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NOISE IMPACT ASSESSMENT AND INTERNAL SOUND INSULATION DESIGN

PROPOSED RESTAURANT, 48 PRINCESS STREET, MANCHESTER

REPORT REFERENCE NO. J005171-8113-SH-04
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	Name	Position
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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.

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1.0 SUMMARY

At the request of Forty Eight M Ltd, Sound Insulation Testing has been carried out to assess the impact on Flat 3 at 48 Princess Street, Manchester of the conversion of a basement area and fire escape into a restaurant.

The performance of the separating floor between Flat 3 and the basement area, and the performance of the separating wall between Flat 3 and the Fire Escape has been assessed in line with the requirements of the Building Regulations 2010 (specifically, Approved Document E). Testing was carried out according to the suggested methods presented in BS EN ISO 140-parts 4 and 7: 1998 “Field Measurements of Airborne Sound Insulation Between Rooms”. The results of the tests were analysed in accordance with BS EN ISO 717.

We have found that while the separating floor does meet the requirements specified within Approved Document E, the separating wall between the Fire Escape and Flat 3 does not meet the requirements. Based on this we would conclude that use of the Fire Escape as an entrance for the proposed restaurant would not be appropriate without remedial works to improve the performance of the separating wall.

In order to support such works, we have made proposals for the design and implementation of an uprated wall between Flat 3 and the Fire Escape, which are enclosed within this report. We would view it as likely that subject to the uprating recommended (or uprating of an equivalent performance), the proposed restaurant would not produce an adverse impact on the residents of the apartment block. We have included further details regarding junction detailing and good acoustic design, adherence to which is essential in order to achieve an acceptable in-situ sound insulation performance.

We have further assessed the noise impact of the proposed supply and extract ventilation units for the kitchen of the restaurant, and have specified attenuation levels required to be achieved in order to mitigate the possibility of an adverse impact on the amenity of the residents of the nearest flats from the proposed units.

PDA’s advice relates only to acoustic design. Compliance with other Building Regulations requirements such as fire and fire safety, structural integrity or any other area other than acoustics should be checked by others.

2.0 NOISE ASSESSMENT CRITERIA

2.1 National Planning Policy Framework (NPPF)

National Planning Policy is guided by the National Planning Policy Framework (NPPF) updated in February 2025. With regard to Noise the Framework states the following;

Planning policies and decisions should contribute to and enhance the natural and local environment by:

- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.*

  Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- *mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms '*significant adverse impact*' and '*adverse impact*' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The notes also offer an explanation of the term 'other adverse impacts' as follows;

… refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

It should be noted that no specific noise limits for LOAEL and SOAEL have yet been specifically defined; however guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

2.2 BS4142:2014

The effect of plant noise emissions on the nearest noise sensitive residences can be assessed in accordance with BS4142:2014 – '*Methods for rating and assessing industrial and commercial sound*'.

The standard describes a method of determining the level of a noise of commercial or industrial nature, together with procedures for assessing the impact of such a noise outside nearby noise sensitive areas.

The standard provides a procedure for comparing the noise from commercial sources with background noise levels in the absence of the commercial noise and determining the likely impact of the noise on noise sensitive areas.

In accordance with BS 4142 the background noise level is the typical A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

Certain acoustic features can increase the impact over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are considered by adding corrections to the specific noise level.

The corrections are applied based on whether the following features occur, or are expected to be present. The correction values can either be determined subjectively, or by various objective measurement procedures.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.). 0 – 6 dB penalty
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps). 0 – 9 dB penalty.
- The noise is irregular enough to attract attention. 0 – 3 dB penalty.
- Other features. 0 – 3 dB penalty.

From the addition of the above penalties where appropriate the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 an initial estimate of the impact is given for a rating level of:

- 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

The above initial assessment may then be modified depending on the context to take into account;

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

    1. Façade insulation treatment
    2. Ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
    3. Acoustic screening

2.3 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

British Standard 8233:2014, *Guidance on Sound Insulation and noise reduction for buildings*, gives guidance on internal noise levels within dwellings, flats and rooms in residential use when unoccupied. The following criteria are for Living and Dining Rooms for daytime use and Bedrooms for night time.

Table 1. BS8233 recommended indoor ambient noise levels

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

It should however be stressed that the above criterion relates to steady noise, in this case from road traffic etc., excluding unusual noise events departing from the typical noise character of the area.

2.0 SOUND INSULATION TESTING

Complaints have previously been made by the occupants of Flat 3 at 48 Princess Street relating to noise from the fire escape stairwell which would form the entrance to the proposed basement restaurant. As such, sound insulation testing was carried out between the living room of Flat 3 and the basement and stairwell in order to assess the performance of existing building elements. The findings of these tests are given within this section.

2.1 Testing Methodology

Sound Insulation Testing was carried out by PDA Ltd on Wednesday the 9th of October 2024. All measurements were made by Sky Hawkins MSc AMIOA of PDA Ltd.

The equipment used during the tests is as listed in Table 1 below. The sound level meters were calibrated before and after the tests as appropriate, during which time no significant calibration deviation was observed. The sound level meters, acoustic calibrators and microphones are all covered by current calibration certificates.

