48 Hamilton Road, Levenshulme
Noise Assessment Report



Project: 48 Hamilton Road, Levenshulme

Client: Mr Osama Hamido

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Signature	

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1. Introduction

1.1 RS Acoustic Engineering Ltd has been appointed by Mr Osama Hamido to undertake a noise assessment with regard to a proposed change of use at No.48 Hamilton Road, Levenshulme, Manchester, M13.

1.2 The existing building was previously used for car sales and the current proposals are to create a new ceramic tile shop with storage space and a small office. The upper floor of the property will be converted from office space into a single residential apartment.

1.3 The proposed operating hours are 07:00 to 19:00, seven days per week.

1.4 The properties in the immediate surrounding area are predominantly residential dwellings. The neighbouring property to the north is a clothing manufacturer and St. Agnes primary school is located to the south on the opposite side of Slade Grove. There is a small vehicle workshop and clothing manufacturer to the west along Hawkhurst Road.

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 Operational noise transmission through the separating party floor and wall has also been considered and recommendations have been provided with regard to acoustic enhancement.

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: Planning & Noise Technical Guidance

2.1 With regard to residential developments, Manchester City Council has adopted 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}.

2.2 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

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

2.4 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.

2.5 The internal sound level targets presented in Table 2.1 overleaf 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 $L_{Aeq,8hour}$

2.6 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.

2.7 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)

2.8 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 $L_{AFmax,T}$.

2.9 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).

2.10 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)

2.11 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.

Internal noise level guidelines

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).

Building Regulations 2010: Approved Document E

2.18 The Building Regulations 2010, Approved Document E: *'Resistance to the passage of sound'*, provides minimum sound insulation performance standards for separating party floor and wall constructions between adjacent dwellings (houses and flats).

2.19 With regard to separating party floors and walls, a minimum airborne performance of 45 dB $D_{nT,w}+C_{tr}$ applies to new-build dwellings and 43 dB $D_{nT,w}+C_{tr}$ applies to existing buildings (undergoing a material change of use).

2.20 Separating floors between apartments also have to achieve a maximum impact sound insulation performance of 64 dB $L'_{nT,w}$. This applies to vertically adjacent dwellings only and not commercial properties.

3. Environmental Noise Survey

Survey methodology

3.1 Continuous sound level monitoring was conducted over a 45-hour period on the east facing elevation overlooking Hamilton Road.

3.2 Measurements were performed from 13:30 hours on Monday 11th through to 10:30 hours on Wednesday 13th September 2023.

3.3 The equipment was installed at first floor level 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.

3.4 The site location, surrounding area and survey measurement position 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 position (source: Google Earth)



Figure 3.2 - Photographs showing survey measurement position



Survey equipment

3.5 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.

3.6 Calibration of the sound level meter and microphone used for the measurements are traceable to UKAS accredited laboratories (calibration certificates are available upon request).

3.7 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

3.8 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 0.9 and 2.4 m/s^{-1}.

3.9 The air temperature during the survey ranged between 7°C and 19°C. The overall weather conditions were considered suitable to obtain representative measurements.

Subjective observations of the acoustic environment

3.10 The dominant source of noise at the site is road traffic on the local road network (Hamilton Road and Slade Grove).

3.11 Operational noise from nearby commercial premises was negligible during the daytime and night-time period and was predominantly vehicle related noise.

3.12 Machinery/equipment noise from the neighbouring textile/clothing manufacturer was just audible on Hamilton Road when there were no passing cars, however the level of noise was subjectively very low.

3.13 Operational noise from the primary school was negligible. The most notable noise was from vehicles during child collection/drop-off.

3.14 Other noted sources of noise include high altitude aircraft and passing pedestrians.

Measured indices

3.15 Although a wide range of statistical sound level data was recorded during the survey, the L_{Aeq}, L_{A90} 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).
- $L_{A90,T}$ - The sound pressure level that is exceeded for 90% of the measurement time interval, T. L_{A90} is often used to describe the 'background' 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).

3.16 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

3.17 Table 3.1 presents a summary of the continuously measured sound pressure levels. Measured values have been rounded to the nearest whole number.

Table 3.1 - Summary of continuously measured sound pressure levels

Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	Typical[1] $L_{A90,T}$ dB	10th Highest[2] $L_{AFmax,T}$ dB
Monday 11/09/2023	Daytime (13:30-23:00)	9.5	60	49	---
	Night-time (23:00-07:00)	8	53	40	70
Tuesday 12/09/2023	Daytime (07:00-23:00)	16	60	51	---
	Night-time (23:00-07:00)	8	51	43	68
Wednesday 13/09/2023	Daytime (07:00-10:30)	3.5	60	48	---

