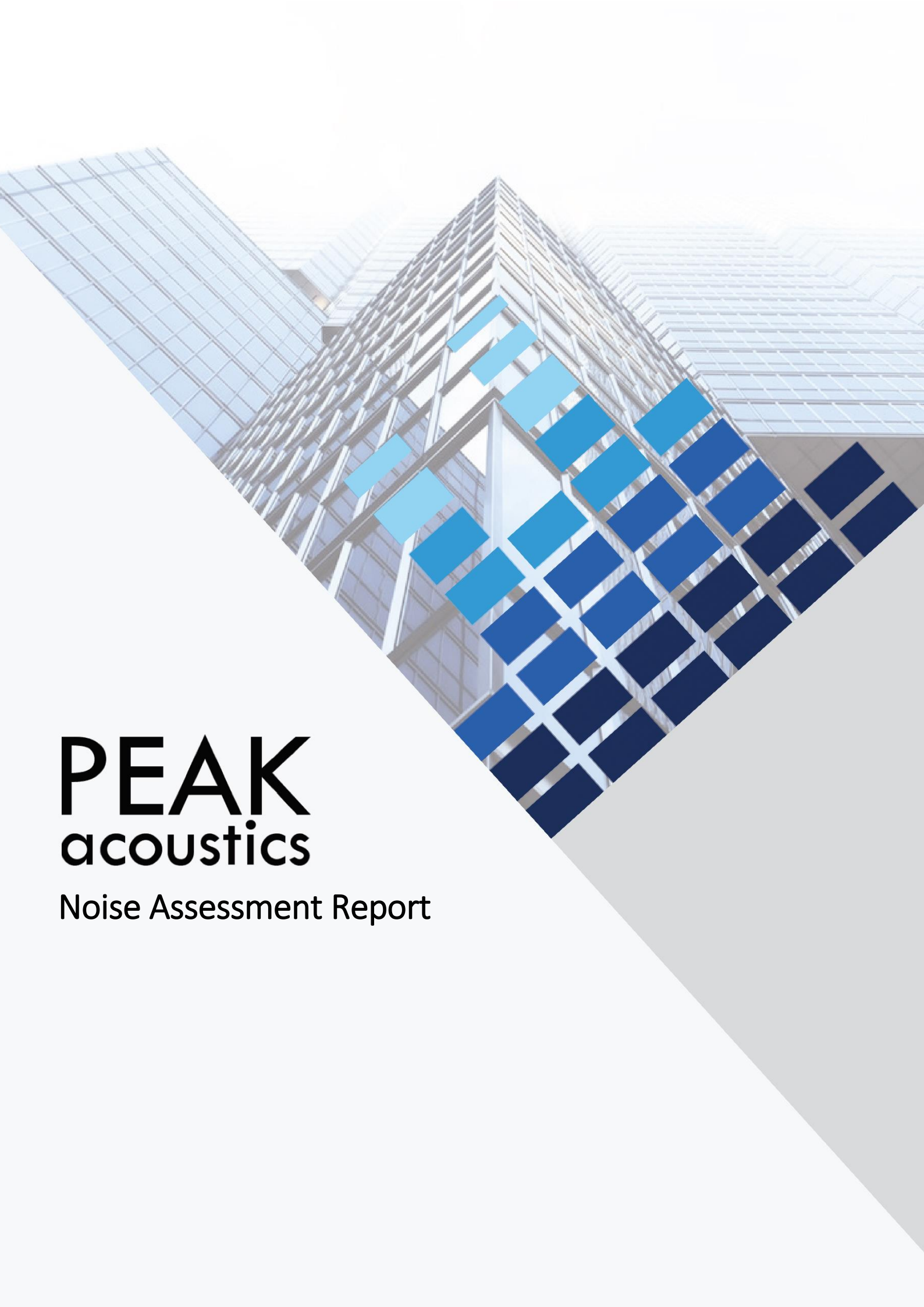




PEAK acoustics

Noise Assessment Report

Rev. 1



Noise Impact Assessment

Project No: PA820

Report Ref: NM1203191NR Rev 1

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Globe House, 30 – 34 Southall Street, Manchester, M3 1LG

Project Consultant

N. Mitchell, BSc (Hons)
Acoustic Consultant
info@acousticsurveys.co.uk

Proofing Consultant

T. Hegan, BSc (Hons) AMIOA
Acoustic Consultant
info@acousticsurveys.co.uk

Peak Acoustics Ltd
Fernbank House
Springwood Way
Macclesfield
SK10 2XA

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1. Summary

1.1. Proposal

The development of 30 residential apartments is proposed at Globe House, 30–34 Southall Street, Manchester M3 1LG.

1.2. Reason for Assessment

The local planning authority have stipulated that a noise assessment is submitted as part of the planning application due to noise associated with the nearby road traffic.

1.3. Planning Conditions & Criteria

No criteria have been supplied by the local planning authority; therefore, the following criteria is stipulated in accordance with British Standards.

Desirable internal noise levels are to be maintained as given in BS8233:2014:

- 30dB $L_{Aeq, 8hr}$ within bedrooms at night (23:00 – 07:00).
- 45dB L_{Amax} should not be regularly exceeded within bedrooms at night (23:00 – 07:00).
- 35dB $L_{Aeq, 16hr}$ within living areas during the day (07:00 – 23:00)

1.4. Assessment Standards & Justification

'BS8233:2014 – Guidance on sound insulation and noise reduction for buildings' is a recognised standard for assessing and mitigating environmental noise levels upon a proposed noise sensitive development. The standard gives a rigorous calculation method for determining interior noise levels based on measured environmental noise levels.

1.5. Measurements

In order to assess noise emissions, a noise survey was undertaken from Thursday 4th – Friday 5th April 2019. The results of the measurements are tabulated below; corresponding measurement locations are shown in **Section 1.8**.

Measurement Summary				
Measurement	Date	Daytime	Night-time	
		L _{Aeq,16hr} (dB)	L _{Aeq, 8hr} (dB)	L _{AFmax} (dB)
M1 - Front* [Façade Corrected]	4 th (11:32:38) – 5 th (11:52:38)	60.6	52.9	72.8
M2 - Rear* [Façade Corrected]	4 th (11:31:26) – 5 th (11:46:26)	55.2	50.3	68.0

**Measurement M1 and M2, results are inclusive of a – 3.0 dB correction due to the positioning of the microphone within 1m of a reflective façade.*

1.6. Noise Assessment Outcome

It is determined that by using mitigation as specified below for the building façade, the outcome summarised in the following tables is achieved.

