

Noise impact assessment of a proposed residential development

Zoar Chapel, 21 South Street, Reading



Client: Pednor Property Ltd

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0. SUMMARY

- 0.1. ACA Acoustics Limited has been commissioned to assess external noise intrusion to a proposed new residential development at Zoar Chapel, 21 South Street, Reading. The assessment is required by the Local Planning Authority (Reading Borough Council) to discharge Planning Condition 6 of the decision notice for planning application number 211063 for the development.
- 0.2. A sound level survey has been carried out between 7th – 11th March 2024. Whilst on site the author considered the sound climate during the daytime primarily consists of infrequent road traffic on nearby routes.
- 0.3. The survey was undertaken over a weekend period when it was confirmed that the South Street Arts Centre had events on, in accordance with the requirements of Condition 6.
- 0.4. Sound levels used in the assessment at the front façade overlooking South Street are LAeq 16-hour 60dB during the daytime and LAeq 8-hour 54dB overnight, with short-term individual noise events overnight not regularly exceeding LAfmax 73dB. At the rear façade overlooking the rear of the South Street Arts Centre, measured sound levels are LAeq 16-hour 54dB during the daytime and LAeq 8-hour 48dB overnight, with short-term individual noise events overnight not regularly exceeding LAfmax 65dB.
- 0.5. A scheme for sound insulation of the building envelope has been developed such that internal sound levels during the daytime do not exceed LAeq 35dB within living rooms and bedrooms. Sound levels at night shall not exceed LAeq 30dB and LAfmax 45dB to bedrooms. Details of the sound insulation scheme are provided within this report.
- 0.6. In conclusion, it is recommended that the sound insulation scheme set out in this report will ensure a good standard of amenity for future occupants of the dwellings.

1. INTRODUCTION

ACA Acoustics Limited have been commissioned by the client to carry out a survey and assessment of external sound levels to a proposed residential development at Zoar Chapel, 21 South Street, Reading, and, where necessary, to make recommendations for a suitable sound mitigation scheme.

The objective of the assessment is to determine whether existing external noise sources would result in internal sound levels that are within the criteria stipulated by the Local Authority and ensure compliance with the noise related planning conditions attached to this development scheme.

This report presents results of the sound level survey, assessments, and a scheme for sound mitigation measures.

2. ACOUSTIC CRITERIA

Reading Borough Council have issued a Decision Notice for planning application reference S/22/1418/MILE. Condition 5 of the decision notice relates to noise and states:

"6. [Pre-commencement] No development shall take place until a detailed scheme, informed by an assessment of the current noise environment, for protecting the dwellings from the external noise environment of the area has been submitted to and approved, in writing, by the Local Planning Authority. The scheme itself shall be designed, specified and constructed so that the sound insulation performance of the structure and the layout of the dwellings are such that the indoor ambient noise levels do not exceed the values detailed in Table 4 of BS 8233:2014. The assessment shall include specific considerations and mitigation of the noise impact of the adjacent South Street Arts Centre and shall include noise measurements when there are live events taking place at the Arts Centre. Where opening windows will lead to an internal noise level increase of 5dBA or greater above BS 8233:2014 recommended internal levels, the scheme shall include provision of alternative mechanical ventilation with minimum performance equivalent to a mechanical heat recovery (MVHR) system with cool air bypass as an alternative means of cooling and ventilation. Noise from the system should not result in BS8233 internal levels being exceeded. Thereafter, the development shall not be carried out other than in accordance with the approved scheme which shall be completed before any part of the accommodation hereby approved is occupied, unless the Local Planning Authority otherwise agrees in writing and shall be retained in accordance with the approved details thereafter.

REASON: to protect the amenity of future occupants of the proposed development in accordance with Policies CC8 and EN16."

The introduction to BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* confirms that,

“This guide suggests criteria, such as suitable sleeping/resting conditions, and proposes noise levels that normally satisfy these criteria.”

Guidance limits for internal sound levels within living rooms and bedrooms, taken from Table 4 of BS 8233:2014, are shown in Table 1 below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35dB LAeq, 16hr	-
Dining	Dining Room/Area	40dB LAeq, 16hr	-
Sleeping (daytime resting)	Bedroom	35dB LAeq, 16hr	30dB LAeq, 8hr

Table 1: BS 8233:2014 indoor ambient sound levels for dwellings

Achieving the guideline values within BS 8233:2014 will ensure the amenity of occupants of the proposed development will be preserved.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The site is on South Street, Reading. This is an area comprising of a mixture of offices and residential properties. To the west of the development site is the South Street Arts Centre. This centre hosts both amplified and un-amplified events periodically. While on site the author considered sound levels in the vicinity are comprised primarily of traffic activity on nearby routes.

The proposal is for the erection of 8 apartments.

A site location plan showing the proposed development location and the sound monitoring position is shown in Figure 1 below.



Figure 1: Site Location Plan

4. SOUND LEVEL SURVEY

To assess the impact of existing sound sources, a sound level survey has been conducted at the development site to determine sound levels incident on the proposed residential unit.

The sound level survey was carried out by Alfie Morgan of ACA Acoustics over a weekend period between 7th and 11th February 2024. The measurement positions are marked in Figure 1 and described below.

The weekend measurement period was chosen as the South Street Arts Centre is understood to have had events on over the weekend period.

Position Reference	Description
MP1	In a free-field position near the front of the site.
MP2	In a free-field position to the side of the site overlooking the South Street Arts Centre

Table 2: Sound level survey measurement position

The following equipment was used during the survey; the sound level meter was calibrated before the survey and checked after with no deviation noted.

