
No.3 Warburton Street, Didsbury Noise Assessment Report



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Authorised by	Ryan Swales, BSc, MIOA Director & Principal Consultant
Signature	

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RS Acoustic Engineering Ltd

76 Marple Road

Stockport

SK2 5QH

Web: www.rsacoustic.co.uk

Email: info@rs-acoustic.co.uk

A company registered in England & Wales (No: 07604309)

Corporate Member of the Institute of Acoustics (MIOA)

Member of the Sound Insulation Testing & Measurement Association (SITMA)

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1. Introduction

- 1.1 RS Acoustic Engineering Ltd has been appointed by Belinda Hall to undertake a noise assessment with regard to a proposed material change of use at No.3 Warburton Street, Didsbury, Manchester, M20.
- 1.2 The proposals are to convert the mid-terraced property back into a self-contained residential dwelling. The property was most recently used as a physiotherapy clinic.
- 1.3 Manchester City Council granted prior approval on the 3rd June 2024, subject to two conditions (ref: 139780/P3MA/2024).
- 1.4 The dominant source of noise at the site is road traffic on Wilmslow Road. Other notable noise sources include overhead aircraft, passing pedestrians and intermittent trams.
- 1.5 A noise assessment has been undertaken taking into consideration the guidance contained within British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and ProPG's *Planning & Noise*. Manchester City Council's planning and noise guidance has also been taken into consideration.
- 1.6 This assessment is based on the results of an environmental noise survey undertaken by RS Acoustic Engineering Ltd. Continuous sound level monitoring was conducted over a number of days in order to establish the ambient sound pressure levels during the daytime and night-time period.
- 1.7 The measured sound level data has been used to determine the acoustic performance requirements for the building envelope construction and to determine whether it will be suitable to naturally ventilate habitable rooms via opening windows alone.
- 1.8 An assessment of noise ingress through the building envelope with windows open and closed has been undertaken to determine the resulting sound levels.
- 1.9 The guidance given within Approved Document F (Ventilation) and Approved Document O (Overheating) has also been taken into consideration with regard to noise ingress and opening windows.
- 1.10 The survey and assessment was conducted by Mr Ryan Swales (BSc(Hons), MIOA), Principal Acoustic Consultant and Member of the Institute of Acoustics.
- 1.11 The results of the noise survey have been presented, along with the assessment criteria and a discussion of the results with respect to the appropriate guidance and targets.
- 1.12 Recommendations regarding sound insulation, ventilation and noise mitigation are also provided within this report.

2. Assessment Guidance & Acoustic Criteria

Manchester City Council Prior Approval

2.1 With regard to noise, Manchester City Council have stipulated the following condition:

1) a) *Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise from the local traffic network shall be submitted to and approved in writing by the City Council as local planning authority. There may be other actual or potential sources of noise which require consideration on or near the site, including any local commercial premises and associated externally fixed plant. The approved noise insulation and ventilation scheme shall be completed before any of the dwelling units are occupied.*

b) *Prior to first occupation of the residential units, a verification report shall be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that the internal noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the internal noise criteria.*

Reason: To secure a reduction in noise from traffic or other sources in order to protect future residents from noise disturbance pursuant to policy DM1 of the Core Strategy and saved Unitary Development Plan policy DC26.

In order to discharge condition 1 of this approval noise survey data shall include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary. The following noise criteria shall be required to be achieved: Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events shall not exceed 45 dB $L_{Amax,F}$ by more than 10 times) Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq} Gardens and terraces (daytime) 55 dB L_{Aeq} .

British Standard 8233:2014: Guidance on sound insulation and noise reduction for buildings

2.2 BS 8233 provides guidance regarding acoustic criteria and noise levels appropriate for various types of space that have different functions.

2.3 With regard to dwellings, appropriate internal ambient sound levels are given for bedrooms, living rooms and dining rooms (habitable rooms). The guidelines take into consideration the effect of internal noise on sleep and also the effect of noise on resting, listening and communicating.

2.4 The internal sound level targets presented in Table 2.1 have been reproduced directly from the standard.

Table 2.1 - Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 2.5 Note 7 of the standard also suggests that in some circumstances it may be appropriate to relax the indoor ambient noise level targets by up to 5 dB:

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

- 2.6 Note 5 also states:

If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

World Health Organisation: Guidelines for community noise (1999)

- 2.7 To help avoid sleep disturbance within bedrooms, this historical guidance document recommends that the night-time internal ambient sound level should not exceed 30 dB $L_{Aeq,T}$ and the maximum sound level should not typically exceed 45 dB $L_{AFmax,T}$.
- 2.8 The corresponding values directly outside of bedroom windows are therefore 45 dB $L_{Aeq,8hour}$ and 60 dB $L_{AFmax,T}$. This is based on the assumption that a partially open window provides approximately 15 dB of sound attenuation (from external noise).
- 2.9 With regard to sleep disturbance and maximum L_{AFmax} sound levels, the study undertaken by Vallet & Vernet (1991) suggests that for good sleep, indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night.

Professional Practice Guidance on Planning & Noise (2017)

- 2.10 Professional Practice Guidance on Planning and Noise (ProPG) has been produced in order to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.
- 2.11 The NPPF encourages improved standards of design. This guidance document encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.
- 2.12 The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transportation sources.

