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Noise Assessment Report

80 Old Shoreham Road, Shoreham-on-Sea

Mitigation Scheme for Residential Conversion

Reference: JB-011242-ENV-REP-JRH-280918-R0

28 September 2018



REVISION	DESCRIPTION	DATE	ISSUED BY	REVIEWED BY
R0	Initial Report	23/09/18	JRH	PW
R1	Final Report	28/09/18	JRH	PW

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1. INTRODUCTION

ATSPACE Ltd have been instructed by Showtec, to undertake an environmental noise assessment at the proposed residential conversion at 80 Old Shoreham Road, Shoreham-on-Sea in order to fulfil the requirements of Planning Conditions 10 and 11:

10. A scheme for protecting the proposed dwellings from traffic noise shall be submitted to and approved in writing by the by the Local Planning Authority. The scheme shall demonstrate good acoustic design and shall comply with the internal noise level guidelines set out in BS8233:2014 and shall have regard to the principles contained within the World Health Organisation community noise guidelines. Following approval and completion of the scheme, a test shall be undertaken to demonstrate that the attenuation measures proposed in the scheme are effective and protect the residential units from noise.

11. The use hereby permitted shall not commence unless and until an insulation scheme for protecting the upper floor residential units from noise from the ground floor commercial use has been submitted to and approved by the local planning authority. The scheme shall achieve a minimum airborne sound insulation value of 50dB (DnTw + Ctr dB) for all floors. Following approval and completion of the scheme, a test shall be undertaken to demonstrate that the attenuation measures proposed in the scheme are effective and protect the residential units from noise.

Noise measurements have been undertaken at the site and the results have been used to assess the mitigation needed to meet the criteria of BS8233:2014, as required by Condition 10. A sound insulation scheme has also been recommended, as required by Condition 11

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2. SITE DESCRIPTION

2.1 Site Location

The site is located on Old Shoreham Road, as shown in Figure 1.