Internal Noise Levels				
Zone	Internal Space	Noise Parameter	Internal Noise Level	Within Desirable Limit (BS8233)
Zone 1 – Front (GF, FF, 2F)	Living Rooms	Daytime L _{Aeq, 16hr}	32.1	Yes
	Bedrooms	Night-time L _{Aeq, 8hr}	22.9	Yes
	Bedrooms	Night-time L _{AFmax}	42.8	Yes
Zone 1 – Front (3 rd Floor)	Living Rooms	Daytime L _{Aeq, 16hr}	30.5	Yes
	Bedrooms	Night-time L _{Aeq, 8hr}	20.0	Yes
	Bedrooms	Night-time L _{AFmax}	39.9	Yes
Zone 2 – Rear (GF, FF, 2F)	Living Rooms	Daytime L _{Aeq, 16hr}	25.0	Yes
	Bedrooms	Night-time L _{Aeq, 8hr}	19.8	Yes
	Bedrooms	Night-time L _{AFmax}	39.0	Yes
Zone 2 – Rear (3 rd Floor)	Living Rooms	Daytime L _{Aeq, 16hr}	21.4	Yes
	Bedrooms	Night-time L _{Aeq, 8hr}	16.0	Yes
	Bedrooms	Night-time L _{AFmax}	35.9	Yes

1.7. Mitigation Recommendations

1.7.1. Glazing Scheme

The Façade Zones referred to in the table below are shown in **Section 1.7.2**.

Façade Zone (See Fig. 1)	Internal Space	Glazing	
		Minimum Performance, R_w+C_{tr}	Example Specification
1 	Bedrooms	25	4/12/4mm
	Living area	25	4/12/4mm
2 	Bedrooms	25	4/12/4mm
	Living area	25	4/12/4mm

Design Guidance:

- The glazing that has been installed was inspected on-site and is understood to be a 4/12/4mm Double Glazed Unit and therefore conforms with the recommended specifications for both zones.

1.7.2. Ventilation Scheme

It is understood that there will be MVHR installed throughout the third (top) floor and trickle ventilators for ground, first and second floor. Calculations for internal noise levels within both zones are displayed within **Section 1.6**. The use of both systems will comply with the BS8233:2014 assessment standard, provided that the guidance within **Section 5** is followed.

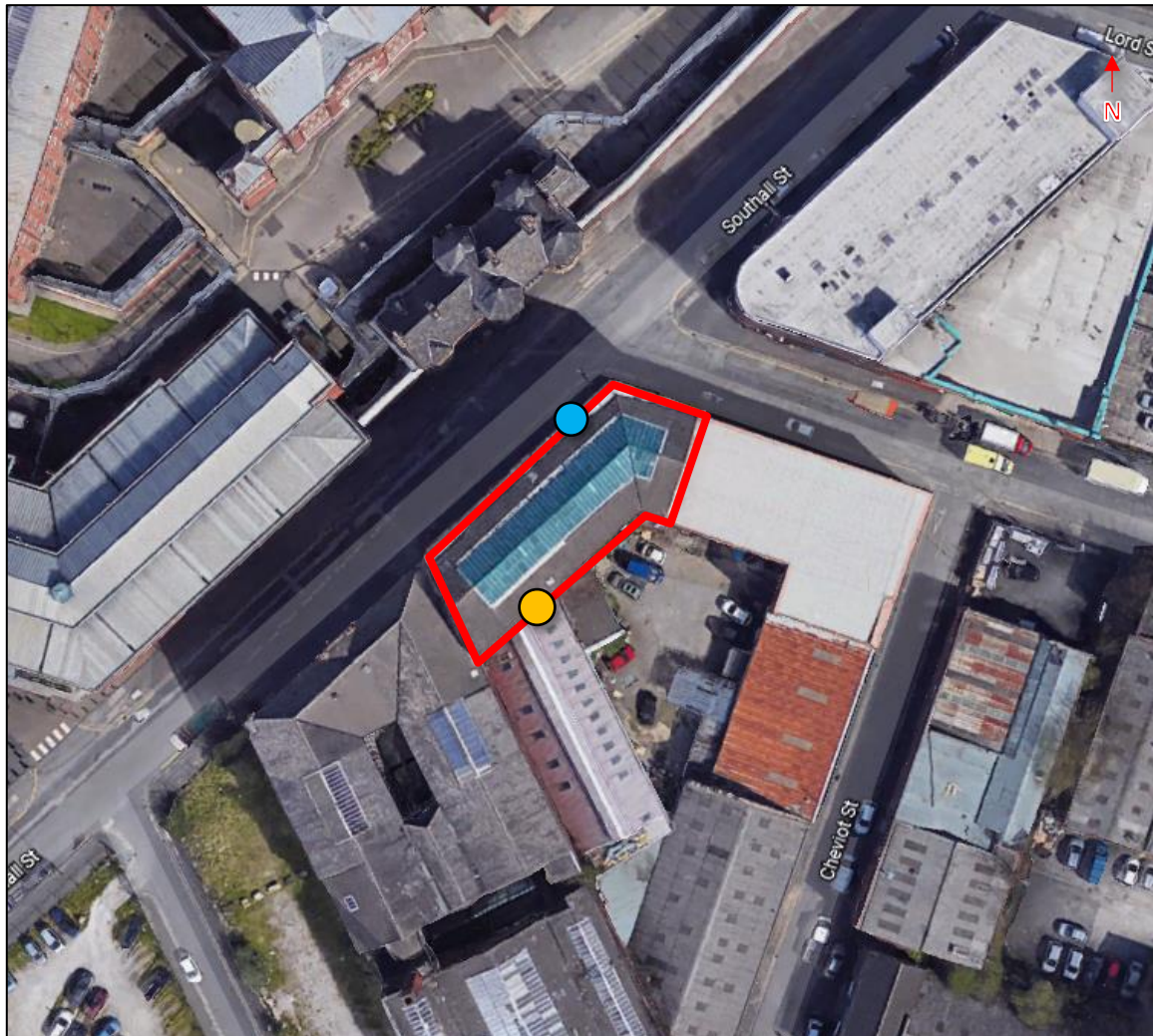
1.7.2. Façade Zone Designation

Figure 1: Façade Specification Zones



1.8. Site & Measurement Locations

Figure 2: Site & Measurement Locations



- Measurement M1
- Measurement M2
- ▬ Site Location

2. Environmental Noise Survey

2.1. Source Under Investigation

To the front is Southall Street; the primary noise source is vehicle traffic including cars, motorbikes, buses and HGVs. Sound from pedestrian conversation was noted as a secondary noise source.

At the rear, the noise climate consists of passing conversing pedestrians within the car park and vehicles along Cheviot Street and Carnarvon Street.

3. Survey Measurements

Daytime and night-time noise measurements have been undertaken from 4th – 5th April 2019.

3.1. Measurement Location

Measurement locations were as follows:

- M1** Outside 3rd floor window overlooking Southall St.
- M2** Outside 3rd floor window overlooking the rear carpark and both, 'Cheviot St' and 'Carnarvon St'.

3.2. Weather Conditions

Weather conditions during the noise surveys were deemed satisfactory for environmental noise measurements; detailed weather conditions are given in **Appendix C**.

