

Pentangle Design

**4 Station Road
Letchworth**

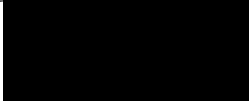
**Conversion from
Commercial to
Part Residential**

**Noise Impact Assessment
Report**

August 2024

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1. INTRODUCTION

At the request of Pentangle Design, a noise impact assessment has been carried out for the proposed conversion of the first floor and part ground floor commercial premises to residential at 4 Station Road, Letchworth. The assessment has been carried out according to the noise guidelines of BS8233:2014 as specified in national planning policy and ProPG 'Planning and Noise' 2017.

The measurements and assessment have been carried out by John Hyde, a Member of the Institute of Acoustics and Chartered Physicist who has over 35 years' experience as a noise and acoustics consultant.

2. TERMINOLOGY

It has become practice to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear. It is helpful to remember that a noise level change of 3dB on a sound meter reading would be just perceptible, and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequencies. The ear "hears" high frequency sound of a given level more loudly than low frequency sound of the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second. It is clearly impractical to specify the sound level for each second thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

$L_{Aeq,T}$: the equivalent A-weighted continuous sound level over period T. This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hr for daytime noise. It contains all the sound energy of the varying sound levels over the same time period, and expresses it as a continuous sound level over that period. The unit is used for assessing traffic, transportation and industrial noise for planning purposes.

$L_{A90,T}$: the A-weighted level of sound exceeded for 90% of the time period T. This latter unit is commonly used to represent the background noise, and is used in assessing the effects of industrial noise in UK.

L_{Amax} : the maximum A-weighted sound level over a period of measurement.

3 NOISE GUIDELINES

The requirements of BS8233 are summarised as follows:

<i>Criterion</i>	<i>Situation</i>	<i>L_{Aeq,T}</i>
Reasonable resting or sleeping conditions	Living Rooms	35dB Day (16hrs)
	Bedrooms	30dB Night (8hrs)

In addition to internal average noise level criteria, BS8233 recommends that a limit should be placed on maximum internal noise levels at night due to individual external events, such as passing vehicles, although a specific guideline is not proposed. However, WHO Noise Guidelines recommend that internal maximum noise levels due to individual events at night, should not regularly exceed 45dB(A) on no more than 10 occasions. It is also recommended that ambient noise in external amenity spaces should not exceed a free-field $L_{Aeq,16hr}$ 55dB.

4 NOISE MEASUREMENTS

Noise measurements were carried out at the adjoining building, 6 Station Road, from 12th to 13th August 2024 at the first-floor front façade. It is considered that the road traffic noise source would be the same for both buildings thus the data for number 6 can be adapted to apply to number 4. This would take account of the angle of view of the traffic source and distance of the facades from the roadside.

The weather conditions during the measurements at number 6 were warm and dry with negligible wind and were within the parameters recommended in BS7445-1:1991 'Description and measurement of environmental noise'.

The noise measurements were carried out using the following equipment:

SVAN 955 Sound Level Meter	S/N 27330
SV12L pre-amp	S/N 25706
ACO 7052E Microphone	S/N 49605
NOR 1251Calibrator	S/N 29151

The above equipment fulfils IEC 61672-3:2013 - Class 1 and is traceable to calibration under BS7580: Part 1:1997. The meter was calibrated before and after the measurement and no significant drifting of the calibration signal was observed.

The same equipment was used to carry out short term noise measurements at the rear of 4 Station Road on 27th August 2024 to assess the potential impact of railway noise.

Figure 1: Noise measurement position

The following parameters were measured at 15-minute intervals at both locations.

- L_{Aeq} The equivalent continuous noise level
 - L_{Amax} The maximum noise level during each period
 - L_{A90} The level exceeded for 90% of the time, the background level
- Octave band frequency levels were measured for the façade sound insulation calculations.

Based on daytime observation, the dominant noise source at the front of number 6 was from road traffic on Station Road while at the rear of number 4, distant road traffic dominated as railway noise was barely perceptible. This was mainly due to the slow movement of trains entering and leaving the station and the fact that the wheel-rail noise was screened by the platform edge.

The results are summarised below in Table 1 and the original data shown in Appendix 1.