Equipment	Serial Number
Svantek Class 1 sound level meter type SV 307	84914
Svantek Class 1 sound level meter type SVAN971, complete with MOLES weatherproof and lockable outdoor environmental kit	84045
Svantek calibrator type SV33B.	10436

Table 3: Equipment used during the sound level survey

Weather conditions when setting up and collecting the sound level survey were cool, clear and dry. Over the weekend period sound levels were monitored online and were considered acceptable for the duration of the survey and will not have adversely impacted the survey results.

Results of the survey in terms of raw data are shown in Figure 2 below.

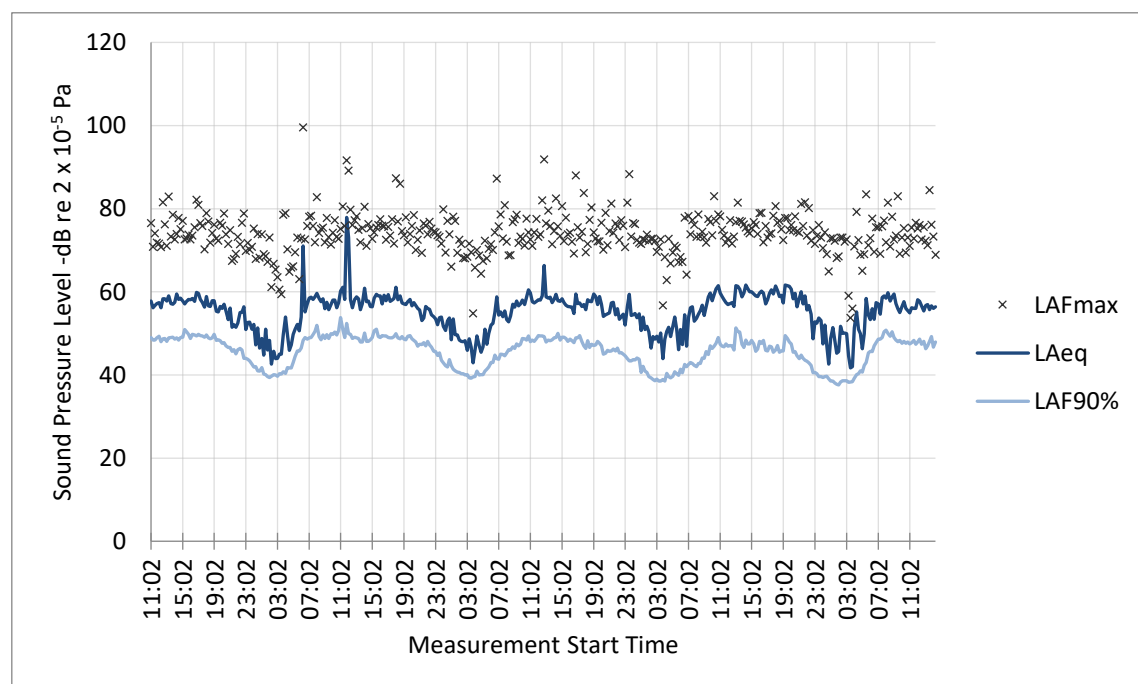


Figure 2: sound level survey results to the front of the site.

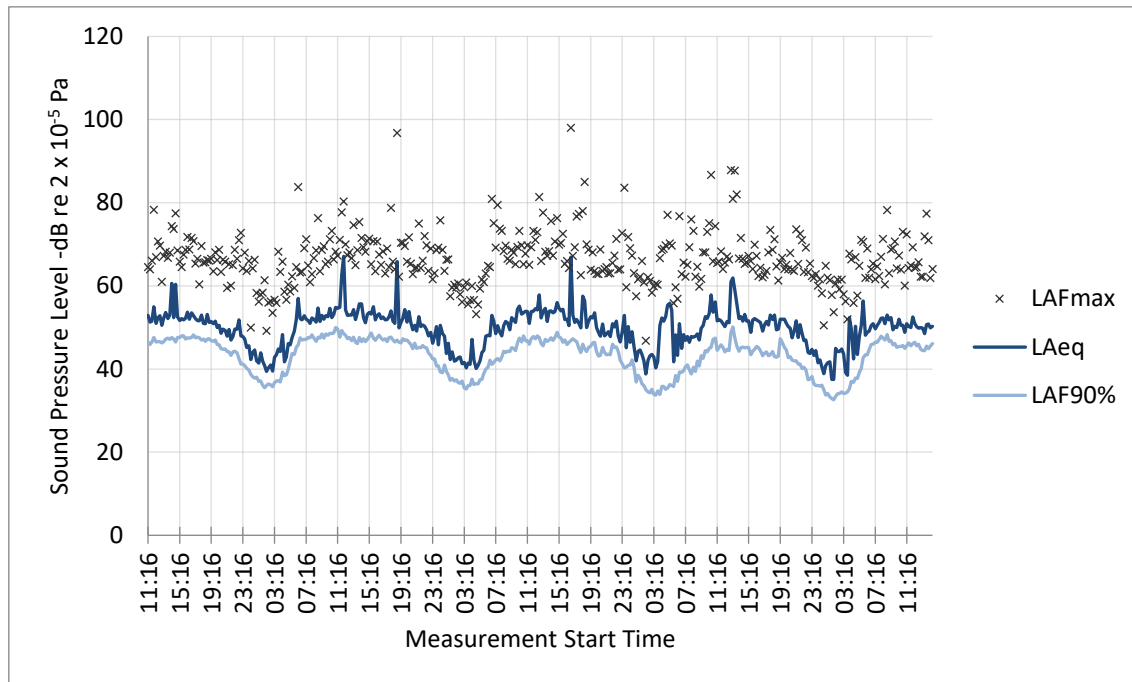


Figure 3: sound level survey results to the rear of the site.

Sound level measurements were recorded in consecutive 15-minute samples of overall LAFmax, LAeq, and LA90 values along with other statistical indices and octave band spectra. The sound level meter was set to log short-term levels simultaneously, to assist with assessment of individual noise events overnight.