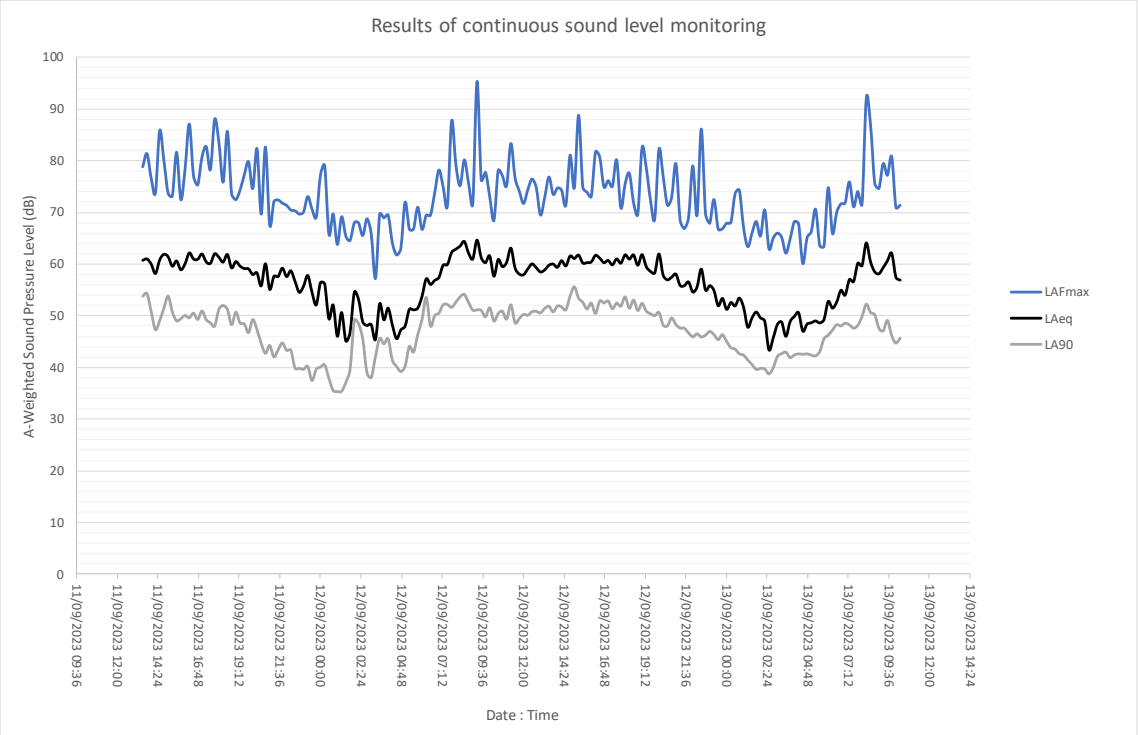
[1]Considered to be the representative background sound level from a statistical analysis (modal value)

[2]The 10th highest value from 32 measurement periods (indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10-15 times per night)

3.18 The daytime ambient sound pressure level was approximately 60 dB $L_{Aeq,16hour}$ and the night-time ambient sound pressure level was approximately 51 to 53 dB $L_{Aeq,8hour}$.

3.19 The ambient and background sound levels are presented graphically in Figure 3.3. Additional tabulated survey data can be made available upon request.

Figure 3.3 - Graph showing results of continuous sound level monitoring



4. Assessment & Discussion

Building envelope construction and acoustic performance

4.1 The external walls are of a traditional double-leaf brickwork construction. The wall construction is expected to provide a sound insulation performance of approximately 50 to 60 dB R_w.

4.2 The pitched roof construction appears to consist of profiled metal cladding panels, plywood, insulation and a 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 existing windows are 4 mm thick single glazing with timber frames. The glazing and frames are in a very poor condition. It is understood that the glazing and frames will be replaced throughout the apartment.

4.4 The glazing is the weakest element with regard to the sound insulation performance of the building envelope. Ventilation is currently provided via opening windows. There are no trickle vents in the existing window frames to the sides and rear of the building.

Noise ingress with windows closed

4.5 Table 4.1 and 4.2 presents the noise ingress calculation results for the large corner bedroom and small bedroom on the first floor overlooking Hamilton Road.

4.6 The consistently measured daytime sound pressure level has been used in the calculations (60 dB $L_{Aeq,16hour}$).

4.7 The calculation takes into account the sound insulation performance of each building element, surface area and internal room dimensions. The sound insulation data for a standard thermal double glazed window has been used in the calculation (4 mm glass/16 mm cavity/4 mm glass).

4.8 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 (large corner bedroom)

Title: No.48 Hamilton Road (Large Bedroom) **Noise Break In (ISO 12354-3)**												
Formula/Comment	***Single Value***		***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***	***Rw***	***(C,C_{tr})***
				21.9	19.6	27.3	36.0	36.8	33.4			
L_{in}				42.1	40.4	30.7	19.0	15.2	11.6			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass		8.0		21.0	17.0	25.0	35.0	37.0	31.0		**29**	**(-1,-4)**
Brickwork external wall		14.7		39.0	43.0	51.0	58.0	63.0	68.0		**55**	**(-2,-6)**
Pitched roof, insulation, plasterboard ceiling		19.2		28.0	34.0	40.0	45.0	49.0	50.0		**44**	**(-2,-5)**
$L_{out,s}$												
$L_{out,2m}$	Add Element			64.0	60.0	58.0	55.0	52.0	45.0		**60**	
$L_{out,free\ field}$				61.0	57.0	55.0	52.0	49.0	42.0		**57**	
Element 1				21.9	19.6	27.3	36.0	36.8	33.4			
Plane façade	ΔL_{fs}	41.8		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	x_{fs}	0.0		21.9	19.6	27.3	36.0	36.8	33.4			**31**
$L_{p,out,2m}$				64.0	60.0	58.0	55.0	52.0	45.0		**60**	
$L_{p,in}$				42.1	40.4	30.7	19.0	15.2	11.6		**34**	**dBA**