3.3. Measurement Equipment

Measurement equipment used complies with accuracy requirements for common environmental noise measurement standards. A detailed equipment list is given in **Appendix B** with calibration information in **Appendix D**.

3.4. Measurement Results

The results from the measurement intervals are summarised in the tables below. Full measurement details and information can be found in **Appendix E**.

The displayed results for measurement M1 are inclusive of a -3 dB façade correction due to the position of the microphone being within 1m of a reflection façade.

Measurement Results				
Measurement	Date	Daytime	Night-time	
		L _{Aeq,16hr} (dB)	L _{Aeq, 8hr} (dB)	L _{AFmax} (dB)
M1 [Façade Corrected]	4 th (11:32) – 5 th (11:52)	60.6	52.9	72.8*
M2 [Façade Corrected]	4 th (11:31) – 5 th (11:46)	55.2	50.3	68.0**

**M1 maxima chosen 05/04/19 @ 00:07 and is deemed representative of regularly occurring maxima containing consistent broadband frequency data.*

***M2 maxima chosen 04/04/19 @ 23:41 and is deemed representative of regularly occurring maxima containing consistent broadband frequency data.*

4. BS8233:2014 Environmental Noise Assessment

4.1. Criteria

No criteria have been supplied by the local planning authority; therefore, the following criteria is stipulated in accordance with British Standards.

Desirable internal noise levels are to be maintained as given in BS8233:2014:

- 30dB $L_{Aeq, 8hr}$ within bedrooms at night (23:00 – 07:00).
- 45dB L_{Amax} should not be regularly exceeded within bedrooms at night (23:00 – 07:00).
- 35dB $L_{Aeq, 16hr}$ within living areas during the day (07:00 – 23:00)

4.2. External Noise Analysis

Measured noise levels are shown graphically in **Appendix E** and display that there is a typically urban environment with moderate levels of traffic noise occurring during the daytime hours and reduced noise levels during the evenings.

4.3. Internal Noise Levels – Proposed Insulation

Internal noise levels have been calculated in order to demonstrate that the proposed development can achieve suitable internal noise levels inside rooms, when appropriate glazing and ventilation systems are used.

In order to describe the likely internal exposure to environmental noise at the site, Peak Acoustics, Ltd. use suggested data from BS8233:2014 on standard construction.

The calculations reflect the installed façade elements as follows:

- Standard Double Glazing (understood to be a minimum of 4/12/4mm) – All floors.
- Trickle ventilators – Ground, First and Second Floor.
- Nuaire MRXBOX95AB-WM1 – Third Floor

Room dimensions and glazed areas have been measured based on the current plans provided by the client. Assumed construction details are provided within **Appendix F**.

4.4. Allocation of Noise Data

Environmental noise data from measurements M1 and M2 have been allocated for internal noise level calculations relevant to the façade zone in which it was measured. Allocation of this data is listed below:

- Zone 1 – Noise data from M1
- Zone 2 – Noise data from M2

4.5. Daytime Internal Noise Levels

4.5.1. Living Area (Zone 1) – Ground, 1st and 2nd Floor

Considering the insulation with the addition of dB 25 R_{w+Ctr} rated glazing and dB 32 $D_{ne,w+Ctr}$ rated ventilators, daytime noise would be reduced from 60.6 dB $L_{Aeq,16hr}$ to 32.1 dB $L_{Aeq,16hr}$.

BS8233:2014 suggests a desirable guideline of 35 dB $L_{Aeq,16hr}$ for suitable resting conditions, and up to 40 dB is considered acceptable for necessary developments. *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.5.2. Living Area (Zone 1) – 3rd Floor

With 25 dB R_{w+Ctr} rated glazing, daytime environmental noise would be reduced from 60.6 dB $L_{Aeq, 16hr}$ to interior levels of 30.5 $L_{Aeq, 16hr}$.

BS8233:2014 suggests a desirable guideline of 35 dB $L_{Aeq,16hr}$ for suitable resting conditions, and up to 40 dB is considered acceptable for necessary developments. *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.5.3. Living Area (Zone 2) – Ground, 1st and 2nd Floor

Considering the insulation with the addition of dB 25 R_{w+Ctr} rated glazing and dB 32 $D_{ne,w+Ctr}$ rated ventilators, daytime noise would be reduced from 55.2 dB $L_{Aeq,16hr}$ to 25.0 dB $L_{Aeq,16hr}$.

BS8233:2014 suggests a desirable guideline of 35 dB $L_{Aeq,16hr}$ for suitable resting conditions, and up to 40 dB is considered acceptable for necessary developments. *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.5.4. Living Area (Zone 2) – 3rd Floor

With 25 dB R_{w+Ctr} rated glazing, daytime environmental noise would be reduced from 55.2 dB $L_{Aeq, 16hr}$ to interior levels of 21.4 $L_{Aeq, 16hr}$.

BS8233:2014 suggests a desirable guideline of 35 dB $L_{Aeq,16hr}$ for suitable resting conditions, and up to 40 dB is considered acceptable for necessary developments. *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.6. Night-time Internal Noise Levels

4.6.1. Bedrooms (Zone 1) – Ground, 1st and 2nd Floor

Considering the insulation with the addition of 25 dB R_{w+Ctr} rated glazing and 32 dB $D_{ne,w+Ctr}$ rated ventilators, night-time noise would be reduced from 59.2 dB $L_{Aeq,8hr}$ to 22.9 dB $L_{Aeq,8hr}$ with maximum individual noise events reduced 72.8 dB L_{AFmax} to 42.8 L_{AFmax} .

BS8233:2014 suggests a desirable guideline of 30dB $L_{Aeq, 8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq, 8hr}$. Individual noise events (Measured with fast time-weighted Maximum) should not normally exceed 45dB L_{AFmax} (as in BS8233:1999). *The above standard of*

construction would place the internal levels in living as below 35dB and therefore within the desirable category.

4.6.2. Bedrooms (Zone 1) – 3rd Floor

With 25 dB R_{w+Ctr} rated glazing, night-time environmental noise would be reduced from 52.9 dB $L_{Aeq, 8hr}$ to interior levels of 20.0 dB $L_{Aeq, 8hr}$ with maximum individual noise events reduced from 72.8 dB L_{AFmax} to 39.9 dB L_{AFmax} .

BS8233:2014 suggests a desirable guideline of 30dB $L_{Aeq, 8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq, 8hr}$. Individual noise events (Measured with fast time-weighted Maximum) should not normally exceed 45dB L_{AFmax} (as in BS8233:1999). *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.6.3. Bedrooms (Zone 2) 4.6.4. Bedrooms (Zone 2) – Ground, 1st and 2nd Floor

Considering the insulation with the addition of 25 dB R_{w+Ctr} rated glazing and 32 dB $D_{ne,w+Ctr}$ rated ventilators, night-time noise would be reduced from 50.3 dB $L_{Aeq, 8hr}$ to 19.8 dB $L_{Aeq, 8hr}$ with maximum individual noise events reduced 68.0 dB L_{AFmax} to 39.0 dB L_{AFmax} .