Table 1 - Equipment used for Sound Insulation Testing

Type	Manufacturer	Model	Serial Number	Calibration Date	Calibration Certificate Number	Calibration Lab	Calibration Expiration
Sound Level Meter	RION	NA28	3041896	03/10/2023	06454/2	University of Salford	03/10/2025
Pre-amplifier	RION	NH-23	21959	03/10/2023	06454/2	University of Salford	03/10/2025
Microphone	RION	UC-59	4959	03/10/2023	06454/2	University of Salford	03/10/2025
Calibrator	RION	NC-74	34536106	02/10/2023	06454/1	University of Salford	02/10/2024
Sound Source	JBL	EON 10	P0349-22298	n/a	n/a	n/a	n/a
Pink Noise Generator	CEL	513	36164	09/06/2023	n/a	Internal Verification	09/06/2025

Testing was carried out on the separating elements between Flat 3 and both the basement area directly below the flat, and the fire escape adjacent to it. As such, two full sets of airborne testing was carried out.

The testing method for airborne sound insulation was in full accordance with the suggested methods presented in BS EN ISO 140-parts 4 and 7: 1998 “Field Measurements of Airborne Sound Insulation Between Rooms”. The results of the tests were analysed in accordance with BS EN ISO 717.

2.2 Sound Insulation Test Results

Testing between Flat 3 and the basement area directly below the flat produced a sound insulation performance of 64 dB $D_{nT,w} + C_{tr}$. Noting that the performance requirement of this element is 45 dB $D_{nT,w} + C_{tr}$, the floor was found **to be compliant** with the requirements given in Approved Document E.

Testing between Flat 3 and the fire escape produced a sound insulation performance of 39 dB $D_{nT,w} + C_{tr}$. Noting that the performance requirement of this element is 45 dB $D_{nT,w} + C_{tr}$, the wall between the flat and fire escape was found **to not be compliant** with the requirements given in Approved Document E.

Full Sound Insulation Certificates are provided in Appendix C.

3.0 ACOUSTIC DESIGN RECOMMENDATIONS

In order to make recommendations for further works, we have referred to the values presented for separating element performance in Section 0.

We have assumed the separating floor to be of a similar nature across all ground floor apartments. Under this assumption, it appears likely that the separating floor will have a performance sufficient to not preclude the proposed restaurant space within the basement. As such, recommendations within this section will focus on the separating wall between Flat 3 and the Fire Escape, which at present would preclude the creation of the proposed restaurant.

Based on drawings that predate the installation of the fire escape, and discussions with our client, we understand the approximate layout to be as shown in Figure 1 below.

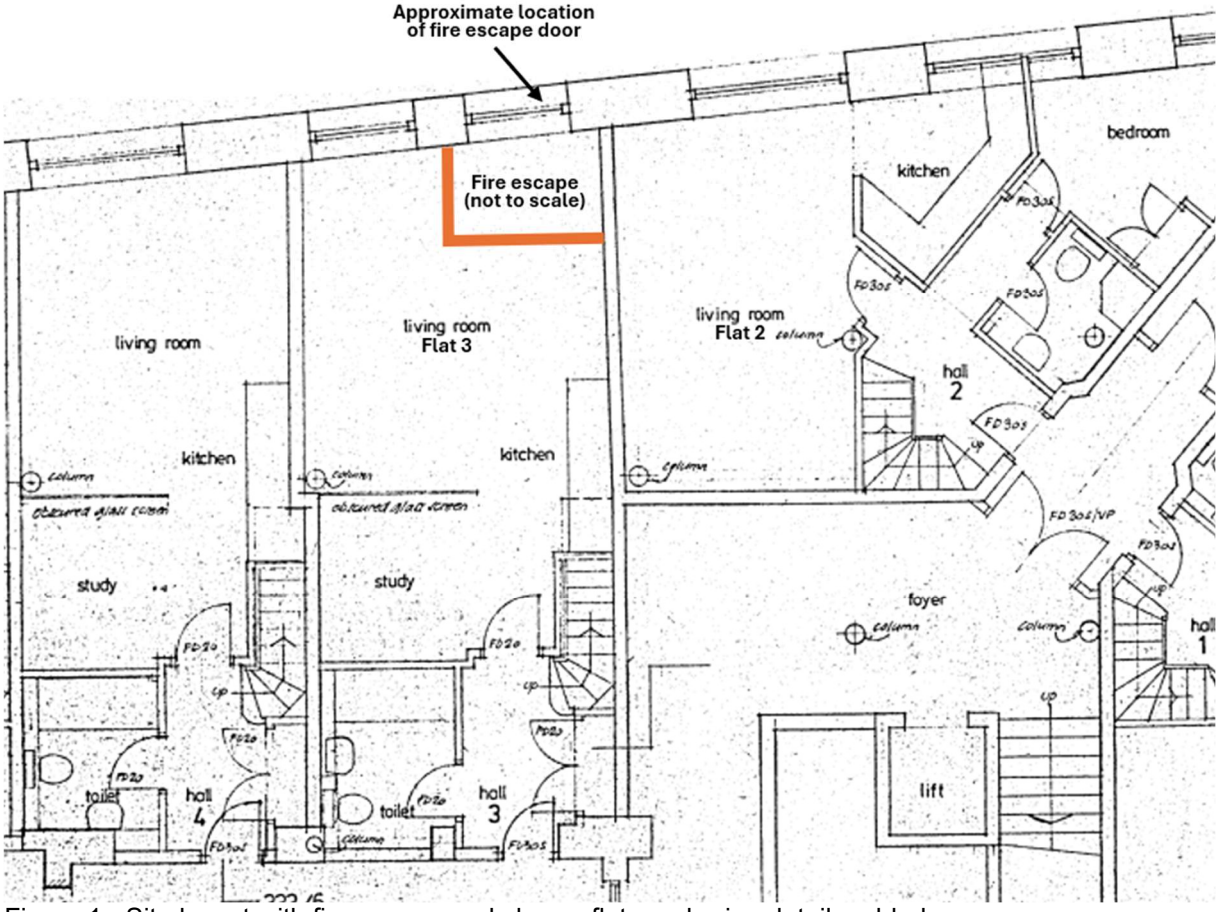


Figure 1 - Site layout with fire escape and clearer flat numbering details added.