Table 4.2 - Noise ingress calculation results (small bedroom)

Title: No.48 Hamilton Road (Small 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	21.9	29.7	38.8	41.3	36.1			
L_{in}				40.3	38.1	28.3	16.2	10.7	8.9			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass		2.2		21.0	17.0	25.0	35.0	37.0	31.0		**29**	**(-1,-4)**
Brickwork external wall		3.9		39.0	43.0	51.0	58.0	63.0	68.0		**55**	**(-2,-6)**
Pitched roof, insulation, plasterboard ceiling		8.8		28.0	34.0	40.0	45.0	49.0	50.0		**44**	**(-2,-5)**
$L_{out,s}$												
$L_{out,2m}$	Add Element			64.0	60.0	58.0	55.0	52.0	45.0		**60**	
$L_{out,free\ field}$				61.0	57.0	55.0	52.0	49.0	42.0		**57**	
Element 1				23.7	21.9	29.7	38.8	41.3	36.1			
Plane façade	ΔL_{fs}	14.9		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	X_{fs}	0.0		23.7	21.9	29.7	38.8	41.3	36.1			**34**
$L_{p,out,2m}$				64.0	60.0	58.0	55.0	52.0	45.0		**60**	
$L_{p,in}$				40.3	38.1	28.3	16.2	10.7	8.9		**32**	**dBA**

4.9 The calculation results indicate a daytime internal sound level of approximately 32 to 34 dB $L_{Aeq,16hour}$ with standard thermal double glazing.

4.10 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be achieved with windows closed.

4.11 Since the night-time L_{Aeq} sound level is approximately 7 to 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.

4.12 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 $L_{AFmax,5min}$ – 25 dB R_w+C_{tr} = 45 dB $L_{AFmax,5min}$

4.13 This assessment demonstrates that standard thermal double glazing will be sufficient for all habitable rooms and additional noise mitigation such as installing acoustically-laminated double glazing and/or thick heavy panes of glass is unnecessary.

Noise ingress with windows open

4.14 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.

4.15 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.

4.16 Daytime façade sound pressure levels are approximately 60 dB $L_{Aeq,16hour}$ and night-time sound pressure levels approximately 51 to 53 dB $L_{Aeq,8hour}$.

4.17 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.

4.18 The corresponding ‘free-field’ sound pressure levels are therefore 57 dB $L_{Aeq,16hour}$ during the daytime and 48 to 50 dB $L_{Aeq,8hour}$ during the night-time.

4.19 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 42 dB $L_{Aeq,16hour}$ during the daytime and approximately 33 to 35 dB $L_{Aeq,8hour}$ during the night-time.

- 57 dB $L_{Aeq,16hour}$ – 15 dB = 42 dB $L_{Aeq,16hour}$
- 50 dB $L_{Aeq,8hour}$ – 15 dB = 35 dB $L_{Aeq,8hour}$

4.20 The 35 dB $L_{Aeq,16hour}$ daytime and 30 dB $L_{Aeq,8hour}$ night-time sound level targets will therefore not be achieved with windows open.

4.21 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.

4.22 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.

4.23 It is therefore recommended that an alternative means of ventilation is provided to all habitable rooms.

4.24 A suitable mitigation measure would be to install good quality (acoustically treated) sound attenuating ventilator units to the new window frames and/or external brickwork wall.

4.25 As an alternative to acoustic ventilator units, a mechanically assisted ventilation system could be installed within the property (e.g. MVHR system).

4.26 Fully opening windows will be appropriate to provide rapid or purge ventilation (e.g. to remove odour from painting and decorating or from burnt food).

4.27 Further guidance regarding property ventilation and noise mitigation options are provided within Section 5 of this report.

Overheating and opening windows

4.28 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).

4.29 The predicted internal sound levels achieve the noise limits above which indicates that occupants are likely to open windows during the night-time for room cooling.

Internal sound insulation and acoustic separation

Separating floor between ground floor office and first floor bedrooms

4.30 The separating floor consists of a 250 mm thick concrete slab.

4.31 It is estimated that the existing floor construction will provide an airborne sound insulation performance of approximately 39 to 41 dB $D_{nT,w}+C_{tr}$ and is therefore below the minimum requirements of Approved Document E of the Building Regulations (≥43 dB $D_{nT,w}+C_{tr}$).

4.32 The separating party floor will therefore require appropriate acoustic enhancement to satisfy the minimum sound insulation requirement and provide sufficient acoustic separation.

4.33 It is recommended that the new ceiling to the ground floor consists of either 2 x 12.5 mm SoundBloc or 2 x 15 mm FireLine plasterboard (or similar) suspended via a metal-framed system.