Figure 1: Site location and noise measurement position



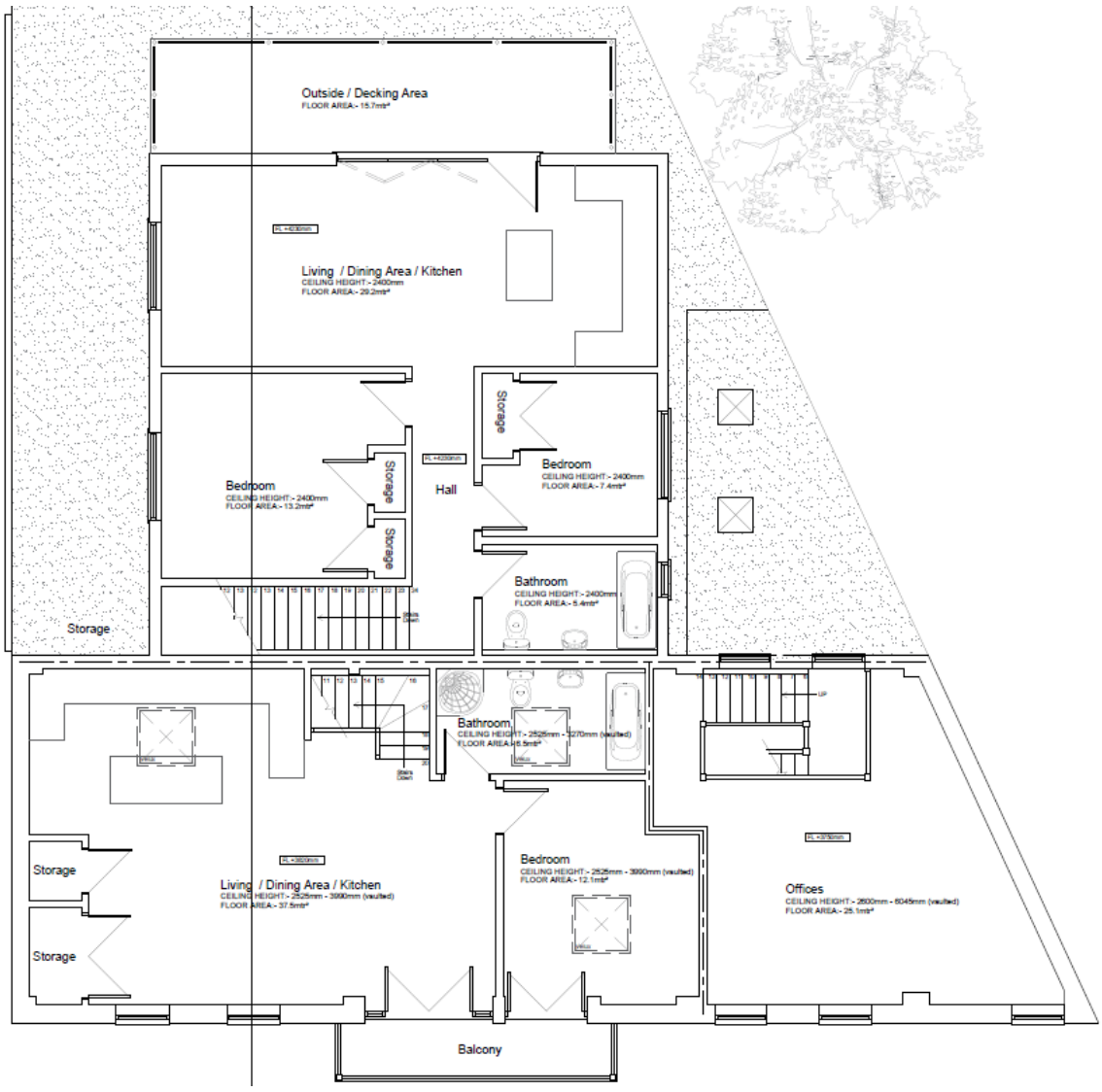
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3. DEVELOPMENT PROPOSALS

As stated in the introduction, the development proposal for the site is to rebuild the property as single storey and to add additional accommodation as shown in Figure 2. (Drawing No. 2017/0025-03 Rev D)

Environmental noise will be taken into account in the final design to achieve acceptable internal noise levels.

Figure 2: Proposed Development – First Floor



4. BASIS OF ASSESSMENT

A summary of the planning guidance relevant to the required assessment are summarised below:

4.1 BS 8233: 2014: Guidance on sound insulation and noise reduction for buildings

This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

The guidance provided includes appropriate internal and external noise level criteria, which are applicable to dwellings exposed to steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in the Table below:

Activity	Location	Period	
		0700 – 2300 hrs i.e. Daytime	2300 – 0700 hrs i.e. Night-time
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Whilst BS 8233 recognises that a guideline value may also be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that *can* cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment, to the World Health Organisation (WHO) 1999: Guidelines for Community Noise document.

With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

4.2 World Health Organisation (*WHO*) 1999: Guidelines for Community Noise

If a noise is not continuous, L_{Amax} (*or SEL*) is used to indicate the probability of noise induced awakenings. Effects have been observed at individual L_{Amax} exposures of 45 dB or

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less. Consequently, it is important to limit the number of noise events with a L_{Amax} exceeding 45 dB. Therefore, the guidelines should be based on a combination of values of 30 dB $L_{Aeq,8h}$ and 45 dB L_{Amax}. To protect sensitive persons, a still lower guideline value would be preferred when the background level is low. Sleep disturbance from intermittent noise events increases with the maximum noise level.

Therefore, to avoid sleep disturbance, guidelines for community noise should be expressed in terms of equivalent sound pressure levels, as well as L_{Amax}/*SEL* and the number of noise events. Measures reducing disturbance during the first part of the night are believed to be the most effective for reducing problems in falling asleep.