We understand the separating and flanking elements between the fire escape and habitable spaces to be as follows:

- Fire Escape Walls and Ceiling: 1 layer of plasterboard and 1 layer of plyboard, 150mm timber studwork, 1 layer of plasterboard.
- Flanking Façade Wall: Masonry outer face, 100mm hollow cavity and 1 layer of plasterboard on inner face.
- Flanking Party Wall: Apparent metal studwork wall (assumed non acoustic c studs) with studs on Flat 2 side. Flat 2 side wall composition unknown, either plasterboard or plyboard, approx. 200mm cavity with either 1 or 2 layers of plasterboard on fire escape side.

It is our understanding that the fire escape was installed subsequently to the conversion of the building into flats. It appears unlikely that proper attention was given to flanking details, and as such it is probable that plasterboard on both the party and façade wall directly flanks the fire escape, and that the façade cavity is not sealed (with a cavity stop or similar) between the spaces. Without attention to these details, any remedial works to the walls would achieve marginal results at best.

We cannot comment as to the performance of the separating wall between Flat 3 and Flat 2, but our client informs us that it was built to an appropriate standard, and the design was signed off by building control. Based on this, we have assumed the separating wall to be an ADE compliant design achieving at least 45 dB D_{nTw} + C_{tr}.

We wish to reiterate that all recommendations made within this report are purely from an acoustics perspective, and **must** be verified as acceptable by a suitably qualified individual in the field of Building Fire Safety before they are implemented. They may also require confirmation from a structural engineer in order to assess the impact on the constructions made by Flat 3 upon the fire escape framework.

3.1 Design of the Separating Wall

The acoustic performance of wall designs is typically specified in terms of dB R_w, which is the laboratory performance of a given wall element. Due to the small surface area of the separating element relative to the volume of Flat 3, we have predicted an increase of approximately 5dB when converting from dB R_w to dB D_{nTw} in this instance.

We would consider that if the separating wall between Flat 3 and the stairwell can achieve ADE requirements, it can be presumed to be suitable for purpose, provided that lobbied doors are used at the basement end of the stairwell so as to ensure the noise level within the stairwell is not substantially greater than that expected for a typical building corridor.

3.1.1 Remedial Wall Treatment (Independent Twin-Stud)

The best approach to improving the performance of the separating wall element would be the construction of an independent twin stud wall system on the fire-escape side. This would be built in-front of the existing separating wall, and is exemplified by British Gypsum A216009 as shown in Figure 2 overleaf.

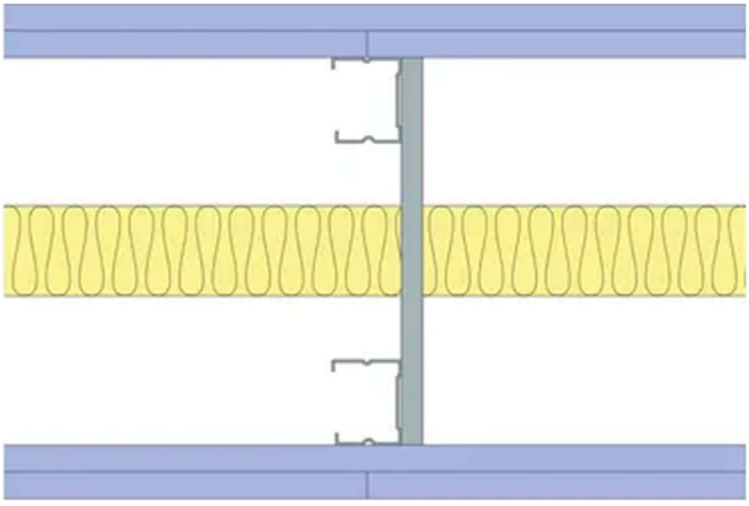


Figure 2 - British Gypsum A216009 - Acoustic Principles Only. Design must be checked / modified by others as required for structure, fire resistance / strategy etc. Not to Scale. Not for Construction

Plasterboard: 2 no. Gyproc SoundBloc 15mm on each side of cavity.

Studwork: 2no. 48 S 50 'C' Stud frameworks with studs at 600mm centres, cross braced using Gypframe 99 FC 50 Fixing Channel.
Cavity Insulation: 50mm Isover Acoustic Partition Roll (APR 1200) at centre of cavity.

The laboratory tested performance of the above wall is 56dB R_w + Ctr. This will be expected to achieve 61 dB D_{nTw}` + C_{tr} in-situ, which would substantially exceed the 45 dB D_{nTw} + Ctr on-site requirements of the Building Regulations Approved Document E. This design would therefore be highly likely to be effective in mitigating the impact on the residents of Flat 3 subject to suitable workmanship and correct flanking detail design.

3.1.2 Remedial Wall Treatment (Single Stud)

If the above design cannot be achieved, then a single frame design may be considered instead, with the caveat that a lower overall performance would be expected, which may decrease the probability of successfully achieving the required performance. This principle is exemplified by British Gypsum A046005, shown in Figure 3 below.

