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Noise Report for Proposed Residential Development at Thurnscoe, Barnsley

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On behalf of:
Keepmoat Homes Ltd

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1.0 INTRODUCTION

1.1 Blue Tree Acoustics was commissioned by Keepmoat Homes Ltd to carry out an assessment of the potential impact of rail noise on a proposed residential development at School Street, Thurnscoe, Barnsley.

1.2 The development site is in Thurnscoe, to the west of the railway line from Rotherham to Pontefract and to the north of Station Road– Doncaster Road. The site is bounded by the railway cutting to the east, with railway located 5-6m below the adjacent site level. Much of the site is redevelopment of existing residential areas, however, the site will bring new residential properties much closer to the railway line than the existing layout.

1.3 The surrounding area is solely residential in nature. There are no industrial or other commercial premises in the immediate vicinity.

1.4 The proposed development comprises numerous phases. Phase 1 is the part closest to the railway line, and thus is the most important for assessment purposes. This phase contains approximately one hundred and sixty residential units. The proposed scheme is not fixed at the time of writing. Figure 1 represents the current proposal and possible layout.

1.5 The noise impact assessment has included:

i) Inspection of the site and surroundings and study of the plans provided by Keepmoat Homes Ltd and Watson Batty Architects.

ii) Daytime and night time noise monitoring surveys.

iii) Evaluation of the site in accordance with Planning policy guidance note 24 'Planning and Noise' issued by the Department of the Environment, HMSO, 1994 (PPG24)

iv) Consideration of noise control measures required to maintain acceptable noise levels within the proposed bedrooms and living rooms in accordance with British Standard 8233: 1999, 'Code of practice for Sound insulation and noise reduction for buildings'.

2.0 EXISTING NOISE SOURCES

Road

2.1 The site is a minimum of 200m from a major road, namely Station Road. School Road, Willow Road and Lingamore Leys are lightly trafficked throughout the day and at night with occasional passing vehicles. Road traffic noise levels are very low across the site.

Rail

2.2 The railway line is in close proximity to the site and we understand that there are two distinct types of passenger train using the line between approximately 5am and midnight. It is understood that the railway line does not support scheduled freight use.

Noise from passing trains is clearly audible at the Eastern edge of the development site and railway noise is the dominant noise source affecting the site. Railway noise does however quickly reduce in level once the line is out of sight due to the acoustic screening effect of the cutting and the majority of the site is screened from train noise in this way.

3.0 NOISE SURVEY

Daytime Survey

3.1 A daytime noise survey was undertaken on 14th October 2009.

3.2 Noise levels were measured at the following locations, as shown on Figure 1.

i) Eastern side of development (free-field)

ii) Central site location (free-field)

3.3 Noise measurements were carried out using a Rion NA28 Type 1, Class 1 Integrating Sound Level Meter(s). Noise was measured in terms of broadband A-weighted indices and at 1/3 octave bands from 50Hz to 10kHz. The sound level meter was mounted on a tripod at approximately 1.5m from local ground level and the proprietary windshield was fitted to the microphone. Calibration checks were carried out both before and after the measurements with no variance observed.

3.4 Two distinctly different types of measurement were made: measurement of ambient noise levels over a 15 minute period, (including noise from any trains passing during the measurement period) and short period measurement of a train pass-by only.

3.5 Weather conditions were good, being dry and still with wind speeds <5m/s.

Table 1: Location 1 Daytime Noise Levels – Free field at approx 20m from track

Time	Time Period	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}	Comments
1420	15 min	42.7	57.9	44.6	39.1	Ambient
1433	14 seconds	73.3	82.2	80.9	44.0	Fast train
1436	11 seconds	74.7	81.9	80.3	55.3	Fast train
1436	10 min	41.6	52.8	43.8	38.6	Ambient
1446	26 seconds	65.9	76.1	71.6	46.6	Slow train
1520	15 min	41.5	55.8	45.6	39.3	Ambient

Table 2: Location 2 Daytime Noise Levels – Free field at approx 200m from track

Time	Time Period	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}	Comments
1448	15 min	62.0	82.2	62.3	37.9	Ambient including Bus pass-by
1536	6 seconds	45.7	47.7	46.8	44.1	Distant Train
1538	15 min	48.7	49.5	50.8	39.1	Ambient

Night-time Survey

3.6 A night-time noise survey was undertaken on 14th October 2009. With measurement locations, equipment and conditions as per the day survey.

