
**Proposed Residential Development
Land to the East of No.21 Great Jones Street**

Noise Assessment Report

Project: Great Jones Street, Manchester

Client: Olsady Homes Ltd

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Signature	

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1. Introduction

- 1.1 RS Acoustic Engineering Ltd has been appointed by Olsady Homes Ltd to undertake a noise assessment with regard to a proposed residential development on a parcel of land to the east of No.21 Great Jones Street, Manchester, M12.
- 1.2 The proposals are to construct a total of four two-storey dwellings directly adjacent to a row of existing terraced dwellings that are situated along Great Jones Street.
- 1.3 Full planning permission was granted on the 25 February 2020 for two dwellings subject to a number of conditions (ref: 125667/FO/2019). Full planning permission was subsequently granted for an additional two dwellings on the 23 June 2022 (ref: 132856/FO/2022).
- 1.4 There is a noise related planning condition which states that a scheme for acoustically insulating the proposed residential accommodation needs to be submitted and approved by the local planning authority prior to the occupation of the dwellings.
- 1.5 A noise assessment has been undertaken taking into consideration the guidance contained within British Standard (BS) 8233:2014 *Guidance on sound insulation and noise reduction for buildings*.
- 1.6 This assessment is based on the results of an environmental noise survey undertaken at the site by RS Acoustic Engineering Ltd. Fully attended sound level monitoring was conducted at the site to establish the existing noise 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 intrusion through the building envelope with windows open and closed has been undertaken and the resulting sound levels determined.
- 1.9 An assessment of noise within garden areas has also been undertaken to determine whether noise barriers are necessary at the development site.
- 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 acoustic performance targets.
- 1.12 Recommendations regarding sound insulation, ventilation and noise mitigation are also provided.

2. Assessment Guidance & Acoustic Criteria

Manchester City Council Planning Conditions

2.1 Manchester City Council granted full planning permission for the development on the 25 February 2020 for two dwellings subject to a number of conditions (ref: 125667/FO/2019). Full planning permission was subsequently granted for an additional two dwellings on the 23 June 2022 (ref: 132856/FO/2022).

2.2 With regard to noise, condition number 5 applies:

5). Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise from surrounding roads 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/industrial premises or plant associated with commercial premises. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

Noise survey data must include measurements taken during a rush-hour period and night-time period to determine the appropriate sound insulation measures necessary.

Reason: To secure a reduction in noise from traffic or other sources in order to protect future residents from noise disturbance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.

Manchester City Council: Planning & Noise Technical Guidance

2.3 With regard to residential developments, Manchester City Council typically stipulates the following noise criteria:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally 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} .

2.4 These criteria have been adopted for the following reasons:

- BS 8233: 2014 recognises these levels as a good standard for resting/sleeping conditions.
- The WHO document 'Guidelines for Community Noise' recommends an internal L_{Aeq} of 30 dB for optimal sleep conditions (and no more than 35 dB for internal rooms during daytime).
- The performance of acoustic insulation schemes can often be below that specified, according to the quality of installation, materials, noise spectrum and deterioration / wear and tear of building elements. A high design specification introduces a 'safety margin' should building elements not perform as well as expected ('on-site' performance).
- Performance specification for glazing does not usually take into account the detrimental effect of vents on the sound insulation. Even 'acoustic' vents will reduce the performance of the facade insulation, as they will inherently contain a free open area for air exchange.
- There is a general increase in urban noise levels, which can in the future be reasonably accommodated by these standards.
- The standards support the Local Authority corporate objective to prevent ill-health and improve local people's health and well-being.

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

- 2.5 BS 8233 provides guidance regarding acoustic criteria and noise levels appropriate for various types of space that have different functions.
- 2.6 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.
- 2.7 The internal sound level targets presented in Table 2.1 have been reproduced directly from Table 4 of BS 8233.

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 $L_{Aeq,8hour}$

- 2.8 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.

- 2.9 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.

- 2.10 With regard to outdoor living areas (gardens), the following guidance is given:

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.

Professional Practice Guidance on Planning & Noise (2017)

- 2.11 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.

- 2.12 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.
- 2.13 The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transportation sources.
- 2.14 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 $L_{Amax,F}$

- 2.15 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.
- 2.16 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.
- 2.17 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).

World Health Organisation: Guidelines for community noise (1999)

- 2.18 The guidelines and corresponding sound level targets within this historical document also corroborate those given within BS 8233. The guideline values are to help avoid speech interference, annoyance and sleep disturbance within dwellings.
- 2.19 The study undertaken by Vallet & Vernet suggests that for good sleep, indoor maximum sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10 to 15 times per night.

