



**NOISE IMPACT ASSESSMENT & SOUND INSULATION
ADVICE**

196 & 197 PARROCK STREET, GRAVESEND

XENIA DEVELOPMENTS LTD

JUNE 2023

NOISE IMPACT ASSESSMENT & SOUND INSULATION ADVICE

196 & 197 PARROCK STREET, GRAVESEND

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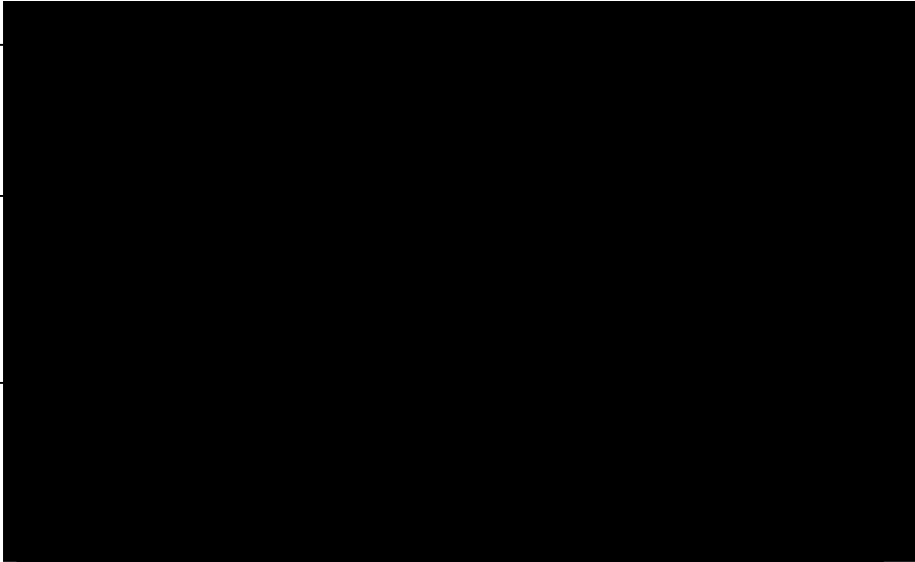
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CONTENTS

1	INTRODUCTION	6
2	SITE DESCRIPTION	7
3	EXTERNAL BUILDING FABRIC	9
4	INTERNAL BUILDING FABRIC	15
5	CONCLUSIONS	21
6	REFERENCES	22
A	ENVIRONMENTAL NOISE SURVEY DETAILS	25
B	DETAILED EXTERNAL NOISE BREAK-IN CALCULATIONS	30
C	DETAILED SOUND INSULATION TEST RESULTS	33
D	ACOUSTIC WALL MARK-UPS	36

1 INTRODUCTION

Anderson Acoustics has been appointed by Xenia Developments Ltd to provide acoustic consultancy services for the refurbishment of the property at 196 and 197 Parrock Street, Gravesend.

The property is a 4-storey listed building that was previously used as offices and will be converted to provide residential accommodation (HMO).

This report addresses the acoustic design of the development to ensure the internal ambient noise levels within the proposed accommodation satisfy the relevant guidelines (BS8233:2014). Further advice has been given to inform the treatment required to the existing separating constructions between habitable rooms in order to comply with the Approved Document E of the Building Regulations.

A brief description of the site is given in Section 2.

Section 3 presents the results of an assessment of the external building fabric and provides performance specifications for glazing and ventilation.

Section 4 reviews the sound insulation performance of the existing separating elements between rooms and other relevant areas. Outline advice on junction detailing, penetrations and doors is also provided.

The report is summarised in Section 5.

A glossary of acoustic terminology can be viewed on our [website](#).

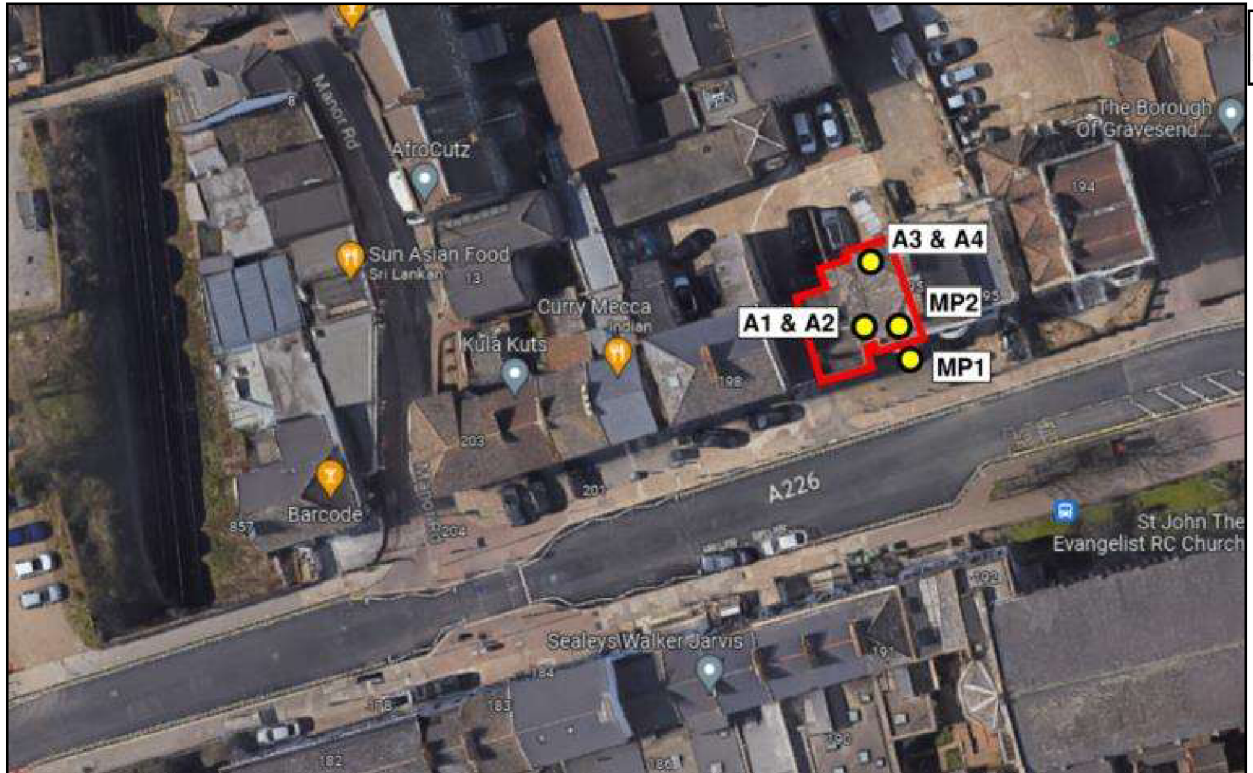
2 SITE DESCRIPTION

The project involves the refurbishment of a listed property formerly used as offices to provide the following:

- 1 No. self-contained flat at basement level
- 9 No. dwellings (with en-suites) and 2 shared kitchen areas spread ground, 1st, 2nd and 3rd floors.

The site location is shown in Figure 2.1 below.

Figure 2.1: Site Location – Unattended (MP) and attended (A) monitoring locations, site boundary (red) (Google Maps ®)



The site is bound to the north, east and west by mixed residential/commercial premises, with Parrock Street (A226) to the south and residential buildings and more commercial premises across the road (including a church). Approximately 90m to the east is the Southern Eastern and Thameslink railway line serving Gravesend station.

Observations during site visits indicated that the noise climate was mostly dominated by road traffic. Parrock Street (A226) was the dominant noise source at the front elevation, road traffic from the A245 was also discernible across the rear elevation but was significantly quieter. Train pass-bys were significantly quiet compared to road traffic noise, this is due to both distance and the building elevation being fully screened from the railway line. The rear of site serves a small parking area for surrounding commercial and residential properties – it was noted that activity here was minimal.

The existing front and rear façades of the building consist of single glazed sash windows with masonry non-glazed elements. The extent of the property's front and rear elevations is shown in Figures 2.1 and 2.2 below:

Figure 2.1: Front elevation, extent of properties (red) (Google Maps ®) and external noise monitoring location at 1st floor level (blue)



Figure 2.2: Rear elevation, extent of properties (red) (Google Maps ®)



As indicated above, the right side of the front elevation has bowed windows and the left side has straight windows – both types are sash windows, as were the windows on the rear elevation. It was noted that the glazed elements had identical thicknesses throughout. The non-glazed elements of the façade were built from masonry and the roof was pitched with roofing tiles. Given the difference in ratio between the non-glazed and glazed elements of the façade, it is likely that the sound reduction provided by them may vary. It was noted that the window seals were poor and that some glazed panels had been temporarily replaced with composite timber board.

3 EXTERNAL BUILDING FABRIC

3.1 General

This section of the report assesses whether the sound reduction provided by the existing façade is such that indoor ambient noise levels are suitable for residential use.

Maintaining appropriate indoor noise levels in residential dwellings is crucial for our well-being. Excessive noise can lead to stress, sleep disturbances and health issues. It affects sleep quality, concentration, productivity, privacy and emotional well-being. By minimizing noise levels, we can improve sleep, focus better and enjoy a more peaceful environment. Clear communication and positive social interactions are also facilitated.

In instances where the existing façade fails to provide adequate sound reduction to meet suitable indoor noise level requirements, upgrades to the existing façade will be proposed.