Summary of the daytime and night-time sound level results are shown in tabular form in Table 4 below. In accordance with criteria in Section 2, short-term individual noise events should not exceed LAFmax 45dB inside residential bedrooms more than 10-15 times per night and therefore the 10th highest measured LAFmax value is shown in the table.

Sound levels measured to the west of the site will include sound levels from the South Street Arts Centre.

Assessment location	Daytime (07:00 – 23:00) LAeq	Night-Time (23:00 – 07:00) LAeq	Night-Time (23:00 – 07:00) Typical LAFmax
Front façade	60dB	54dB	73dB
Rear façade	54dB	48dB	65dB

Table 4: Summary sound level survey results

Design of the façade sound insulation performance has been conducted in Section 5 allowing for the levels in Table 4 above.

5. FAÇADE ACOUSTIC ASSESSMENT

A scheme for sound insulation is necessary to ensure sound levels inside rooms of the new residential dwellings are reasonable and comply with the requirements of planning condition 6.

A computer model has been set up using the measured sound levels incident on the façade of the development along with anticipated façade elements. The computer model is based on the calculation procedures outlined in BS EN ISO 12354-3:2000 and BS 8233:2014.

The assessment is based on drawings provided by the client, references PL-A-03 to PL-A-12. Confirmation of the acoustic performance of the building envelope elements used in the calculation model is provided below.

Description	Rw (dB)	Rw + C'tr (dB)	Typical Construction
Lower Ground – Level 2 Masonry Facade	52	48	105mm Brick, 75mm Cavity, 100mm Block
Level 3 Façade	43	36	Timber cladding over insulated frame
Glazing type 1	34	30	Thermal double glazing such as 4-16-6 configuration or equivalent
Glazing type 2	41	36	Laminated double glazing such as 6.5-12-8.4 configuration or equivalent
Roof/ceiling	47	38	Flat timber joist roof comprising 25mm plasterboard ceiling with insulation.

Table 5: Acoustic performance specification for facade elements

Note that the constructions provided are typical and variations on the specification would be acceptable, so long as the installed construction achieved the specified sound insulation performance. The specification for glazed elements is for the window/door as a complete unit, including frames and seals. It is recommended the glazing supplier submit test data confirming their unit will comply with the specified performance.

Condition 6 requires that where opening windows will cause internal levels to exceed a sound level 5dB greater than the guideline requirements of BS 8233:2014, then a mechanical ventilation system should be incorporated into the design.

Table 6 below shows internal sound levels from opening windows allowing for a 15dBA loss through openable windows as recommended by BS 8233:2014

Description	Internal sound level with windows open (Measured external sound level – 15dB open window loss)	Open window internal criteria
Flats with windows to the front facade	Daytime: 45dB Night-time: 39dB	Daytime: ≤ 40dB Night-time: ≤ 35dB
Flats with windows to the rear facade	Daytime: 39dB Night-time: 33dB	Daytime: ≤ 40dB Night-time: ≤ 35dB

Table 6: Acoustic performance specification for facade elements

With windows open, internal sound levels to flats to the rear of the development meet the requirements of Swindon Borough Council. To the front in accordance with the requirements of Planning Condition 6, a mechanical ventilation system is recommended.

5.1. Mechanical Ventilation Scheme to Front Flats

In accordance with the requirements of Condition 6, habitable rooms to the front of the development will require mechanical ventilation heat recovery units (MVHR) or other mechanical extract ventilation, or comfort cooling systems such as reverse cycle heat pumps or air conditioning. Design of an appropriate mitigation strategy is beyond the scope of ACA Acoustics and should be considered by a suitable third party accordingly.

It is important that any self-noise (i.e., noise from the fans) and external noise intrusion through the ducted system must not cause internal sound levels to exceed the design requirements. To achieve these limits, it is recommended that the overall noise from any mechanical ventilation system will need to be no higher than LAeq 25dB to allow for accumulation of noise sources.

5.2. Passive Ventilation Scheme to Rear Flats

Values in Table 7 below show a specification schedule of ventilator sound insulation performance used in the computer model. Note that there are many different passive ventilators including through-wall type and those built into the window frame. If the Dn,e,w performance is not lower than that shown in Table 7 then any alternative ventilator may be used.

Description	Dn,e,w (dB)	Typical Ventilator Type
Vents to habitable rooms to the rear façade flats	35	Hit & Miss trickle vents or equivalent

Table 7: Specification for ventilator Element Normalized Level Difference - Dn,e,w (dB)

A copy of the acoustic calculations for daytime and night-time noise intrusion with windows closed into sample rooms is provided in Appendix A. Summary results are confirmed in Table 8 below and demonstrate that intrusive sound levels within rooms of the proposed residential units will comply with Condition 6.

Plot/Room	Description	Calculated Internal Sound Level	Criteria
LGF Flat 2 Studio	Daytime LAeq	25dB	≤ 35dB
	Night-time LAeq	20dB	≤ 30dB
	Night-time LAFmax	36dB	≤ 45dB
1F Flat 6 Living Room	Daytime LAeq	25dB	≤ 35dB
	Night-time LAeq	-	-
	Night-time LAFmax	-	-
1F Flat 6 Bedroom	Daytime LAeq	32dB	≤ 35dB
	Night-time LAeq	27dB	≤ 30dB
	Night-time LAFmax	45dB	≤ 45dB
3F Flat 7 Snug/Study	Daytime LAeq	35dB	≤ 35dB
	Night-time LAeq	-	-
	Night-time LAFmax	-	-
1F Flat 6 Bedroom	Daytime LAeq	31dB	≤ 35dB
	Night-time LAeq	25dB	≤ 30dB
	Night-time LAFmax	42dB	≤ 45dB

Table 8: Summary internal sound levels within sample habitable rooms

6. CONCLUSION

ACA Acoustics have undertaken a sound level survey over a weekend period when the nearby South Street Arts Centre is understood to have had events on, and have calculated sound intrusion through the façade to the new dwellings. Calculated internal sound levels comply with criteria required to discharge the noise related planning conditions attached to this Development.