BS8233:2014 suggests a desirable guideline of 30dB $L_{Aeq, 8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq, 8hr}$. Individual noise events (Measured with fast time-weighted Maximum) should not normally exceed 45dB L_{AFmax} (as in BS8233:1999). *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.6.4. Bedrooms (Zone 2) – 3rd Floor

With 25 dB R_{w+Ctr} rated glazing, night-time environmental noise would be reduced from 50.3 dB $L_{Aeq, 8hr}$ to interior levels of 16.0 dB $L_{Aeq, 8hr}$ with maximum individual noise events reduced from 68.0 dB L_{AFmax} to 35.9 dB L_{AFmax} .

BS8233:2014 suggests a desirable guideline of 30dB $L_{Aeq, 8hr}$ for sleeping conditions, with an acceptable limit of 35dB $L_{Aeq, 8hr}$. Individual noise events (Measured with fast time-weighted Maximum) should not normally exceed 45dB L_{AFmax} (as in BS8233:1999). *The above standard of construction would place the internal levels in living as below 35dB and therefore within the desirable category.*

4.7. Effect Level and Exposure Outcomes

A summary of internal noise levels resulting from environmental noise and their respective BS8233 classifications can be found below:

Façade Zone	Internal Space	Noise Parameter	Internal Noise Level	BS8233:2014 Classification
Zone 1 – Front (GF, FF, 2F)	Living Rooms	Daytime $L_{Aeq, 16hr}$	32.1	'Desirable'
	Bedrooms	Night-time $L_{Aeq, 8hr}$	22.9	'Desirable'
	Bedrooms	Night-time L_{AFmax}	42.8	'Desirable'
Zone 1 – Front (3rd Floor)	Living Rooms	Daytime $L_{Aeq, 16hr}$	30.5	'Desirable'
	Bedrooms	Night-time $L_{Aeq, 8hr}$	20.0	'Desirable'
	Bedrooms	Night-time L_{AFmax}	39.9	'Desirable'
Zone 2 – Rear (GF, FF, 2F)	Living Rooms	Daytime $L_{Aeq, 16hr}$	25.0	'Desirable'
	Bedrooms	Night-time $L_{Aeq, 8hr}$	19.8	'Desirable'
	Bedrooms	Night-time L_{AFmax}	39.0	'Desirable'
Zone 2 – Rear (3rd Floor)	Living Rooms	Daytime $L_{Aeq, 16hr}$	21.4	'Desirable'
	Bedrooms	Night-time $L_{Aeq, 8hr}$	16.0	'Desirable'
	Bedrooms	Night-time L_{AFmax}	35.9	'Desirable'

5. Ventilation Guidance

It is understood that a Nuaire MRXBOX95AB-WM1 Mechanical Ventilation system may be used as part of the scheme. The following recommendations for such a system are set out below:

- Self-generated noise from the system should not exceed NR25 in habitable rooms. It may be necessary to use attenuators at the fan inlet and/or outlet to achieve these levels.
- Where possible, inlets and outlets should be routed to non-habitable rooms. Where façade penetrations are required in habitable rooms, these should meet the minimum sound insulation requirements ($D_{ne,w+Ctr}$) set out in **Section 1.7**.
- Where appropriate, fans and ductwork should be fitted using resilient mountings to mitigate vibration and re-radiated structural noise.

APPENDIX A - Measurement Details

Measurement	Kit	Start Date	Start Time	End Date	End Time
M1	A1	04/04/19	11:32	05/04/19	11:52
M2	A4	04/04/19	11:31	05/04/19	11:46

APPENDIX B - Equipment Details

Kit	Equipment	Make	Model	Class	Serial Number
A1	Sound Meter	Svantek	958	1	34525
A1	Pre-Amp	Svantek	SV12L	1	41651
A4	Sound Meter	Svantek	971	1	60688
A4	Pre-Amp	Svantek	SV18	1	62781
A1/A4	Calibrator	Svantek	SV31	1	90273

APPENDIX C - Meteorology Details

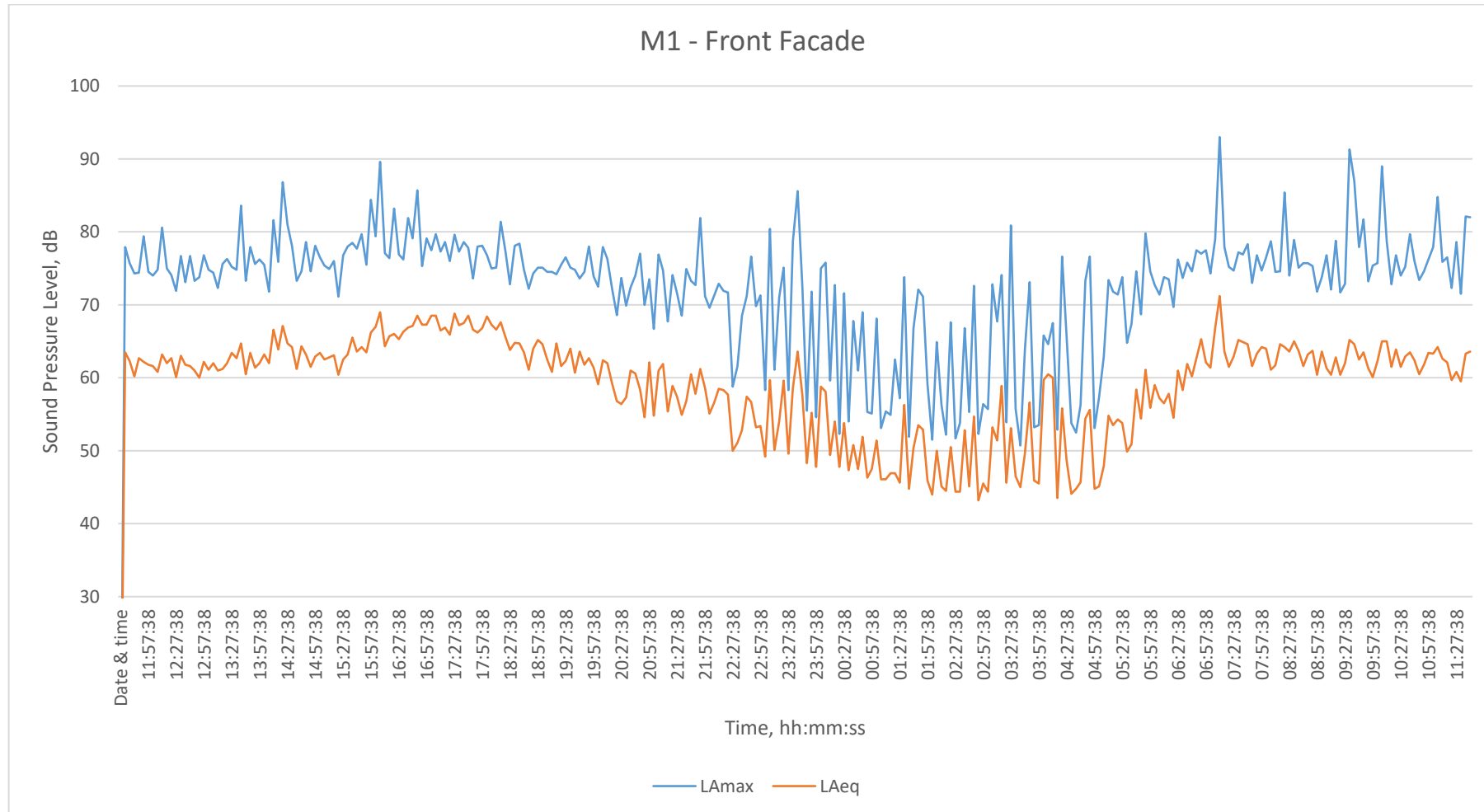
Measurement Date	Temp C	Wind Speed m/s	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
Thu 4 th Mar (Start of Survey)	6	8 – 9	E	64	0.0	8/8
Fri 5 th Mar (End of Survey)	10	8 – 9	ESE	57	0.0	7/8