5. MEASUREMENTS

Environmental noise monitoring was carried out at the first floor façade overlooking Old Shoreham Road, as indicated in Figure 1.

Levels were recorded in 15 minute samples from 18-19 September 2018, to determine the equivalent continuous sound level, L_{Aeq}, the L_{Amax} values and the percentile L_{A90} (background noise level). Weather conditions over the survey period were in accordance with BS7445 (Measurement and Description of Environmental Noise). Winds were moderate west to north westerly with no precipitation over the course of the survey and with a temperature of 15-19^{o}C

All measurements were made with calibrated, precision grade sound level meters in accordance with BS EN 60651 and BS 7445:2003. Details of the equipment used are provided in Appendix 2 – List of Measurement Equipment. All equipment was calibration-checked before and after the survey; no significant drift was observed.

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6. RESULTS

The results are shown in detail in Appendix 3 and are summarised in Table 1.

Table 1: Summary of façade noise levels

Date	Time	LAeq,T [dB]	Night LAmax [dB]
20/12/2017	13:59 - 23:00	68.6	
20/12/2017	23:00 - 07:00	61.6	82*
21/12/2017	07:00 - 23:00	70.3	

*Level not exceeded on more than 5 occasions, according to WHO Noise Guidelines

The measured daytime $L_{Aeq,16hr}$ was taken as 69dB and the night time $L_{Aeq,8hr}$ was 62dB. The night time L_{Amax} was taken as 82dB, all to the nearest decibel.

7. DISCUSSION

7.1 Existing Noise Climate

The principle source of noise was from traffic on Old Shoreham Road at the front of the building. During a period of observation at the start of the monitoring, the traffic was a continuous flow of cars, vans and a significant number of HGV's.

7.2 BS8233: 2014 Assessment

From the noise measurement data, façade sound insulation requirements were determined, in order to achieve the internal noise criteria given in Table 4, Section 7 of BS8233:2014.

The proposed internal layout of the living room and front bedroom has been used to determine façade sound insulation values according to the methodology of BS8233:2014 Annexe G2. It was clear from the outset that the required sound insulation required to meet the BS8233 criteria, could only be achieved with windows closed. Thus measures for background ventilation needed to be included in the façade insulation calculations.

Due to the high external noise events both during the day and at night, the sound insulation of the proposed roof needed to be taken into account. The roof as proposed would give a sound attenuation of approximately 35dB thus additional mitigation would be needed. This could be achieved by the addition of 50mm acoustic insulation between the roof rafters and the addition of two layers of ceiling board of 15mm Soundbloc to the underside of the rafters.

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The source spectrum has been taken from the average daytime values for the 19th September and appropriate combinations of window and ventilator type were used to calculate the relevant façade attenuation. The calculations are shown in Appendix 4. For the living room, this resulted in an overall façade attenuation of 36dB which would in turn result in worst case internal noise level of $L_{Aeq,16hr}$ 34dB and meet the BS8233 requirement of 35dB.

For the front bedroom the proposed mitigation resulted in a façade attenuation of 39dB which would in turn give an internal $L_{Aeq,8hr}$ 23dB, adequately meeting the BS8233 requirement and would give internal maximum noise levels of 43dB and therefore meet the WHO guideline requirement of less than 45dB.

The façade sound insulation for the front bedroom and living room on the southern façade would be achieved with the following measures:

- Glazing to windows and balcony doors to give a sound reduction R_w+C_{tr} 34dB, formed from 6-16-8.8 double glazed units (6mm glass, 16mm argon filled gap, 8.8mm Optiphon laminated glass). The same speciification should apply to the front bedroom skylight. The skylights to the living room are partially screened from traffic noise being located on the rear pitch of the roof and should provide a minimum attenuation of R_w+C_{tr} 28dB.
- through wall ventilators to be installed which give a minimum sound attenuation of $D_{n,e,w}$ 39dB, such as the AWV39 acoustic through wall vent from Greenwood Airvac. Similar ventilators meeting the above specifications from other manufacturers would be suitable.
- Roof construction to include acoustic insulation between rafters and a ceiling of 2 layers of 15mm Soundbloc (or similar 13kg/m^2 board).