Table 1: Summary of results of noise measurements

Date & time	L _{Aeq,T} [dB]	L _{Amax} [dB]*
Front of No. 6		
12/08/24 11:24-23:00	61.5	-
12/08/24 23:00-07:00	53.4	77
13/08/24 07:00-11:24	61.5	-
Rear of No. 4		
27/08/24 09:55-12:40	56.2	70

* Level exceeded on no more than 3 occasions

The noise measurement position at number 6 had a 103° angle of view of Station Road whereas number 4 has a 180° angle of view. According to the DoT document 'Calculation of road traffic noise', a correction of +2.5dB should be applied to the measured L_{Aeq,T} values. The measurement position was located at 10m from the kerbside whereas number 4 is located at 3m from the kerbside. By the same methodology, a correction of +5.2dB should be added to the measured noise levels.

The octave band frequency levels used for the calculations of façade sound insulation are shown in Table 2.

Table 2: Octave Band Frequency Levels

Façade	Octave Band Frequency Levels [dB]				
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz
Front	65.7	61.0	57.3	58.0	53.2
Rear	61.7	57.0	53.3	54.0	53.9

The measured noise levels at the front were effectively façade measurements which included the façade correction factor of 3dB. The calculation methodology uses free-field data and includes the façade correction thus the following free-field levels, to the nearest 1dB, were used for the calculations.

L_{Aeq,16hr} 59dB L_{Aeq,8hr} 50dB L_{Amax} 74dB

The measured values were then corrected to give the corresponding values at the front of number 4 Station Road.

L_{Aeq,16hr} 66dB L_{Aeq,8hr} 58dB L_{Amax} 82dB

5 ASSESSMENT

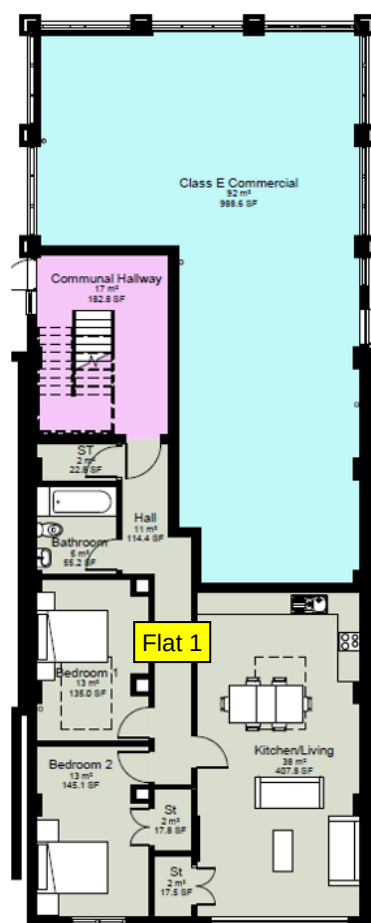
Façade Sound Insulation

The corrected façade noise levels have been used to determine internal noise levels by selecting appropriate glazing and ventilation mitigation measures, using the BS8233:2014 Annex G2 methodology. The spectrum of external noise was taken over a 3-hour daytime period at as shown in Table 2.

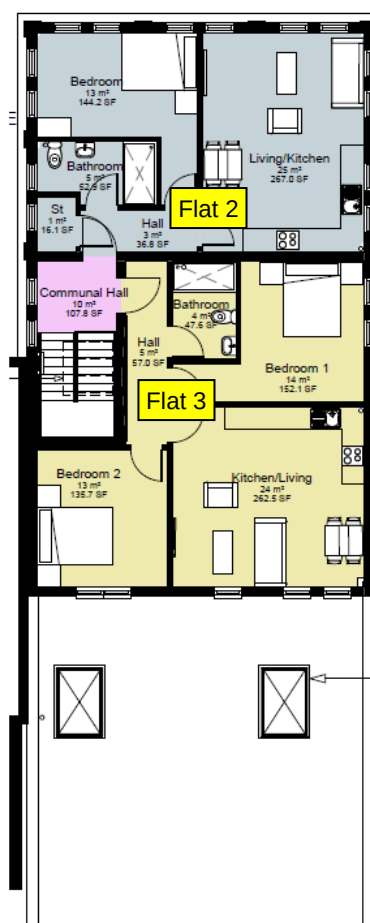
The G2 sound insulation calculation method takes account of the room dimensions, acoustic absorption, the façade area and the window area meaning that a particular form of glazing will result in varying internal noise levels depending on the room characteristics. A room façade with a high percentage area of glazing will have a lower sound insulation than a room façade with a lower percentage area of the same glazing. The room façade and glazing dimensions have been taken from the floor layouts of the flats shown in Figure 2.