APPENDIX D - Calibration Details

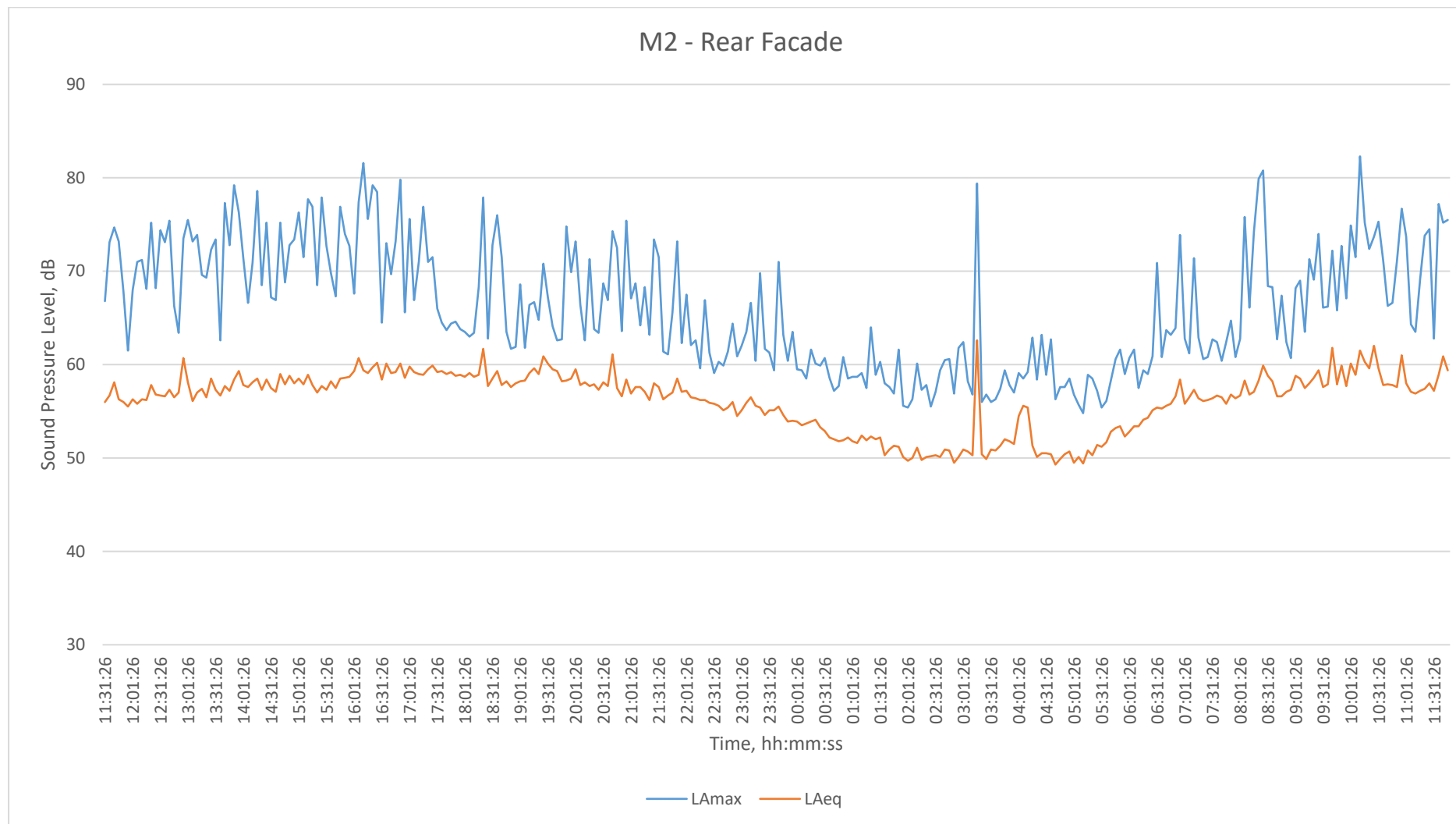
Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
M1	114.0	114.6	-0.6	114.5	-0.5
M2	114.0	114.0	0.0	113.6	0.4

APPENDIX E – Noise Survey Results

Environmental Noise Measurements, 4th – 5th January, Measurement M1
Pre Façade-Correction



Environmental Noise Measurements, 4th – 5th January 2019, Measurement M2
Pre Façade-Correction

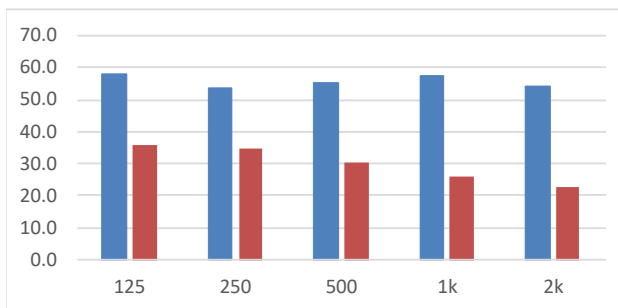


APPENDIX F – BS8233 Rigorous Design Calculations (GF, FF, 2F)

Daytime LAeq - (Zone 1)

Room Properties		Sound Insulation Properties					
Room Width (m)	8.7	Freq. Hz	125	250	500	1k	2k
Room Depth (m)	7.8	Wall, dB R _{w+Ctr}	41	45	45	54	58
Room Height (m)	2.6	Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazed Area (m ²)	7.0	Glazing, dB R _{w+Ctr}	24	20	25	34	37
Is dwelling within roof	☒	Vents, D _{n,e,w+Ctr}	34	27	37	35	34