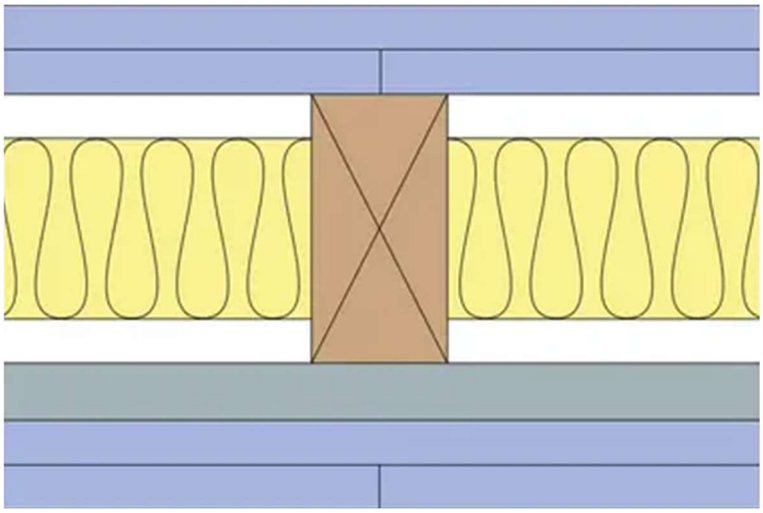


Figure 3 - British Gypsum A046005 - Acoustic Principles Only. Design must be checked / modified by others as required for structure, fire resistance / strategy etc. Not to Scale. Not for Construction

Plasterboard: 2 no. Gyproc SoundBloc 12.5mm on each side of cavity.
Studwork: 75 x 38mm timber studs at 600mm centres, with Gypframe RB1 Resilient Bars fixed horizontally to one side at 600mm centres.
Cavity Insulation: 50mm Isover Acoustic Partition Roll (APR 1200) at centre of cavity.

The laboratory tested performance of the above wall is 55 dB R_w, however due to the requirement to retain the existing plasterboard on the Flat 3 side of the partition, and the lack of attention to acoustic detailing thus far observed, we consider it unlikely that the existing plasterboard is Gyproc SoundBloc 12.5mm or equivalent. As such we have assumed it to be two layers of 10mm plasterboard. Using INSUL 9 we have predicted it's performance to be 53 dB Rw, and 44 dB Rw + Ctr.

This would be predicted to achieve 49 dB D_{nTw} + C_{tr}, subject to suitable workmanship and correct flanking detail design. This design would therefore be likely to be effective in mitigating the impact on the residents of Flat 3 subject to suitable workmanship and correct flanking detail design.

3.2 Design of Separating Ceiling

Assuming that the shape of the fire escape stairwell is to be retained as currently designed, any upgrade to the separating wall must be accompanied with equivalent upgrades to the separating ceiling between the fire escape and Flat 3.

We would recommend upgrading of the existing ceiling with either the fixing of a secondary independent ceiling to new independent joists, or suspension of a secondary independent ceiling using Gypframe Acoustic Hangers.

3.2.1 Remedial Treatment by installation of Suspended Secondary Ceiling

A suspended ceiling system could be employed using a design similar to that exemplified in British Gypsum C106023, shown in Figure 4 below.

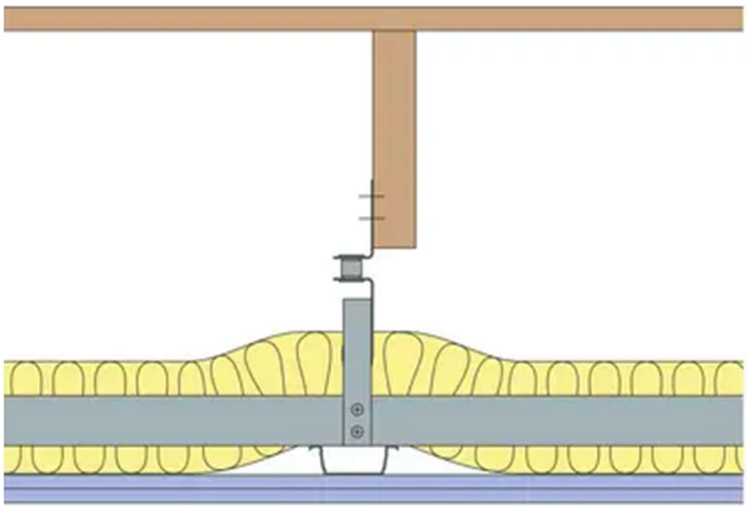


Figure 4 - British Gypsum C106023 - Acoustic Principles Only. Design must be checked / modified by others as required for structure, fire resistance / strategy etc. Not to Scale. Not for Construction.

Assumed Existing Floor: 21mm T&G wood chipboard flooring on 45 x 195mm solid timber joists at 600mm centres.
Hanger System: GypCeiling MF suspended ceiling installed beneath joists using Gypframe Acoustic Hangers to give 277mm cavity.
Cavity Absorption: 100mm Isover Spacesaver Ready-Cut.
Secondary Ceiling: 2no. layers of Gyproc SoundBloc 15mm or equivalent.

The laboratory tested performance of the above ceiling is 55 dB $R_w + C_{tr}$. This would be predicted to achieve 64 dB $D_{nTw} + C_{tr}$, subject to suitable workmanship and correct flanking detail design. This design would therefore be likely to be effective in mitigating the impact on the residents of Flat 3 subject to suitable workmanship and correct flanking detail design.