Internal noise level guidelines

- 2.13 The recommended ProPG internal noise level guidelines are presented in Table 2.2. The guidelines reflect and extend current practice contained within BS 8233:2014.

Table 2.2 - ProPG internal noise level guidelines

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$

- 2.14 Where the local planning authority accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban

areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment.

- 2.15 In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide “*whole dwelling ventilation*” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.
- 2.16 It should also be noted that the internal noise level guidelines are generally not applicable under “*purge ventilation*” conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

External noise and amenity areas

- 2.17 The ProPG external amenity area noise assessment reflects and extends the advice contained within BS 8233:2014 and is summarised as follows:

(i) If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

(ii) The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.

(iii) These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.

(iv) Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.

(v) Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.*

3. Environmental Noise Survey

Survey methodology

- 3.1 Continuous sound level monitoring was conducted over a 44-hour period on the front elevation facing Warburton Street. The equipment was installed at first floor level (position A).
- 3.2 Measurements were performed from 14:30 hours on Monday 10th through to 10:30 hours on Wednesday 12th June 2024.
- 3.3 Continuous sound level monitoring was also conducted over a 43.5-hour period on the rear elevation. The equipment was again installed at first floor level (position B).
- 3.4 Measurements were performed from 15:00 hours on Monday 10th through to 10:30 hours on Wednesday 12th June 2024.
- 3.5 A measurement interval of 5-minutes was used during the survey and measurements were considered to be subject to sound reflections from the façade (as opposed to free field). One-third octave band and A-weighted broadband sound pressure levels were recorded during the survey.
- 3.6 The site location, surrounding area and survey measurement positions are shown in Figure 3.1 and Figure 3.2. The floor plans and elevations are presented in Appendix A.

Figure 3.1 - Site location and survey measurement positions (source: Google Earth)

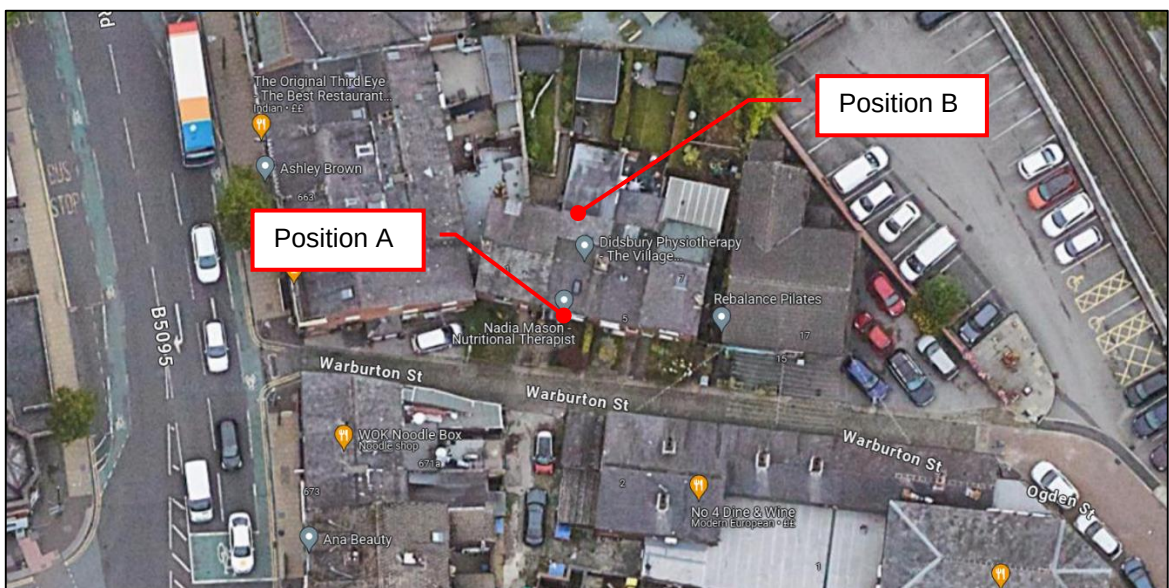


Figure 3.2 - Photographs showing survey measurement positions



Survey equipment

- 3.7 The survey was conducted using the following Class-1 specification equipment:
- Brüel & Kjaer 2250-Light sound level meter, microphone type 4189, pre-amplifier type ZC0032.
 - Brüel & Kjaer 2260 sound level meter, microphone type 4189, pre-amplifier type ZC0032.
 - CEL-120/1 Acoustic calibrator.
- 3.8 Calibration of the sound level meter and microphone used for the measurements are traceable to UKAS accredited laboratories (calibration certificates are available upon request).
- 3.9 The calibration of both sound level meter and microphone was checked using a 1 kHz tone at 94 dB prior to and following the measurements performed. Calibration drift was less than 0.1 dB.

Weather conditions

- 3.10 The weather conditions during the survey were generally dry and fine with a light cloud cover. Wind speed measurements taken outside of the building were between 0.8 and 2.1 m/s⁻¹.
- 3.11 The air temperature during the survey ranged between 7°C and 14°C. The overall weather conditions were considered suitable to obtain representative measurements.