Noise Levels, dB



External Level	60.6 dB LAeq
Internal Level	32.1 dB LAeq
Insertion Loss	28.5 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	32	D _{n,e,w+Ctr}	Hit & miss trickle vent Titon Trimvent XS13 4400EA

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	0.000176	0.0009	8.8E-05	0.0001	0.00018
Term 2	0.001232	0.0031	0.00098	0.0001	6.2E-05
Term 3	5.49E-05	2E-05	2.2E-05	3E-06	1.1E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	35.9	34.7	30.2	25.9	22.6
Internal, dB LAeq	19.8	26.1	27.0	25.9	23.8

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Hit & miss trickle vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{L1}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{gl}}{S} 10^{\frac{-R_{gl}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Daytime LAeq - (Zone 2)

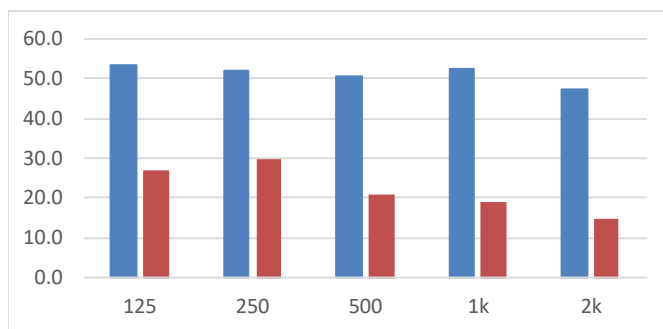
Room Properties

Room Width (m)	6.3
Room Depth (m)	5.0
Room Height (m)	2.6
Glazed Area (m ²)	1.8
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	34	27	37	35	34

Noise Levels, dB



External Level	55.2 dB LAeq
Internal Level	25.0 dB LAeq
Insertion Loss	30.2 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	32	D _{n,e,w+Ctr}	Hit & miss trickle vent Titon Trimvent XS13 4400EA

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	0.000243	0.0012	0.00012	0.0002	0.00024
Term 2	0.000437	0.0011	0.00035	4E-05	2.2E-05
Term 3	7.07E-05	3E-05	2.8E-05	4E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	26.8	29.6	20.9	19.2	14.7
Internal, dB LAeq	10.7	21.0	17.7	19.2	15.9

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Hit & miss trickle vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{st}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{\pi}}{S} 10^{\frac{-R_{\pi}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night LAeq - (Zone 1)

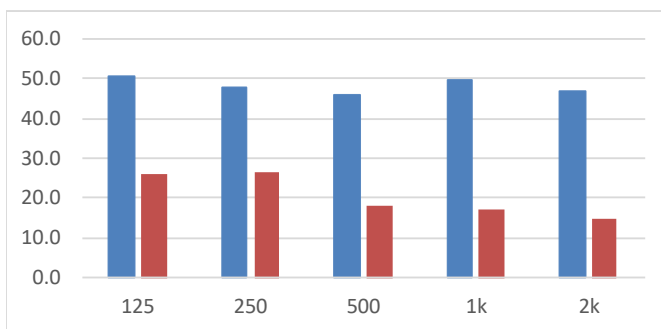
Room Properties

Room Width (m)	6.8
Room Depth (m)	4.9
Room Height (m)	2.6
Glazed Area (m ²)	3.5
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	34	27	37	35	34

Noise Levels, dB



External Level	52.9 dB LAeq
Internal Level	22.9 dB LAeq
Insertion Loss	30.0 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	32	D _{n,e,w+Ctr}	Hit & miss trickle vent Titon Trimvent XS13 4400EA

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	0.000225	0.0011	0.00011	0.0002	0.00023
Term 2	0.000788	0.002	0.00063	8E-05	3.9E-05
Term 3	6.37E-05	3E-05	2.5E-05	3E-06	1.3E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	25.9	26.6	18.3	17.2	14.8
Internal, dB LAeq	9.8	18.0	15.1	17.2	16.0

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Hit & miss trickle vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{st}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{tr}}{S} 10^{\frac{-R_{tr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night LAeq - (Zone 2)

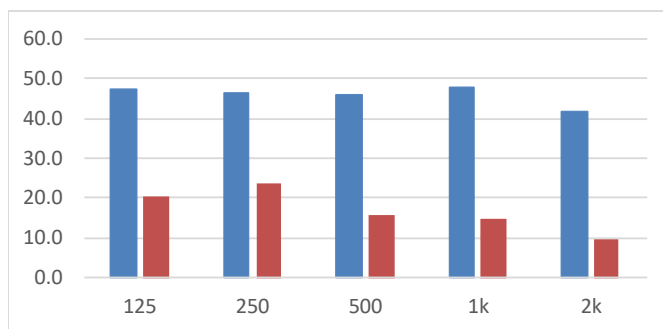
Room Properties

Room Width (m)	5.4
Room Depth (m)	4.5
Room Height (m)	2.6
Glazed Area (m ²)	1.8
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	34	27	37	35	34

Noise Levels, dB



External Level 50.3 dB LAeq

Internal Level 19.8 dB LAeq

Insertion Loss 30.5 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement

Glazing	25	dB R _{w+Ctr}
Ventilation	32	D _{n,e,w+Ctr}

Suitable Systems

Double Glazing
[4/12/4mm](#)
Hit & miss trickle vent
[Titon Trimvent XS13 4400EA](#)

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	0.000284	0.0014	0.00014	0.0002	0.00028
Term 2	0.00051	0.0013	0.00041	5E-05	2.6E-05
Term 3	6.92E-05	3E-05	2.8E-05	3E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	20.6	23.7	15.8	14.8	9.4
Internal, dB LAeq	4.5	15.1	12.6	14.8	10.6

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Hit & miss trickle vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{st}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{tr}}{S} 10^{\frac{-R_{tr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night Maxima (Zone 1)

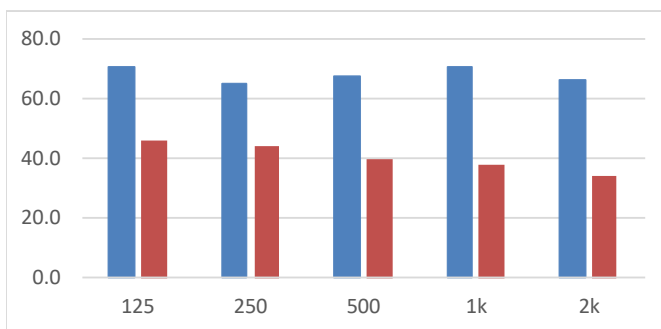
Room Properties

Room Width (m)	6.8
Room Depth (m)	4.9
Room Height (m)	2.6
Glazed Area (m ²)	3.5
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	34	27	37	35	34