- Gyproc SoundBloc 12.5mm | Acoustic Plasterboard | British Gypsum (british-gypsum.com)
- Gyproc FireLine 15mm | Fire Resistant Plasterboard | British Gypsum (british-gypsum.com)

4.34 It is often recommended that the minimum mass per unit area of a new acoustic ceiling is at least 20 kg/m^2. Using two layers of acoustic/dense plasterboard will satisfy this recommendation.

4.35 A suitable suspension system would be the CasoLine metal frame:

- CasoLine MF Ceiling System | Gyproc

4.36 The new plasterboard should be installed with staggered joints. The joints to the outer board layer should be sealed with tape or caulked with sealant and the perimeter edge of the ceiling boards should also be sealed with flexible sealant. Ideally, a small perimeter gap (2 – 3 mm) should be maintained to ensure the new ceiling boards do not touch the surrounding walls.

4.37 It is recommended that acoustic hangars are used to isolate the plasterboard from the structure.

4.38 Suitable acoustic hangars include British Gypsum's GAH1, Siniat's GTEC Phonissimo or Cellecta's AH50.

- Gypframe GAH1 Acoustic Hanger for GypCeiling MF Ceiling | British Gypsum (british-gypsum.com)
- GTEC Phonissimo Acoustic Hanger - Siniat
- AH50 - Cellecta

4.39 The suspension depth between the bottom of the concrete slab and the top of the plasterboard should be at least 175 mm.

4.40 It is also recommended that a minimum of 100 mm thick mineral wool insulation (e.g. Knauf's acoustic partition roll or Isover's APR1200) is placed within the cavity above the plasterboard.

- www.knaufinsulation.co.uk/products/acoustic-roll
- www.isover.co.uk/products/acoustic-partition-roll-apr-1200

4.41 It should be noted that down-lighting degrades the high frequency sound insulation of the ceiling. If down-lighting is required, acoustically-rated down lighters should be installed or alternatively acoustic hoods should be installed over the unit.

Anticipated sound insulation performance on completion

4.42 With the recommended construction, the separating floor is expected to achieve an airborne sound insulation performance of approximately 45 to 50 dB $D_{nT,w}+C_{tr}$.

4.43 The anticipated sound insulation performance will therefore achieve the minimum requirements of Part E of the Building Regulations for separating floors.

Noise transmission from the ground floor commercial unit

4.44 Sample noise measurements previously conducted within a builder's merchants and associated storage area indicate typical ambient sound levels in the region of 55 to 70 dB $L_{Aeq,60sec}$.

4.45 Taking into consideration the sound insulation performance of the separating floor on completion, the corresponding sound level within first floor habitable rooms is expected to be approximately 10 to 25 dB $L_{Aeq,60sec}$.

- 70 dB $L_{Aeq,60sec}$ - 45 dB $D_{nT,w}+C_{tr}$ = 25 dB $L_{Aeq,60sec}$

4.46 The resulting sound level is therefore expected to easily achieve the recommended daytime noise limit for bedrooms (35 dB $L_{Aeq,16hour}$).

4.47 Noise disturbance due to the operation of the ceramic tile showroom and associated storage area is therefore unlikely.

Acoustic enhancement to apartment walls

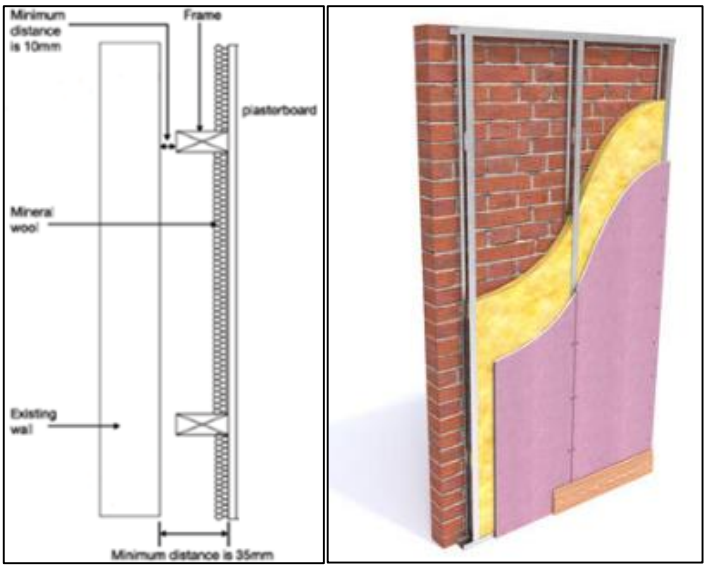
4.48 Without appropriate enhancement, vertical flanking noise transmission via the external brickwork walls will undermine the sound insulation performance of the separating floor.

4.49 Appropriate wall linings are therefore necessary to help sufficiently reduce the level of flanking sound energy from being radiated via the brickwork wall construction.

4.50 A wall lining is also necessary to increase the performance of the party wall separating the textile/clothing manufacturer to the north and the first floor bedroom.

4.51 It is recommended that the walls to the apartment are lined with a fully independent lining system (as shown below).