3.2 Relevant Guidance

3.2.1 British Standard 8233:2014

British Standard BS 8233:2014 [1] provides guideline values for indoor noise levels within a number of building types including residential dwellings. In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 3.1:

Table 3.1: British Standard 8233 Indoor Noise Levels

Activity	Location	Daytime	Night-time
Resting	Living room	35 dB $L_{Aeq, 16\text{hour}}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16\text{hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\text{hour}}$	30 dB $L_{Aeq, 8\text{hour}}$
			45 dB $L_{Amax, F}$

Notes: Daytime assessment period – 07:00 to 23:00 hrs
Night-time assessment period – 23:00 to 07:00 hrs

Furthermore, the Standard notes that *“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax, F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.”* No thresholds/criteria are provided within the Standard, however.

The previous, 1999 version of the Standard included the note that, *“For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax} .”*

This is the same threshold (i.e. 45 dB) given in the World Health Organization (WHO) Guidelines for Community Noise [2], and it is, therefore, considered to remain relevant and is described in the following sub-section.

3.2.2 World Health Organisation Guidelines

The following guideline values for community ambient noise levels in specific environments are presented in the World Health Organization (WHO) Guidelines for Community Noise.

Table 3.2: WHO Guideline Noise Values

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours	dB $L_{Amax,F}$
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outdoor living areas	Serious Annoyance (upper limit)	55	16	-
	Moderate Annoyance (lower limit)	50		

The 45 dB $L_{Amax, F}$ criterion applies to “single sound events” within bedrooms at night. This guideline is generally interpreted as the value that individual noise events should not normally exceed more than 10 times a night.

The above noise levels account for the overall noise within habitable rooms, this includes the contribution from external noise sources, structure-borne noise and mechanical services.

3.3 Baseline Noise Survey

A detailed environmental noise survey was undertaken on site between Friday 2nd and Monday 5th June 2023. The purpose of this survey is to understand the existing noise levels within the proposed dwellings and to understand the noise levels incident on the façade – to be able to advise on possible upgrades, where necessary.

The survey involved long-term unattended monitoring at two positions, as shown in Figure 2.1 (MP1 and MP2). One unattended monitor was installed externally to understand noise levels incident on the worst affected façades of the building (south facing, front elevation, 1st floor window), while another monitor was set up internally to understand the existing noise levels within the rooms. Given these monitors were measuring simultaneously, it is possible to estimate the sound reduction provided by the existing façade, which will inform any mitigation measures.

Five-minute consecutive measurements were obtained using the ‘F’ time weighting and A-weighting frequency network, capturing $L_{Amax,F}$, $L_{Aeq,T}$ and $L_{A90,T}$ levels. The equipment was calibrated before and after the survey using a Rion NC-74 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed. Full details of the survey can be found in Appendix A.

3.4 Survey results

A summary of the daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ ambient noise levels is presented below in Tables 3.3 and 3.4 for all measurement positions, along with the typical $L_{Amax,F}$ level not exceeded more than 10 times per night. The time histories for each measurement position are presented in graphical form in Figures A.3 and A.4 in Appendix A.

Table 3.3: Summary Results of Unattended Noise Survey at MP1 (Façade levels), dB – External (1st floor, Room 3)

Monitoring Period	Daytime	Night-time	
	$L_{Aeq,16hr}$	$L_{Aeq,8hr}$	$L_{Amax,F}^{[1]}$
Fri 02/06/2023 ^[2]	66	60	81
Sat 03/06/2023	67	62	79
Sun 04/06/2023	67	62	83
Mon 05/06/2023	67	-	-
Summary	67 ^[3]	61 ^[3]	81 ^[4]

Note ^[1]: The $L_{Amax,F}$ levels presented are representative of the value not exceeded more than 10 times each night.

^[2]: Data obtained during the daytime was not a full 16-hour measurement (start time = 11:20 hours), so this has been excluded from the summary averages.

^[3]: Logarithmic average.

^[4]: Arithmetic average.

Table 3.4: Summary Results of Unattended Noise Survey at MP2 – Indoor Noise Levels, dB (2nd floor, Room 6)

Monitoring Period	Daytime	Night-time	
	$L_{Aeq,16hr}$	$L_{Aeq,8hr}$	$L_{Amax,F}^{[1]}$
Fri 02/06/2023 ^[2]	42	35	54
Sat 03/06/2023	42	34	52
Sun 04/06/2023	41	38	57
Mon 05/06/2023	42	-	54
Summary	42 ^[3]	36 ^[3]	54 ^[4]

Note ^[1]: The $L_{Amax,F}$ levels presented are representative of the value not exceeded more than 10 times each night.

^[2]: Data obtained during the daytime was not a full 16-hour measurement (start time = 11:40 hours), so this has been excluded from the summary averages.

^[4]: Logarithmic average.

^[5]: Arithmetic average.

3.5 Attended Noise Measurements

Attended noise measurements were undertaken on both Friday 2nd and 5th June to provide further understanding of the indoor noise levels in the other rooms within the property. These measurements consisted of:

- Indoor measurements within rooms to the front elevation that had slightly different window configuration (i.e.: flush windows instead of bow windows)
- Indoor measurements were taken a sample of rooms to the rear elevation (this was to confirm that these are exposed to significantly lower noise levels).

Although these are shorter-term measurements, they still provide an understanding on the whether the indoor noise requirements will be satisfied or if mitigation measures will be required.

Sound levels were measured using a Norsonic 118 sound level meter fitted with a windshield. The meter was tripod-mounted such that the microphone was approximately 1.5m above the floor level in the centre of the room.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. 10-minute measurements of $L_{Aeq,T}$ and L_{AFmax} levels were obtained.

3.5.1 Survey results

Table 3.5: Daytime Attended Survey Results

Position	Start Time	$L_{Aeq,10min}$	L_{AFmax}	Dominant Source
A1 – 1 st floor, Front elevation, Kitchen	12:08 02/06/2023	42	64	- Road traffic from the A245 road (dominant) - Bird song
A2 – 2 nd floor, Front elevation, Kitchenette	12:23 02/06/2023	45	67	Road traffic from the A245 road (dominant)
A3 – 1 st floor, rear elevation, Room 4	08:50 05/06/2023	28	43	- Shielded road traffic from the A245 road (dominant) - Bird song - Plane flying overhead
A4 – 2 nd floor, rear elevation, Room 7	09:04 05/06/2023	29	40	- Shielded road traffic from the A245 road (dominant) - Bird song

3.6 Discussion

The results have revealed that the sound reduction provided by the existing external façade is such that the indoor noise levels within proposed dwellings fail to satisfy BS8223 and WHO requirements. Conversely, these requirements are satisfied within dwellings to the rear elevation – this is due to the rear of the building being significantly shielded from road traffic.

With the above in mind, upgrades to the front elevation are necessary to control indoor noise levels to within the requirements. The main contributor to noise break-in to the dwellings will generally be the glazing (as it is the weakest element in terms of sound reduction of the façade). Upgrades to the glazing and associated frame/seals are therefore the most suitable approach to increasing the overall sound reduction provided by the façade.

It is noted that the building is listed, therefore, it is unknown whether permission will be granted to replace the existing window frames/glazing. As such, secondary glazing may be the most suitable approach, details of which are provided in the following section.

3.7 External Building Fabric assessment

Based on information regarding the existing glazed/non-glazed facade areas, proposed floor plans and measured external noise levels (detailed in Tables 3.3 and 3.4), an assessment of the external building fabric elements has been undertaken.

Based upon the GA drawings and elevations provided by Xenia Developments Ltd, calculations have been undertaken following the general method set out in BS EN 12354-3:2017 [3] to determine a suitable secondary glazing specification to ensure that the criteria in Table 3.1 can be achieved within habitable rooms of the proposed dwellings. Detailed calculations for sample rooms are provided in Appendix B.

3.7.1 Assumptions

Drawings

Our assessment has been based on key dimensions taken from drawings and elevations provided by Xenia Developments Ltd.

Room Reverberation

In order to calculate the internal ambient noise levels within habitable rooms, our analysis has assumed typical reverberation times in furnished bedrooms and living rooms, which have been based on a flat reverberation time of 0.5 seconds across the frequency spectrum between 125Hz and 4kHz.

Non-glazed External Wall Areas

The core build-up of the existing external walls is understood to be cavity blockwork. We would expect the proposed external wall to achieve the following minimum sound reduction performance, based on experience of similar wall constructions and sound reduction performance estimated with specialist software Insul:

Table 3.6: Estimated sound reduction index (dB) of the proposed external wall construction

Construction	125	250	500	1k	2k	4k	$R_w / R_w + C_{tr}$
Cavity blockwork	41	45	45	54	58	58	51 / 48

3.7.2 Glazing

The resulting minimum performance requirements are presented in Table 3.7 with an example specification provided. Detailed calculations for the worst-case, most representative habitable rooms in the property can be found in Appendix B.

Table 3.7: Minimum sound reduction performance R (dB) for the glazed elements of the front façade

Elevation	Room	Glazing example	125	250	500	1k	2k	4k	$R_w / R_w + C_{tr}$
Front façade	Living rooms and bedrooms	6/150/4 ¹	29	35	45	56	52	50	47 / 40

1) The exact thickness of the existing glazing is unknown, however the specification above accounts for it being either 4mm or 6mm, which is highly likely.

Windows should still be openable for purge or rapid ventilation, as recommended by Building Regulations Approved Document F. Internal noise level guidelines are generally not applicable under these exceptional events, which should only occur occasionally (i.e. to remove odour from painting, cooking, etc.).