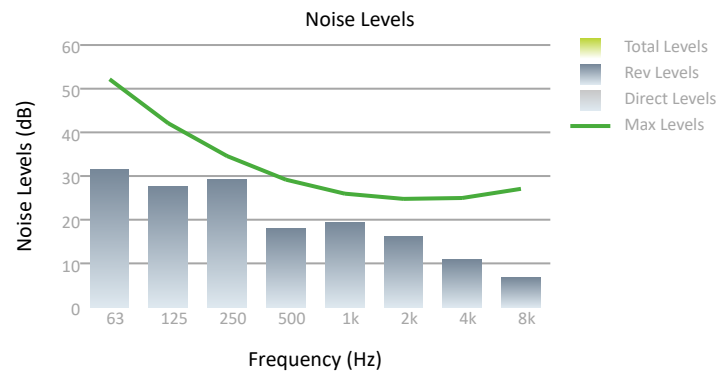
It is the author's assessment that, allowing for the recommended acoustic specification for façade envelope elements set out in this report, internal sound levels within the new residential dwelling and sound levels to the external amenity space will not be detrimental to the amenity of future occupants and the noise-related planning condition may be discharged.

Appendix A

Acoustic Calculations

Zoar Chapel 21 South Street Reading

Reference	LGF Flat 2 Studio Daytime LAeq
Description	
Target Sound Level	-
Max Sound Level	35dB(A)
Calculated Sound Level	25.1dB(A)
Calculated Tmf T60 (s)	0.48
Volume (m ³)	71.5

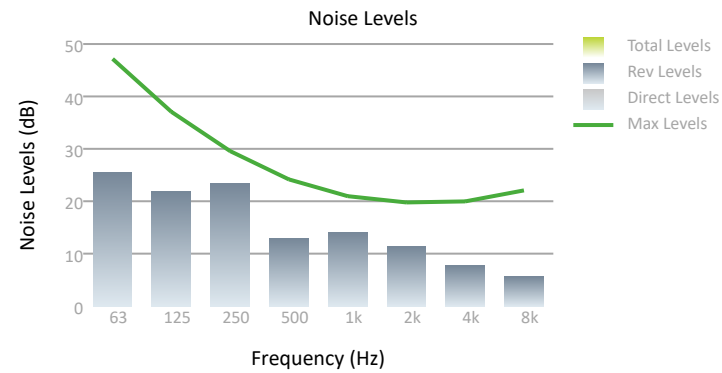


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	31.4	27.7	29.2	18.1	19.4	16.2	10.8	6.8

Zoar Chapel 21 South Street Reading

Reference	LGF Flat 2 Studio Night-time LAeq
Description	
Target Sound Level	-
Max Sound Level	30dB(A)
Calculated Sound Level	19.9dB(A)
Calculated Tmf T60 (s)	0.48
Volume (m ³)	71.5

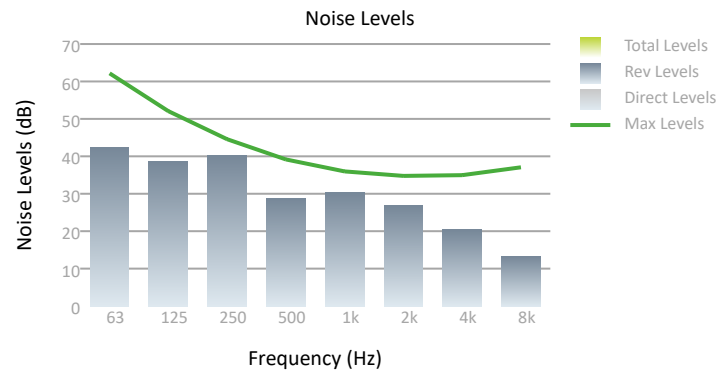


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	25.5	21.8	23.3	12.9	14.1	11.3	7.7	5.7

Zoar Chapel 21 South Street Reading

Reference	LGF Flat 2 Studio Night-time LAfmax
Description	
Target Sound Level	-
Max Sound Level	45dB(A)
Calculated Sound Level	35.9dB(A)
Calculated Tmf T60 (s)	0.48
Volume (m ³)	71.5

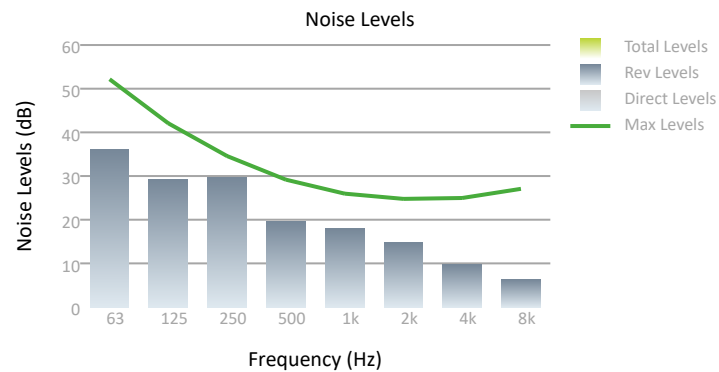


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	42.4	38.7	40.2	28.8	30.2	26.7	20.3	13.3

Zoar Chapel 21 South Street Reading

Reference	1F Flat 6 Living Room
Description	
Target Sound Level	-
Max Sound Level	35dB(A)
Calculated Sound Level	25.1dB(A)
Calculated Tmf T60 (s)	0.48
Volume (m ³)	71.5