Subjective observations of the acoustic environment

- 3.12 The dominant and consistent source of noise is road traffic on Wilmslow Road.
- 3.13 Vehicle movements along Warburton Street are sporadic and the associated noise is negligible over the course of the day.
- 3.14 Overhead aircraft is also a notable but infrequent source of noise.
- 3.15 Distant tram movements to the east are audible, however the noise level at the property is neither significant or likely to cause disturbance.
- 3.16 During the late afternoon site visit, continuous low-level plant noise was audible outside of the front elevation. The plant noise was thought to be associated with a neighbouring commercial kitchen extract fan. During the night-time site visit, there was no audible building services plant noise associated with the neighbouring properties.
- 3.17 Other notable sources of noise include passing pedestrians and intermittent vehicle movements in the small carpark to the north east.

Measured indices

- 3.18 Although a wide range of statistical sound level data was recorded during the survey, the L_{Aeq} and L_{AFmax} indices are of most interest in this instance:
- $L_{Aeq,T}$ - The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
 - $L_{AFmax,T}$ - The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of occasional loud noises).
- 3.19 Sound pressure level measurements are taken with an A-weighting (denoted by a subscript 'A', e.g. L_{Aeq}) to approximate the frequency response of the human ear.

Results summary

- 3.20 Table 3.1 presents a summary of the continuously measured sound pressure levels at the front elevation (Position A). Measured values have been rounded to the nearest whole number.

Table 3.1 - Summary of continuously measured sound pressure levels, front elevation

Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	10 th Highest ¹ $L_{AFmax,T}$ dB	15 th Highest ² $L_{AFmax,T}$ dB
Monday 10/06/2024	Daytime (14:30-23:00)	8.5	59	---	---
	Night-time (23:00-07:00)	8	50	70	69
Tuesday 11/06/2024	Daytime (07:00-23:00)	16	59	---	---
	Night-time (23:00-07:00)	8	50	68	67
Wednesday 12/06/2024	Daytime (07:00-10:30)	3.5	58	---	---
¹ The 10 th highest value from 96 measurement periods ² The 15 th highest value from 96 measurement periods (indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10-15 times per night).					

- 3.21 Table 3.2 presents a summary of the continuously measured sound pressure levels at the rear elevation (Position B). Measured values have been rounded to the nearest whole number.

Table 3.2 - Summary of continuously measured sound pressure levels, rear elevation

Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	10 th Highest ¹ $L_{AFmax,T}$ dB	15 th Highest ² $L_{AFmax,T}$ dB
Monday 10/06/2024	Daytime (15:00-23:00)	8	52	---	---
	Night-time (23:00-07:00)	8	48	65	64
Tuesday 11/06/2024	Daytime (07:00-23:00)	16	52	---	---
	Night-time (23:00-07:00)	8	48	61	58
Wednesday 12/06/2024	Daytime (07:00-10:30)	3.5	51	---	---
¹ The 10 th highest value from 96 measurement periods ² The 15 th highest value from 96 measurement periods (indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10-15 times per night).					

- 3.22 The daytime ambient L_{Aeq} sound pressures levels are approximately 7 dB lower on the rear elevation and the night-time sound pressure levels are approximately 2 dB lower (compared to the front elevation).
- 3.23 The ambient and background sound levels are presented graphically in Figure 3.3 and Figure 3.4 overleaf. Additional tabulated survey data can be made available upon request.

Figure 3.3 - Graph showing results of continuous sound level monitoring, front elevation