3.2.2 Remedial Treatment by installation of Secondary Independent Ceiling

An alternative approach would be to install a secondary independent ceiling with new joists built into the wall joists. This approach would be similar but not identical to that given in British Gypsum C106045. The description would be as follows:

Assumed Existing Floor: 21mm wood chipboard flooring.
Joists: 45 x 195mm solid timber joists at 600mm centres on both sides of cavity, forming independent twin joist-work.
Cavity Absorption: 100mm Fibreglass Absorption (12kg/m^3, approx. equivalent to Isover ARP 1200).
Secondary Ceiling: 2no. layers of Gyproc SoundBloc 15mm or equivalent.

The performance of the above system has been predicted using INSUL 9, and was found to be 59 dB $R_w + C_{tr}$. This would be predicted to achieve 68 dB $D_{nTw} + C_{tr}$, subject to suitable workmanship and

correct flanking detail design. This design would therefore be likely to be effective in mitigating the impact on the residents of Flat 3 subject to suitable workmanship and correct flanking detail design.

3.3 Staircase Noise Mitigation

It is understood that previous noise complaints from the residents of Flat 3 have included reference to noise from the existing metal staircase. In order to minimise said noise, we would recommend the addition of a solid layer of resilient backed vinyl (minimum 6mm) on the upper surface of all steps. This would act to attenuate footsteps, reducing the airborne noise re-radiated by the staircase.

3.4 Lobbied Doors

In order to minimize noise egress from the restaurant into the fire escape, the proposed entrance should be fully lobbied with two sets of separating doors with an adequate acoustic performance. Considering both the performance of the uprated walls and practical limits in terms of access and buildability, we would recommend use of doors rated to achieve 35 dB R_w. It is recommended that good quality solid-core doorsets should be used alongside appropriate perimeter sealing. Appropriate sealing could be achieved through use of neoprene seals applied to the head and jambs of the door alongside a drop seal or wipe seal at the base of the door.

4.0 IN-SITU FLANKING MITIGATION DESIGN

In order to maximise the in-situ performance of installed elements, careful attention should be paid to flanking paths created both by existing flanking elements (the façade and party wall), and the construction of new elements placed in-situ during the uprating process.

4.1 Uprated Walls

In general, the walls should be constructed according to the guidance given in the British Gypsum White Book, for the independent twin stud design shown in Section 3.1.1 see the guidance for GypWall Quiet, and for the single frame design shown in Section 3.1.2 see the guidance for Gypwall Quiet SF and Non-loadbearing timber stud.

For the independent twin stud design, the existing wall should be made good by either replacing damaged areas of plasterboard, or infilling the holes in the existing plasterboard to make them good. Alternatively the existing wall may be replaced using the twin stud wall.

For the single frame design, the existing wall should be taken back to the timber studwork for uprating to allow for installation of insulation and the resilient bars.

Layers of plasterboard should be staggered, and all outer layer joints sealed with tape or caulked with sealant. Where multiple layers of plasterboard meet at a corner, they should be layered into each other in an abutted and staggered fashion.

4.2 Uprated Ceiling

In general, the ceiling should be constructed according to the guidance given in the British Gypsum White Book, for both proposed designs, see guidance for the Casoline MF and Loadbearing timber joist floors systems.

Layers of plasterboard should be staggered, and all outer layer joints sealed with tape or caulked with sealant. Where multiple layers of plasterboard meet at a corner, they should be layered into each other in an abutted and staggered fashion.

4.3 Façade Wall

Where the separating wall meets the façade wall, a break should be introduced in the plasterboard inner leaf of the façade wall and sealed with a cavity stop both in the façade cavity and the new gap in the plasterboard, as demonstrated by Approved Document E Diagram 2.38, reproduced as Figure 5 below.

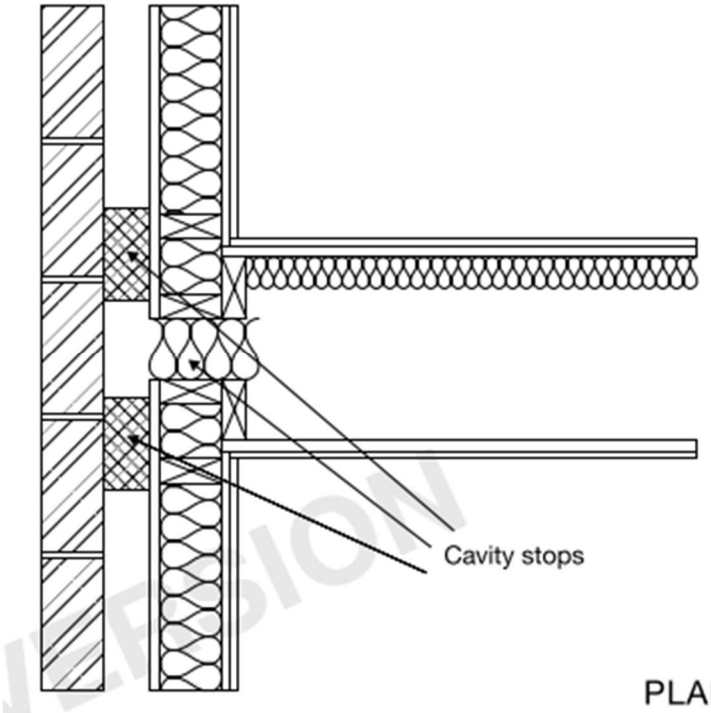


Figure 5 - Separating wall junction with external facade wall detailing (source: Approved Document E)

Alternatively, the fire escape side of the separating partition could be run up to the masonry in the façade. A cavity stop should then be introduced at the approximate location of the junction of the retained Flat 3 side plasterboard and the façade.