3. Environmental Noise Survey

Survey methodology

- 3.1 Several site visits and fully attended sound level measurements were conducted on Thursday 24, Friday 25 June 2021 and Wednesday 21 December 2022, in order to observe the local acoustic environment and determine the existing ambient sound pressure levels.
- 3.2 It was not possible to install monitoring equipment unattended over an extended period due to local security constraints (the site is open, accessible and unsecure).
- 3.3 Sample measurements were conducted during early morning peak traffic flow (07:00 to 09:00 hours), early afternoon, early evening and during the night-time period to determine the typical ambient sound pressure levels impacting on the site.
- 3.4 Measurements were subject to free-field conditions (away from reflective surfaces) and the microphone was tripod mounted at a height of approximately 1.2 metres from the ground.
- 3.5 The site location, surrounding area and survey measurement position are shown in Figure 3.1 and Figure 3.2.
- 3.6 The proposed site layout, floor plans and elevations are presented in Appendix A.

Figure 3.1 - Site location and survey measurement position (Source: Google Maps)



Figure 3.2 - Photographs showing survey measurement position



Survey equipment

- 3.7 The survey was conducted using the following Class-1 specification equipment:
- Brüel & Kjaer 2250-Light data logging sound level meter, microphone type 4189 and 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 on-site were typically 1.1 to 2.2 m/s⁻¹.
- 3.11 The air temperature during the survey ranged between 10°C and 20°C. The overall weather conditions were considered suitable to obtain representative measurements.

Subjective observations of the acoustic environment

- 3.12 The dominant source of background noise at the site is a combination of road traffic flow on Belle Vue Street to the east, Hyde Road (A57) to the south and Pottery Lane (A6010) to the west. Local ambient noise is due to sporadic vehicles on Great Jones Street, Boundary Street and Birch Street.
- 3.13 The site is set-back from the major roads and is screened by intervening buildings which consequently serve to reduce the noise levels impacting on the site.
- 3.14 Operational noise associated with the adjacent commercial premises was negligible during the site visits. The roller shutters to the unit face directly on to Milne Close and are therefore screened from the site. There was no significant plant or machinery noise associated with the premises during the survey.
- 3.15 Other noted sources of noise include high altitude aircraft, passing pedestrians and domestic activity at neighbouring dwellings.
- 3.16 It was noted that neighbouring dwellings along Great Jones Street and Milne Close have standard thermal double glazing with uPVC frames and frame mounted trickle vents for ventilation.

Measured indices

3.17 Although a wide range of statistical sound level data was recorded during the survey, the L_{Aeq} and $L_{A_{fmax}}$ indices are of most interest here:

- $L_{Aeq,T}$ – 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).
- $L_{A_{fmax},T}$ – The A-weighted ‘maximum’ sound pressure level that occurred during a given period, T (commonly used for the assessment of occasional loud noises).

3.18 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

3.19 Table 3.1 presents a summary of the measured L_{Aeq} ambient sound pressure levels. Measured values have been rounded to the nearest whole number.

Table 3.1 - Summary of measured ambient L_{Aeq} sound pressure levels

Date	Period	Duration, T (hours)	$L_{Aeq,60min}$ dB	Highest $L_{Aeq,5min}$ dB	Lowest $L_{Aeq,5min}$ dB
Thursday 24/06/2021	Daytime (07:00-08:00)	1	45	48	43
	Daytime (08:00-09:00)	1	49	53	44
	Daytime (13:25-14:25)	1	52	54	50
	Evening (20:00-21:00)	1	46	50	44
	Night-time (23:00-00:00)	1	44	46	42
Friday 25/06/2021	Night-time (00:00-01:00)	1	44	47	42
Wednesday 21/12/2022	Daytime (16:00-17:00)	1	50	53	44

3.20 The daytime ambient sound pressure levels ranged between 43 to 54 dB $L_{Aeq,5min}$. The hourly sound pressure levels ranged between 45 to 52 dB $L_{Aeq,60min}$ and the average sound level over a five-hour period is 49 dB $L_{Aeq,5hour}$.

3.21 The night-time ambient sound pressure levels ranged between 42 to 47 dB $L_{Aeq,5min}$. The hourly sound pressure level was 44 dB $L_{Aeq,60min}$.

3.22 Table 3.2 overleaf presents a summary of the measured $L_{A_{fmax}}$ sound pressure levels. Measured values have been rounded to the nearest whole number.

Table 3.2 - Summary of measured maximum L_{AFmax} sound pressure levels

Date	Period	Duration, T (hours)	Average $L_{AFmax,T}$ dB	Highest $L_{AFmax,5min}$ dB	Lowest $L_{AFmax,5min}$ dB
Thursday 24/06/2021	Daytime (07:00-08:00)	1	58	76	49
	Daytime (08:00-09:00)	1	66	78	53
	Daytime (13:25-14:25)	1	76	83	71
	Evening (20:00-21:00)	1	59	65	55
	Night-time (23:00-00:00)	1	58	70	48
Friday 25/06/2021	Night-time (00:00-01:00)	1	58	69	47
Wednesday 21/12/2022	Daytime (16:00-17:00)	1	68	78	53