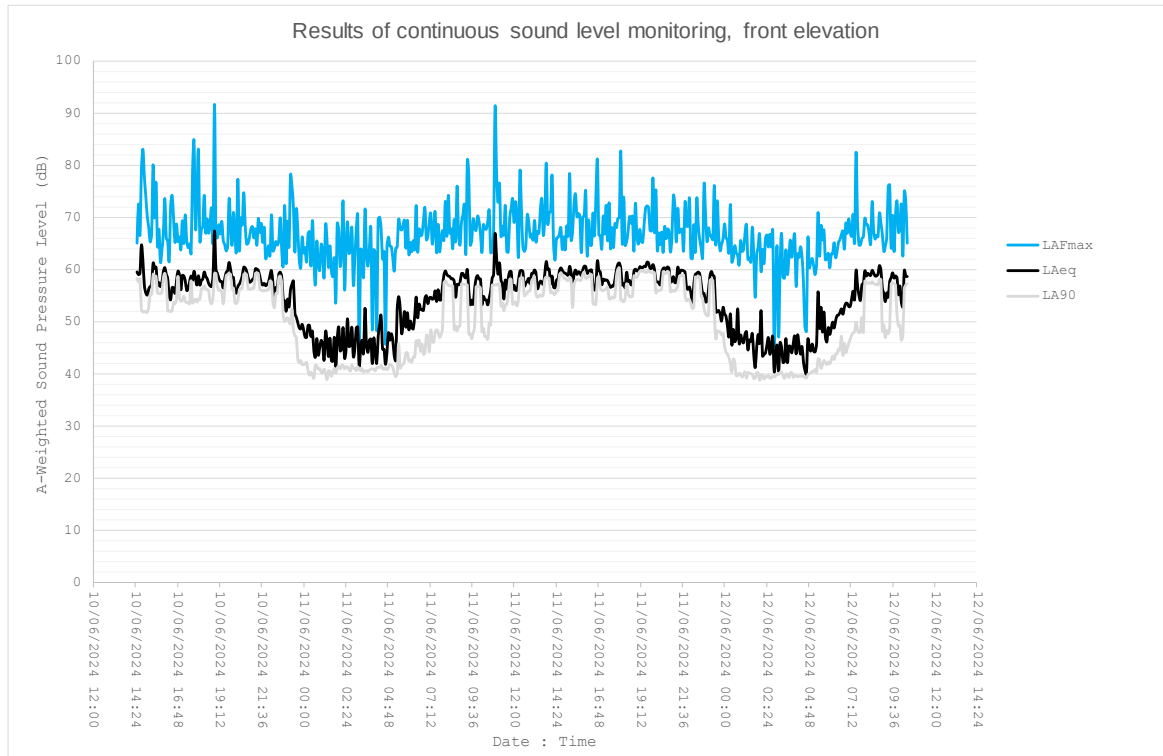
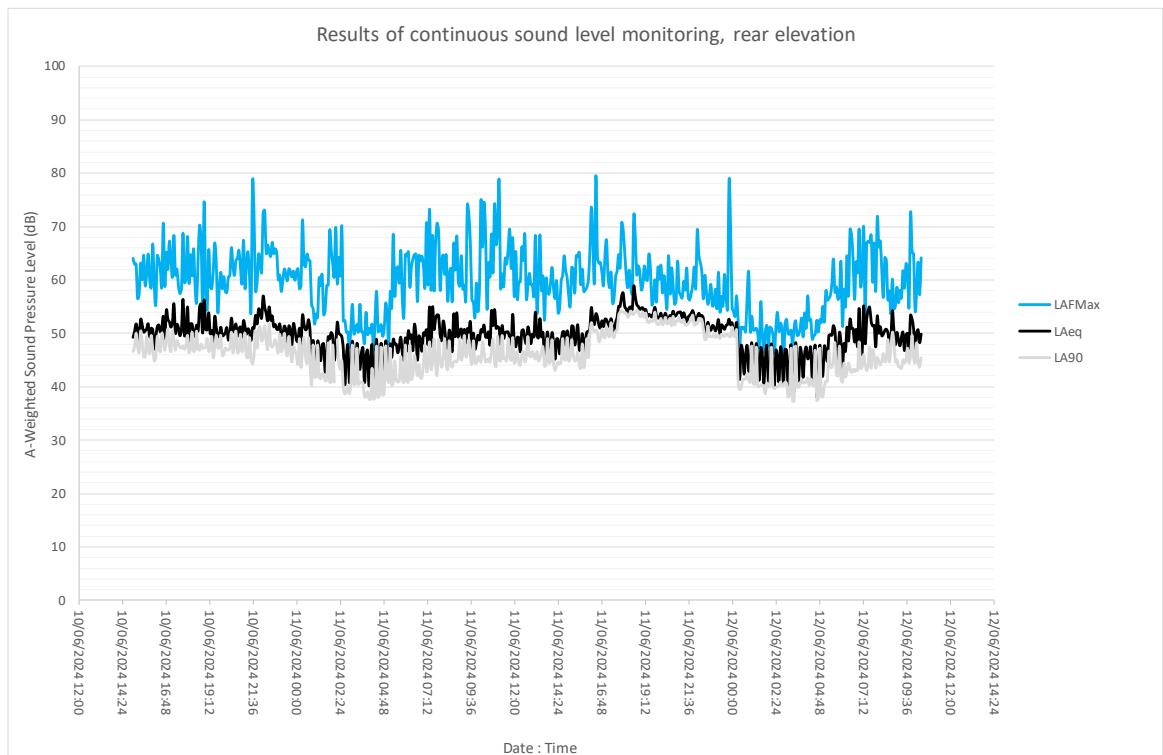


Figure 3.4 - Graph showing results of continuous sound level monitoring, rear elevation



4. Assessment & Discussion

Building envelope construction and acoustic performance

- 4.1 The external walls are of a traditional double-leaf brickwork construction. The sound insulation performance is expected to be approximately 50 to 60 dB R_w .
- 4.2 The roof and ceiling construction consists of a pitched tiled roof, mineral wool (loft) insulation and plasterboard ceiling. The roof and ceiling combination is expected to provide a sound insulation performance of approximately 40 to 50 dB R_w .
- 4.3 The windows to the ground floor kitchen/lounge on the rear elevation and the 1st floor bedroom on the front elevation are currently standard thermal double-glazed units fixed within uPVC frames. The construction appears to be 4 mm glass/18 mm cavity/4 mm glass.
- 4.4 The windows to the ground floor lounge on the front elevation and the 1st floor study on the rear elevation are currently standard double-glazed units fixed within timber frames. The construction appears to be 4 mm glass/12 mm cavity/4 mm glass.
- 4.5 The sound insulation performance of the existing double glazing is approximately 29 to 32 dB R_w .
- 4.6 Rapid/purge ventilation of the habitable rooms is currently achieved via opening windows. There are trickle vents to the front bedroom and ground floor kitchen/living room (Titon vents). There are currently no wall or window ventilator units to the ground floor lounge or 1st floor study.

Noise ingress with windows closed

Front lounge

- 4.7 Table 4.1 presents the noise ingress calculation results for the ground floor lounge on the front elevation facing Warburton Street. The highest daytime sound pressure level on the front elevation has been used in the calculation (59 dB $L_{Aeq,16hour}$).
- 4.8 The calculations take into account the sound insulation performance of each building element, surface area and internal room dimensions. Standard thermal double glazing consisting of 4 mm glass /12 – 18 mm cavity /4 mm glass has been assumed for the calculations.
- 4.9 The measured octave-band sound levels and typical reverberation time for a habitable room have also been taken into consideration.