The sound insulation requirements of the glazing are applicable to the window system as a whole, including frames, mullions and panels. They are based on BS EN ISO 10140: 2021 "Acoustics - Laboratory measurement of

sound insulation of building elements" [4] and rated in accordance with BS EN ISO 717-1:2020 "Acoustics – Rating of sound insulation in buildings and of building elements Part 1. Airborne sound insulation"[5].

The above sound reduction performance should ensure that appropriate internal noise levels are achieved using suitable façade treatments and should in turn comply with the criteria set out in Table 3.1.

Proposals indicate that the basement floor entrance will be significantly shielded from ground level road traffic noise. In any case, it is recommended that the external door provides a sound insulation of at least 35 dB R_w and glazing elements should provide at least 33 dB $R_w + C_{tr}$.

3.7.3 Ventilation

The existing ground floor rooms are ventilated via a fan fixed to the front glazing pane with the several fans for ventilation and air conditioning fitted to the rear façade. The other rooms across the remaining floor have no means of ventilation other than openable windows.

Given the listed nature of the building it has been assumed that the proposed dwellings will be mechanically ventilated (ADF System 4), as passive ventilation will involve penetrating the existing façades. As such it is recommended that mechanical services noise is controlled to $\leq L_{Aeq} 26\text{dB}$ in bedrooms and $\leq L_{Aeq} 30\text{dB}$ in Living rooms.

4 INTERNAL BUILDING FABRIC

4.1 General

Sound insulation between residential dwellings is crucial for maintaining a peaceful and comfortable living environment. Effective sound insulation minimizes the transmission of unwanted noise, such as loud conversations and footsteps between adjacent units. It enhances privacy, reduces disturbances and promotes better sleep, concentration, and overall well-being. Sound insulation also fosters harmonious relationships among neighbours, minimizing conflicts and complaints related to noise. It is especially vital in separating walls and floors, where sound can easily transfer.

Proposals indicate that there will be new walls separating rooms, as well as existing walls being retained which will have a separating function. This section provides details on the tested and predicted sound insulation associated to the separating elements between rooms, recommending upgrades to these structures, where necessary. In instances where new separating elements are proposed, recommendations have been made to ensure that the sound insulation provided complies with Building Regulations Approved Document E (ADE).

4.2 Guidance

4.2.1 Building Regulations Approved Document E (ADE)

ADE to the Building Regulations 2010 [6] states that the performance standards for “rooms for residential purposes formed by material change of use” detailed in Table 4.1 shall be achieved.

Table 4.1: Rooms for residential purposes – Sound Insulation Performance Standards

Description and Separating Element	Airborne Sound Insulation $D_{nT,w} + C_{tr}$ dB	Impact Sound Insulation $L'_{nT,w} + C_{tr}$ dB
	(Minimum values)	(Maximum values)
Dwellings-houses and flats formed by material change of use		
Walls	43	-
Floors and stairs	43	64

Airborne sound describes sounds that travel through the air before entering the building structure which could include voices and TV sets. Impact sound describes sounds that arise as a result of a direct impact on the building structure, such as footsteps.

It should be noted that for airborne sound insulation the higher the value the better, whereas for impact sound the lower the value, the better the impact sound isolation.

Separating walls between apartments and communal corridors

These walls are not subject to acoustic testing, however, it is recommended that they achieve a minimum airborne sound insulation of 43 dB $D_{nT,w} + C_{tr}$ by design intent.

Internal walls within dwellings

The internal walls and floors within dwellings are required to achieve a minimum airborne sound insulation of 40 dB R_w . It should be noted that the 40 dB R_w criterion is a laboratory rating only and cannot be measured on-site. Please note that Requirement E2 of the Building Regulations does not apply to internal walls that contain doors, or to internal walls separating an en-suite bathroom from the associated bedroom.

Doors

Approved Document E recognises that in many cases the sound insulation of separating walls between dwellings and common circulation areas will be limited by the entrance door. In this regard, ADE states:

“Ensure that any door has good perimeter sealing (including the threshold where practical) and a minimum mass per unit area of 25 kg/m² or a minimum sound reduction index of 29 dB R_w (measured according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997)”.

We recommend that doorsets capable of achieving a minimum sound reduction of 29 dB R_w are provided. This only applies to the entrance doors to the dwellings from the common areas. It should be noted that pre-completion tests would not be carried out between common areas and flats.

4.3 Sound Insulation Testing Results of Existing Separating elements

Investigative sound insulation testing was undertaken on Friday 2nd June to understand the performance of the existing separating elements that will be retained.

Based on site observations, we understand that the separating floors are of a timber framed construction, consisting of floorboards, timber joists and a lathe and plaster ceiling. The depth of the timber joints and whether the cavity is insulated is unknown. It is understood that the existing ceilings were over-boarded with a single layer of plasterboard to improve sound insulation.

On each floor, there were no instances where a cellular wall (without a doorset) is expected to be retain and fulfil a separating function between two habitable rooms and therefore none were tested. It was noted that the build-up of the walls was timber framed with plasterboard directly fixed either side, the exact depth and whether the walls are insulated is unknown.

With the above in mind, testing was undertaken across two sample separating floors, as detailed in Table 4.2 below.

Acoustic testing performed on-site is summarised in Table 4.2 below. Detailed test results are included in Appendix C.

Table 4.2: Measured Sound Insulation Performance across Separating Floors

Test no.	Source Room	Receiving Room	Measured in-situ Sound Insulation Performance D _{nT,w} + C _{tr} dB	ADE Criterion D _{nT,w} + C _{tr} dB (Minimum level)
1	Ground Floor, Room 2	1 st Floor, Room 4	37	43
2	1 st floor, Room 4	2 nd Floor, Room 7	36	43

The results indicate that sound insulation provided by the tested floors falls short of the expected 43 dB D_{nT,w} + C_{tr} target. The main reason that the existing floor construction fails to comply with such target is due to an overall lack of mass in the build-up. This was also backed up by site observations during testing, where the acoustician perceived that most of the sound was significantly propagating through the floor structure as opposed to any flanking paths (e.g., external walls, junction of floors and bay windows, etc.).

Although impact sound insulation testing was not undertaken across the floors, the performance of the floors can be predicted based on the existing floor build-up and the above airborne sound insulation test results.

4.4 Separating Floor Construction

In order to comply with ADE sound insulation requirements, the existing floor construction needs to be upgraded. Given the listed nature of this building, the following recommendations may need to be confirmed with Local Authority / Building Control prior to install.

To control the level of impact noise transmitted through the floor to the room below, it is advised that a platform floor system is installed on top of the existing floor. This involves a floating layer being installed above a resilient layer, as described below:

Floating layer:

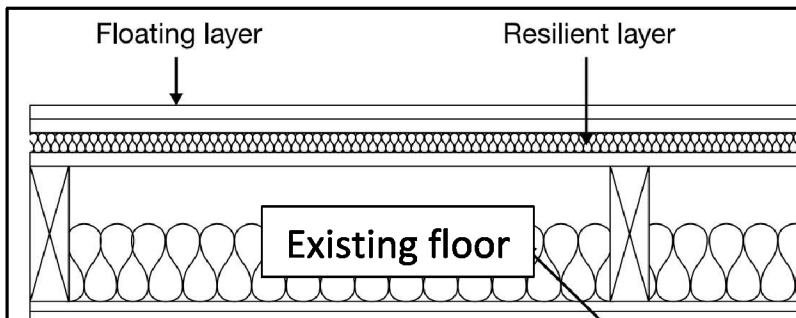
- A minimum of 2 No. layers of board material (Minimal total mass per unit area 25 Kg/m^2)
- Each layer a minimum of 8mm thickness.
- Board layers should be fixed together (e.g. spot bonded or glued/screwed) with joints staggered.

Resilient layer (floating layer should be laid loose on resilient layer)

- Mineral wool, minimum thickness 25mm, density 60 to 100 kg/m^3
- The mineral wool may be paper faced on the underside.

The above-described floor build-up is shown in Figure 4.1 below.

Figure 4.1: Floor Recommendation

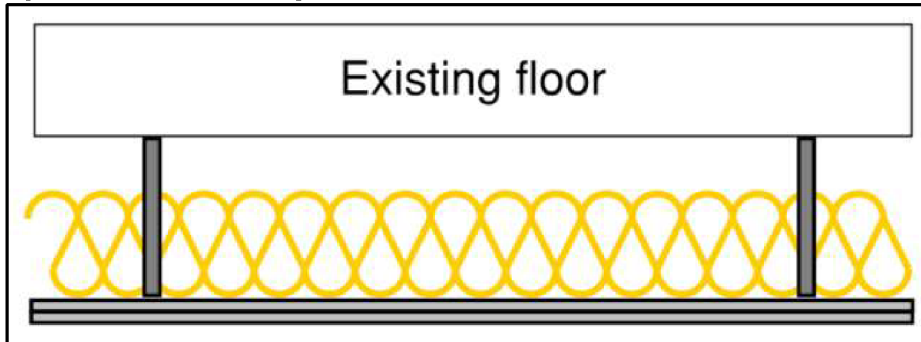


To control the level of airborne noise transmitted through the floor between rooms, it is advised that an additional / secondary ceiling is hung from the underside of the existing floor structure. We recommend the following build-up:

- 2 no. layers of 12.5mm dense plasterboard (e.g., SoundBloc or similar, min. surface mass 20 kg/m^2), hung via
- An MF system to a depth of at least 150mm; with 100mm mineral wool insulation (min. density 33 kg/m^3) laid in the cavity.

The above-described ceiling build-up is shown in Figure 4.2 below.