We would recommend that the junction details are reviewed by an acoustic consultant prior to construction.

4.4 Flat 2 to 3 Party Wall

Where the inner leaf of the separating wall meets the plasterboard on the fire escape side of the party wall, the plasterboard of the party wall should be broken by the fire escape face of the plasterboard of the separating wall, with cavity stops installed in the party wall at the junction in a fashion equivalent to that shown in Figure 5. The plasterboard junction between the walls should interleave the boards, with all gaps being either sealed with tape or caulked with sealant.

We would recommend that the junction details are reviewed by an acoustic consultant prior to construction.

4.5 Good Practice Notes

The following information provided below should be noted as good practice guidance.

4.5.1 Gaps

When constructing lightweight partitions, it is essential that all gaps that could allow air (and therefore sound) to bypass the wall are sealed. The boards used should be abutted, with all outer layer joints sealed with tape or caulked with sealant. The joints between boards should be staggered so as to ensure the gaps between boards do not occur at the same position on both layers of plasterboard.

4.5.2 Penetrations

If any pipes internal to habitable rooms, e.g. soil pipes, water pipes, rainwater pipes etc. are to be run in risers or horizontal service ducts between rooms, then these need to be boxed out with material of at least 15kg/m^2, e.g. two layers of 12.5mm plasterboard. The boxed out enclosure is to be mechanically independent of the pipes. The pipes either need to be wrapped in 25mm unfaced mineral-fibre or the enclosure should be lined with 25mm unfaced mineral-fibre.

Penetrations across separating partitions, whether boxed out or not, should be slightly oversized around the penetrating member (e.g. pipe or other) utilizing approximately 5-10mm gap around the perimeter to suppress structure-borne noise transmission across the partition. The remaining gap should then be well-sealed on both sides of the partition with minimum 10mm depth acoustic non-setting mastic with the cavity loosely packed with mineral wool (minimum density 10kg/m^3). Alternatively acoustically acceptable firestopping collars can be used as long as they do not rigidly connect the penetrating member to the partition structure.

4.5.3 Electrical services and sockets

Wall sockets, or other fixing penetrations (e.g. aerials, light-switches etc), in plasterboard walls or linings should be staggered on either side of partitions to ensure they are not back to back (recommended stagger of at least 600mm). In addition the penetrations should be treated either with proprietary acoustic back boxes, e.g. Hilti CP617 Putty Pad, or sealed plasterboard backing to an equivalent specification to the wall lining.

Where sealed plasterboard backing to sockets is used it would be recommended that once the backing boards are screwed on, mineral wool be stuffed into the gaps all around the perimeter of the backing board leaving 10mm depth around the perimeter to be filled with non-setting mastic. It cannot be too strongly stated that total sealing of all gaps in the socket back-boards will be paramount to maintain performance on-site.

There should be **no loudspeakers nor any vibrating / rotating equipment suspended from the floor** between the restaurant and the proposed flat.

4.5.4 Steelwork

Where a separating partition incorporates structural steel, either columns, or beams at the head, the steel should be boxed out for its entire length with plasterboard; the build-up should be a minimum 2 no. layers of plasterboard (total minimum mass per unit area 20kg/m^2) and the cavity packed with mineral wool. It should be ensured that the plasterboard is not in direct contact with the steel.

Should any steelwork pass through a separating party or corridor wall, this would also need to be boxed out with two layers of plasterboard and stuffed to full wall depth with dense mineral wool in the web of the steel. The enclosure would then need to be sealed with copious amounts of acoustic mastic. Where steelwork is above the plasterboard ceiling, the enclosure may be reduced to one layer. It should be ensured that the plasterboard is not in direct contact with the steel.

5.0 NOISE IMPACT ASSESSMENT

We would consider that the proposed restaurant would have a low overall impact if both of the following conditions are true:

1. All separating elements between the proposed restaurant and existing habitable spaces achieve the requirements set out in Approved Document E for separating walls and floors, and-
2. The noise levels likely to occur within habitable spaces from noise sources within the proposed restaurant are below the criteria specified for internal ambient noise levels within BS 8233.

As has been established, the separating wall between Flat 3 and the fire escape does not achieve a performance compliant with the Building Regulations. We would however note that the separating floor has been measured to perform very well. For this assessment we have assumed that our recommendations for remedial works will be adopted in full.

This assessment will consider both the likely impact with the current separating elements, and the likely impact with the separating wall being upgraded to achieve compliance with Approved Document E. For the purposes of this assessment, we have assumed the restaurant to only operate during daytime hours (from 7am to 11pm).

5.1 Assessment of Restaurant Noise through separating floor

In this section, we have assumed the separating floor between Flat 3 and the Basement Space to be typical of the floor construction across all sections of the ground floor with a separating function.

Typically, we would assume a restaurant space with music playing to be approximately 85 dB(A) $L_{Aeq,1hr}$. In order to determine an estimate for the performance of the separating elements we can subtract their measured $D_{nT,w}$ + C_{tr} from this assumed value.

In order to assess the likely performance of the existing elements, we have compared their measured performances to spectral data taken from a small disco and bar space, which was itself calibrated to 85 dB(A). This is intended to represent a fairly lively restaurant with recorded music playing, as a reasonable worst case scenario for the use of the proposed space.