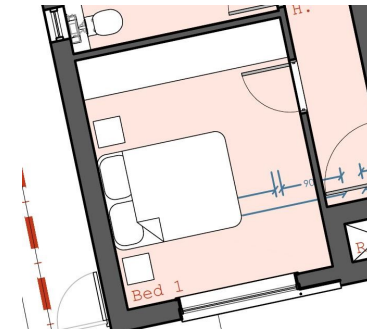
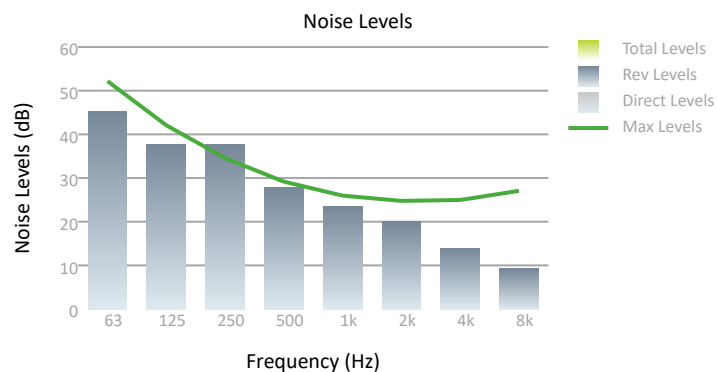


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	36.0	29.3	29.7	19.6	17.9	14.8	9.8	6.3

Zoar Chapel 21 South Street Reading

Reference	1F Flat 6 Bedroom Daytime LAeq
Description	
Target Sound Level	-
Max Sound Level	35dB(A)
Calculated Sound Level	32.3dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	31.2

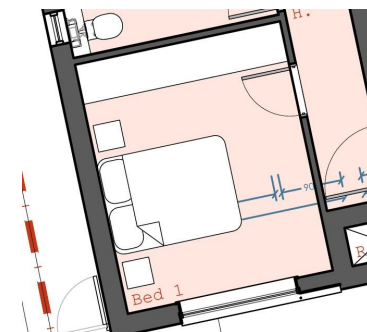
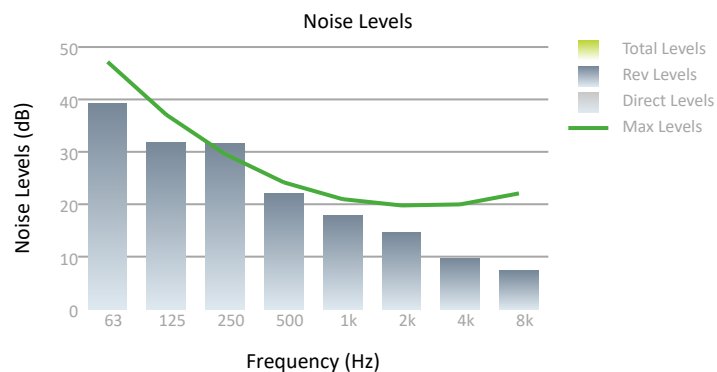


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	45.2	37.7	37.6	27.8	23.5	20.0	13.9	9.2

Zoar Chapel 21 South Street Reading

Reference	1F Flat 6 Bedroom Night-time LAeq
Description	
Target Sound Level	-
Max Sound Level	30dB(A)
Calculated Sound Level	26.5dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	31.2

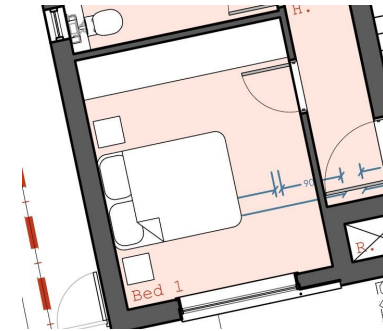
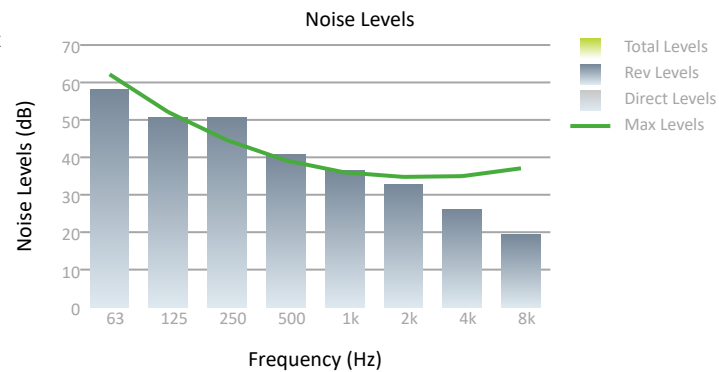


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	39.2	31.7	31.6	22.0	17.8	14.6	9.7	7.3

Zoar Chapel 21 South Street Reading

Reference	1F Flat 6 Bedroom Night-time LAfmax
Description	
Target Sound Level	-
Max Sound Level	45dB(A)
Calculated Sound Level	45.2dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	31.2

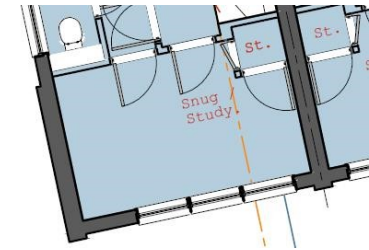
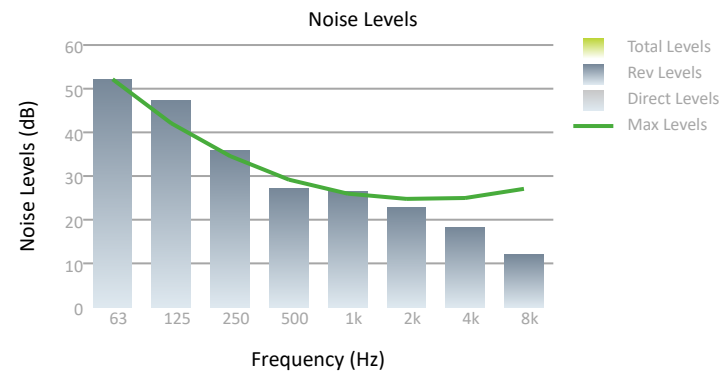