Standard double-glazed units (4-16-4) to windows of the bedrooms and living room to the rear of the conversion would provide sufficient noise attenuation to meet the BS8233 requirements, as the facades are screened from traffic noise by the adjacent buildings.

7.3 Outdoor Amenity Space

WHO & BS8233:2014 guidelines suggest that $L_{Aeq,16hr}$ 55dB should not be exceeded in amenity areas such as gardens. An external decking area is provided at the rear of the living room where the guideline noise level should be adequately met due to effective screening by the new building.

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8. SOUND INSULATION OF FLOORS

Planning Condition 11 required the floor between the conversion and commercial premises to meet a sound reduction of $D_{nTw}+C_{tr}$ 50dB. This means that the floor construction should meet at least R_w 57dB. The existing floor construction in the proposed living room area is chipboard on battens on 200mm concrete slab which would provide R_w of approximately 55dB. Thus additional insulation would be needed. It is recommended that 19mm Gyproc Plank is laid on the existing floor followed by a composite floor decking such as CMS Danskin SoundDeck or JCW Acoustic Deck 32. Both systems would require an isolating flanking strip to be applied between the boards and the perimeter walls.

The existing roof to the rear of the building is formed from 115mm Stramit Boarding. This is to be retained and the floor of the extension is to be built above this boarding. According to Stramit International data, the boarding would give a sound reduction of R_w 45dB. The steel framework for the extension floor would be between 10mm and 90mm above the existing boarding (due to the rake of the roof), and floor joists located between the steel beams. 100mm dense mineral insulation to be installed between joists and a finished floor surface of 22mm chipboard. As the new floor is acoustically independent of the existing roof boards, the overall sound insulation should meet the required R_w 57dB.

9. CONCLUSIONS

Survey work carried out at this site indicates that the overall noise climate at the front of the building is dominated by noise from traffic on Old Shoreham Road.

Based upon the results of long-term monitoring at the site, appropriate glazing, acoustic ventilators and sound insulation measures have been recommended for the proposed development in order to meet the internal noise standards of BS8233:2014 and WHO Guidelines as required by Planning Condition 10.

Measures to improve the sound insulation of the existing floor at the front of the building have been recommended and for the new floor at the rear of the building, so as to meet the requirements of Planning Condition 11.

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APPENDIX 1 – GLOSSARY OF TERMS

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm's are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

$L_{Aeq,T}$

The A-Weighted equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

$L_{A90,T}$

The A-Weighted noise level exceeded for 90% of the specified measurement period (T). This is generally taken to indicate the prevailing background noise level.

L_{Amax}

The highest A-Weighted noise level recorded during a noise event.

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APPENDIX 2 – LIST OF MEASUREMENT EQUIPMENT

Measurements

SVAN 977 Sound Level Meter	S/N 36438

Additional Equipment

Rion NC-74 Calibrator	S/N 34167512

The above equipment fulfils IEC 61672 Class 1 and is traceable to calibration under BS7580: Part 1:1997.

The equipment was calibration-checked before and after measurement – no adverse deviation was observed.