Table 2 - Predicted restaurant noise impact from noise transmitted via the separating floor

Element	Sound Pressure Level (dB(A)) 1/3 Octave Band Centre Frequency (Hz)								Overall Level dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Reference spectral data	61	71	81	79	79	73	66	55	85 dB(A)
Measured Separating Floor Performance (dB D_{nTw})	50	57	66	75	74	75	81	*81**	69 dB $D_{nT,w}$
Predicted noise level within Flat 3 from separating floor.	26	20	20	9	10	4	-3	-22	28 dB(A)

**replicated from 4kHz performance*

Based on the information provided in Table 2, the predicted noise level within the flat would be 28 dB(A). This would be 7 dB below the day-time internal ambient noise limit specified by BS 8233, and as such would be unlikely to cause an adverse impact to typical flats (considering Flat 3 to be atypical due to the fire escape being present adjacent to it).

5.2 Assessment of Restaurant Noise into Flat 3 via separating wall

An assessment of the entry of noise from the restaurant into Flat 3 has been carried out based on the expected sound insulation performance of the British Gypsum A046005 Single Stud uprated wall, as this is the lowest performing uprated element specified. This assessment has been presented within Table 3.

Table 3 – Predicted restaurant noise impact from noise transmitted via the separating wall

Element	Sound Pressure Level (dB(A)) 1/3 Octave Band Centre Frequency (Hz)								Overall Level dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Reference spectral data	61	71	81	79	79	73	66	55	85 dB(A)
Predicted Separating Wall Performance (dB $D_{nT,w}$)	21	34	50	60	67	69	69	*69**	58 dB $D_{nT,w}$
Assumed Insertion Loss into Stairwell	-10	-10	-10	-10	-10	-10	-10	-10	n/a
Predicted noise level within Flat 3 from separating wall.	30	27	22	9	2	-6	-13	-24	32 dB(A)

**replicated from 4kHz performance*

As can be seen in Table 3, the predicted noise level would be 32 dB(A), which is 3dB(A) below the day-time internal ambient noise limit specified by BS 8223.

However, this calculation does not account for the presence of a door between the fire escape and the restaurant, which we would expect to be closed for the majority of the time. As such, the energy average noise level can be expected to be at least 10dB lower than the value presented within Table 3, and we would therefore consider it to be unlikely to cause an adverse impact on the residents of Flat 3.

5.3 Assessment of Entry and Egress noise into Flat 3 via separating wall

We have noted that previous noise complaints regarding the basement space focused on noise created through the entry and egress of workers into the fire escape, which is proposed to be repurposed into a new restaurant entrance.

We would consider the primary source of noise in this instance to be conversation between individuals using the staircase. In order to define the level of noise associated with this use, we have carried out test measurements of raised voice speech from two adult males within a comparable space to the

stairwell. Spectral data for shouted male speech as reported in Pearsons et al. (1997) has been calibrated to this level and used in Table 4 to assess the performance of the proposed uprated wall.

Table 4 - Predicted stairwell noise impact from noise transmitted via the separating wall

Element	Sound Pressure Level (dB(A)) 1/3 Octave Band Centre Frequency (Hz)								Overall Level dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Reference spectral data	-	25	57	71	77	75	67	57	80 dB(A)
Predicted Separating Wall Performance (dB $D_{nT,w}$)	-	34	50	60	67	69	69	*69**	58 dB $D_{nT,w}$
Predicted noise level within Flat 3 from separating floor.	-	-9	7	11	10	6	-2	-12	15 dB(A)

As can be seen in Table 4 the predicted noise level would be 15 dB(A), which is 20 dB(A) below the day-time internal ambient noise limit specified by BS 8223. As such, we would consider it to be unlikely to cause an adverse impact on the residents of Flat 3.

5.4 Noise Impact Assessment Conclusion

Based on the evidence shown within this section, we would consider that if the separating wall between Flat 3 and the fire escape stairwell is upgraded as specified within Section 3.0, it is unlikely that the proposed change of use will cause an adverse impact on the residents of the apartment block from an acoustics perspective.

6.0 RESTAURANT KITCHEN VENTILATION NOISE

It is understood that the restaurant kitchen is to be served by mechanical supply and extract ventilation. As of the latest proposals we have been provided with, it is proposed to run the extract ventilation up through the building and out through the roof via the building lightwell, while supply ventilation is to be supplied provided through venting situated under the window of Flat 5. This section is intended to assess the likely noise impact on residents in the flats from both the supply and extract ventilation outlets in accordance with the methodology set out in BS 4142:2014.

6.1 Planning Conditions

Based on discussions with Laura Miller MRes MA BSc (Hons) who is an Environmental Protection Specialist at Manchester City Council, it is understood that the following conditions are likely to apply to this proposed development:

NSE6 (External plant/equipment/servicing)

a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

b) Prior to the operation of the scheme a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the verification report shall be detailed along with any measures required to be undertaken prior to operation of the scheme to ensure compliance with the agreed noise criteria.

This section is intended to satisfy the requirements of condition a, with condition b being subject to verification once installation has occurred.

6.2 Background Noise Survey

In order to characterise the background noise climate during operation of the proposed plant items, we have carried out a background noise survey consisting of measurements at the window threshold of the lightwell, and on the pavement outside Flat 5 of 48 Princess Street.

Table 5 - Summary of measured sound levels.