Table 4.1 - Noise ingress calculation results (ground floor lounge)

Title: Front Lounge Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	R_w	(C, C_{tr})
			25.3	24.5	31.0	31.9	31.0	27.9				
L_{in}			39.7	37.5	25.0	21.1	16.0	12.1				
Materials												
4mm glass/18mm cavity/4mm glass	1.7		21.0	17.0	25.0	35.0	37.0	31.0			29	(-1,-4)
Double-leaf brickwork wall	4.3		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
Timber door	2.0		19.0	22.0	26.0	24.0	23.0	20.0			25	(-1,-2)
$L_{out,s}$												
$L_{out,2m}$		Add Element	65.0	62.0	56.0	53.0	47.0	40.0			59	
$L_{out,free field}$			62.0	59.0	53.0	50.0	44.0	37.0			56	
Element 1			25.3	24.5	31.0	31.9	31.0	27.9				
Plane façade	ΔL_{fs}	8.0	0.0	0.0	0.0	0.0	0.0	0.0				
Visible	X_{fs}	0.0	25.3	24.5	31.0	31.9	31.0	27.9				
$L_{p,out,2m}$			65.0	62.0	56.0	53.0	47.0	40.0			59	
$L_{p,in}$			39.7	37.5	25.0	21.1	16.0	12.1			31	dBA

- 4.10 The calculation results indicate a daytime internal sound level of approximately 31 dB $L_{Aeq,16hour}$ with standard double glazing.
- 4.11 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be achieved with windows closed.
- 4.12 The night-time sound level target applies to bedrooms and does not apply to lounges/living rooms.

Rear kitchen/living room

- 4.13 Table 4.2 presents the calculation results for the ground floor kitchen/living room on the rear north facing elevation. The highest daytime sound pressure level on the rear elevation has been used in the calculation (52 dB $L_{Aeq,16hour}$).

Table 4.2 - Noise ingress calculation results (ground floor kitchen/living room)

Title: Rear Kitchen/Living Room Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C _r ,C _{tr})
				26.8	22.9	30.9	40.8	42.8	36.9			
L _{in}				31.2	32.1	18.1	5.2	-2.8	-3.9			
Materials												
4mm glass/18mm cavity/4mm glass		3.6									29	(-1,-4)
Double-leaf brickwork wall		4.0									51	(-1,-4)
L _{out,s}												
	Add Element											
L _{out,2m}											52	
L _{out,free field}											49	
Element 1												
Plane façade	ΔL _{fs} X _{fs}	7.6 0.0									52	dB _A
Visible												
L _{p,out,2m}												
L _{p,in}												

- 4.14 The calculation results indicate a daytime internal sound level of approximately 25 dB $L_{Aeq,16hour}$ with standard double glazing.
- 4.15 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be achieved with windows closed.

Front bedroom

- 4.16 Table 4.3 presents the noise ingress calculation results for the 1st floor bedroom on the front elevation.

Table 4.3 - Noise ingress calculation results (1st floor bedroom)

Title: Front Bedroom Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
				25.4	24.6	32.2	40.7	43.5	38.8			
L _{in}			39.6	37.4	23.8	12.3	3.5	1.2				
Materials												
4mm glass/18mm cavity/4mm glass	1.8		21.0	17.0	25.0	35.0	37.0	31.0			29	(-1,-4)
Double-leaf brickwork wall	8.1		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	11.8		28.0	34.0	40.0	45.0	49.0	50.0			44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element			65.0	62.0	56.0	53.0	47.0	40.0		59	
L _{out,free field}				62.0	59.0	53.0	50.0	44.0	37.0		56	
Element 1				25.4	24.6	32.2	40.7	43.5	38.8			
Plane façade	ΔL _{fs}	21.7		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	X _{fs}	0.0		25.4	24.6	32.2	40.7	43.5	38.8			
L _{p,out,2m}				65.0	62.0	56.0	53.0	47.0	40.0		59	
L _{n,in}				39.6	37.4	23.8	12.3	3.5	1.2		31	dBA

- 4.17 The calculation results indicate a daytime internal sound level of approximately 31 dB $L_{Aeq,16hour}$ with standard double glazing.
- 4.18 Since the night-time L_{Aeq} sound level is approximately 9 dB lower than the daytime sound level, the night-time sound level target of 30 dB $L_{Aeq,8hour}$ will also be easily achieved.
- 4.19 With regard to the maximum L_{AFmax} internal sound levels, the recommended target of 45 dB L_{AFmax} will also be achieved within bedrooms for the majority of the night-time period.
- 70 dB $L_{AFmax,5min}$ – 28 dB R_w+C_{tr} = 42 dB $L_{AFmax,5min}$

Rear study

- 4.20 Table 4.4 presents the calculation results for the 1st floor study on the rear elevation. Since the study could be potentially used as a bedroom, the daytime and night-time sound level targets are appropriate in this instance.