Figure 2: Proposed Floor Plans

Ground Floor



First Floor



Façade attenuation calculations were carried out for bedroom and the living room of Flat 2 facing Station Road on the first floor and for Flat 3 facing the rear of the building. The calculations are shown in Appendix 2. Each table shows the glazing and ventilator assumptions for each room and the resulting internal noise level is shown at the foot of the table.

The sound insulation required for the façade of each room is shown in Table 3 for day and night time periods. The sound insulation likely to be achieved by the proposed measures in the calculations in Appendix 2 are also shown.

Table 3: Calculated façade sound insulation for each Flat

Flat	Room	Façade Level [dB]		Attenuation needed to meet guidelines [dB]			Attenuation Achieved (dB)
		LAeq	LAm _{ax}	Day(35)	Night(30)	LAm _{ax} (45)	
2	Living Room	66	-	31	-	-	33
2	Bedroom	58	82	-	28	37	40
1/3	Living Room	56	-	21	-	-	29
1/3	Bedroom 2	56	70	-	26	25	29
3	Bedroom 1	56	72		26	27	29

The noise measurement at the rear of Flat 1 was a 3-hour daytime sample and it is considered that this is a worst-case representation of the 16-hour average as the inclusion of evening data would tend to lower the overall average. It also represents worst case values for the night time 8-hour average and L_{Amax} as these values also tend to be lower at night. The calculations showed that the required guidelines were met with standard glazing and ventilation measures at Flat 1, thus the requirements would also be met at the rear façade of Flat 3 for the living room and bedroom 2, as it is exposed to the same noise environment.

The side façade of Flat 3 bedroom 1 is partially exposed to traffic noise on Station Road. However, the windows are set back 7.5m from the front façade and there is only a 60° angle of view of the road. This amounts to a -10.2dB correction to the noise level at the front façade giving side façade noise levels of L_{Aeq,16hr} 56dB and L_{Amax} 72dB.

The data shows that, for all flats, the windows would need to remain closed to achieve the required internal noise levels. A window slightly opened for ventilation purposes gives an attenuation of only 13dB which would not be sufficient to adequately meet the guidelines. Therefore, provision for background ventilation, through the Part F systems, needs to be made in order to be able to maintain closed windows. This does not mean that residents need to keep windows closed, it means that there is a choice between meeting a high standard of sound insulation and accepting that these standards are not achieved when windows are open.

Based on the calculations, the bedroom of Flat 2 would require a high standard of acoustic glazing due to the proximity of road traffic. Secondary glazing is recommended with an insulation specification of R_w+C_{tr} 43dB, such as (6-100-4). An acoustic ventilator would be needed meeting a minimum specification of $D_{ne,w}$ 50dB, such Greenwood through wall ventilator MA3051.

For the living room, the same glazing is recommended but with an acoustic ventilator meeting a minimum specification of $D_{ne,w}$ 39dB, such Greenwood through-wall ventilator GAV AVW39.

Alternatively mechanical ventilation with heat recovery, MVHR, could be provided for this flat, avoiding the need for acoustic ventilators.

The living rooms and bedrooms of flats 1 and 3 at the rear and side facades would require standard glazing with an insulation of R_w+C_{tr} 28dB, such as (6-16-4) together with standard trickle vents.

The mitigation measures are therefore summarised as follows:

Flats 1/3 living rooms/bedrooms:	Glazing R_w+C_{tr} 28dB (eg 6-16-4) Standard trickle vents
Flat 2 bedroom :	Glazing R_w+C_{tr} 43dB (eg 6-100-4 Secondary) Ventilator $D_{ne,w}$ 50dB (eg GAV MA3051)
Flat 2 living room	Glazing R_w+C_{tr} 43dB (eg 6-100-4 Secondary) Ventilator $D_{ne,w}$ 39dB (eg GAV AVW39)

The proposed ventilators would meet Part F System 1 where background ventilation is achieved through intermittent mechanical extractors in kitchens and bathrooms or through a Continuous Mechanical Extract system. The M&E engineer should ensure that the selected extract system provides adequate air flow to meet the Part F requirements. Alternatively, MVHR, could be provided.