Figure 4.2: Recommended Ceiling Construction



4.5 Separating Wall Construction

As mentioned in Section 4.1, proposals indicate some new separating walls will be constructed and some other existing walls will be retained and have a separating function between adjacent rooms.

Specific details of this are listed below for each level (where applicable):

- Ground Floor: New wall proposed separating Rooms 1 and 2
- 1st floor: two existing walls to be retained, one wall separating Rooms 5 with a kitchen and one wall separating Rooms 3 and 4.
- 2nd floor: existing wall separating Rooms 6 and 7.

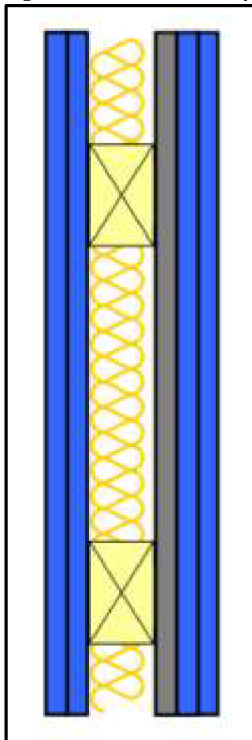
4.5.1 New separating wall construction

A new separating wall is proposed between ground floor Rooms 1 and 2. The following build-up can be used in this instance:

- 2 No. layers of 15mm dense plasterboard (e.g., SoundBloc or similar, min. surface mass 24 kg/m²),
- Single timber studwork wall (e.g. 85-100mm) infilled with 50mm insulation.
- Resilient bars on one side
- 2 No. layers of 15mm dense plasterboard (e.g., SoundBloc or similar, min. surface mass 24 kg/m²),

The above wall build-up is illustrated in Figure 4.3 below.

Figure 4.3: Recommend Separating wall construction.



4.5.2 Upgrades to Existing Walls

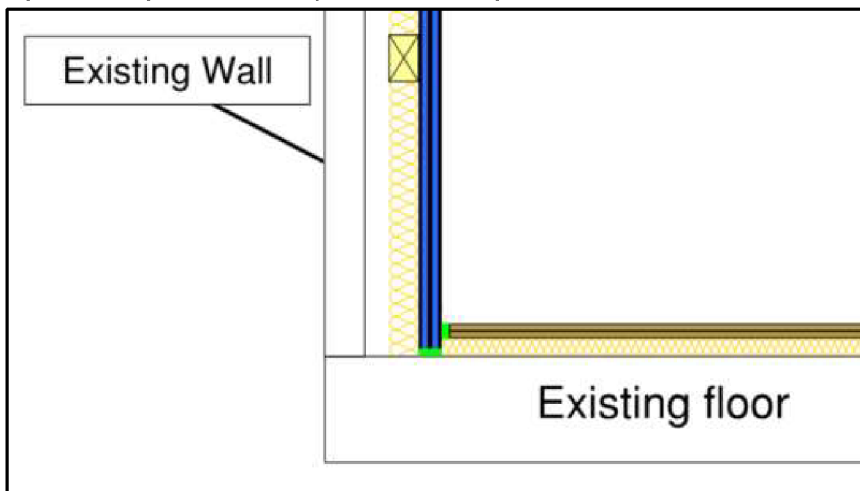
The existing walls were not tested as they had doorsets fitted to them. In any case, based on site observations, it is unlikely that if the doorset openings are filled, they would provide a sound insulation performance $\geq 43\text{dB } D_{nT,w} + C_{tr}$. With this in mind, we recommend an independent wall lining is installed to one side of the wall, details of which are detailed below.

In the first instance the opening will need to be adequately sealed. This infill should comprise 2 No. layers of 15mm dense plasterboard (e.g., SoundBloc or similar) can be fixed to the existing door rebate, with the frame filled with 100mm dense mineral wool (60-100 kg/m³) and another 2 No. layer of 15mm plasterboard fixed to the other side of the frame. Alternatively, masonry blockwork (min density 1,500 kg/m³) to match the depth of the existing wall could be installed.

Once the door openings are sealed, the following independent lining can be installed to one side of the separating wall. The lining should be at least 20mm away from the perimeter walls and consist of 2 No. layers of 15mm dense plasterboard supported on timber studs with 50mm mineral wool insulation (min. density 33 kg/m³) laid within the cavity. A structural engineer should be consulted to determine the size of the timber studs to ensure that the independent wall can be adequately supported.

The described independent lining must also be mounted on the proposed isolated floor construction to stop flanking sound transmission via the structural floor, as shown in Figure 4.4 below.

Figure 4.4: Independent Wall Lining & Junction of Lining and Isolated Floor



Mark-ups highlighting the location of the new wall/linings are included in Appendix D. On floors where the layout is such that wall sound insulation is not an issue, mark-ups have been omitted.

4.6 Junction detailing

Appropriate junction detailing is paramount to ensure that the acoustic integrity of the separating walls and floors is not compromised. The following general guidance should be noted:

- The separating walls should be constructed full height supported off the existing floor and built up to the underside of the soffit, with the floating/platform floor and suspended ceiling installed on a room-by-room basis. This will contribute to the control of flanking transmission between adjacent dwellings.
- The isolated floor and suspended ceiling should be isolated from perimeter walls and wall linings (where proposed), using a resilient flanking strip and flexible sealant respectively.

4.7 Penetrations

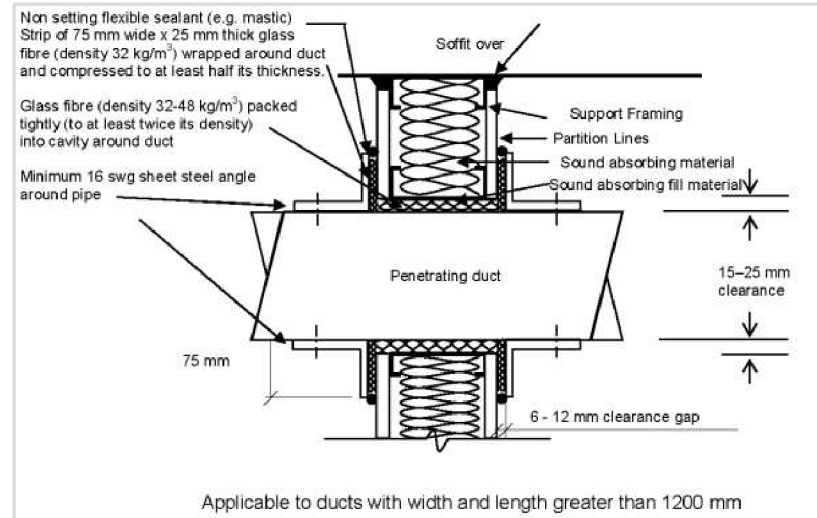
4.7.1 Service penetrations

Where a partition has a separating function between dwellings and/or dwellings and non-residential areas, all service penetrations through separating partitions must be fully sealed in order to ensure the acoustic performance requirements are achieved. Good practice dictates that where services are required to enter flats

from common areas, the services should be routed to enter above the flat entrance doors. Where other penetrations of separating walls cannot be avoided, suitably robust detailing must be employed.

Where services penetrate a wall, the hole should be tightly packed with mineral wool (45 kg/m³) for the full depth of the partition and be completely sealed with non-hardening mastic. Floor and/or ceiling linings should not touch the pipework.

Figure 4.5: Recommended service penetration detail



5 CONCLUSIONS

Anderson Acoustics Ltd was commissioned by Xenia Developments Ltd in to provide acoustic consultancy services for the refurbishment of 196 and 197 Parrock Street, Gravesend.

The report focuses on the acoustic design of the development to ensure that the internal ambient noise levels in the proposed dwellings comply with BS8233:2014 guidelines and well as ensure that the sound insulation provided by separating elements between rooms is sufficient.

The results of a noise survey indicate that the existing façade does not meet the required sound reduction standards. Upgrades to the front elevation, specifically the glazing, are recommended to improve sound reduction through secondary glazing.

The results from sound insulation testing has also informed upgrades to the separating structures between rooms to ensure Approved Document E of the Building Regulations is satisfied.

6 REFERENCES

- 1 British Standards Institution. Sound Insulation and Noise Reduction for Buildings – Code of Practice. BS 8233: 2014.
- 2 World Health Organisation - Guidelines for Community Noise. 2000
- 3 British Standards Institution. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound. BS12354-3: 2017.
- 4 British Standards Institution. Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Application rules for specific products. BS EN ISO 10140-1:2021.
- 5 British Standards Institution. Acoustics. Rating of sound insulation in buildings and of building elements. BS EN ISO 717-1:2020.
- 6 Building Regulations. Approved Document E - Resistance to the passage of sound. 2003 edition, amended in 2004, 2010, 2013 and 2015.
- 7 British Standards Institution. BS61672: 2003: Electroacoustics. Sound level meters. Part 1 Specifications.

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APPENDIX A

ENVIRONMENTAL NOISE SURVEY DETAILS

A ENVIRONMENTAL NOISE SURVEY DETAILS

A.1 Instrumentation

All noise measurements were undertaken by consultants certified as competent in noise monitoring. All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672 [7]. A full inventory of this equipment is shown in Table B.1 below. All equipment's calibration certificates are available on request.