4. Assessment & Discussion

Building envelope construction and acoustic performance

- 4.1 External walls are expected to be of a brickwork/cavity/blockwork construction. The sound insulation performance of such a construction is typically in the region of 45 to 55 dB R_w+C_{tr} .
- 4.2 A tiled roof construction with mineral wool (loft) insulation and an internal plasterboard finish typically provides a sound insulation performance in the region of 39 to 43 dB R_w+C_{tr} .
- 4.3 Standard double glazing typically provides a sound insulation performance in the region of 25 to 30 dB R_w+C_{tr} .
- 6 mm glass / 16 mm - 20 mm cavity / 4 mm glass (28 - 30 dB R_w+C_{tr})
 - 6 mm glass / 16 mm - 20 mm cavity / 6 mm glass (27 - 29 dB R_w+C_{tr})
 - 4 mm glass / 16 mm - 20 mm cavity / 4 mm glass (25 - 27 dB R_w+C_{tr})
- 4.4 Laminated (acoustic) double glazing as is commonly used within dwellings provides a sound insulation performance in the region of 31 to 37 dB R_w+C_{tr} .
- 6 mm glass / 16 mm - 20 mm cavity / 10.8 mm acoustic laminate (35 - 37 dB R_w+C_{tr})
 - 6 mm glass / 16 mm - 20 mm cavity / 8.8 mm acoustic laminate (33 - 35 dB R_w+C_{tr})
 - 6 mm glass / 16 mm - 20 mm cavity / 6.8 mm acoustic laminate (31 - 33 dB R_w+C_{tr})
- 4.5 As an example, Pilkington Optiphon is a high performing acoustic laminate that can be used within double glazed systems.
- www.pilkington.com/en-gb/uk/products/product-categories/noise-control/pilkington-optiphon/
- 4.6 The glazing is expected to be the weakest element with regard to the building envelope sound insulation (excluding ventilator units).
- 4.7 With standard double glazing, the composite sound insulation of the building envelope is expected to be in the region of 32 to 34 dB R_w+C_{tr} .
- 4.8 The quantity R_w is the weighted sound reduction index expressed in dB. It is a single number quantity for rating airborne sound insulation. The 'C_{tr}' term is added to the single number rating R_w to take account of the characteristics of particular sound spectra (e.g. road traffic).
- 4.9 The acoustic performance of a particular construction may differ slightly between manufacturers and therefore the sound insulation performance should be verified where possible.
- 4.10 To achieve the optimum performance, external windows should be well sealed around the frame when installed. Large gaps between the frame and the brickwork and poorly sealed frames can notably reduce performance.

Noise ingress with windows closed

- 4.11 The calculation results for the ground floor lounge, first floor bedroom, second floor study and second floor master bedroom (end plot) are presented in Table 4.1 to 4.4 below. It is assumed that the study could be used as a habitable room/bedroom at a later date.
- 4.12 The highest one-hour daytime L_{Aeq} sound pressure level has been used in the calculation (52 dB $L_{Aeq,60min}$). The measured free-field sound level has also been corrected by +3 dB in order to represent a facade sound level.
- 4.13 Standard thermal double glazing consisting of 4 mm glass, 16 - 20 mm cavity, 4 mm glass has been assumed for all habitable rooms.
- 4.14 The calculation takes into account the typical sound insulation performance of each building element, surface area and estimated room dimensions. Small bedrooms generally experience higher noise levels than lounges due to the smaller room volume.
- 4.15 The measured octave band sound levels and the typical reverberation time for a habitable room have also been taken into consideration.

Table 4.1 - Noise ingress calculation results, lounge

Title: Great Jones Street (Lounge)												
Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
L_{in}			24.1	20.2	28.1	38.1	40.1	34.2				
			31.9	31.8	21.9	13.9	4.9	3.8				
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	4.7		21.0	17.0	25.0	35.0	37.0	31.0			29	(-1,-4)
Brickwork / blockwork cavity wall	4.3		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
$L_{out,s}$												
$L_{out,2m}$	Add Element		56.0	52.0	50.0	52.0	45.0	38.0			55	
$L_{out,free field}$			53.0	49.0	47.0	49.0	42.0	35.0			52	
Element 1			24.1	20.2	28.1	38.1	40.1	34.2				
Plane façade	ΔL_{fs} 9.0		0.0	0.0	0.0	0.0	0.0	0.0				
Visible	x_{fs} 0.0		24.1	20.2	28.1	38.1	40.1	34.2				32
$L_{p,out,2m}$			56.0	52.0	50.0	52.0	45.0	38.0			55	
$L_{p,in}$			31.9	31.8	21.9	13.9	4.9	3.8			25	dBA