6 SUMMARY

Data from a noise survey carried out at the adjacent building, 6 Station Road, in August 2024, has been used to assess noise levels at the front façade of 4 Station Road as the road traffic noise source is the same for both buildings. Noise levels at the rear of the building have also been measured.

The survey results and sound insulation calculations showed that the guidance on internal noise levels, as recommended by ProPG 'Planning and Noise' 2017 using BS8233:2014 and WHO guidelines, can be achieved through acoustic glazing and ventilators on the front façade and standard glazing and ventilators on the rear façade.

APPENDIX 1 - Results of Noise Measurements

Rear Façade

Date & time	L _{Amax} [dB]	L _{Aeq,T} [dB]	L _{A90} [dB]
27/08/2024 09:55	69.1	55.4	44.8
27/08/2024 10:10	63.0	61.1	45.6
27/08/2024 10:25	69.1	52.7	45.6
27/08/2024 10:40	63.2	54.2	46.9
27/08/2024 10:55	71.5	53.8	46.0
27/08/2024 11:10	66.1	53.1	46.4
27/08/2024 11:25	68.2	55.0	48.5
27/08/2024 11:40	74.3	55.5	46.7
27/08/2024 11:55	67.8	59.6	47.2
27/08/2024 12:10	69.4	54.3	47.3
27/08/2024 12:25	66.4	54.3	47.5
27/08/2024 12:40	68.5	55.8	48.4

Front Façade (6 Station Road)

Date & time	L _{Amax} [dB]	L _{Aeq,T} [dB]	L _{A90} [dB]
13/08/2024 11:03	82.5	60.9	54.1
13/08/2024 11:18	73.8	58.9	53.8
13/08/2024 11:33	76.7	60.7	54.2
13/08/2024 11:48	85.2	63.8	55.1
13/08/2024 12:03	88.5	61.4	56.0
13/08/2024 12:18	73.2	60.4	55.3
13/08/2024 12:33	70.7	60.2	55.5
13/08/2024 12:48	72.1	60.1	55.8
13/08/2024 13:03	73.6	59.9	54.9
13/08/2024 13:18	70.2	61.7	59.0
13/08/2024 13:33	71.2	60.3	55.5
13/08/2024 13:48	76.5	60.0	55.1
13/08/2024 14:03	80.3	60.5	55.7
13/08/2024 14:18	77.1	60.2	55.3
13/08/2024 14:33	79.0	61.3	55.1
13/08/2024 14:48	69.3	60.1	55.8
13/08/2024 15:03	71.7	60.8	56.8
13/08/2024 15:18	94.0	63.7	56.1
13/08/2024 15:33	78.6	61.4	55.0

Date & time	L _{Amax} [dB]	L _{Aeq,T} [dB]	L _{A90} [dB]
13/08/2024 15:48	89.8	65.2	55.6
13/08/2024 16:03	80.8	60.8	55.5
13/08/2024 16:18	71.6	60.1	56.1
13/08/2024 16:33	77.2	61.6	56.2
13/08/2024 16:48	79.9	61.5	57.0
13/08/2024 17:03	80.2	61.2	56.4
13/08/2024 17:18	77.3	63.2	57.1
13/08/2024 17:33	82.6	62.8	56.2
13/08/2024 17:48	77.3	60.8	55.9
13/08/2024 18:03	76.6	60.9	56.6
13/08/2024 18:18	79.0	61.1	56.9
13/08/2024 18:33	76.4	61.8	56.9
13/08/2024 18:48	74.2	61.0	56.6
13/08/2024 19:03	78.1	61.2	56.4
13/08/2024 19:18	92.8	64.6	56.6
13/08/2024 19:33	77.8	60.1	55.3
13/08/2024 19:48	81.0	61.8	56.6
13/08/2024 20:03	81.2	62.7	56.6
13/08/2024 20:18	80.7	61.0	55.7
13/08/2024 20:33	88.4	62.3	54.4
13/08/2024 20:48	73.7	60.5	55.1
13/08/2024 21:03	86.1	62.0	55.4
13/08/2024 21:18	77.5	60.4	55.2
13/08/2024 21:33	70.8	60.1	54.9
13/08/2024 21:48	92.7	62.1	53.8
13/08/2024 22:03	88.8	65.8	53.2
13/08/2024 22:18	74.3	57.6	51.6
13/08/2024 22:33	85.3	60.1	52.5
13/08/2024 22:48	78.5	59.5	49.2
13/08/2024 23:03	74.0	57.0	48.9
13/08/2024 23:18	69.1	56.0	48.3
13/08/2024 23:33	74.0	58.5	48.8
13/08/2024 23:48	70.2	55.9	46.6
14/08/2024 00:03	74.7	54.1	45.9
14/08/2024 00:18	85.4	59.3	46.8
14/08/2024 00:33	73.2	54.0	46.8
14/08/2024 00:48	77.1	55.8	45.4
14/08/2024 01:03	65.1	49.5	44.3
14/08/2024 01:18	63.1	50.5	44.3