Table A.1 Inventory of Measurement Equipment

Equipment ID	Item	Make and Model	Serial Number	Calibration	
				Certificate number	Expiry Date
1 (MP1)	Sound Level Meter	Rion NL-52	00743139	TCRT23/1336	03/05/2025
	Preamplifier	NH-25	98924		
	Microphone	UC-59	06668		
2 (MP2)	Sound Level Meter	01dB DUO	10927	1500966-2	29/09/2023
	Preamplifier	Integrated	-		
	Microphone	GRAS 40CD	136961		
3 (Attended measurements and Sound insulation testing)	Sound Level Meter	Norsonic 118	31792	U43134	31/01/2025
	Preamplifier	Norsonic 1206	29560		
	Microphone	Norsonic 1225	128814		
4	Calibrator	Rion NC-74	35173438	UCRT21/1435	11/08/2023
5	Calibrator	Norsonic 1251	32991	U43132	31/01/2025
6	Cabinet Loudspeaker	Yamaha DBR10 Active PA Speaker	-	N/A	N/A

The noise measurement equipment used during the survey was calibrated at the start and end of each measurement. No significant drift in calibration was found to have occurred.

A.2 - Unattended Noise Survey

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. Consecutive five-minute measurements of $L_{Aeq,T}$, $L_{Amax,F}$ and $L_{A90,T}$ noise levels were obtained between Friday 2nd and Monday 5th June 2023.

The microphones were fitted with protective windshields for the measurements, which are described in greater detail below:

- MP1 – Noise measurement overlooking the A245. The microphone was mounted on a pole extended from the 1st floor window measuring under facade conditions. The noise climate was clearly dominated by constant road traffic on the A245 and distant constant road traffic noise from the surrounding roads.
- MP2 – Noise measurement located internally within the 2nd floor room the A245 (with windows closed). The sound level meter mounted on a tripod at a height of 1.5m above ground and measuring under free field conditions. The noise climate was dominated by constant road traffic on the A245.

Figure A.1 – MP1



Figure A.2 – MP2



A.3 - Weather Conditions

Weather conditions during the survey period were obtained from internet sources www.wunderground.com (weather station in Northfleet, located 2 miles west of the site), which indicated dry conditions for the entire monitoring period.

Figure A.3: Unattended Noise Survey at MP1 (Façade levels), dB – External

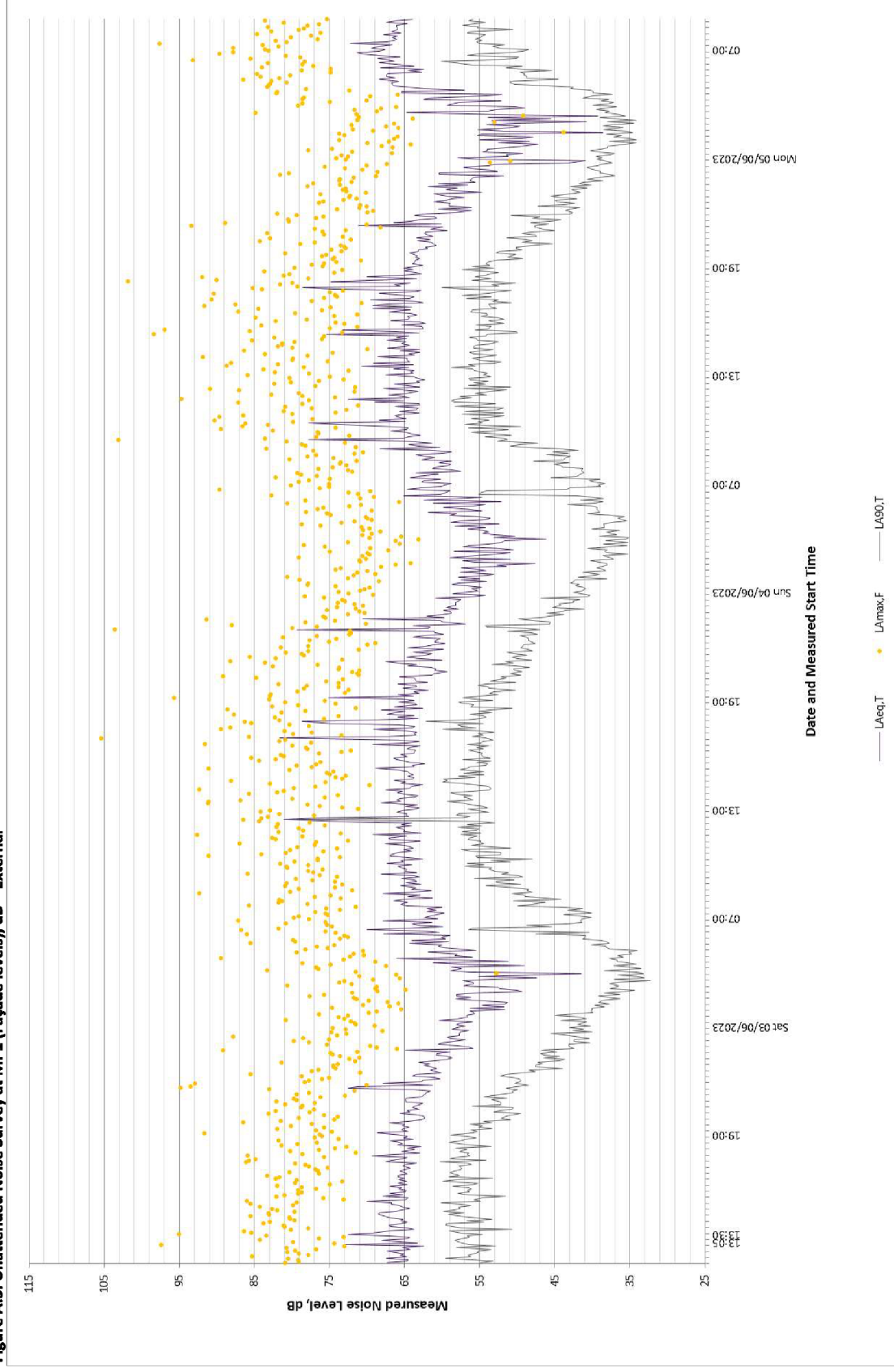
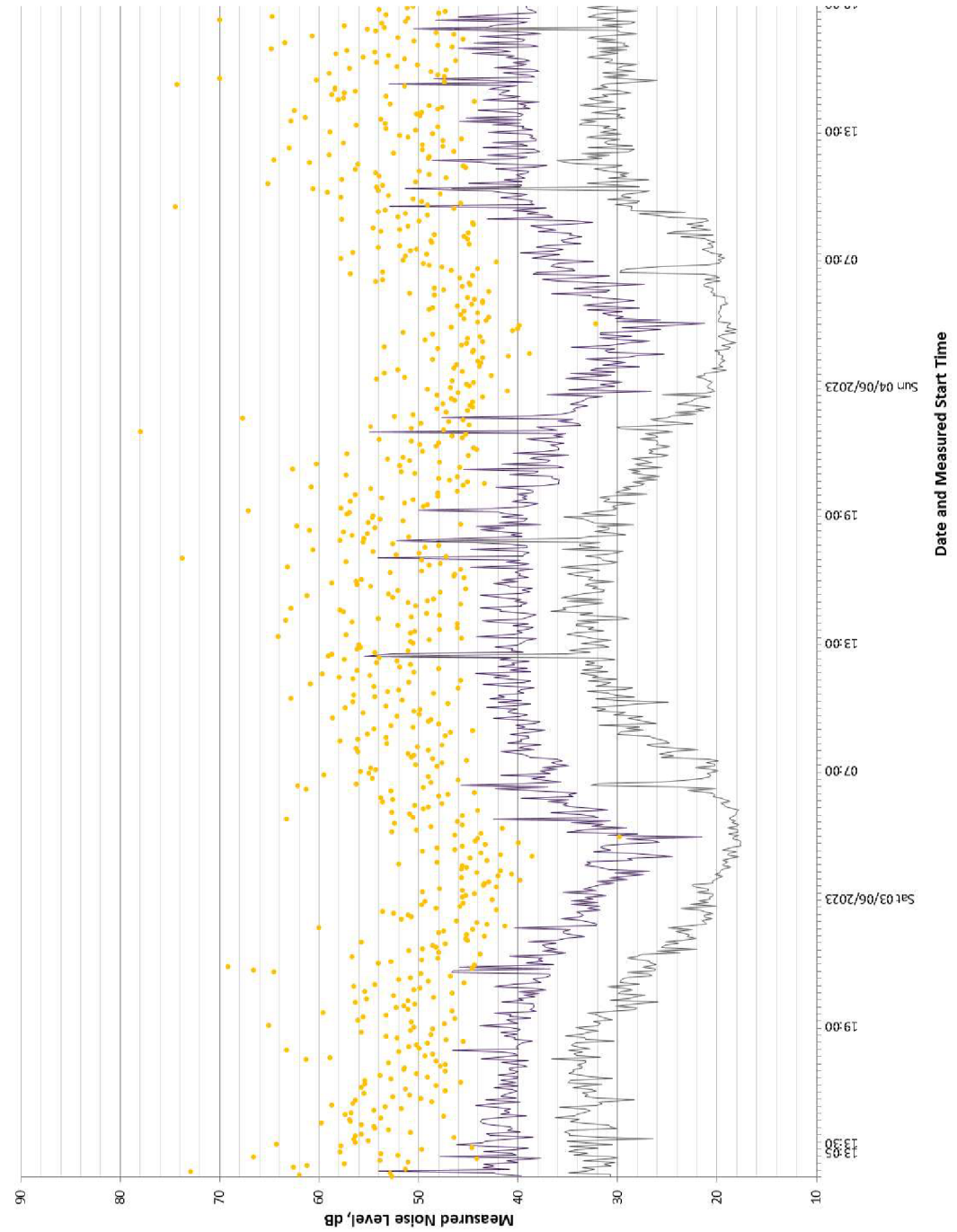