Table 4.2 - Noise ingress calculation results, bedroom 02

Title: Great Jones Street (Bedroom 02)												
Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
L_{in}			26.3	22.5	30.4	40.0	42.3	36.5				
			29.7	29.5	19.6	12.0	2.7	1.5				
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	1.6		21.0	17.0	25.0	35.0	37.0	31.0			29	(-1,-4)
Brickwork / blockwork cavity wall	8.5		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
$L_{out,s}$												
$L_{out,2m}$	Add Element		56.0	52.0	50.0	52.0	45.0	38.0			55	
$L_{out,free field}$			53.0	49.0	47.0	49.0	42.0	35.0			52	
Element 1			26.3	22.5	30.4	40.0	42.3	36.5				
Plane façade	ΔL_{fs} 10.1		0.0	0.0	0.0	0.0	0.0	0.0				
Visible	x_{fs} 0.0		26.3	22.5	30.4	40.0	42.3	36.5				34
$L_{p,out,2m}$			56.0	52.0	50.0	52.0	45.0	38.0			55	
$L_{p,in}$			29.7	29.5	19.6	12.0	2.7	1.5			23	dBA

Table 4.3 - Noise ingress calculation results, study

Title: Great Jones Street (Study) Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
				23.3	22.2	29.8	38.5	41.2	36.4			
L _{in}				32.7	29.8	20.2	13.5	3.8	1.6			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	0.6		21.0	17.0	25.0	35.0	37.0	31.0			29	(-1,-4)
Brickwork / blockwork cavity wall	2.0		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	3.4		28.0	34.0	40.0	45.0	49.0	50.0			44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element		56.0	52.0	50.0	52.0	45.0	38.0			55	
L _{out,free field}			53.0	49.0	47.0	49.0	42.0	35.0			52	
Element 1			23.3	22.2	29.8	38.5	41.2	36.4				
Plane façade	ΔL _{fs}	6.0	0.0	0.0	0.0	0.0	0.0	0.0				
Visible	X _{fs}	0.0	23.3	22.2	29.8	38.5	41.2	36.4				34
L _{p,out,2m}			56.0	52.0	50.0	52.0	45.0	38.0			55	
L _{p,in}			32.7	29.8	20.2	13.5	3.8	1.6			24	dBA

Table 4.4 - Noise ingress calculation results, master bedroom

Title: Great Jones Street (Master Bedroom) Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
				25.6	27.1	34.2	41.6	44.9	41.5			
L _{in}				30.4	24.9	15.8	10.4	0.1	-3.5			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	1.8										29	(-1,-4)
Brickwork / blockwork cavity wall	14.3										51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	34.4										44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element										55	
L _{out,free field}											52	
Element 1												
Plane façade	ΔL _{fs}	50.5										
Visible	X _{fs}	0.0										38
L _{p,out,2m}											55	
L _{n,in}											20	dBA

- 4.16 The calculation results indicate a daytime internal sound level of approximately 20 to 25 dB L_{Aeq,60min} with standard thermal double glazing.
- 4.17 The daytime sound level target of 35 dB L_{Aeq,16hour} and the night-time sound level target of 30 dB L_{Aeq,8hour} will therefore be easily achieved within habitable rooms with windows closed.
- 4.18 With regard to the maximum L_{AFmax} internal sound levels, for the majority of the night-time period the recommended target of 45 dB L_{AFmax} will also be achieved.
- 70 dB L_{AFmax,T} - 32 dB R_w+C_{tr} = 38 dB L_{AFmax,T} internally.
- 4.19 Standard thermal double glazing will therefore provide sufficient sound insulation with regard to external noise ingress.
- 4.20 On the basis of this assessment, additional noise mitigation for habitable rooms is considered unnecessary (e.g. installing acoustically laminated double glazing and/or thick heavy panes of glass).

Noise ingress with windows open

- 4.21 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.
- 4.22 It is considered reasonable to assume a sound attenuation performance of approximately 15 dBA for a partially open window. Partially open windows are expected to provide background ventilation only (as opposed to rapid/purge ventilation).
- 4.23 The free-field daytime sound pressure level was 45 to 52 dB $L_{Aeq,60min}$ and the average sound level over a five-hour period was 49 dB $L_{Aeq,5hour}$.
- 4.24 The free-field night-time sound pressure level was 44 dB $L_{Aeq,60min}$.
- 4.25 Assuming a partially open window provides 15 dBA of sound attenuation, the resulting daytime internal sound level is predicted to be approximately 30 to 37 dB $L_{Aeq,60min}$ over a one-hour period and approximately 34 dB $L_{Aeq,5hour}$ when averaged over a five-hour period.
- 4.26 The resulting internal night-time sound level is predicted to be approximately 29 dB $L_{Aeq,60min}$.
- 52 dB $L_{Aeq,60min}$ – 15 dB = 37 dB $L_{Aeq,60min}$ (daytime)
 - 49 dB $L_{Aeq,5hour}$ – 15 dB = 34 dB $L_{Aeq,5hour}$ (daytime)
 - 44 dB $L_{Aeq,60min}$ – 15 dB = 29 dB $L_{Aeq,60min}$ (night-time)
- 4.27 The ideal 35 dB $L_{Aeq,16hour}$ daytime and 30 dB $L_{Aeq,8hour}$ night-time sound level targets will therefore be achieved with windows open.
- 4.28 On an hourly basis there will be an occasional exceedance, however when averaged over several hours or a full day/night-time period, the sound level targets will be achieved.
- 4.29 Taking into consideration the sporadic vehicle movements on Great Jones Street during the night-time period, it is anticipated that the recommended maximum sound level target of 45 dB $L_{AFmax,T}$ will also be achieved with windows open.
- 4.30 It should be noted that BS 8233 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.*
- 4.31 BS 8233 states that 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.
- 4.32 The standard 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.*
- 4.33 Taking into consideration the predicted internal sound levels, an alternative method of ventilation such as a mechanical ventilation system is considered unnecessary.
- 4.34 Standard trickle vents could be fitted to the window frames of habitable rooms in order to provide background ventilation when the windows are closed.
- 4.35 It is considered appropriate for windows to be openable in order to provide rapid or purge ventilation (e.g. to remove odour from painting and decorating or from burnt food).