Figure 4.1 - Diagram showing independent wall lining



4.52 The wall lining should comprise of a minimum 1 x 12.5 mm SoundBloc plasterboard or alternatively 1 x 15 mm FireLine plasterboard with 50 mm thick mineral wool insulation (or acoustic slab) fitted between studs.

4.53 The greatest level of flanking sound attenuation will be achieved via a fully independent wall lining system and it is therefore recommended that an independent lining is used if possible.

- GypLyner Independent Wall Lining System | British Gypsum (british-gypsum.com)

4.54 The supporting framework for the linings can be constructed from metal studs and floor/ceiling channels or alternatively from timber (e.g. 3" x 2" timber battens).

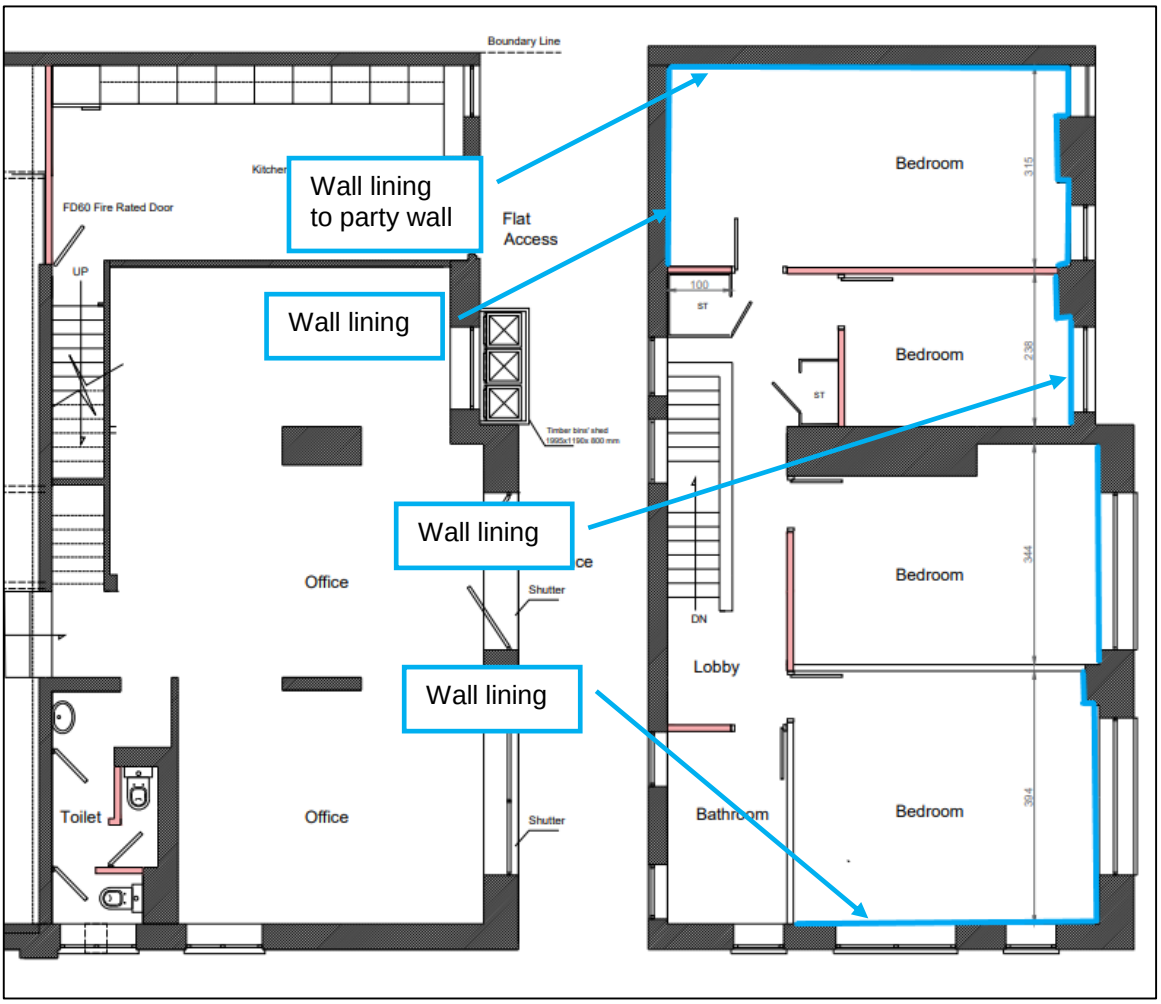
4.55 Where metal is preferred, the independent frame can be constructed from Gypframe floor and ceiling channels with Gypframe 'I' studs friction-fitted vertically within the channel sections to form the framework. There should be a gap of at least 10 mm between the metal frame and the existing masonry to prevent acoustic bridging.

4.56 Where it is impractical to install independent wall linings, a 'virtually' independent wall lining may be used, such as the GypLyner Single metal-framed lining system:

- GypLyner Single Wall Lining System | British Gypsum (british-gypsum.com)

4.57 Figure 4.2 shows the wall linings to the first floor apartment (linings highlighted in blue).

Figure 4.2 - Floor plan showing independent wall linings



5. Ventilation & Noise Mitigation

Acoustically rated ventilator units

5.1 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.