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APPENDIX 3 – RESULTS OF NOISE MEASUREMENTS

Date & time	LAFMax	LAeq	LA90
	[dB]	[dB]	[dB]
18/09/2018 13:59	76.8	68.0	58.9
18/09/2018 14:15	78.9	68.3	60.6
18/09/2018 14:30	81.2	68.8	59.7
18/09/2018 14:45	80.0	68.7	58.0
18/09/2018 15:00	79.3	69.2	59.0
18/09/2018 15:15	83.2	69.6	57.7
18/09/2018 15:30	81.1	69.5	58.4
18/09/2018 15:45	82.5	70.0	59.1
18/09/2018 16:00	89.2	69.5	59.6
18/09/2018 16:15	83.3	69.6	60.0
18/09/2018 16:30	82.7	71.2	61.8
18/09/2018 16:45	78.8	70.0	61.5
18/09/2018 17:00	79.8	69.9	61.9
18/09/2018 17:15	81.5	70.3	60.1
18/09/2018 17:30	81.2	70.3	62.2
18/09/2018 17:45	84.0	70.2	61.3
18/09/2018 18:00	82.4	70.0	59.3
18/09/2018 18:15	81.2	70.3	59.6
18/09/2018 18:30	79.7	67.6	58.8
18/09/2018 18:45	88.9	70.5	59.0
18/09/2018 19:00	87.5	69.6	57.4
18/09/2018 19:15	79.5	68.2	56.0
18/09/2018 19:30	81.4	68.1	54.5
18/09/2018 19:45	88.3	69.1	54.8
18/09/2018 20:00	80.4	66.9	51.6
18/09/2018 20:15	80.3	65.7	50.4
18/09/2018 20:30	81.6	66.8	49.2
18/09/2018 20:45	81.0	66.4	50.4
18/09/2018 21:00	85.8	66.4	48.2
18/09/2018 21:15	79.6	65.7	46.0
18/09/2018 21:30	83.5	64.6	47.6
18/09/2018 21:45	81.1	65.6	47.5
18/09/2018 22:00	81.8	66.1	45.7
18/09/2018 22:15	79.8	64.3	43.0
18/09/2018 22:30	86.0	66.2	43.4
18/09/2018 22:45	83.4	64.7	43.9
18/09/2018 23:00	80.6	62.7	41.5
18/09/2018 23:15	79.2	61.7	40.3
18/09/2018 23:30	77.4	60.8	39.4
18/09/2018 23:45	82.7	61.7	38.6
19/09/2018 00:00	79.6	60.5	37.4
19/09/2018 00:15	75.5	56.3	37.5
19/09/2018 00:30	79.3	59.2	36.6
19/09/2018 00:45	81.2	56.1	37.2

Date & time	LAFMax	LAeq	LA90
	[dB]	[dB]	[dB]
19/09/2018 01:00	77.2	58.0	37.3
19/09/2018 01:15	81.5	61.1	36.4
19/09/2018 01:30	74.3	55.5	36.5
19/09/2018 01:45	80.0	54.9	37.1
19/09/2018 02:00	72.7	51.1	37.1
19/09/2018 02:15	75.4	51.5	36.6
19/09/2018 02:30	78.3	51.8	36.2
19/09/2018 02:45	77.2	53.2	36.2
19/09/2018 03:00	77.0	54.0	36.4
19/09/2018 03:15	75.1	51.3	37.0
19/09/2018 03:30	76.1	56.9	38.1
19/09/2018 03:45	80.6	57.8	38.0
19/09/2018 04:00	83.2	61.1	38.3
19/09/2018 04:15	78.1	54.2	38.6
19/09/2018 04:30	80.7	61.5	39.9
19/09/2018 04:45	81.5	59.9	39.0
19/09/2018 05:00	79.1	60.6	40.0
19/09/2018 05:15	78.5	59.2	40.0
19/09/2018 05:30	81.7	63.7	42.1
19/09/2018 05:45	83.6	64.6	42.5
19/09/2018 06:00	81.7	65.3	44.8
19/09/2018 06:15	85.2	66.8	45.4
19/09/2018 06:30	82.0	66.2	47.0
19/09/2018 06:45	82.6	69.5	53.2
19/09/2018 07:00	83.8	69.3	54.9
19/09/2018 07:15	82.4	70.2	56.8
19/09/2018 07:30	86.4	70.7	60.2
19/09/2018 07:45	83.6	70.6	56.9
19/09/2018 08:00	82.1	70.8	60.1
19/09/2018 08:15	83.5	70.4	60.0
19/09/2018 08:30	81.4	70.8	61.4
19/09/2018 08:45	82.8	70.4	60.2
19/09/2018 09:00	82.8	70.5	60.6
19/09/2018 09:15	81.8	70.4	60.3
19/09/2018 09:30	82.0	70.1	60.4
19/09/2018 09:45	80.4	69.7	59.9
19/09/2018 09:53	80.9	70.1	59.2