- 4.36 It should be noted that the rear elevations will be acoustically screened from passing road traffic and therefore the resulting internal sound level will be notably lower than the front elevation.

Opening windows and overheating

- 4.37 With regard to noise at night and opening windows, Approved Document O (Overheating) 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.

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

- 4.38 The predicted internal sound levels will be below these limits which indicates that residents will open windows during the night to help remove excess heat from the bedroom.

Garden ambient sound levels

- 4.39 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.

- 4.40 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 $L_{Aeq,16hr}$.

- 4.41 The hourly daytime sound pressure level was 45 to 52 dB $L_{Aeq,60min}$ and the average sound level over a five-hour period was 49 dB $L_{Aeq,5hour}$.

- 4.42 The measured sound levels fall within the guideline values which are considered to be appropriate for residential amenity space. It is anticipated that a good acoustic standard will be achieved within garden areas and it is highly unlikely that future residents will be annoyed by road traffic noise.

- 4.43 Acoustic barriers/fences are therefore not required for the rear garden areas.

5. Ventilation & Noise Mitigation Options

Acoustically rated ventilator units

- 5.1 Manually controlled trickle ventilators (the most common type of background ventilators) can be located over the window frames, in window frames, just above the glass or directly through the wall.
- 5.2 Sound attenuating ventilator units can be installed to habitable rooms, in order to allow background ventilation whilst maintaining a high sound insulation performance from the facade.
- 5.3 It is recommended that the ventilator unit provides a sound insulation performance of at least 28 dB $D_{n,e,w}$ (in the open position).
- 5.4 Example manufacturers of acoustically-rated ventilator units include:
 - www.aereco.co.uk/products-and-systems/
 - www.greenwood.co.uk/acoustic
 - <http://brookvent.co.uk/product/airvent-sm-acoustic/>

Mechanically assisted ventilation

- 5.5 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).
- 5.6 Example suppliers of MVHR and PIV systems include:
 - www.envirovent.com/specifier/products/heat-recovery-systems/
 - www.envirovent.com/specifier/products/positive-input-ventilation/
 - www.greenwood.co.uk/range/5/heat-recovery-mvhr.html
- 5.7 Appropriate dwelling ventilation rates will depend on the number of bedrooms within the dwelling and the anticipated occupancy rate (refer to Approved Document F for guidance).
- 5.8 Such systems can also be supplied with a 'boost' function in order to reduce the need to open windows for purge ventilation.
- 5.9 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.
- 5.10 On the basis of the survey results and predicted noise levels, full mechanical ventilation is considered unnecessary.

Single room heat recovery ventilation units

- 5.11 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.
- 5.12 Example single room heat recovery units include:
 - [heatSava | Single Room Heat Recovery System | EnviroVent](#)
 - [Single Room MVHR \(bpcventilation.com\)](http://bpcventilation.com)

6. Conclusion

- 6.1 Standard thermal double glazing and a traditional building envelope construction will provide sufficient sound insulation for all habitable rooms.
- 6.2 A suitable glazing construction would be 4 mm glass / 16 – 20 mm cavity / 4 mm glass.
- 6.3 It is unnecessary to provide additional noise mitigation to habitable rooms such as installing acoustically laminated double glazing and/or thick heavy panes of glass.
- 6.4 The ideal 35 dB $L_{Aeq,16hour}$ daytime and 30 dB $L_{Aeq,8hour}$ night-time sound level targets will be easily achieved within all habitable rooms with windows closed.
- 6.5 With windows open, appropriate sound levels and good acoustic conditions are anticipated within all dwellings during the daytime and night-time period.
- 6.6 Taking into consideration the predicted sound levels, an alternative method of ventilation such as a full mechanical ventilation system is considered unnecessary for habitable rooms.
- 6.7 It is appropriate to install standard frame-mounted trickle vents to habitable rooms in order to provide background ventilation with windows closed. Opening windows are suitable for providing rapid/purge ventilation.
- 6.8 Appropriate daytime sound levels and good acoustic conditions are anticipated for the proposed garden areas. Additional mitigation such as a noise barrier to garden boundaries is considered unnecessary.
- 6.9 The noise related planning condition (no.05) can be discharged.