5.2 Sound attenuating (acoustically rated) 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 The ventilator unit should provide a sound insulation performance of at least 38 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.nuaire.co.uk/residential/positive-input-ventilation
- 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). Such systems can also be supplied with a 'boost' function in order to reduce the need to open windows for purge ventilation.

5.8 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.

Single room heat recovery ventilation units

5.9 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.

5.10 Example single room heat recovery units include:

- in Decentralised & Single Room Heat Recovery Ventilation Units (blauberg.co.uk)
- heatSava | Single Room Heat Recovery System | EnviroVent
- Single Room MVHR (bpcventilation.com)

Building Regulations 2010: Approved Document F (Ventilation)

5.11 The approved document supports Part F of Schedule 1 to the Building Regulations 2010 and came into effect on 15 June 2022.

5.12 The aim of requirement F1(1) is to protect the health of occupants with the dwelling by providing adequate ventilation. Without adequate ventilation, mould and internal air pollution might become hazardous to health.

5.13 The document sets minimum standards for purge ventilation for rapidly diluting indoor air pollutants and extracting water vapour where necessary in habitable rooms in dwellings. For domestic-type buildings, Part O may require a higher standard than the guidance given in this document for purge ventilation to remove excess heat. In this case, the higher of the two standards should be followed.

5.14 With regard to noise (from mechanical systems), page 6 of the document states the following:

1.5 Mechanical ventilation systems, including both continuous and intermittent mechanical ventilation, should be designed and installed to minimise noise. This includes doing all of the following.

a. Correctly sizing and jointing ducts.

b. Ensuring that equipment is appropriately and securely fixed, such as using resilient mountings where noise carried by the structure of the building could be a problem.

c. Selecting appropriate equipment, including following paragraph 1.6.

1.6 For mechanical ventilation systems, fan units should be appropriately sized so that fans operating in normal background ventilation mode are not overly noisy. This might require fans to be sized so that they do not operate near maximum capacity when in normal background ventilation mode.

1.7 Account should be taken of outside noise when considering whether openable windows are appropriate for purge ventilation.

Note: Although there is no requirement to undertake noise testing, achieving the levels in the following guidance would ensure good acoustic conditions. The average A-weighted sound pressure level for a ventilator operating under normal conditions and not at boost rates should not exceed both of the following.

a. 30 dB $L_{Aeq,T}$ for noise-sensitive rooms (e.g. bedrooms and living rooms) when a continuous mechanical ventilation system is running on its minimum low rate.*

b. 45 dB $L_{Aeq,T}$ in less noise-sensitive rooms (e.g. kitchens and bathrooms) when a continuous operation system is running at the minimum high rate or an intermittent operation system is running.*

** The noise index $L_{Aeq,T}$ is used in BS 8233, where T is the duration of the measurement. If the noise from the sound source is steady (i.e. fluctuating by up to 3dB), a measuring time of 1 minute will be adequate and the L_{Aeq}, 1 min level will be similar to the dB(A) level used elsewhere. If the noise from the sound source fluctuates more than this, a longer measuring time (T) may be required, but the higher portion of the fluctuating level should be considered, and the sound may attract more attention due to the changes in level.*

Note: Methods for measuring the sound power level produced by the fan unit of decentralised extract ventilation, centralised extract ventilation and balanced mechanical ventilation with heat recovery systems are described in BS EN 13141.

5.15 Section 3 of Approved Document F (Replacing windows) states the following:

Existing windows with background ventilators

3.14 - If the existing windows have background ventilators, the replacement windows should include background ventilators. The new background ventilators should comply with both of the following conditions.

a. Not be smaller than the background ventilators in the original window.

b. Be controllable either automatically or by the occupant.

If the size of the background ventilators in the existing window is not known, the ventilator sizes in paragraph 3.15 may be applied.

Existing windows without background ventilators

3.15 - Replacing the windows is likely to increase the airtightness of the dwelling. If ventilation is not provided via a mechanical ventilation with heat recovery system, then increasing the airtightness of the building may reduce beneficial ventilation in the building. In these circumstances, it is necessary to ensure that the ventilation provision in the dwelling is no worse than it was before the work was carried out. This may be demonstrated in any of the following ways.

a. Incorporating background ventilators in the replacement windows equivalent to the following.

i. Habitable rooms – minimum 8000mm^2 equivalent area.

ii. Kitchen – minimum 8000mm^2 equivalent area.

iii. Bathroom (with or without a toilet) – minimum 4000mm^2 equivalent area.

b. If the dwelling will have continuous mechanical extract ventilation, installing background ventilators in any replacement windows which are not in wet rooms, with a minimum equivalent area of 4000mm^2 in each habitable room.

c. Other ventilation provisions, if it can be demonstrated to a building control body that they comply with the requirements of paragraph 3.2.

NOTE: If it is not technically feasible to adopt the minimum equivalent areas set out in paragraph 3.15, the background ventilators should have equivalent areas as close to the minimum value as is feasible.