Noise Levels, dB



External Level	72.8 dB LAmax
Internal Level	42.8 dB LAmax
Insertion Loss	30.0 dB LAmax

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	32	D _{n,e,w+Ctr}	Hit & miss trickle vent Titon Trimvent XS13 4400EA

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	0.000225	0.0011	0.00011	0.0002	0.00023
Term 2	0.000788	0.002	0.00063	8E-05	3.9E-05
Term 3	6.37E-05	3E-05	2.5E-05	3E-06	1.3E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	45.9	44.2	39.8	38.0	34.2
Internal, dB LAeq	29.8	35.6	36.6	38.0	35.4

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Hit & miss trickle vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{st}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{\pi}}{S} 10^{\frac{-R_{\pi}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night Maxima (Zone 2)

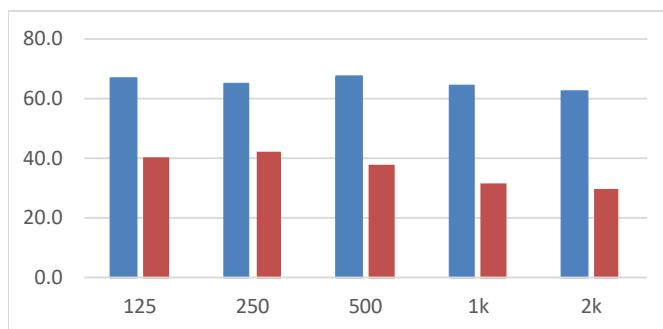
Room Properties

Room Width (m)	5.4
Room Depth (m)	4.5
Room Height (m)	2.6
Glazed Area (m ²)	1.8
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	34	27	37	35	34

Noise Levels, dB



External Level	68.0 dB LAmax
Internal Level	39.0 dB LAmax
Insertion Loss	29.0 dB LAmax

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	32	D _{n,e,w+Ctr}	Hit & miss trickle vent Titon Trimvent XS13 4400EA

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	0.000284	0.0014	0.00014	0.0002	0.00028
Term 2	0.00051	0.0013	0.00041	5E-05	2.6E-05
Term 3	6.92E-05	3E-05	2.8E-05	3E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	40.0	42.2	37.5	31.5	29.9
Internal, dB LA _{eq}	23.9	33.6	34.3	31.5	31.1

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	Hit & miss trickle vent

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{-\frac{D_{st}}{10}} + \frac{S_{wi}}{S} 10^{-\frac{R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{-\frac{R_{ew}}{10}} + \frac{S_{\pi}}{S} 10^{-\frac{R_{\pi}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

APPENDIX G – BS8233 Rigorous Design Calculations (Third Floor)

Daytime LAeq - (Zone 1)

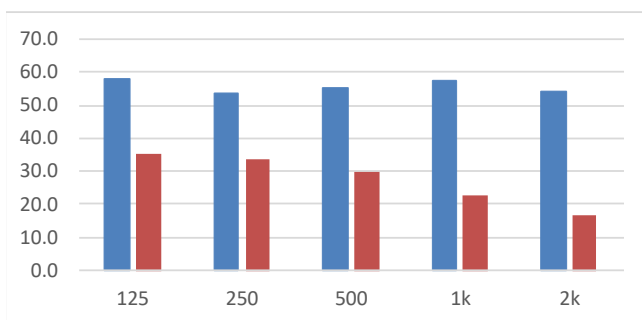
Room Properties

Room Width (m)	8.7
Room Depth (m)	7.8
Room Height (m)	2.6
Glazed Area (m ²)	7.0
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	41	45	45	54	58

Noise Levels, dB



External Level	60.6 dB LAeq
Internal Level	30.5 dB LAeq
Insertion Loss	30.1 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	-	D _{n,e,w+Ctr}	MVHR Nuaire MRXBOX-WM1

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	3.51E-05	1E-05	1.4E-05	2E-06	7E-07
Term 2	0.001232	0.0031	0.00098	0.0001	6.2E-05
Term 3	5.49E-05	2E-05	2.2E-05	3E-06	1.1E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	35.4	33.6	29.9	22.8	16.8
Internal, dB LAeq	19.3	25.0	26.7	22.8	18.0

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	MVHR

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{0,2}}{10}} + \frac{S_{w1}}{S} 10^{\frac{-R_{w1}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{g1}}{S} 10^{\frac{-R_{g1}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Daytime LAeq - (Zone 2)

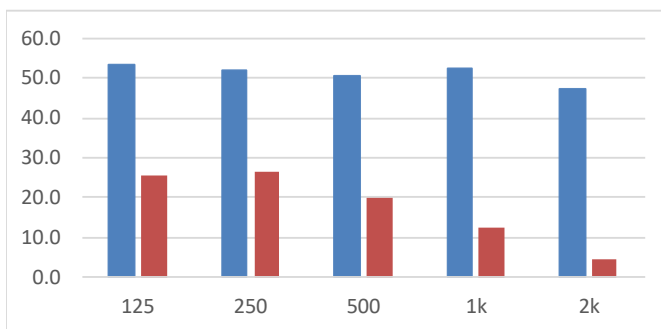
Room Properties

Room Width (m)	6.3
Room Depth (m)	5.0
Room Height (m)	2.6
Glazed Area (m ²)	1.8
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	41	45	45	54	58

Noise Levels, dB



External Level	55.2 dB LAeq
Internal Level	21.4 dB LAeq
Insertion Loss	33.8 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	-	D _{n,e,w+Ctr}	MVHR Nuair MRXBOX-WM1

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	4.85E-05	2E-05	1.9E-05	2E-06	9.7E-07
Term 2	0.000437	0.0011	0.00035	4E-05	2.2E-05
Term 3	7.07E-05	3E-05	2.8E-05	4E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	25.5	26.5	19.9	12.4	4.3
Internal, dB LAeq	9.4	17.9	16.7	12.4	5.5

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	MVHR

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{0,2}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{n}}{S} 10^{\frac{-R_{n}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night LAeq - (Zone 1)

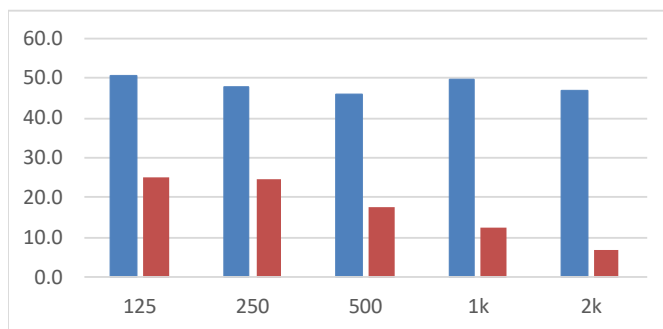
Room Properties

Room Width (m)	6.8
Room Depth (m)	4.9
Room Height (m)	2.6
Glazed Area (m ²)	3.5
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	41	45	45	54	58