Date & time	L _{Amax} [dB]	L _{Aeq,T} [dB]	L _{A90} [dB]
14/08/2024 01:33	66.1	52.6	44.4
14/08/2024 01:48	62.5	49.5	44.1
14/08/2024 02:03	63.8	50.2	44.3
14/08/2024 02:18	68.4	50.1	44.0
14/08/2024 02:33	63.4	46.5	43.8
14/08/2024 02:48	62.2	47.6	43.9
14/08/2024 03:03	66.1	49.1	44.0
14/08/2024 03:18	65.3	47.3	44.3
14/08/2024 03:33	68.1	50.9	43.9
14/08/2024 03:48	67.5	47.5	44.1
14/08/2024 04:03	59.8	46.5	44.1
14/08/2024 04:18	59.1	46.7	44.3
14/08/2024 04:33	73.7	56.6	45.0
14/08/2024 04:48	56.0	47.0	45.0
14/08/2024 05:03	67.5	52.0	45.3
14/08/2024 05:18	68.6	52.2	45.6
14/08/2024 05:33	67.0	52.7	46.6

Date & time	L _{Amax} [dB]	L _{Aeq,T} [dB]	L _{A90} [dB]
14/08/2024 05:48	72.9	55.5	50.8
14/08/2024 06:03	72.0	56.7	51.7
14/08/2024 06:18	74.2	58.1	49.5
14/08/2024 06:33	70.3	57.1	50.2
14/08/2024 06:48	70.7	58.9	51.7
14/08/2024 07:03	71.1	60.0	53.4
14/08/2024 07:18	74.2	61.1	55.4
14/08/2024 07:33	73.7	61.2	54.9
14/08/2024 07:48	85.3	62.0	55.1
14/08/2024 08:03	74.3	61.0	54.9
14/08/2024 08:18	80.3	61.0	54.4
14/08/2024 08:33	75.6	60.7	54.1
14/08/2024 08:48	80.3	61.6	54.5
14/08/2024 09:03	73.4	60.6	54.7
14/08/2024 09:18	70.2	59.8	54.8
14/08/2024 09:33	89.7	61.8	55.1
14/08/2024 09:48	79.0	61.0	54.9