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	58.2	50.7	50.6	40.8	36.4	32.8	26.1	19.3

Zoar Chapel 21 South Street Reading

Reference	3F Flat 7 Snug/Study
Description	
Target Sound Level	-
Max Sound Level	35dB(A)
Calculated Sound Level	35.2dB(A)
Calculated Tmf T60 (s)	0.48
Volume (m ³)	26

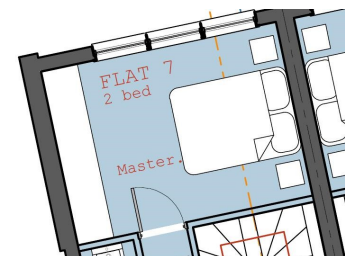
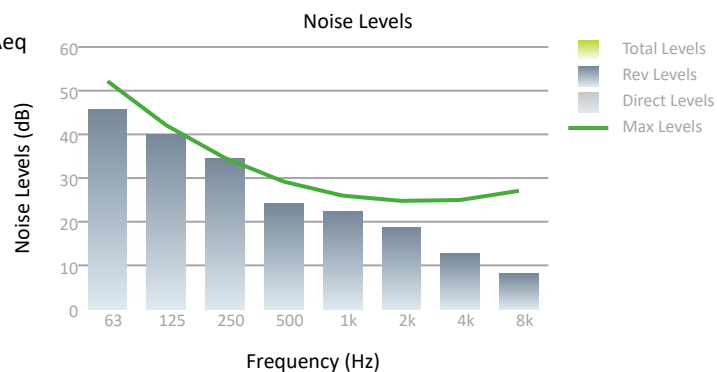


Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	52.2	47.3	35.9	27.3	26.5	22.7	18.3	12.0

Zoar Chapel 21 South Street Reading

Reference	3F Flat 7 Master Bedroom Daytime LAeq
Description	
Target Sound Level	-
Max Sound Level	35dB(A)
Calculated Sound Level	30.6dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	31.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	45.7	40.0	34.5	24.1	22.2	18.6	12.6	8.1

Zoar Chapel 21 South Street Reading

Reference

3F Flat 7 Master Bedroom Night-time LAeq

Description

Target Sound Level

-

Max Sound Level

30dB(A)

Calculated Sound Level

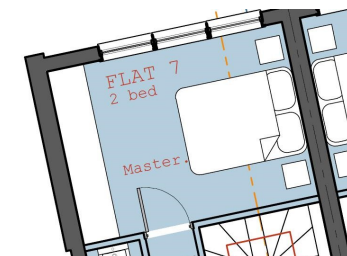
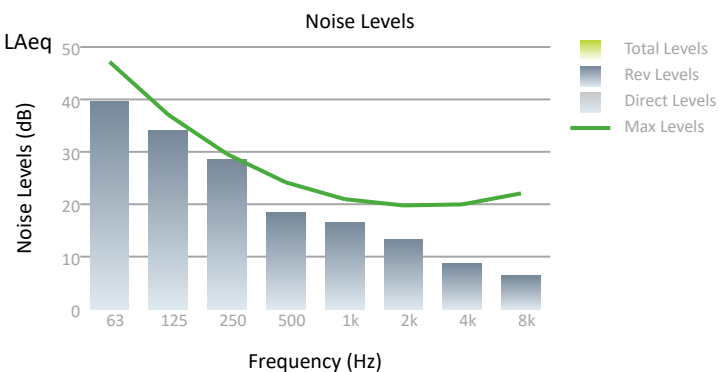
24.8dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

31.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	39.7	34.0	28.6	18.4	16.6	13.3	8.6	6.4

Zoar Chapel 21 South Street Reading

Reference

3F Flat 7 Master Bedroom Night-time LAfmax

Description

Target Sound Level

-

Max Sound Level

45dB(A)

Calculated Sound Level

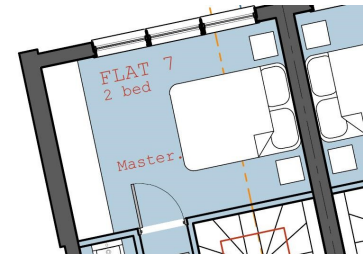
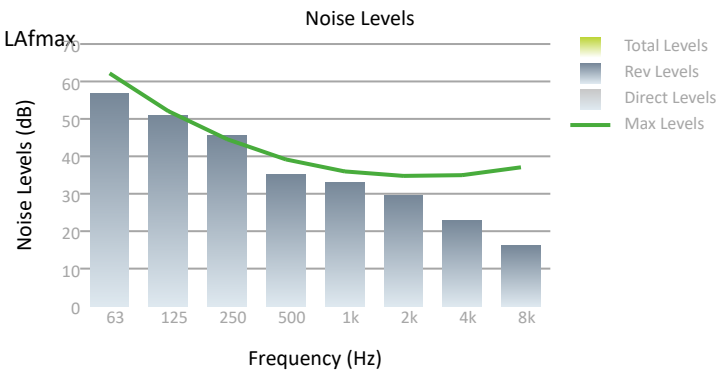
41.5dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

31.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	56.7	51.0	45.5	35.0	33.1	29.4	22.8	16.1