Noise Levels, dB



External Level	52.9 dB LAeq
Internal Level	20.0 dB LAeq
Insertion Loss	32.9 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	-	D _{n,e,w+Ctr}	MVHR Nuair MRXBOX-WM1

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	4.49E-05	2E-05	1.8E-05	2E-06	9E-07
Term 2	0.000788	0.002	0.00063	8E-05	3.9E-05
Term 3	6.37E-05	3E-05	2.5E-05	3E-06	1.3E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	25.1	24.7	17.7	12.3	6.7
Internal, dB LAeq	9.0	16.1	14.5	12.3	7.9

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	MVHR

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{s,z}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{n}}{S} 10^{\frac{-R_{n}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night LAeq - (Zone 2)

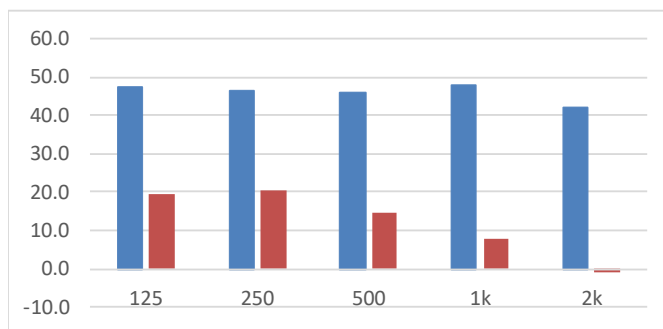
Room Properties

Room Width (m)	5.4
Room Depth (m)	4.5
Room Height (m)	2.6
Glazed Area (m ²)	1.8
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	41	45	45	54	58

Noise Levels, dB



External Level 50.3 dB LAeq

Internal Level 16.0 dB LAeq

Insertion Loss 34.3 dB LAeq

Sound Insulation Requirement

Minimum Sound Insulation Requirement

Glazing	25	dB R _{w+Ctr}
Ventilation	-	D _{n,e,w+Ctr}

Suitable Systems

Double Glazing
4/12/4mm
MVHR
Nuaire MRXBOX-WM1

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	5.66E-05	2E-05	2.3E-05	3E-06	1.1E-06
Term 2	0.00051	0.0013	0.00041	5E-05	2.6E-05
Term 3	6.92E-05	3E-05	2.8E-05	3E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	19.3	20.6	14.8	7.9	-1.0
Internal, dB LAeq	3.2	12.0	11.6	7.9	0.2

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	MVHR

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{st}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{n}}{S} 10^{\frac{-R_{n}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night Maxima (Zone 1)

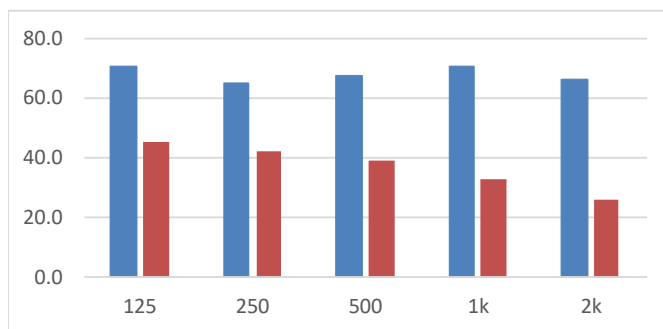
Room Properties

Room Width (m)	6.8
Room Depth (m)	4.9
Room Height (m)	2.6
Glazed Area (m ²)	3.5
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	41	45	45	54	58

Noise Levels, dB



External Level	72.8 dB LAmax
Internal Level	39.9 dB LAmax
Insertion Loss	32.9 dB LAmax

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	-	D _{n,e,w+Ctr}	MVHR Nuair MRXBOX-WM1

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	4.49E-05	2E-05	1.8E-05	2E-06	9E-07
Term 2	0.000788	0.002	0.00063	8E-05	3.9E-05
Term 3	6.37E-05	3E-05	2.5E-05	3E-06	1.3E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	45.1	42.3	39.2	33.1	26.1
Internal, dB LA _{eq}	29.0	33.7	36.0	33.1	27.3

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	MVHR

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{st}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{n}}{S} 10^{\frac{-R_{n}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Night Maxima (Zone 2)

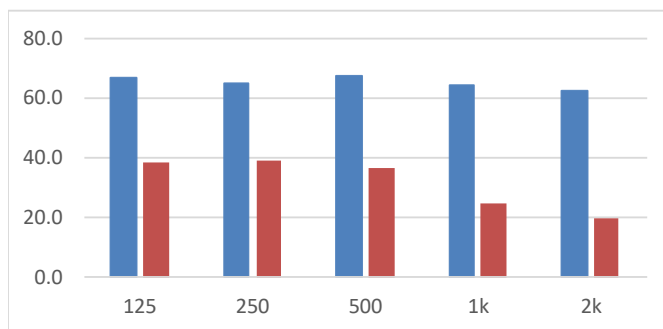
Room Properties

Room Width (m)	5.4
Room Depth (m)	4.5
Room Height (m)	2.6
Glazed Area (m ²)	1.8
Is dwelling within roof	☒

Sound Insulation Properties

Freq. Hz	125	250	500	1k	2k
Wall, dB R _{w+Ctr}	41	45	45	54	58
Roof, dB R _{w+Ctr}	41	45	45	54	58
Glazing, dB R _{w+Ctr}	24	20	25	34	37
Vents, D _{n,e,w+Ctr}	41	45	45	54	58

Noise Levels, dB



External Level	68.0 dB LAmax
Internal Level	35.9 dB LAmax
Insertion Loss	32.1 dB LAmax

Sound Insulation Requirement

Minimum Sound Insulation Requirement			Suitable Systems
Glazing	25	dB R _{w+Ctr}	Double Glazing 4/12/4mm
Ventilation	-	D _{n,e,w+Ctr}	MVHR Nuair MRXBOX-WM1

Technical Calculations

Frequency, Hz	125	250	500	1k	2k
Term 1	5.66E-05	2E-05	2.3E-05	3E-06	1.1E-06
Term 2	0.00051	0.0013	0.00041	5E-05	2.6E-05
Term 3	6.92E-05	3E-05	2.8E-05	3E-06	1.4E-06
Term 4	0	0	0	0	0
Internal, dB L _{eq}	38.7	39.1	36.5	24.6	19.5
Internal, dB LAeq	22.6	30.5	33.3	24.6	20.7

Façade Components

Wall	Brick and block, 75mm cavity
Roof	Not Within Roof Space
Glazing	Double Glazing
Vents	MVHR

Calculations conducted in accordance with BS8233:2014 rigorous calculation method

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{0,2}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{n}}{S} 10^{\frac{-R_{n}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$