Table 3: Location 1 Night-time Noise Levels – Free field at approx 20m from track

Time	Time Period	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}	Comments
2327	15 min	50.7	75.0	40.5	32.2	2 trains
0024	15 min	32.3	47.7	34.9	28.3	Ambient

Table 4: Location 2 Night-time Noise Levels – Free field at approx 200m from track

Time	Time Period	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}	Comments
2308	15 min	52.6	76.5	46.8	31.8	Ambient
2359	15 min	34.6	45.2	36.8	31.9	Ambient

3.7 The last train passing the site was noted at 2335 hours.

Noise Calculations

3.8 Using the above data, it is possible to calculate the noise levels which would be experienced at any location on the site, assuming a certain number of train movements in a time period.

Table 5: Calculated Noise Levels for Nearest Property.

Time	Time Period(mins)	dB L_{Aeq}	dB SEL	1 Trains in 15 minutes
1433	14 seconds	73.3	84.8	55.3
1436	11 seconds	74.7	85.5	56.0
1446	26 seconds	65.9	80.0	50.5
Logarithmic Average				54.5 dB(A)
6 trains in 1 hour				56.3dB(A)

3.9 During the survey the highest number of trains passing the site within any one hour period was four. The bottom line of the table shows the noise level which would result from 6 average trains in 1 hour. The figure of 56.3dB L_{Aeq} tallies well with the 15 minute ambient measurements made on site. This value of 50.7dB L_{Aeq} contains 2 trains in 15 minutes which equates to 55.5dB L_{Aeq} for 6 trains in one hour.

3.10 The figure of 56.3dB L_{Aeq} can be used as being representative of the most exposed location on the site. As trains operate every hour of the day (0700 hours to 2300 hours) the 56.3dB L_{Aeq} is therefore representative of the 16 hour noise level.

3.11 Although only two trains were witnessed at night, it has been assumed that there can be up to 6 trains an hour for 3 hours and no trains for the remaining 5 hours of the night. A noise level of 56.3dB L_{Aeq} would therefore occur for 3 hours. The 5 hours with no passing trains have much reduced noise levels. As can be seen from the above tables when there are no trains passing the site, noise levels are very low and can be as low as 32.3dB L_{Aeq}. Assuming 32.3dB L_{Aeq} for 5 hours, the night time 8 hour ambient noise level becomes 52.1dB L_{Aeq}.

3.12 The minor roads in the middle of the site have occasional bus movements passing the site. A bus pass-by was measured at location 2 as being 62dB L_{Aeq} at the roadside. Due to the limited number of bus movements in the area it is very unlikely that this 62dB L_{Aeq} level would be exceeded. For the majority of the time noise levels in this location are much less.

4.0 PPG24 ASSESSMENT AND BS8233 ASSESSMENT CRITERIA

4.1 Using the lookup table below, the noise exposure categories (NEC) may be established for the development site.

Table 6: PPG24 NEC Categories

Categories For New Dwellings dB $L_{Aeq,T}$				
	Noise Exposure Category			
Noise Source	**A**	**B**	**C**	**D**
Road Traffic				
07.00 - 23.00	<55	55 – 63	63 – 72	>72
23.00 - 07.00	<45	45 – 57	57 – 66	>66
Rail Traffic				
07.00 - 23.00	<55	55 – 66	66 – 74	>74
23.00 - 07.00	<45	45 – 59	59 – 66	>66
Air Traffic				
07.00 - 23.00	<57	57 – 66	66 – 72	>72
23.00 - 07.00	<48	48 – 57	57 – 66	>66
Mixed Sources				
07.00 - 23.00	<55	55 – 63	63 – 72	>72
23.00 - 07.00	<45	45 – 57	57 – 66	>66

4.2 *if maximum noise levels through the night regularly exceed 82dB LAmax(slow) several times in any hour it is considered to be NEC C unless it is already categorised as NEC D.*

4.3 The site is dominated by rail noise. The highest ambient noise levels experienced on this site are those calculated in the previous section. Namely, 56.3dB L_{Aeq} during the 16 hour daytime period and 52.1dB L_{Aeq} during the 8 hour night-time period. Road traffic noise is limited and apart from the occasional bus movement, noise levels are low. Even with bus movements NEC B is not exceeded.