Appendix A

Proposed site plan, floor plans and elevations

Figure A.1 - Proposed site plan

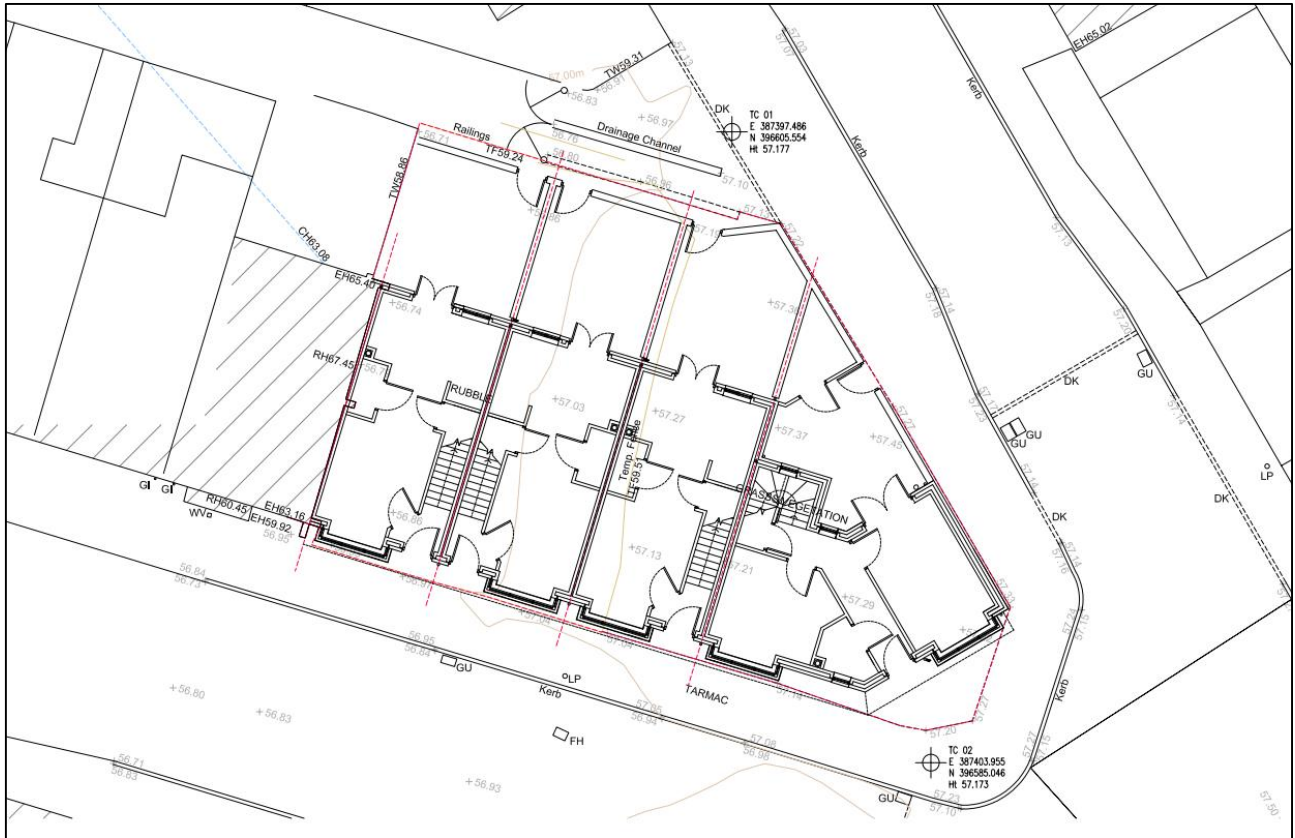


Figure A.2 - Proposed ground and first floor plan