Table 4.4 - Noise ingress calculation results (1st floor study)

Title: Rear Study/Bedroom Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
				23.7	22.5	30.1	38.7	41.5	36.6			
L _{in}				34.3	32.5	18.9	7.3	-1.5	-3.6			
Materials												
4mm glass/12mm cavity/4mm glass	1.2										29	(-1,-4)
Double-leaf brickwork wall	6.9										51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	6.6										44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element										52	
L _{out,free field}											49	
Element 1												
Plane façade	ΔL _{fs}	14.7										
Visible	X _{fs}	0.0										
L _{p,out,2m}											52	
L _{p,in}											26	dBA

- 4.21 The calculation results indicate a daytime internal sound level of approximately 26 dB $L_{Aeq,16hour}$ with standard double glazing.
- 4.22 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ and the night-time target of 30 dB $L_{Aeq,8hour}$ will therefore be easily achieved with windows closed.
- 4.23 The recommended target of 45 dB L_{AFmax} will also be achieved for the majority of the night-time period.

Assessment summary

- 4.24 The existing double glazing and associated frames can be retained on the front and rear elevations. Standard double glazing will be appropriate for any new/replacement units.
- 4.25 Additional noise mitigation measures such as installing new replacement acoustically-laminated double glazing or secondary glazed units in addition to the existing units is unnecessary.

Noise ingress with windows open

4.26 The level of sound attenuation through an open window is dependent on the type and size of window, the extent of opening, the angle of sound incidence and the characteristics of the noise source in question.

4.27 It is reasonable to assume a sound attenuation performance of approximately 15 dB for a partially open window. Partially open windows will provide background ventilation only, as opposed to rapid/purge ventilation.

4.28 BS 8233 provides the following guidance regarding the sound insulation from an open window:

If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB³. ³⁾ Note that the level difference through a window partially open for ventilation can vary significantly depending on the window type and the frequency content of the external noise. If the specific details of the window and external noise are known the value for insulation may be adjusted accordingly.

Front lounge

4.29 Daytime façade sound pressure levels are approximately 59 dB $L_{Aeq,16hour}$ and night-time sound pressure levels are approximately 50 dB $L_{Aeq,8hour}$.

4.30 When assessing noise ingress through an open window, it is appropriate to correct the measured sound levels at the façade by approximately -3 dB to give an equivalent free-field sound level.

4.31 The corresponding 'free-field' sound pressure levels are therefore 56 dB $L_{Aeq,16hour}$ during the daytime and 47 dB $L_{Aeq,8hour}$ during the night-time.

4.32 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 41 dB $L_{Aeq,16hour}$ during the daytime.

Daytime

- $56 \text{ dB } L_{Aeq,16hour} - 15 \text{ dB} = 41 \text{ dB } L_{Aeq,16hour}$

4.33 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will not be achieved with the window open.

4.34 The night-time sound level target applies to bedrooms and not lounges.

Front bedroom

4.35 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 41 dB $L_{Aeq,16hour}$ during the daytime and 32 dB $L_{Aeq,8hour}$ during the night-time.

Daytime

- $56 \text{ dB } L_{Aeq,16hour} - 15 \text{ dB} = 41 \text{ dB } L_{Aeq,16hour}$

Night-time

- $47 \text{ dB } L_{Aeq,8hour} - 15 \text{ dB} = 32 \text{ dB } L_{Aeq,8hour}$

4.36 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ and the night-time target of 30 dB $L_{Aeq,8hour}$ will therefore not be achieved with the window open.

Alternative ventilation to habitable rooms

4.37 BS 8233 states where occupants rely on closed windows to meet the internal noise limits, there needs to be appropriate *alternative ventilation* that does not compromise the facade sound insulation or resulting internal sound level.

4.38 BS 8233 also provides the following comment with regard to ventilation:

The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

Front lounge

4.39 On the basis of the guidance above, it is recommended that an alternative means of ventilation is provided for the lounge (in addition to opening windows).

4.40 Taking into consideration the measured sound levels, a suitable noise mitigation measure would be to install a good quality acoustic (sound attenuating) ventilator unit to the front elevation.

4.41 Installing a background ventilator directly through a wall that provides the equivalent areas described in Approved Document F can also be an acceptable route to compliance (as opposed to installing the ventilator unit within the window frame).

4.42 It is anticipated that installing a ventilator unit to the lounge will be the simplest and most cost effective noise mitigation measure (compared to installing mechanical ventilation).

4.43 Further guidance regarding ventilator types and acoustic performance is provided below.

4.44 It will be appropriate to provide rapid or purge ventilation by fully opening the window (e.g. to remove odour from painting and decorating or from burnt food).

Front bedroom

4.45 There is a controllable trickle vent in the existing Velux roof-light which appears to be in good working order. Taking into consideration the size of the room, the trickle vent should be sufficient for providing background ventilation.

4.46 It will be appropriate to provide rapid or purge ventilation by fully opening the window (e.g. to remove odour from painting and decorating or from burnt food).

Rear kitchen/living room

4.47 Daytime façade sound pressure levels are approximately 52 dB $L_{Aeq,16hour}$ and night-time sound pressure levels are approximately 48 dB $L_{Aeq,8hour}$.

4.48 The corresponding 'free-field' sound pressure levels are therefore 49 dB $L_{Aeq,16hour}$ during the daytime and 45 dB $L_{Aeq,8hour}$ during the night-time.

4.49 On this basis, the internal sound level is expected to be approximately 34 dB $L_{Aeq,16hour}$ during the daytime and approximately 30 dB $L_{Aeq,8hour}$ during the night-time.

