to protect the amenity of the surrounding residential receptors, it may be necessary to limit noise emissions from mechanical plant. At this stage, it is too early to provide a full assessment of plant noise emissions, as there is no specification at this stage.

As such, Clear Acoustic Design has provided rating level limits for any items of fixed plant to be installed as part of the proposed development. It will be necessary to assess noise generating items of plant against these rating level limits. Note that the lower night time background noise levels will take precedence. The rating level limit is equal to the existing minimum night time background noise. The local planning authority may require more onerous rating level limits. If so, the rating level limit in Table 3.1 should be adjusted accordingly.

Time Period	Background Noise Level, L_{A90} dB	Rating Level Limit, $L_{A,T}$ dB
NIGHT 2300 – 0700	47	37

Table 3.1: Background Noise Levels, Rating Level Limits for Kitchen Extract Plant

Appendix A – BS 8233 Noise Break-in Calculations

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation							
		125	250	500	1000	2000	4000	dB(A)	
Noise Level at Façade		66	64	63	66	63	54	69	
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	115 m3								
Reverberation Time in room	1.2 s	1.2	1.2	1.2	1.2	1.2	1.2		
A = Total absorption in Sabines		15.4	15.4	15.4	15.4	15.4	15.4		
10*log(S/A)		2.1	2.1	2.1	2.1	2.1	2.1		
Facade Details									
Total Façade Area		25.0 m2							
External Wall		17 m2							
External Wall									
Noise ingress through element		43	46	52	52	54	55		
		26.5	21.6	14.0	17.7	12.2	2.4	21.0	
Window		8.5 m2							
Glazing									
Noise ingress through element		23	24	34	42	43	52		
		43.6	40.8	29.1	24.8	20.3	2.5	34.8	
Total Noise Level in Room		44	41	29	26	21	7	35	

Figure A.1: Noise Break-In Calculation – LAeq 16 HOUR – North, East and West Facades

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						
		125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		63	61	60	63	60	51	66
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0	
Volume of room	23 m3							
Reverberation Time in room	0.8 s	0.8	0.8	0.8	0.8	0.8	0.8	
A = Total absorption is Sabines		4.6	4.6	4.6	4.6	4.6	4.6	
10*log(S/A)		1.1	1.1	1.1	1.1	1.1	1.1	
Facade Details								
Total Façade Area		6.0 m2						
External Wall		4 m2						434652525455
External Wall								
Noise ingress through element		22.6	17.7	10.0	13.8	8.2	-1.6	
								253141464658
Window		2 m2						
Glazing								
Noise ingress through element		37.6	29.7	18.0	16.8	13.2	-7.6	25.7
Total Noise Level in Room		38	30	19	19	15	5	26

Figure A.2: Noise Break-In Calculation – LAeq 8 HOUR – North, East and West Facades

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation							
Noise Level at Façade		125	250	500	1000	2000	4000	dB(A)	
		83	80	77	78	74	69	82	
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	23 m3								
Reverberation Time in room	0.8 s	0.8	0.8	0.8	0.8	0.8	0.8		
A = Total absorption is Sabines		4.6	4.6	4.6	4.6	4.6	4.6		
10*log(S/A)		1.6	1.6	1.6	1.6	1.6	1.6		
Facade Details									
Total Façade Area		6.6 m2							
External Wall		4 m2							
External Wall		43	46	52	52	54	55	33.6	
Noise ingress through element		42.3	36.3	27.6	28.6	22.7	16.7		
Window		2 m2							
Glazing		25	31	41	46	46	58	44.8	
Noise ingress through element		57.9	48.8	36.1	32.1	28.3	11.3		
Total Noise Level in Room		58	49	37	34	29	18	45	

Figure A.3: Noise Break-In Calculation – L_{Amax} – North, East and West Facades

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation							
		125	250	500	1000	2000	4000	dB(A)	
Noise Level at Façade		54	52	51	54	51	42	57	
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	115 m3								
Reverberation Time in room	1.2 s	1.2	1.2	1.2	1.2	1.2	1.2		
A = Total absorption in Sabines		15.4	15.4	15.4	15.4	15.4	15.4		
10*log(S/A)		2.1	2.1	2.1	2.1	2.1	2.1		
Facade Details Total Façade Area 25.0 m2									
External Wall	17 m2	43	46	52	52	54	55		
External Wall									
Noise ingress through element		14.5	9.6	2.0	5.7	0.2	-9.6	9.0	
Window	8.5 m2	19	20	27	37	39	40		
Glazing									
Noise ingress through element		35.6	32.8	24.1	17.8	12.3	2.5	27.5	
Total Noise Level in Room		36	33	24	18	13	6	28	

Figure A.4: Noise Break-In Calculation – LAeq 16 HOUR – South Facade

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation							
		125	250	500	1000	2000	4000	dB(A)	
Noise Level at Façade		39	37	36	39	36	27	43	
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	23 m3								
Reverberation Time in room	0.8 s	0.8	0.8	0.8	0.8	0.8	0.8		
A = Total absorption in Sabines		4.6	4.6	4.6	4.6	4.6	4.6		
10*log(S/A)		1.1	1.1	1.1	1.1	1.1	1.1		
Facade Details Total Façade Area 6.0 m2									
External Wall	4 m2	43	46	52	52	54	55		
External Wall									
Noise ingress through element		-1.4	-6.3	-14.0	-10.2	-15.8	-25.6	-6.9	
Window	2 m2	19	20	27	37	39	40		
Glazing									
Noise ingress through element		19.6	16.7	8.0	1.8	-3.8	-13.6	11.4	
Total Noise Level in Room		20	17	9	6	4	3	14	

Figure A.2: Noise Break-In Calculation – LAeq 8 HOUR – South Façade

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						
Noise Level at Façade		125	250	500	1000	2000	4000	dB(A)
		71	68	65	66	62	57	70
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0	
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0	
Volume of room	23 m3							
Reverberation Time in room	0.8 s	0.8	0.8	0.8	0.8	0.8	0.8	
A = Total absorption is Sabines		4.6	4.6	4.6	4.6	4.6	4.6	
10*log(S/A)		1.6	1.6	1.6	1.6	1.6	1.6	
Facade Details								
Total Façade Area		6.6 m2						
External Wall		4 m2						
External Wall		43	46	52	52	54	55	
Noise ingress through element		30.3	24.3	15.6	16.6	10.7	4.7	21.6
Window		2 m2						
Glazing		19	20	27	37	39	40	
Noise ingress through element		51.9	47.8	38.1	29.1	23.3	17.3	42.1
Total Noise Level in Room		52	48	38	29	24	18	42

Figure A.3: Noise Break-In Calculation – L_{Amax} – South Facade