4.4 The highest noise exposure category on the site is therefore NEC B as shown in the above tables.

4.5 PPG24 states that the NEC categories are interpreted as follows:

NEC A

"Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level."

NEC B

"Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise."

NEC C

"Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise."

NEC D

"Planning permission should normally be refused."

4.6 In order to mitigate noise impact PPG24 states that engineering, lay-out and administrative techniques may be employed.

The following standard has been adopted as this was used in a planning permission condition for the last Keepmoat site adjacent to railway in the Barnsley area.

Inside Bedrooms:	30dB $L_{Aeq(8hour)}$ (2300 to 0700 hours)
Inside Bedrooms:	45dB $L_{Amax(8hour)}$ (2300 to 0700 hours)
Inside Living Rooms:	30dB $L_{Aeq(16hour)}$ (0700 to 2300 hours)
External areas such as Gardens:	55dB $L_{Aeq(16hour)}$ (0700 to 2300 hours)

4.7 Noise ingress calculations have been carried out in accordance with BS8233. Typical daytime and night time BS8233 calculations are presented in the appendices.

5.0 NOISE CONTROL MEASURES

5.1 Based on the BS8233 noise ingress calculations, the following sound insulation measures are required in order to achieve the design criteria stated above.

Glazing

Table 7: Glazing Sound Reduction Indices – Living Room windows within 30m of railway, facing the railway

	Minimum Sound Reduction Indices (dB) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Glazing	20	25	22	33	40	43	44

5.2 The above performance is achievable with a number of glazing combinations including a double glazed system comprising 10mm glass/12mm cavity/6mm glass in aluminium, timber or uPVC framing. The above system should be provided to all Living Room windows within 30m of the railway line which face the railway line. All other Living Room windows may be standard double glazing.

Table 8: Glazing Sound Reduction Indices – Bedroom windows within 30m of Railway with a view to railway

	Minimum Sound Reduction Indices (dB) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Glazing	24	26	33	41	52	54	61

5.3 The above performance is achievable with a number of glazing combinations including a double glazed system comprising Saint Goban Glass STADIP SILENCE 8.4mm/16mm cavity/SGGSTADIP SILENCE 10.4mm in aluminium, timber or uPVC framing. The above *system should be provided to all Bedroom windows that have a view of the railway line and are* within 30m of the railway line. All other bedroom windows may be standard double glazing.

Walls

Table 9: Wall Sound Reduction Indices

	Minimum Sound Reduction Indices (dB) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Wall	34	40	40	48	60	61	61

5.4 The above performance is achievable with a well sealed cavity masonry construction.

Ventilation

Table 10: Ventilation Sound Reduction Indices – within 30m of Railway

	Minimum Dne (dB) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Ventilation	29	33	35	44	53	59	60

5.5 The above performance is achievable with a number of ventilation options including the Silavent Freshflo Permanent Vent Type A. There should be no other ventilators in the rooms other than the acoustic ventilators. This system should be provided for all rooms with elevations facing the railway which are within 30m of the railway. All other rooms may have standard trickle ventilation.

5.6 Any alternative glazing, ventilation, wall systems etc should be checked by a competent acoustic consultant in order to ensure adequate sound insulation performance.

External Areas

5.7 All gardens with a view to the railway line and within 30m of the railway line should be protected with a 1.8m high acoustic fence in order to reduce noise levels. Acoustic fencing should be constructed of weather-treated timber (or ply) of at least 15mm minimum thickness. All joints should be tight-butted with timber cover strips or tongue and groove boards used to ensure there are no air gaps. Gravel boards should be used to fully seal the gap between the fencing and the ground. Alternatively, a solid masonry wall can be constructed to provide the acoustic barrier. The 55dBL_{Aeq} garden will be easily satisfied as noise levels are currently only just over the criterion.