Daytime

- 49 dB $L_{Aeq,16hour}$ – 15 dB = 34 dB $L_{Aeq,16hour}$

4.50 The daytime sound level target will be achieved with the window open.

4.51 The night-time sound level target applies to bedrooms and not kitchens/living rooms.

4.52 Since the recommended target will be achieved with windows open, an alternative method of ventilation is considered unnecessary.

4.53 However, the existing Titon trickle vents in the window frames appear to be in good working order and are expected to provide sufficient background ventilation.

Rear study

- 4.54 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 34 dB $L_{Aeq,16hour}$ during the daytime and 30 dB $L_{Aeq,8hour}$ during the night-time.

Daytime

- 49 dB $L_{Aeq,16hour}$ – 15 dB = 34 dB $L_{Aeq,16hour}$

Night-time

- 45 dB $L_{Aeq,8hour}$ – 15 dB = 30 dB $L_{Aeq,8hour}$

- 4.55 The daytime and night-time sound level targets will be achieved with the window open.
- 4.56 The maximum sound level target of 45 dB L_{AFmax} will also be typically achieved during the night-time period.
- 4.57 Since the recommended targets will be achieved with the window open, an alternative method of ventilation is considered unnecessary for the rear study.

Overheating and opening windows

- 4.58 Approved Document O (Overheating) applies to new-build residential dwellings, however the guidance is also worth noting for existing dwellings and those undergoing a material change of use.
- 4.59 With regard to noise at night and opening windows, the document states the following:

In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- 55 dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).

- 4.60 The predicted internal sound levels are below the noise limits given within Approved Document O which indicates that occupants are likely to open bedroom windows during the night to help cool and remove excess heat from the bedrooms.

Ventilation and noise mitigation

Acoustically rated ventilator units

- 4.61 Manually controlled trickle ventilators are the most common type of background ventilator and can be located over the window frames, in the frames, just above the glass or directly through the wall.
- 4.62 Sound attenuating (acoustically rated) ventilator units can be installed to habitable rooms, in order to allow background ventilation whilst maintaining a high acoustic performance from the facade.
- 4.63 The new ventilator unit should provide a sound insulation performance of at least **32 dB $D_{n,e,w}$** in the open position.
- 4.64 For guidance, example manufacturers of acoustically-rated ventilator units include:
- [EHA² | Aereco](#)
 - <https://www.greenwood.co.uk/acoustic-ventilation/aab>
 - <https://brookvent.co.uk/wall-vents/>

- 4.65 The minimum 'equivalent area' of background ventilators for natural ventilation should follow the guidance in Table 1.7 of Approved Document F for each room type.

Single room heat recovery ventilation unit

- 4.66 Heat recovery units are designed to improve indoor air quality and lower the risk of condensation. Single room heat recovery units tend to be more efficient than traditional extract ventilation systems, but are not as complex to install as the centralised packaged units for the whole building.
- 4.67 Example wall mounted systems include:

- [Wall-Mounted Ventilation System | Mitsubishi Electric](#)

Mechanically assisted ventilation

- 4.68 A further option with regard to ventilating and cooling habitable rooms whilst achieving a high facade sound insulation would be to use a mechanical ventilation system, such as a heat recovery system (MVHR) or positive input ventilation system (PIV).
- 4.69 Example suppliers of MVHR and PIV systems include:
- www.nuaire.co.uk/residential/positive-input-ventilation
 - www.envirovent.com/specifier/products/heat-recovery-systems/
- 4.70 With a loft mounted motor and control unit, particular attention should be paid to the construction of bedroom ceilings and the mounting of the motor unit in order to minimise the noise transmission into adjacent rooms. It is commonplace for a double-boarded ceiling construction and acoustically enhanced loft-hatch to be used where there is a loft mounted motor/control unit.

Ambient sound level in outdoor living areas

- 4.71 With regard to outdoor living areas (gardens), BS 8233 provides the following guidelines:
- For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external 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. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*
- 4.72 ProPG also states the following with regard to noise levels:
- The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.*
- 4.73 The measured façade sound pressure level at the rear of the property was 52 dB $L_{Aeq,16hour}$ during the daytime period. The equivalent free-field sound pressure level is 49 dB $L_{Aeq,16hour}$ (e.g. when stood away from the rear elevation).
- 4.74 The daytime ambient sound pressure level within the rear garden area is therefore expected to achieve and even improve on the upper guideline value of 55 dB $L_{Aeq,16hour}$ which is considered appropriate for residential amenity space.
- 4.75 Noise mitigation measures for the rear garden are therefore unnecessary.

5. Conclusion

- 5.1 The external walls and roof construction will provide sufficient sound insulation from external noise and do not require acoustic enhancement.
- 5.2 The existing double glazing and associated frames can be retained on the front and rear elevations. Standard double glazing will be appropriate for any new/replacement units.
- 5.3 The recommended sound level targets will be achieved during the daytime and night-time period with windows closed.
- 5.4 With the window open, the daytime sound level target will not be achieved within the front lounge. It is recommended that an alternative means of ventilation is provided for this habitable room, such as installing a good quality acoustic ventilator unit within the wall or window frame.
- 5.5 The sound level targets will also not be achieved within the front bedroom with the window open. However, there is currently a frame mounted trickle vent that provides background ventilation to the room and therefore an additional ventilator unit is unnecessary.
- 5.6 An alternative method of ventilation is unnecessary for the kitchen/living room and study on the rear elevation, since the daytime and night-time sound level targets will be achieved with windows open.
- 5.7 The recommended guideline value of 50 to 55 dB $L_{Aeq,16hour}$ will be achieved within the rear garden area. Noise mitigation measures such as an acoustic fence are unnecessary.