3.16 - When windows are replaced as part of the work connected with a material change of use, Section 1 of this approved document should be followed in addition to paragraphs 3.14 and 3.15.

5.16 The aim of requirement F1(1) is to protect the health of occupants with the dwelling by providing adequate ventilation. Without adequate ventilation, mould and internal air pollution might become hazardous to health.

5.17 The document sets minimum standards for purge ventilation for rapidly diluting indoor air pollutants and extracting water vapour where necessary in habitable rooms in dwellings. For domestic-type buildings, Part O may require a higher standard than the guidance given in this document for purge ventilation to remove excess heat. In this case, the higher of the two standards should be followed.

6. Conclusion

6.1 Standard thermal double glazing will be sufficient for all habitable rooms and additional noise mitigation such as installing acoustically-laminated double glazing and/or thick heavy panes of glass is unnecessary.

6.2 A suitable double glazed unit would be 4 mm glass/16 - 20 mm cavity/4 mm glass.

6.3 The recommended sound level targets will be achieved during the daytime and night-time period with windows closed.

6.4 With windows open, the sound level targets will not be achieved within habitable rooms.

6.5 It is therefore recommended that an alternative means of ventilation is provided to all habitable rooms (i.e. in addition to opening windows).

6.6 A suitable mitigation measure would be to install good quality (acoustically treated) sound attenuating ventilator units to the new window frames and/or external brickwork wall. The ventilator unit should provide a sound insulation performance of at least 38 dB $D_{n,e,w}$ in the open position.

6.7 Fully opening windows will be appropriate to provide rapid or purge ventilation (e.g. to remove odour from painting and decorating or from burnt food) and for room cooling.

6.8 The existing separating floor will require enhancement in order to provide sufficient acoustic separation from the commercial unit and also to satisfy the Building Regulation requirements.

6.9 Recommendations regarding acoustic enhancement have been provided for the separating floor and masonry flanking walls.

6.10 The property is suitable for the proposed ground floor commercial use and upper floor dwelling subject to the incorporation of the recommended acoustic enhancement.

6.11 It is highly unlikely that the occupants of the new apartment will be subjected to high levels of noise or disturbance due to the operation of the ceramic tile showroom.