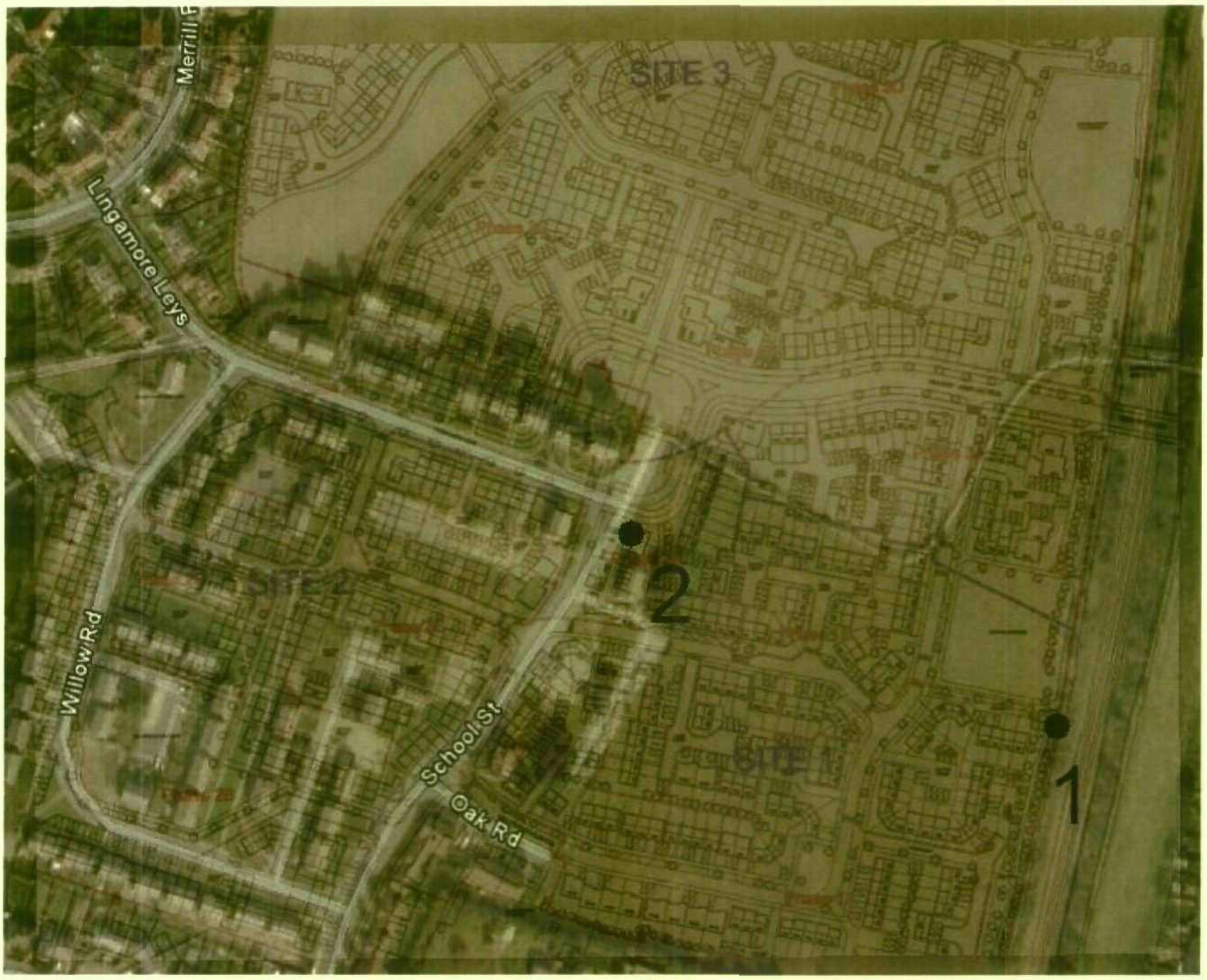
6.0 SUMMARY AND CONCLUSIONS

6.1 A noise assessment has been carried out for the proposed residential development in the vicinity of School Street, Thurnscoe, Barnsley.

6.2 The assessment has included measurements of the daytime and night-time ambient noise levels at the site as well as noise from individual passing trains.