APPENDIX 2 – Calculation of internal noise levels

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Living Room Flat 2							
Wall area		10.4					
Window Area		9.0					
Roof		25.0					
Room Vol.		70					
Frequency (Hz)		125	250	500	1000	2000	L _{Aeq}
Measured Façade ff Leq		65.7	61.0	57.3	58.0	53.2	61.5
Ventilator Dne	GAV AWW39	38	37	38	39	47	
Window R	6-100-4	32	41	44	46	45	
Wall R	Masonry Cavity	40	44	45	51	56	
Ceiling/Roof R		33	39	45	50	54	
Absorption		11	14	16	16	15	
Vent		0.000045	0.000056	0.000045	0.000036	0.000006	
		-43.5	-42.5	-43.5	-44.5	-52.5	
Windows		0.000160	0.000020	0.000010	0.000006	0.000008	
		-37.9	-46.9	-49.9	-51.9	-50.9	
Ext. Wall		0.000004	0.000002	0.000001	0.000000	0.000000	
		-54.0	-58.0	-59.0	-65.0	-70.0	
Ceiling/roof		0.000354	0.000089	0.000022	0.000007	0.000003	
		-34.5	-40.5	-46.5	-51.5	-55.5	
Composite R		-32.5	-37.8	-41.1	-43.1	-47.8	
Abs. Correction		5.1	4.0	3.4	3.4	3.7	
Leq (int)		41.3	30.3	22.7	21.4	12.1	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
L _{Aeq} (internal)		25.2	21.7	19.5	21.4	13.3	28.6
Façade Atten.		32.9 dB					
	Ext. L _{Aeq} ,16hr	66	Internal	33	Guideline	35	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Bedroom Flat 2							
Wall area		11.8					
Window Area		5.1					
Roof		13.0					
Room Vol.		36					
Frequency (Hz)		125	250	500	1000	2000	L _{Aeq}
Measured Façade ff Leq		65.7	61.0	57.3	58.0	53.2	61.5
Ventilator Dne	MA3051	48	47	50	55	65	
Window R	6-100-4	32	41	44	46	45	
Wall R	Masonry Cavity	40	44	45	51	56	
Ceiling/Roof R	n/a	33	39	45	50	54	
Absorption		11	14	16	16	15	
Vent		0.000006	0.000008	0.000004	0.000001	0.000000	
		-51.9	-50.9	-53.9	-58.9	-68.9	
Windows		0.000130	0.000016	0.000008	0.000005	0.000007	
		-38.9	-47.9	-50.9	-52.9	-51.9	
Ext. Wall		0.000027	0.000011	0.000009	0.000002	0.000001	
		-45.7	-49.7	-50.7	-56.7	-61.7	
Ceiling/roof		0.000263	0.000066	0.000017	0.000005	0.000002	
		-35.8	-41.8	-47.8	-52.8	-56.8	
Composite R		-33.7	-40.0	-44.3	-48.6	-50.3	
Abs. Correction		3.5	2.5	1.9	1.9	2.2	
Leq (int)		35.5	23.5	14.9	11.3	5.1	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
L _{Aeq} (internal)		19.4	14.9	11.7	11.3	6.3	21.8
Façade Atten.		39.7	dB				
	Ext. L _{Aeq} ,8hr	58	Internal	18	Guideline	30	
	Ext. L _{Amax}	82	Internal	42	Guideline	45	

BS8233:2014 Annexe G2 - Rigorous Calculation of Façade Sound Insulation							
Living Room/Bedroom Flat 1/3							
Wall area		8.7					
Window Area		2.1					
Roof		13.0					
Room Vol.		36					
Frequency (Hz)		125	250	500	1000	2000	L _{Aeq}
Measured Façade ff Leq		61.7	57.0	53.3	54.0	49.2	57.5
Ventilator Dne	Trickle vent	25	25	26	32	35	
Window R	6/16/4	21	20	26	38	37	
Wall R	Masonry Cavity	40	44	45	51	56	
Ceiling/Roof R		33	39	45	50	54	
Absorption		11	14	16	16	15	
Vent		0.001457	0.001457	0.001158	0.000291	0.000146	
		-28.4	-28.4	-29.4	-35.4	-38.4	
Windows		0.000769	0.000968	0.000243	0.000015	0.000019	
		-31.1	-30.1	-36.1	-48.1	-47.1	
Ext. Wall		0.000030	0.000012	0.000010	0.000002	0.000001	
		-45.2	-49.2	-50.2	-56.2	-61.2	
Ceiling/roof		0.000300	0.000075	0.000019	0.000006	0.000002	
		-35.2	-41.2	-47.2	-52.2	-56.2	
Composite R		-25.9	-26.0	-28.4	-35.0	-37.7	
Abs. Correction		3.0	1.9	1.3	1.3	1.6	
Leq (int)		38.7	32.9	26.2	20.3	13.1	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
L _{Aeq} (internal)		22.6	24.3	23.0	20.3	14.3	28.9
Façade Atten.		28.6 dB					
	Ext. L _{Aeq} ,3hr	56	Internal	27	Guideline	35	
	Ext. L _{Amax}	70	Internal	41	Guideline	45	