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APPENDIX 4 – FAÇADE ATTENUATION CALCULATIONS TO BS8233:2014

ANNEXE G.2

BS8233:2014 Annexe G2							
Façade Sound Reduction - First floor Living Room							
Facade Area		22.0					
Window Area		5.2					
Ceiling/roof Area		55					
Room Vol.		126					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		67.6	64.6	64.0	68.0	62.7	**70.2**
Ventilator Dne	AWV39	38	37	38	39	47	
Window R	6/16/8.8	24	26	40	48	46	
Wall R	Masonry Cavity	40	44	45	51	56	
Ceiling/Roof R	Roof Upgrade	33	39	45	50	54	
Absorption		11	14	16	16	15	
Vent		0.000021	0.000026	0.000021	0.000016	0.000003	
		-46.9	-45.9	-46.9	-47.9	-55.9	
Windows		0.000269	0.000170	0.000007	0.000001	0.000002	
		-35.7	-37.7	-51.7	-59.7	-57.7	
Ext. Wall		0.000022	0.000009	0.000007	0.000002	0.000001	
		-46.6	-50.6	-51.6	-57.6	-62.6	
Ceiling/roof		0.000358	0.000090	0.000023	0.000007	0.000003	
		-34.5	-40.5	-46.5	-51.5	-55.5	
Composite R		-31.7	-35.3	-42.5	-45.8	-51.1	
Abs. Correction		8.5	7.4	6.8	6.8	7.1	
Leq (int)		44.3	36.7	28.4	29.0	18.7	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		28.2	28.1	25.2	29.0	19.9	**34.0**
Façade Atten.		**36.2**	**dB**				

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BS8233:2014 Annexe G2							
Façade Sound Reduction - First floor Front Bedroom							
Facade Area		6.3					
Window Area		2.6					
Ceiling/roof Area		11					
Room Vol.		24					
Frequency (Hz)		125	250	500	1000	2000	LAeq
Measured Façade Leq		67.6	64.6	64.0	68.0	62.7	**70.2**
Ventilator Dne	AWV39	38	37	38	39	47	
Window R	6/16/8.8	24	26	40	48	46	
Wall R	Masonry Cavity	40	44	45	51	56	
Ceiling/Roof R	Roof Upgrade	33	39	45	50	54	
Absorption		11	14	16	16	15	
Vent		0.000094	0.000119	0.000094	0.000075	0.000012	
		-40.3	-39.3	-40.3	-41.3	-49.3	
Windows		0.000616	0.000389	0.000015	0.000002	0.000004	
		-32.1	-34.1	-48.1	-56.1	-54.1	
Ext. Wall		0.000022	0.000009	0.000007	0.000002	0.000001	
		-46.6	-50.6	-51.6	-57.6	-62.6	
Ceiling/roof		0.000313	0.000079	0.000020	0.000006	0.000002	
		-35.0	-41.0	-47.0	-52.0	-56.0	
Composite R		-29.8	-32.3	-38.6	-40.7	-47.3	
Abs. Correction		1.8	0.8	0.2	0.2	0.5	
Leq (int)		39.6	33.1	25.6	27.5	16.0	
A-Weighting		-16.1	-8.6	-3.2	0	1.2	
LAeq (internal)		23.5	24.5	22.4	27.5	17.2	**31.1**
Façade Atten.		**39.1**	**dB**				

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