6.3 Noise from passing trains is the dominant noise source affecting the site. The measured noise levels have been assessed with reference to PPG24 'Planning and Noise' indicating that the site falls within noise exposure category B. Noise control measures have therefore been recommended in order to meet the BS8233 based noise criteria selected.

FIGURE 1 – POSSIBLE SITE LAYOUT SHOWING NOISE MONITORING LOCATIONS



APPENDIX I – NOISE UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of pressure in air. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. Due to the wide range of pressure variations detectable by the ear, a logarithmic scale is used to convert the values into manageable numbers. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

b) Frequency and Hertz (Hz)

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or Hertz (Hz). Sometimes large frequencies are often written as kilohertz (kHz), where 1kHz = 1000Hz.

Young people with normal hearing can hear frequencies in the range 20Hz to 20kHz. However, the upper frequency limit gradually reduces as a person gets older.

As the ear hears some frequencies better than others, the A-weighting scale is used to mimic human hearing. A-weighing applies a correction to the sound level at a given frequency depending on how well the ear hears that frequency.

c) Glossary of Terms

In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted equivalent continuous sound level which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{Amax} This is the maximum A-weighted sound level that was recorded during the monitoring period.

L_{A90} This is the A-weighted sound level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{A10} This is the A-weighted sound level exceeded for 10% of the time period and is often used in the assessment of road traffic noise.

SEL This is the Single Event Level which is used to calculate the resultant L_{Aeq} which would be generated by a number of events with a given SEL. The SEL is the total energy measured over the event, compressed into 1 second. SEL= L_{Aeq} +10log(t) there t is time in seconds. Also L_{Aeq} =SEL - 10log(t) + 10log(n) where t is time in seconds and n is the number of events in the time period. SELs are often used for Train noise calculations and other specific events.

APPENDIX II – TYPICAL BS8233 CALCULATION – LIVING ROOM

In order to find the internal noise level which would result from external noise ingress into a room the following equation is used:

$$L_{eq,2} \approx L_{eq,ff} + 10\log\left\{\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right\} + 10\log\left\{\frac{S}{A}\right\} + 3$$

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
$L_{eq,ff}$	Sound pressure level outside	61	58	55	53	52	50	44	43
$D_{n,e}$	Insulation of the ventilator	29	33	35	44	53	59	60	60
R_{wi}	Window sound reduction index	20	25	22	33	40	43	44	44
R_{ew}	Wall sound reduction index	34	40	40	48	60	61	61	61
R_{rr}	Roof/ceiling sound reduction index	-	-	-	-	-	-	-	-
A	Absorption area of room	9.3	11.1	12.8	14.1	15.5	15.5	15.5	15.5
S_f	Facade area (including window)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
S_{wi}	Window area	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
S_{ew}	$S_f - S_{wi}$	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
S_{rr}	Area of Ceiling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	$S_f + S_{rr}$	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
A_0	Given in BS EN 20140-10	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

White cells denote the information required by BS8223 over the frequency range of 125Hz -2kHz, greyed cells are additional to BS8233 frequency range but are used in the calculation to be more complete.

	Reference Letter	Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
$L_{eq,ff}$	A	61	58	55	53	52	50	44	43
$D_{n,e}$		29	33	35	44	53	59	60	60
$\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}}$	B	1.4E-03	5.6E-04	3.5E-04	4.4E-05	5.6E-06	1.4E-06	1.1E-06	1.1E-06
R_{wi}		20	25	22	33	40	43	44	44
$\frac{S_{wi}}{S_f} 10^{\frac{-R_{wi}}{10}}$	C	2.2E-03	7.0E-04	1.4E-03	1.1E-04	2.2E-05	1.1E-05	8.8E-06	8.8E-06
R_{ew}		34	40	40	48	60	61	61	61
$\frac{S_{ew}}{S_f} 10^{\frac{-R_{ew}}{10}}$	D	3.1E-04	7.8E-05	7.8E-05	1.2E-05	7.8E-07	6.2E-07	6.2E-07	6.2E-07
R_{rr}		-	-	-	-	-	-	-	-
$\frac{S_{rr}}{S_f} 10^{\frac{-R_{rr}}{10}}$	E	-	-	-	-	-	-	-	-
$10 \log_{10} (B + C + D + E)$	F	-24	-29	-27	-38	-45	-49	-50	-50
A									
$10 \log \left(\frac{S}{A}\right)$	G	-0.14	-0.91	-1.53	-1.95	-2.36	-2.36	-2.36	-2.36
$L_{eq,2}$	A + F + G + 3	40	31	29	16	8	2	-5	-6
A-weighting dB		-26	-16	-9	-3	0	1	1	-1
$L_{eq,2}$ + A-weighting	$L_{Aeq,freq}$	14	15	20	13	8	3	-4	-7
$L_{eq,2}$ + A-weighting	L_{Aeq}	23							
	NR	21							