Figure A.4: Unattended Noise Survey at MP2 – Indoor Noise Levels, dB



APPENDIX B

DETAILED EXTERNAL NOISE BREAK-IN CALCULATIONS

Figure B.1 – Noise Break-in calculation, 1st Floor, Front Elevation, Room 1

Job name: 196 and 197 Parrock Street Job no.: 6764 Facade: Front 1F, Front Elevation, Room 1		RESULT SUMMARY: LAeq Day Predicted Internal Level: 21 dB L _a eq,T Criterion: 35 dB L _a eq,T Difference: -14 dB L _a eq,T		RESULT SUMMARY: LAeq Night Predicted Internal Level: 16 dB L _a eq,T Criterion: 30 dB L _a eq,T Difference: -14 dB L _a eq,T		RESULT SUMMARY: LAmax Night Predicted Internal Level: 38 dB L _a eq,T Criterion: 45 dB L _a eq,T Difference: -7 dB L _a eq,T	
SOUND INSULATION BY ELEMENT Formula		Data		Units		Octave band centre frequency, Hz 125 250 500 1000 2000 4000 dB(A)	
Reverberation Time Receiver Room Volume		0.5 s 40.0 m ³				0.5 0.5 0.5 0.5 0.5 0.5	
Element 1		Wall (database) Brick-block cavity wall Element Area where A=0.16V/T		Leq 6.6 m ²		66 64 62 62 58 55 66 41 45 45 54 58 58 8 8 8 8 8 8 11 11 11 11 11 11 0 0 0 0 0 0 23 17 15 5 -2 -6 15 23 17 15 5 -2 -6 15	
L1 -R +10logS -10logA +0 -L2 L2tot						61 60 57 57 54 50 61 41 45 45 54 58 58 8 8 8 8 8 8 11 11 11 11 11 11 0 0 0 0 0 0 17 12 9 0 -7 -11 9 17 12 9 0 -7 -11 9	
Element 2		Window (database) 6/150/4mm secondary glazing Element Area where A=0.16V/T		Leq 4.7 m ²		66 64 62 62 58 55 29 35 45 56 52 50 7 7 7 7 7 7 11 11 11 11 11 11 0 0 0 0 0 0 33 25 13 1 2 1 20 33 26 17 7 3 1 21	
L1 -R +10logS -10logA +0 -L2 L2tot						61 60 57 57 54 50 29 35 45 56 52 50 7 7 7 7 7 7 11 11 11 11 11 11 0 0 0 0 0 0 28 21 7 -3 -2 -5 15 28 21 11 2 -1 -4 16	
						83 82 80 75 72 69 81 41 45 45 54 58 58 8 8 8 8 8 8 11 11 11 11 11 11 0 0 0 0 0 0 39 34 32 18 11 8 31 39 34 32 18 11 8 31	
						83 82 80 75 72 69 29 35 45 56 52 50 7 7 7 7 7 7 11 11 11 11 11 11 0 0 0 0 0 0 49 42 30 15 15 14 37 50 43 34 20 17 15 38	

Figure B.2 – Noise Break-in calculation, 2nd Floor, Front Elevation, Room 3

Job name: 196 and 197 Parrock Street	Job no.: 6764	Job no.: Front 1F., Front Elevation, Room 3	RESULT SUMMARY: LAeq Day Predicted Internal Level: 21 Criterion: 35 Difference: -14	RESULT SUMMARY: LAeq Night Predicted Internal Level: 16 Criterion: 30 Difference: -14	RESULT SUMMARY: Lmax Night Predicted Internal Level: 38 Criterion: 45 Difference: -7
Formula	Sound insulation by element	Formula	Sound insulation by element	Formula	Sound insulation by element
Reverberation Time	0.5 s	Reverberation Time	0.5 s	Reverberation Time	0.5 s
Receiver Room Volume	45.0 m ³	Receiver Room Volume	45.0 m ³	Receiver Room Volume	45.0 m ³
Element 1		Element 2		Element 3	
L1	66	L1	66	L1	83
-R	41	-R	41	-R	41
+10logS	8	+10logS	8	+10logS	8
-10logA	12	-10logA	12	-10logA	12
+0	0	+0	0	+0	0
=L2	22	=L2	22	=L2	39
L2tot	22	L2tot	22	L2tot	39
Running total	14	Running total	14	Running total	8
Element 1		Element 2		Element 3	
L1	66	L1	66	L1	83
-R	41	-R	41	-R	41
+10logS	8	+10logS	8	+10logS	8
-10logA	12	-10logA	12	-10logA	12
+0	0	+0	0	+0	0
=L2	22	=L2	22	=L2	39
L2tot	22	L2tot	22	L2tot	39
Running total	14	Running total	14	Running total	8
Element 1		Element 2		Element 3	
L1	66	L1	66	L1	83
-R	41	-R	41	-R	41
+10logS	8	+10logS	8	+10logS	8
-10logA	12	-10logA	12	-10logA	12
+0	0	+0	0	+0	0
=L2	22	=L2	22	=L2	39
L2tot	22	L2tot	22	L2tot	39
Running total	14	Running total	14	Running total	8

APPENDIX C

DETAILED SOUND INSULATION TEST RESULTS

Standardized level difference according to ISO140-4

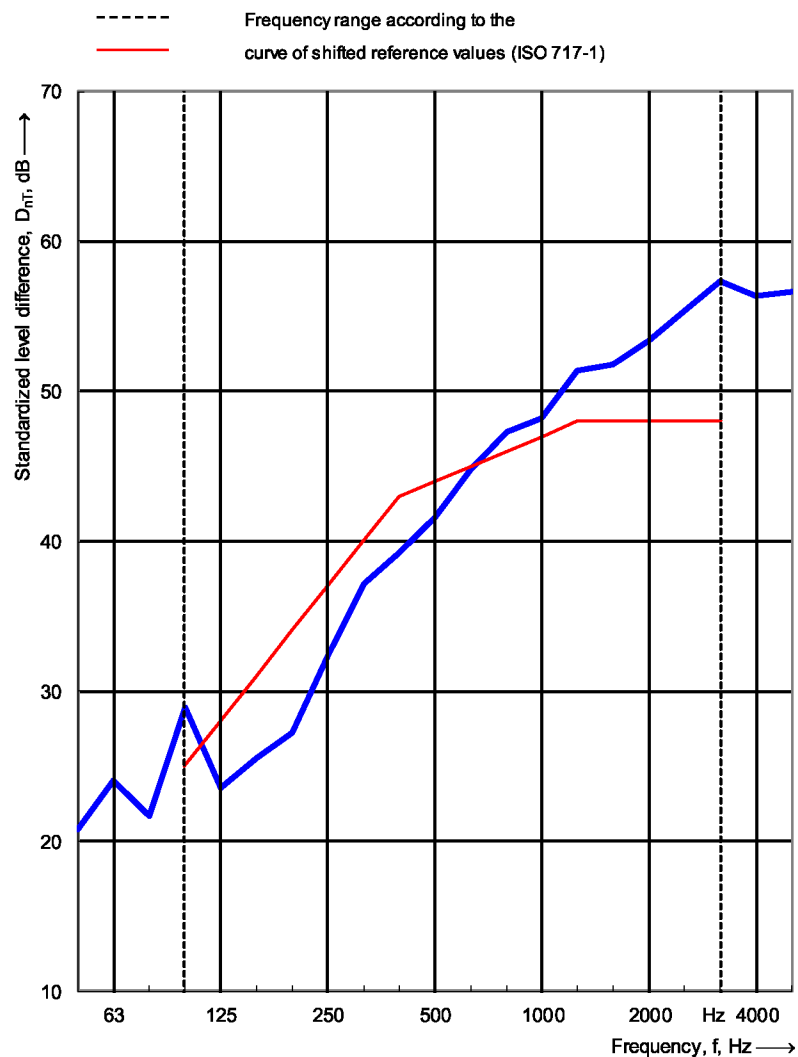
Field measurements of airborne sound insulation between rooms

Client: Xenia Developments Ltd

Date of test: 02/06/2023

Object: Floor Separating Ground Floor Room 2 and 1st Floor Room 4

Frequency f [Hz]	D_{nT} 1/3 octave [dB]
50	20.8
63	24.1
80	21.7
100	28.9
125	23.6
160	25.5
200	27.2
250	32.4
315	37.2
400	39.3
500	41.6
630	44.8
800	47.3
1000	48.2
1250	51.4
1600	51.8
2000	53.4
2500	55.3
3150	57.3
4000	56.3
5000	56.6



Rating according to ISO 717-1

$D_{nT,w}(C;C_T) = 44$ (-2 ; -7) dB

Evaluation based on field measurements results obtained
in one-third-octave bands by an engineering method.