Appendix A

Floor plans and elevations

Figure A.1 - Existing floor plans and elevations

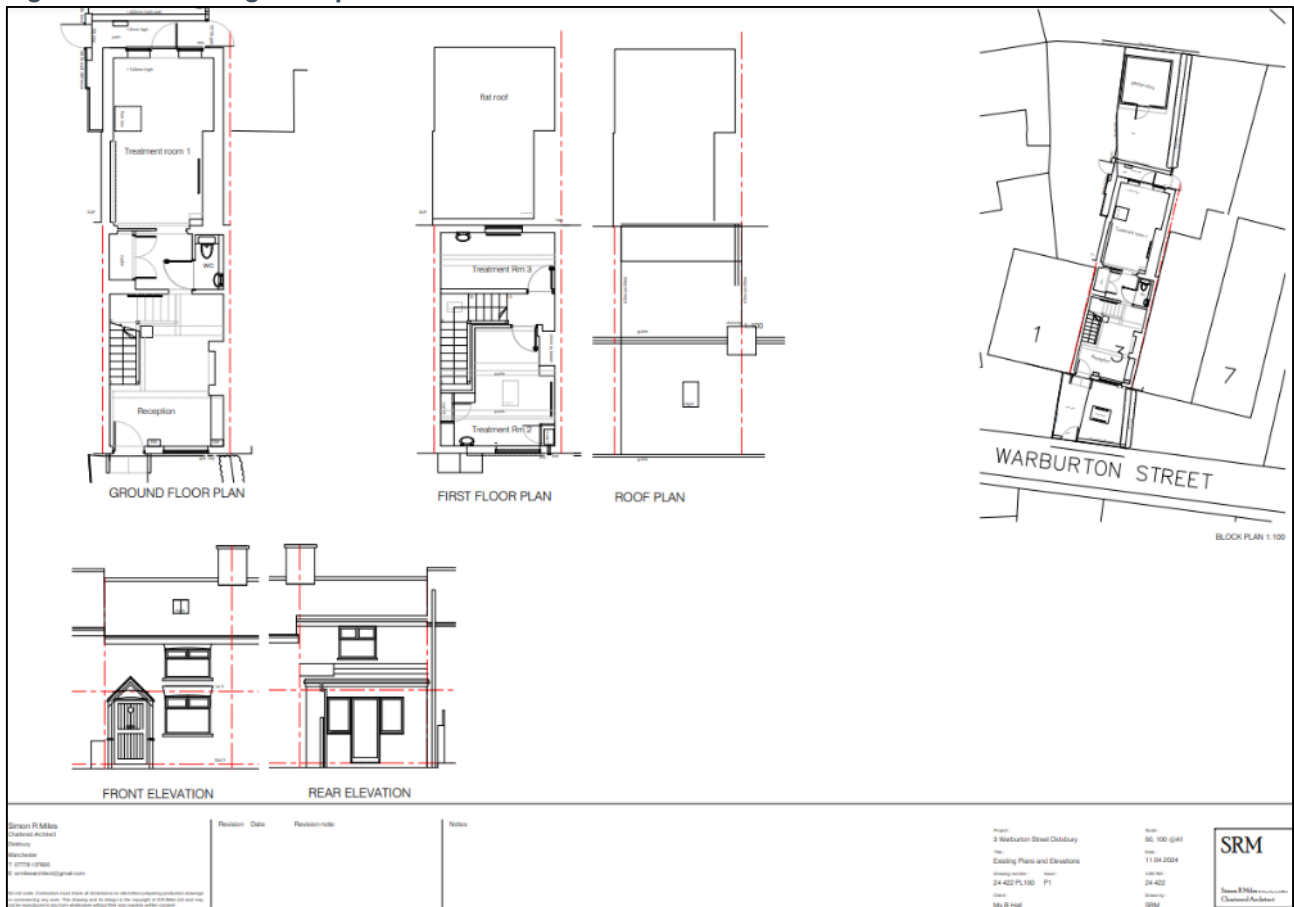


Figure A.2 - Proposed floor plans and elevations



Appendix B

Assessment terminology

Assessment terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2 \times 10^{-5} \text{Pa}$).
dB(A)	The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc, according to the parameter being measured.
Acoustic environment	Sound from all sources as modified by the environment.
Ambient sound level	The totally encompassing sound in a given situation at a given time; it is usually composed of sound from many sources, near and far.
Equivalent continuous sound level - $L_{Aeq,T}$	The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
Maximum sound level - $L_{AFmax,T}$	The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of intermittent loud noises).
Background sound level - $L_{A90,T}$	The sound pressure level that is exceeded for 90% of the measurement time interval, T. $L_{A90,T}$ is often used to describe the 'background' sound level.
Habitable room	Any room used or intended to be used for sleeping, cooking, living or eating purposes (enclosed spaces such as bath or toilet facilities, service rooms, corridors, laundries, hallways, utility rooms or similar spaces are excluded from this definition).
R_w	The weighted sound reduction index expressed in dB. A single number quantity for airborne sound insulation rating.
Free-field level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other significant reflective surfaces. Generally as measured outside and away from buildings (>3.5metres).