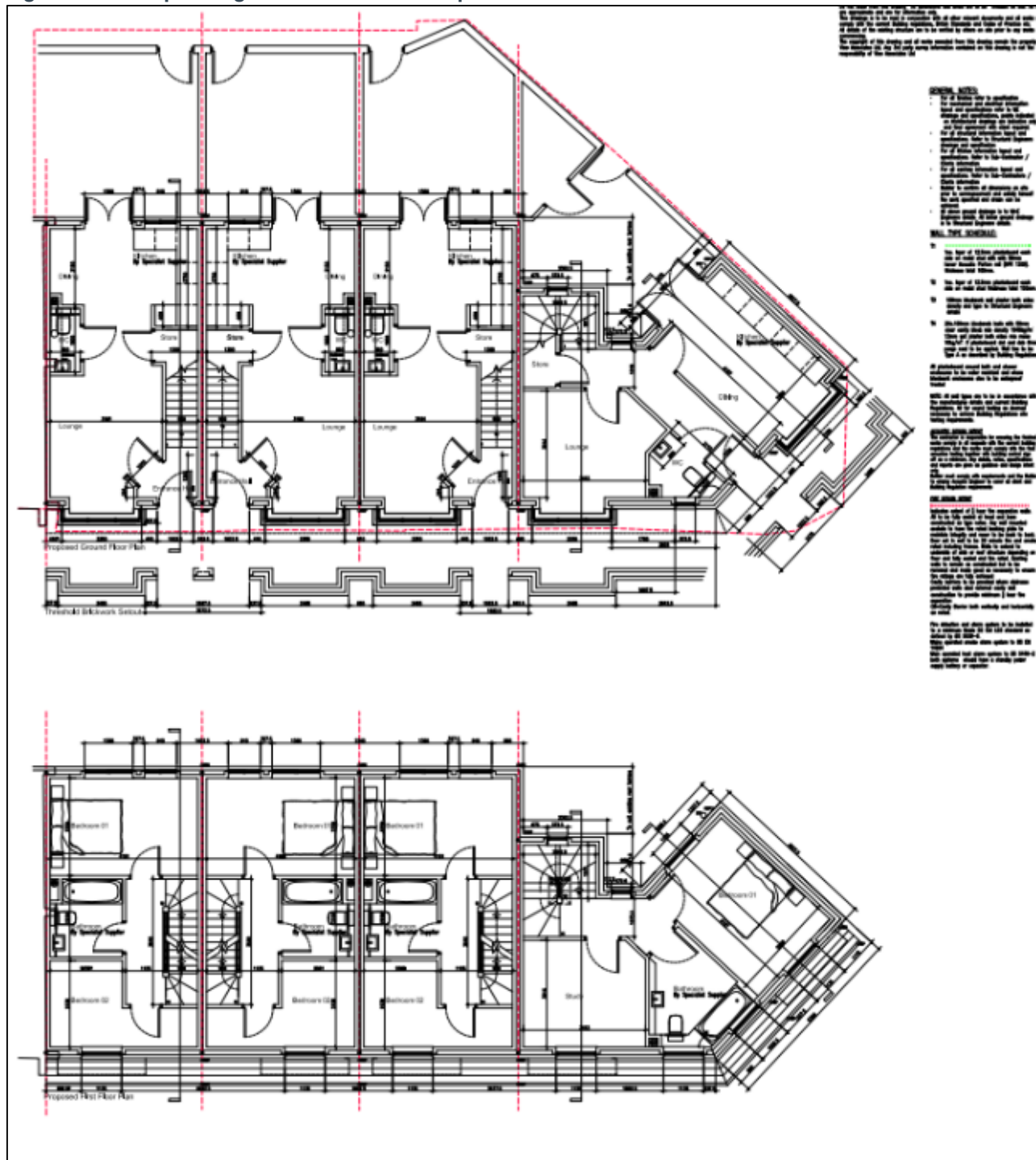


Figure A.3 - Proposed second floor and roof plan

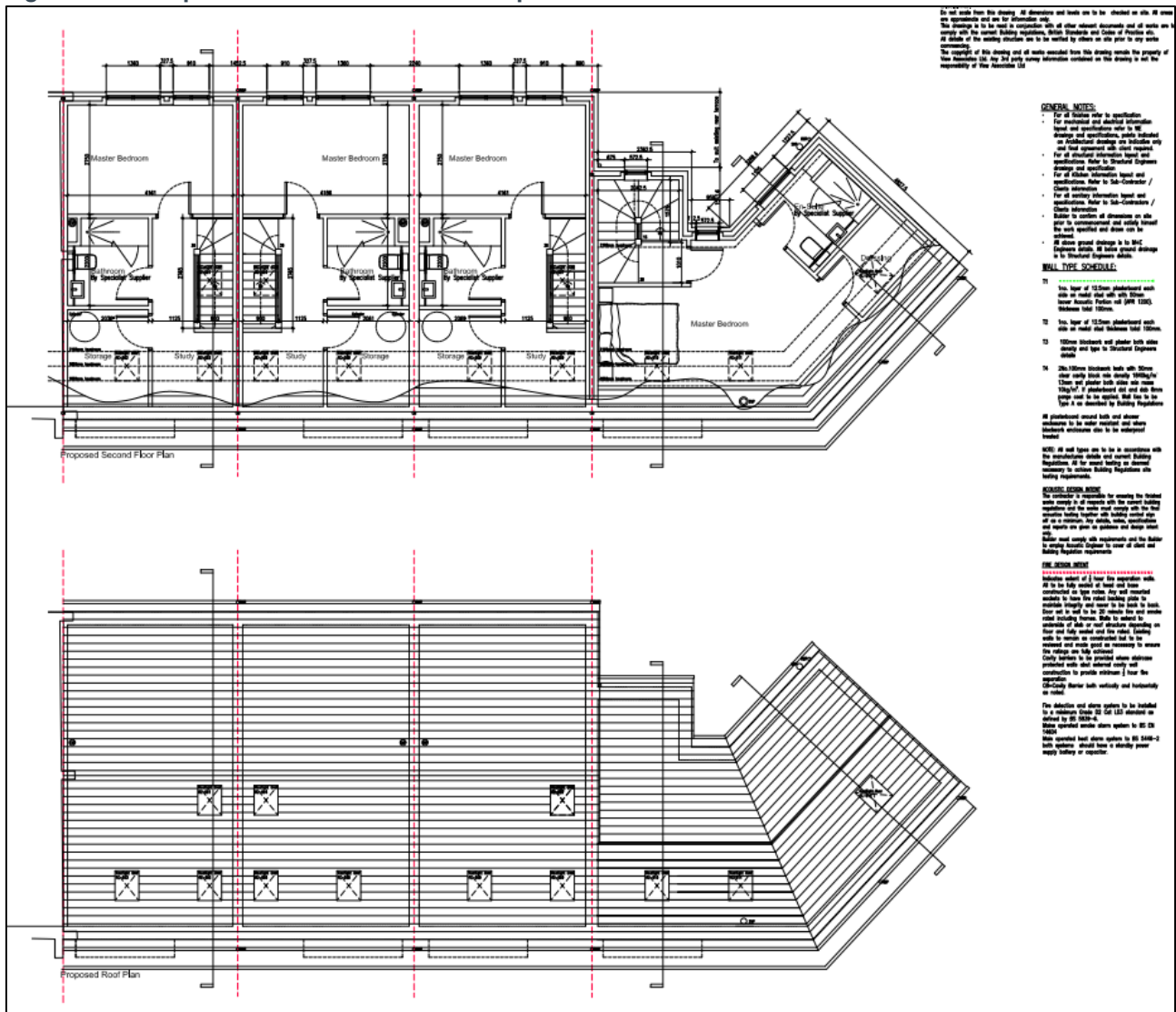