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -1$ dB

$C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -7$ dB

Company:

No. of test report:

Date: 05/06/2023

Signature:

Standardized level difference according to ISO140-4

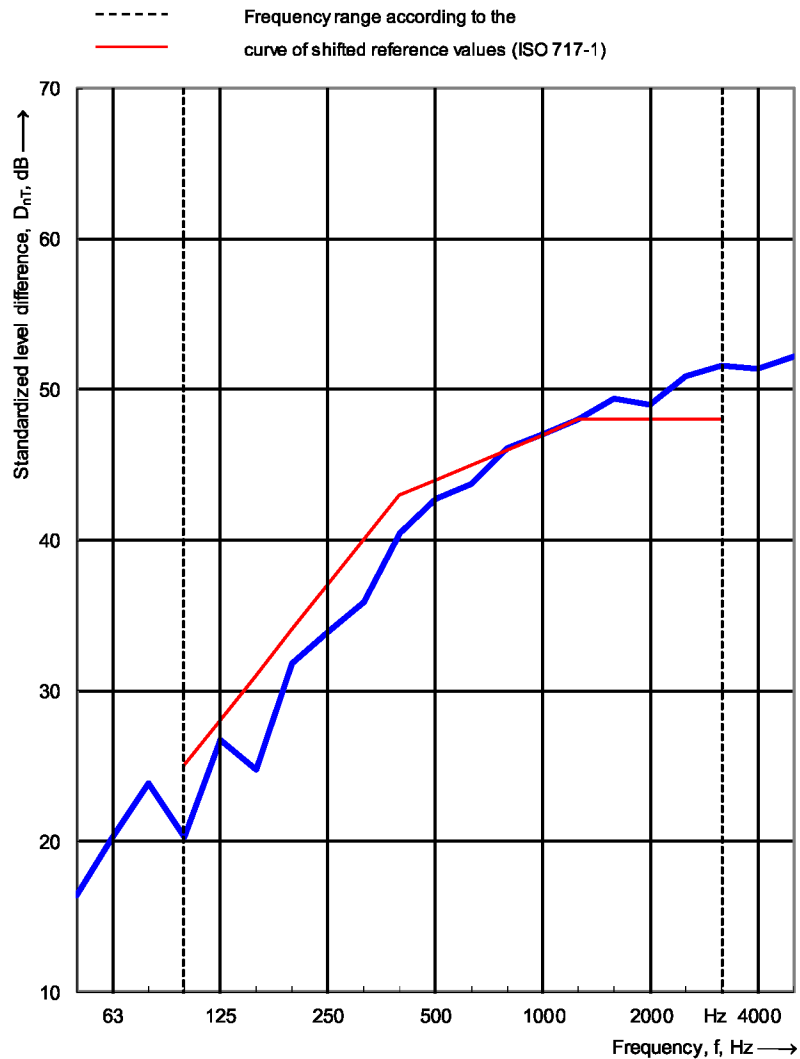
Field measurements of airborne sound insulation between rooms

Client: Xenia Developments Ltd

Date of test: 02/06/2023

Object: Floor Separating 1st Floor Room 4 and 2nd Floor Room 7

Frequency f [Hz]	D_{nT} 1/3 octave [dB]
50	16.4
63	20.3
80	23.9
100	20.3
125	26.7
160	24.8
200	31.8
250	33.9
315	35.9
400	40.4
500	42.7
630	43.7
800	46.1
1000	47.0
1250	48.0
1600	49.4
2000	49.0
2500	50.9
3150	51.6
4000	51.4
5000	52.2



Rating according to ISO 717-1

$D_{nT,w}(C;C_T) = 44$ (-2 ; -8) dB

Evaluation based on field measurements results obtained in one-third-octave bands by an engineering method.

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -1$ dB

$C_{tr,50-3150} = -10$ dB $C_{tr,50-5000} = -10$ dB $C_{tr,100-5000} = -8$ dB

Company:

No. of test report:

Date: 05/06/2023

Signature:

APPENDIX D

ACOUSTIC WALL MARK-UPS

Figure D.1 – Proposed Basement Floor Plan – Wall Mark-up

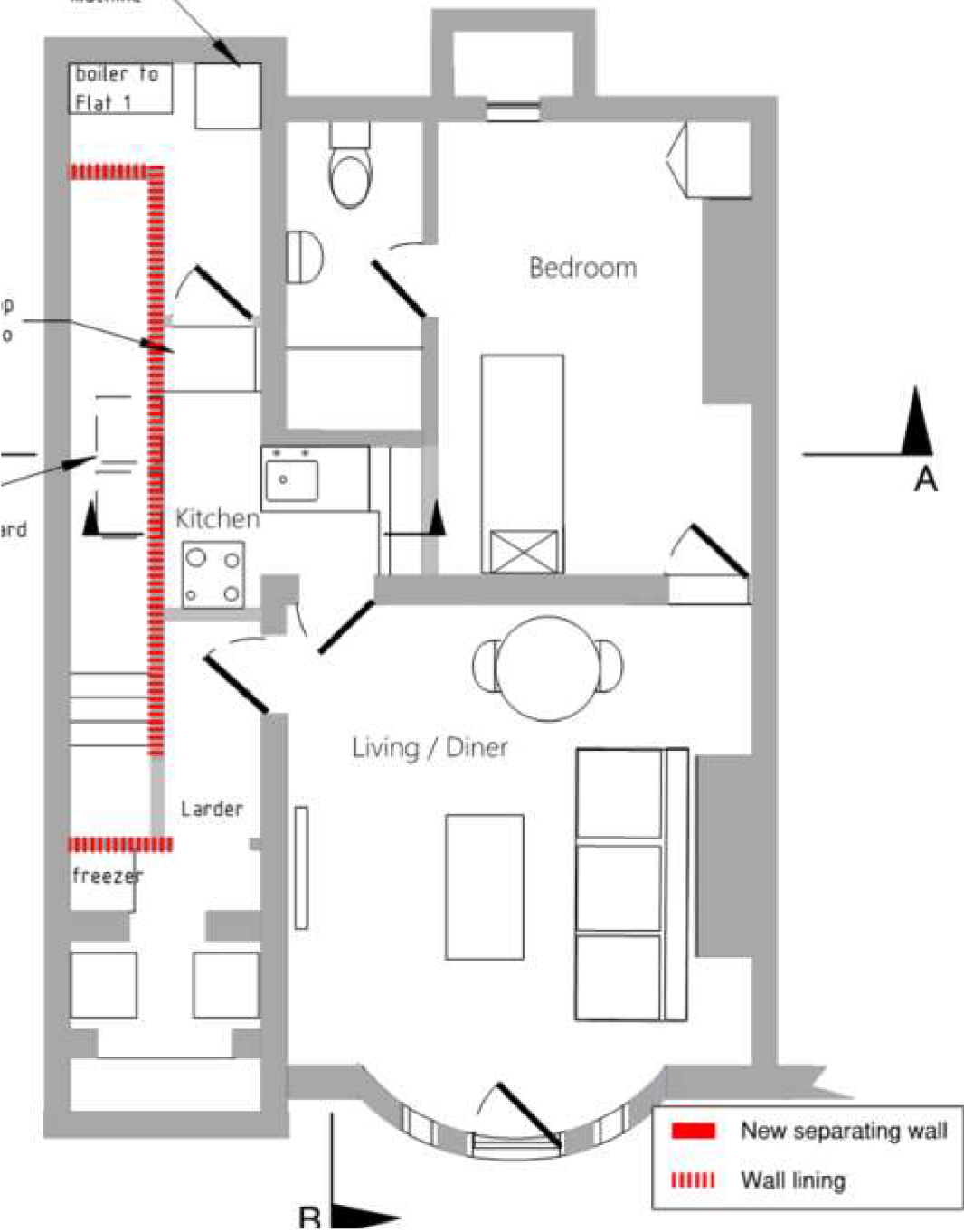


Figure D.2 – Proposed Ground Floor Plan – Wall Mark-up

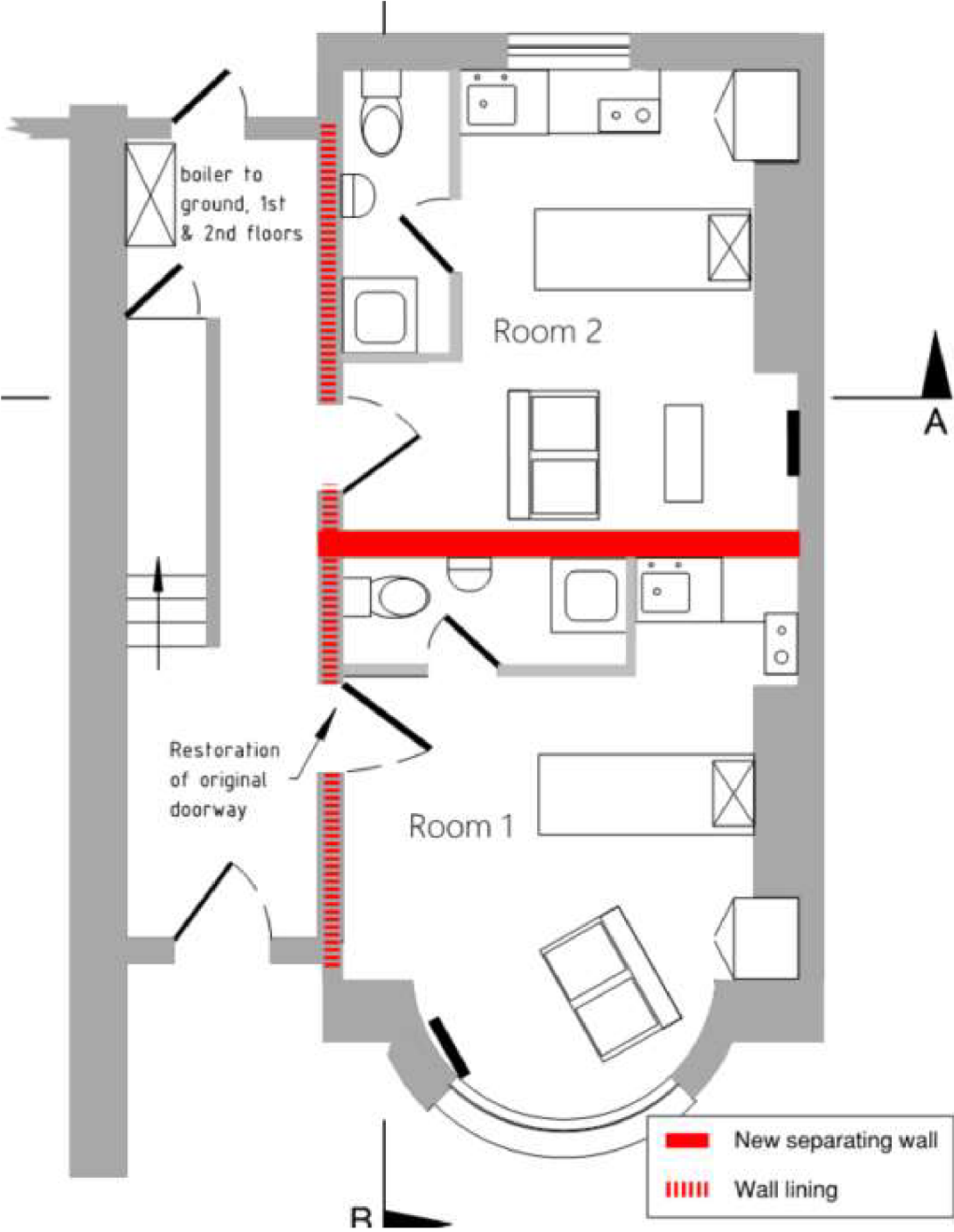


Figure D.3 – Proposed 1st Floor Plan – Wall Mark-up

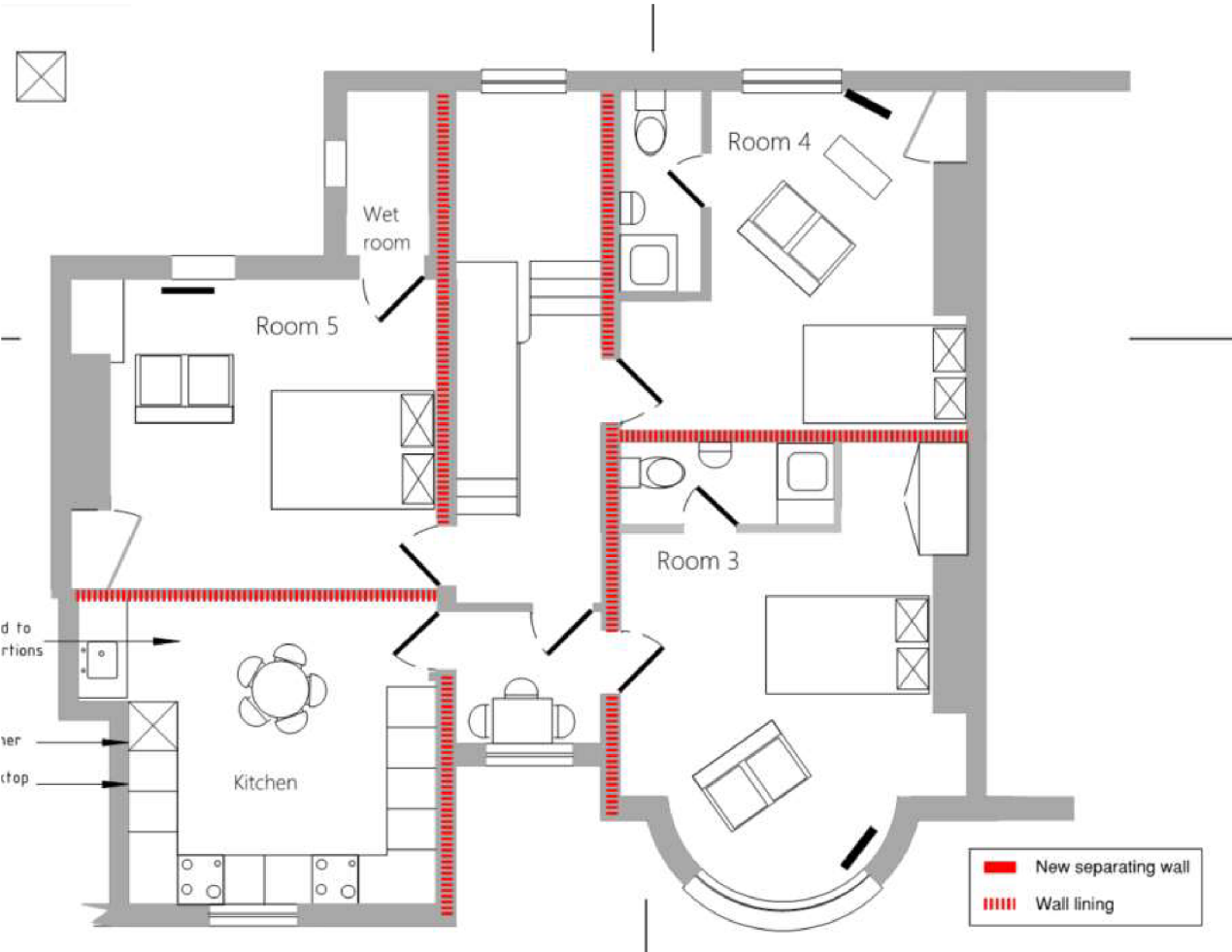


Figure D.4 – Proposed 2nd Floor Plan – Wall Mark-up

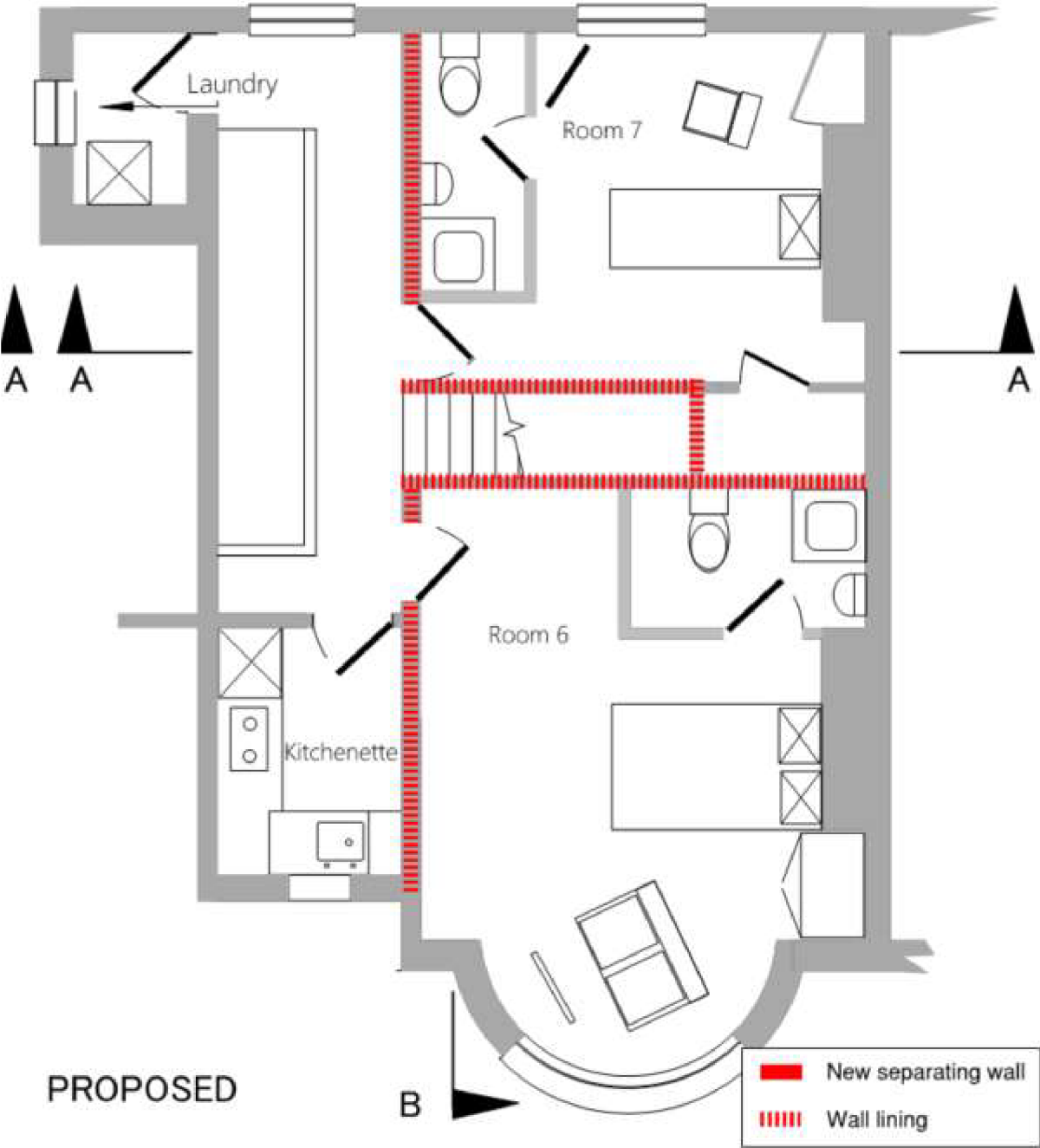


Figure D.5 – Proposed 3rd Floor Plan – Wall Mark-up