Appendix A
Floor plans and elevations

Figure A.1 - Existing floor plans and side elevation

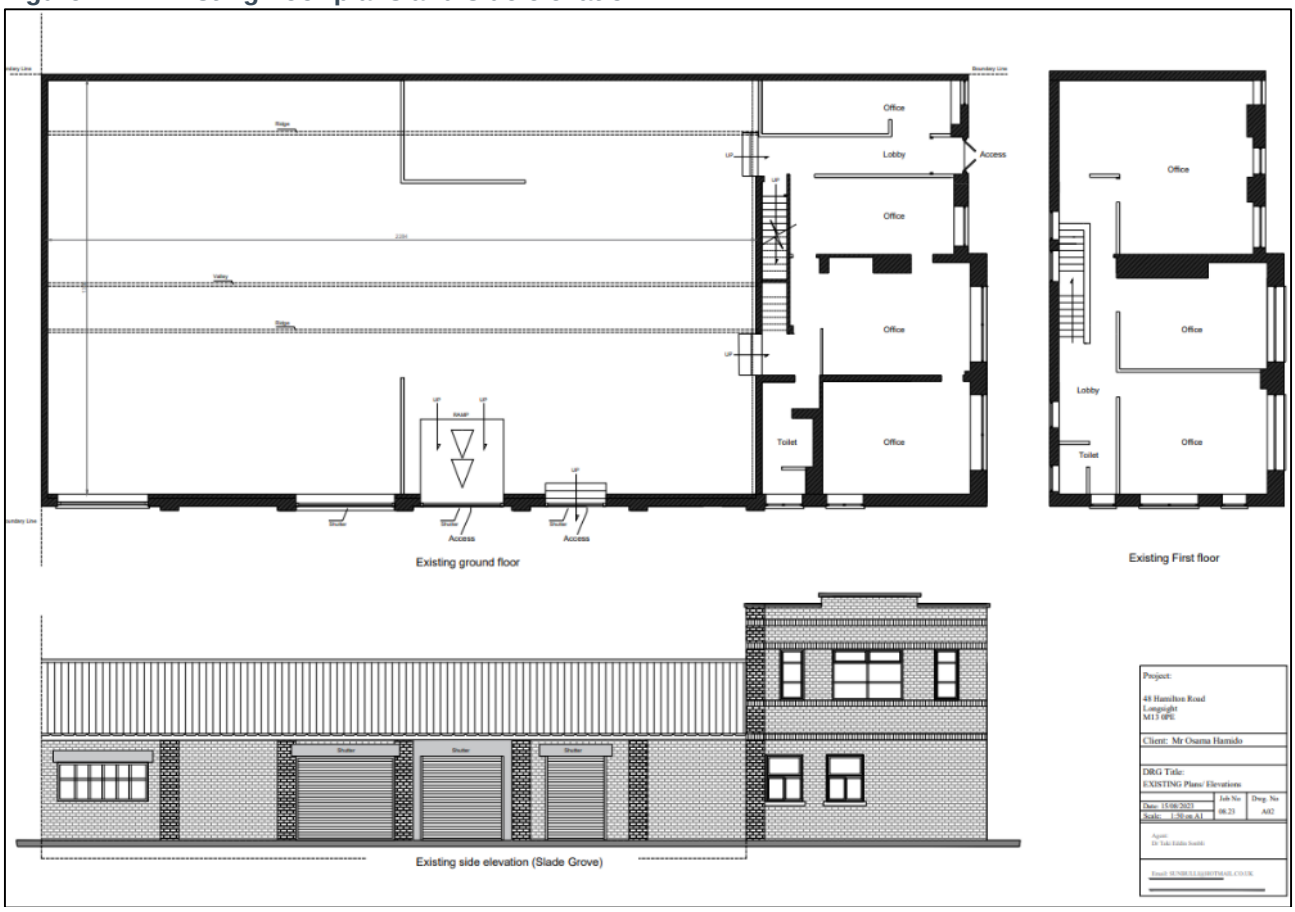


Figure A.2 - Existing elevations



Figure A.3 - Proposed floor plans and side elevation

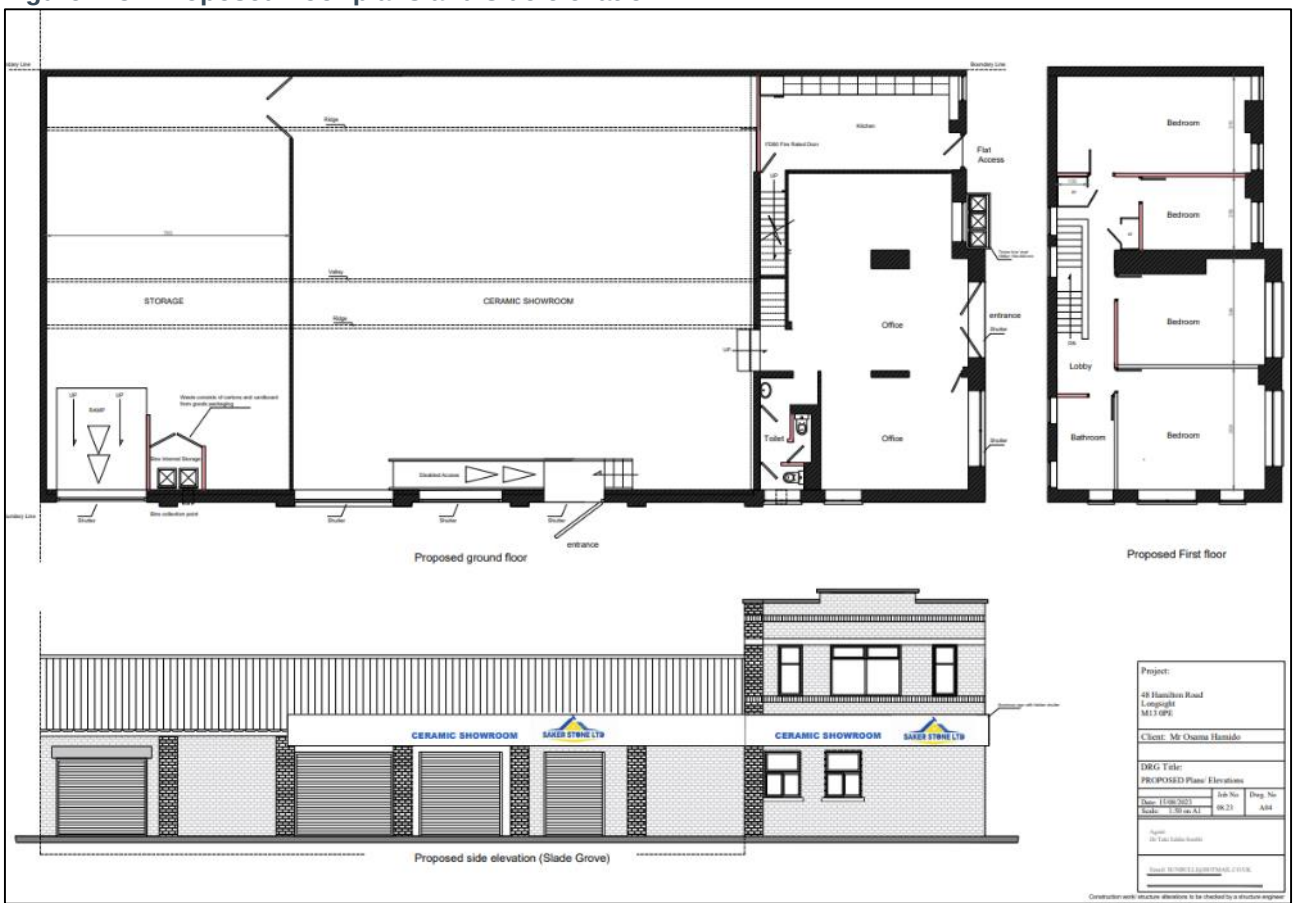


Figure A.4 - Proposed elevations



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 ($2x10^{-5}$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).