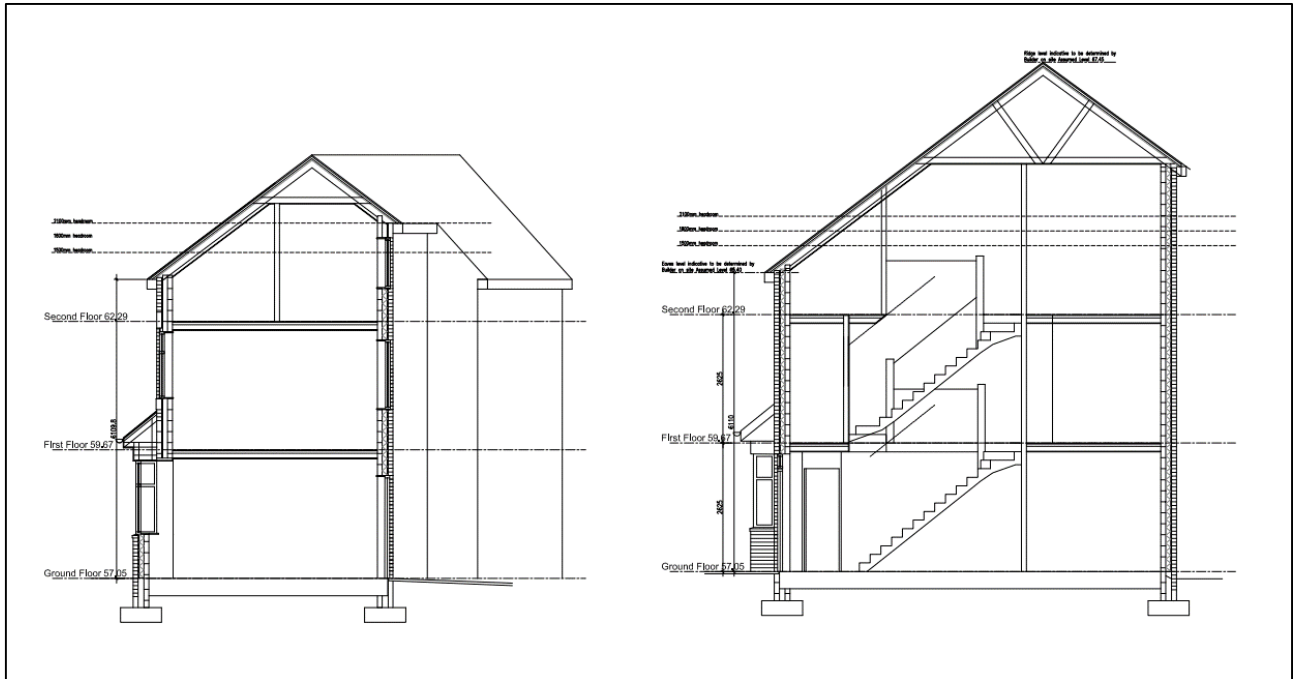


Figure A.4 - Proposed elevations



Figure A.5 - Proposed sections



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).