White cells denote the information required by BS8223 over the frequency range of 125Hz -2kHz, greyed cells are additional to BS8233 frequency range but are used in the calculation to be more complete.

APPENDIX III – TYPICAL BS8233 CALCULATION – BEDROOM

In order to find the internal noise level which would result from external noise ingress into a room the following equation is used:

$$L_{eq,2} \approx L_{eq,ff} + 10\log\left\{\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right\} + 10\log\left\{\frac{S}{A}\right\} + 3$$

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
$L_{eq,ff}$	Sound pressure level outside	57	54	51	49	48	46	40	39
$D_{n,e}$	*Insulation of the ventilator*	29	33	35	44	53	59	60	60
R_{wi}	Window sound reduction index	24	26	33	41	52	54	61	61
R_{ew}	Wall sound reduction index	34	40	40	48	60	61	61	61
R_{rr}	Roof/ceiling sound reduction index	-	-	-	-	-	-	-	-
A	Absorption area of room	9.3	11.1	12.8	14.1	15.5	15.5	15.5	15.5
S_f	Facade area (including window)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
S_{wi}	Window area	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
S_{ew}	$S_f - S_{wi}$	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
S_{rr}	Area of Ceiling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	$S_f + S_{rr}$	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
A_0	Given in BS EN 20140-10	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

White cells denote the information required by BS8223 over the frequency range of 125Hz -2kHz, greyed cells are additional to BS8233 frequency range but are used in the calculation to be more complete.

	Reference Letter	Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
$L_{eq,ff}$	A	**57**	**54**	**51**	**49**	**48**	**46**	**40**	**39**
$D_{n,e}$		29	33	35	44	53	59	60	60
$\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}}$	B	1.4E-03	5.6E-04	3.5E-04	4.4E-05	5.6E-06	1.4E-06	1.1E-06	1.1E-06
R_{wi}		24	26	33	41	52	54	61	61
$\frac{S_{wi}}{S_f} 10^{\frac{-R_{wi}}{10}}$	C	8.8E-04	5.6E-04	1.1E-04	1.8E-05	1.4E-06	8.8E-07	1.8E-07	1.8E-07
R_{ew}		34	40	40	48	60	61	61	61
$\frac{S_{ew}}{S_f} 10^{\frac{-R_{ew}}{10}}$	D	3.1E-04	7.8E-05	7.8E-05	1.2E-05	7.8E-07	6.2E-07	6.2E-07	6.2E-07
R_{rr}		-	-	-	-	-	-	-	-
$\frac{S_{rr}}{S_f} 10^{\frac{-R_{rr}}{10}}$	E	-	-	-	-	-	-	-	-
$10 \log_{10} (B + C + D + E)$	F	-26	-29	-33	-41	-51	-55	-57	-57
A									
$10 \log \left(\frac{S}{A}\right)$	G	-0.14	-0.91	-1.53	-1.95	-2.36	-2.36	-2.36	-2.36
$L_{eq,2}$	A + F + G + 3	34	27	19	9	-2	-8	-16	-17
A-weighting dB		-26	-16	-9	-3	0	1	1	-1
$L_{eq,2}$ + A-weighting	$L_{Aeq,freq}$	8	11	10	6	-2	-7	-15	-18
$L_{eq,2}$ + A-weighting	L_{Aeq}	15							
	NR	10							

White cells denote the information required by BS8223 over the frequency range of 125Hz -2kHz, greyed cells are additional to BS8233 frequency range but are used in the calculation to be more complete.

The same calculation carried out for the L_{Amax} parameter yields a result of $44dBL_{Amax}$