Calculation Sheet

LGF Flat 2 Studio Daytime LAeq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Daytime Leq)										
Source dBA	54.0									
Octave Band Frequencies										
Leq,ff		58.0	56.0	52.0	50.0	50.0	46.0	41.0	35.0	Row A
Facade Wall Element										
		-39.2	-42.2	-46.2	-46.2	-55.2	-59.2	-61.2	-66.2	
Facade Glazed Element										
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2	
Ventilators										
		-32.6	-33.6	-26.6	-36.6	-34.6	-33.6	-34.6	-35.6	
Cumulative Lp										
Result		26.5	23.2	25.5	14.3	15.7	12.9	8.1	4.6	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		4.9	4.5	3.7	3.7	3.7	3.3	2.8	2.2	
Internal Receiver Noise										
Internal Receiver Noise - LGF Flat 2										
Studio Daytime LAeq										
Reverberant Field, LPrev:		31.4	27.7	29.2	18.1	19.4	16.2	10.8	6.8	

Calculation Sheet

LGF Flat 2 Studio Night-time LAeq

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Leq)									
Source dBA	48.0								
Octave Band Frequencies									
Leq,ff		52.0	50.0	46.0	44.0	44.0	40.0	35.0	29.0
Row A									
Facade Wall Element									
		-39.2	-42.2	-46.2	-46.2	-55.2	-59.2	-61.2	-66.2
Facade Glazed Element									
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2
Ventilators									
		-32.6	-33.6	-26.6	-36.6	-34.6	-33.6	-34.6	-35.6
Cumulative Lp									
Result		20.6	17.3	19.6	9.2	10.3	8.1	4.9	3.5
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		4.9	4.5	3.7	3.7	3.7	3.3	2.8	2.2
Internal Receiver Noise									
Internal Receiver Noise - LGF Flat 2									
Studio Night-time LAeq									
Reverberant Field, LPrev:		25.5	21.8	23.3	12.9	14.1	11.3	7.7	5.7

Calculation Sheet

LGF Flat 2 Studio Night-time LAfmax

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Lmax)									
Source dBA	65.0								
Octave Band Frequencies									
Leq,ff		69.0	67.0	63.0	61.0	61.0	57.0	52.0	46.0
Row A									
Facade Wall Element									
		-39.2	-42.2	-46.2	-46.2	-55.2	-59.2	-61.2	-66.2
Facade Glazed Element									
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2
Ventilators									
		-32.6	-33.6	-26.6	-36.6	-34.6	-33.6	-34.6	-35.6
Cumulative Lp									
Result		37.5	34.1	36.5	25.0	26.5	23.5	17.6	11.1
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		4.9	4.5	3.7	3.7	3.7	3.3	2.8	2.2
Internal Receiver Noise									
Internal Receiver Noise - LGF Flat 2									
Studio Night-time LAfmax									
Reverberant Field, LPrev:		42.4	38.7	40.2	28.8	30.2	26.7	20.3	13.3

Calculation Sheet

1F Flat 6 Bedroom Daytime LAeq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Daytime Leq)										
Source dBA	60.0									
Octave Band Frequencies										
Leq,ff		64.0	62.0	58.0	56.0	56.0	52.0	47.0	41.0	Row A
Facade Wall Element										
		-39.3	-42.3	-46.3	-46.3	-55.3	-59.3	-61.3	-66.3	
Facade Glazed Element										
		-25.8	-31.8	-27.8	-34.8	-48.8	-47.8	-49.8	-50.8	
Ventilators										
		-35.6	-36.6	-29.6	-39.6	-37.6	-36.6	-37.6	-38.6	
Cumulative Lp										
Result		38.8	31.7	32.5	22.7	18.9	16.0	10.5	5.8	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		6.4	6.0	5.1	5.1	4.6	4.0	3.4	3.4	
Internal Receiver Noise										
Internal Receiver Noise - 1F Flat 6										
Bedroom Daytime LAeq										
Reverberant Field, LPrev:		45.2	37.7	37.6	27.8	23.5	20.0	13.9	9.2	

Calculation Sheet

1F Flat 6 Bedroom Night-time LAeq

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Leq)									
Source dBA	54.0								
Octave Band Frequencies									
Leq,ff		58.0	56.0	52.0	50.0	50.0	46.0	41.0	35.0
Row A									
Facade Wall Element									
		-39.3	-42.3	-46.3	-46.3	-55.3	-59.3	-61.3	-66.3
Facade Glazed Element									
		-25.8	-31.8	-27.8	-34.8	-48.8	-47.8	-49.8	-50.8
Ventilators									
		-35.6	-36.6	-29.6	-39.6	-37.6	-36.6	-37.6	-38.6
Cumulative Lp									
Result		32.8	25.8	26.5	16.9	13.2	10.6	6.4	3.9
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		6.4	6.0	5.1	5.1	4.6	4.0	3.4	3.4
Internal Receiver Noise									
Internal Receiver Noise - 1F Flat 6									
Bedroom Night-time LAeq									
Reverberant Field, LPrev:		39.2	31.7	31.6	22.0	17.8	14.6	9.7	7.3

Calculation Sheet

1F Flat 6 Bedroom Night-time LAfmax

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Lmax)									
Source dBA	73.0								
Octave Band Frequencies									
Leq,ff		77.0	75.0	71.0	69.0	69.0	65.0	60.0	54.0
		Row A							
Facade Wall Element									
		-39.3	-42.3	-46.3	-46.3	-55.3	-59.3	-61.3	-66.3
Facade Glazed Element									
		-25.8	-31.8	-27.8	-34.8	-48.8	-47.8	-49.8	-50.8
Ventilators									
		-35.6	-36.6	-29.6	-39.6	-37.6	-36.6	-37.6	-38.6
Cumulative Lp									
Result		51.8	44.7	45.4	35.7	31.8	28.8	22.7	15.9
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		6.4	6.0	5.1	5.1	4.6	4.0	3.4	3.4
Internal Receiver Noise									
Internal Receiver Noise - 1F Flat 6									
Bedroom Night-time LAfmax									
Reverberant Field, LPrev:		58.2	50.7	50.6	40.8	36.4	32.8	26.1	19.3

Calculation Sheet

1F Flat 6 Living Room

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade									
Source dBA	54.0								
Octave Band Frequencies									
Leq,ff		58.0	56.0	52.0	50.0	50.0	46.0	41.0	35.0
Row A									
Facade Wall Element									
		-38.7	-41.7	-45.7	-45.7	-54.7	-58.7	-60.7	-65.7
Facade Glazed Element									
		-28.1	-34.1	-30.1	-37.1	-51.1	-50.1	-52.1	-53.1
Ventilators									
		-34.4	-35.4	-28.4	-38.4	-36.4	-35.4	-36.4	-37.4
Cumulative Lp									
Result		31.1	24.8	26.0	15.9	14.2	11.5	7.0	4.1
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		4.9	4.5	3.7	3.7	3.7	3.3	2.8	2.2
Internal Receiver Noise									
Internal Receiver Noise - 1F Flat 6									
Living Room									
Reverberant Field, LPrev:		36.0	29.3	29.7	19.6	17.9	14.8	9.8	6.3

Calculation Sheet

3F Flat 7 Master Bedroom Daytime LAeq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Daytime Leq)										
Source dBA	54.0									
Octave Band Frequencies										
Leq,ff		58.0	56.0	52.0	50.0	50.0	46.0	41.0	35.0	Row A
Facade Wall Element										
		-24.7	-27.7	-37.7	-43.7	-48.7	-52.7	-55.7	-59.7	
Facade Glazed Element										
		-27.6	-33.6	-29.6	-36.6	-50.6	-49.6	-51.6	-52.6	
Facade Roof Element										
		-26.0	-29.0	-41.0	-51.0	-57.0	-60.0	-66.0	-68.0	
Ventilators										
		-33.0	-34.0	-27.0	-37.0	-35.0	-34.0	-35.0	-36.0	
Cumulative Lp										
Result		37.1	31.8	27.2	16.8	15.4	12.4	7.1	2.6	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		8.6	8.2	7.3	7.3	6.8	6.2	5.6	5.6	
Internal Receiver Noise										
Internal Receiver Noise - 3F Flat 7										
Master Bedroom Daytime LAeq										
Reverberant Field, LPrev:		45.7	40.0	34.5	24.1	22.2	18.6	12.6	8.1	

Calculation Sheet

3F Flat 7 Master Bedroom Night-time LAeq

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Leq)									
Source dBA	48.0								
Octave Band Frequencies									
Leq,ff		52.0	50.0	46.0	44.0	44.0	40.0	35.0	29.0
Row A									
Facade Wall Element									
		-24.7	-27.7	-37.7	-43.7	-48.7	-52.7	-55.7	-59.7
Facade Glazed Element									
		-27.6	-33.6	-29.6	-36.6	-50.6	-49.6	-51.6	-52.6
Facade Roof Element									
		-26.0	-29.0	-41.0	-51.0	-57.0	-60.0	-66.0	-68.0
Ventilators									
		-33.0	-34.0	-27.0	-37.0	-35.0	-34.0	-35.0	-36.0
Cumulative Lp									
Result		31.1	25.8	21.2	11.0	9.8	7.1	3.1	0.8
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		8.6	8.2	7.3	7.3	6.8	6.2	5.6	5.6
Internal Receiver Noise									
Internal Receiver Noise - 3F Flat 7 Master Bedroom Night-time LAeq Reverberant Field, LPrev:									
		39.7	34.0	28.6	18.4	16.6	13.3	8.6	6.4

Calculation Sheet

3F Flat 7 Master Bedroom Night-time LAfmax

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Lmax)									
Source dBA	65.0								
Octave Band Frequencies									
Leq,ff		69.0	67.0	63.0	61.0	61.0	57.0	52.0	46.0
		Row A							
Facade Wall Element									
		-24.7	-27.7	-37.7	-43.7	-48.7	-52.7	-55.7	-59.7
Facade Glazed Element									
		-27.6	-33.6	-29.6	-36.6	-50.6	-49.6	-51.6	-52.6
Facade Roof Element									
		-26.0	-29.0	-41.0	-51.0	-57.0	-60.0	-66.0	-68.0
Ventilators									
		-33.0	-34.0	-27.0	-37.0	-35.0	-34.0	-35.0	-36.0
Cumulative Lp									
Result		48.1	42.8	38.2	27.7	26.3	23.2	17.2	10.5
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		8.6	8.2	7.3	7.3	6.8	6.2	5.6	5.6
Internal Receiver Noise									
Internal Receiver Noise - 3F Flat 7 Master Bedroom Night-time LAfmax									
Reverberant Field, LPrev:		56.7	51.0	45.5	35.0	33.1	29.4	22.8	16.1

Calculation Sheet

3F Flat 7 Snug/Study

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade										
Source dBA	60.0									
Octave Band Frequencies										
Leq,ff		64.0	62.0	58.0	56.0	56.0	52.0	47.0	41.0	Row A
Facade Wall Element										
		-24.7	-27.7	-37.7	-43.7	-48.7	-52.7	-55.7	-59.7	
Facade Glazed Element										
		-32.6	-35.6	-35.6	-45.6	-51.6	-55.6	-69.6	-69.6	
Facade Roof Element										
		-26.0	-29.0	-41.0	-51.0	-57.0	-60.0	-66.0	-68.0	
Ventilators										
		-32.8	-31.8	-34.8	-39.8	-38.8	-37.8	-36.8	-37.8	
Cumulative Lp										
Result		42.4	37.9	27.3	18.7	18.0	14.6	10.7	4.9	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		9.7	9.4	8.6	8.6	8.6	8.1	7.6	7.0	
Internal Receiver Noise										
Internal Receiver Noise - 3F Flat 7 Snug/Study										
Reverberant Field, LPrev:		52.2	47.3	35.9	27.3	26.5	22.7	18.3	12.0	