Position	Time	Average Sound Level (dB $L_{Aeq,T}$)	Background Sound Level (dB $L_{A90,T}$)
Lightwell Window	23:31 – 23:33 06/10/2025	45*	44*
Flat 5 Pavement	23:42 – 00:12 06/10/2025 into 07/10/2025	57	52

**Measurements at the lightwell window were taken at the threshold of the window due to limited access. As such we have removed 3dB from the measured levels to account for reflections. We would consider these levels to be equivalent to the external levels.*

Measurements were carried out beyond 23:00 in order to capture a worst case scenario period, in which plant noise continues to occur for some time after closing of the restaurant. Typically we would expect background noise levels to reduce with time.

The background noise climate at the Lightwell window was dominated by constant mechanical services noise from an unknown source. As it was operating at a very constant level, we would consider the relatively short measurement period taken to reasonably represent the background level. Due to the aforementioned access constraints, it was not possible to obtain a longer background measurement.

The representative background levels have been determined in accordance with guidance given within BS 4142:2014+A1 2019, which states in Section 8.1.4:

> *"To obtain a representative background sound level a series of either sequential or disaggregated measurements should be carried out for the period(s) of interest, possibly on more than one occasion. A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value."*

For the Flat 5 Pavement position, we have determined the modal values to best represent the background noise level. For the Lightwell Window we have taken the average LA90,1s value during measurement. Due to the constant nature of the noise source, this would not be expected to vary if taken over a longer period of time.

6.3 Ventilation Specifications

It is understood that supply ventilation requirements are to be met through use of a TCBTx2/4-500 contra rotating cased axial fan, installed in-line within the supply ducting, with an attenuator on either side. It is further understood that extract ventilation requirements are to be met with a CVAT/4-12000/560N D 2.2kW in-line cabinet fan, installed in-line with attenuators as with the supply unit. As we have been unable to confirm the required duty for these units, we have assumed them to operate at maximum capacity as a worst case assessment.

6.4 Ventilation Noise Assessment Criteria

In order to assess the impact of noise from the ventilation units, we have considered the noise that would be produced by them in their highest operational state.

For the supply unit we have then applied attenuation for the movement of noise down the ductwork and exiting into the street , reflecting from buildings on the opposite side of the street (which are understood to be office spaces, and therefore not particularly sensitive to noise) and returning to the flat above the extract point. We have assumed the flats to be ventilated through openable windows.

For the extract unit, we have applied attenuation for the movement of noise down the ductwork to the point of exit out of the building envelope. As details of the pre-existing extract flue are not known, we have assumed the noise to immediately exit at that point. This is the worst possible scenario from an attenuation point of view, and as such if the system is designed to be suitable in this scenario, it can be assumed to work in situ where the down-duct attenuation would be expected to be higher.

6.5 Consideration of character correction penalties

In order to convert the specific sound level to a rating level, BS 4142:2014 advises that consideration (and potential penalties) should be given to the tonality, impulsivity and intermittency of the source (with a further penalty which may be applied to "other sound characteristics").

Considering modern ventilation units and the distance over which these units will operate, we would typically not expect such units to be noticeably tonal or impulsive. While they would be expected to turn on and off when the restaurant opens and closes, it is not our experience that such units are

typically "readily distinctive against the residual acoustic environment" due to such on off states. As such, we would not consider a correction for any of the considered characteristics appropriate. The rating level therefore would equal the specific sound level.

6.6 Supply Ventilation Assessment

In order to determine the sound power of the TCBTx2/4-500 unit to be used for supply, we referred to the manufacturer's datasheet and converted the provided sound pressure values into sound power values (taking the measurement distance to be 1.785m as described within the datasheet).

Table 6 - Predicted noise levels in worst affected flat from supply ventilation.

Element	dB(A) Octave Band Centre Frequency (Hz)								dB L_{wA}
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
TCBTx2/4-500 Inlet Sound Power at 9000m³/h	64	94	103	101	103	97	90	83	108
Down-duct attenuation	-4	-3	-3	-4	-7	-10	-15	-15	n/a
Distance attenuation	-26	-26	-26	-26	-26	-26	-26	-26	n/a
Predicted External Sound Pressure Level without Attenuation	34	65	74	71	70	61	49	42	77

Considering that the background level at the pavement outside Flat 5 was measured at 52 dB $L_{A90,T}$. Attenuation should be specified in order to achieve an external free field level 5dB below the background level. The resulting rating level should not exceed 47 dB L_{rt}.

Previously, we have specified an IAC Acoustics 10LFS attenuator as suitable, based on assessments carried out using BS 8233:2014. The expected effect of this attenuator is outlined in Table 7.

Table 7 – Predicted attenuation performance for IAC Acoustics 10LFS attenuator applied to supply ventilation inlet.

Element	Minimum Specified Attenuation 1/3 Octave Band Centre Frequency (Hz)								dB LwA
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
IAC Acoustics 10LFS (3000)	-13	-22	-37	-43	-44	-31	-24	-16	-
Predicted External Sound Pressure with Attenuation	16	35	25	19	17	15	17	21	36

As shown above, this attenuator would comfortably meet requirements. However, this is arguably an overspecification as it was selected to meet more stringent requirements than those set by Manchester City Council. A more appropriate alternative may be as follows:

Table 8 – Predicted attenuation performance for IAC Acoustics 6LFS attenuator applied to supply ventilation inlet.

Element	Minimum Specified Attenuation 1/3 Octave Band Centre Frequency (Hz)								dB LwA
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
IAC Acoustics 6LFS (1800)	-18	-30	-49	-52	-53	-46	-32	-21	-
Predicted External Sound Pressure with Attenuation	21	43	37	28	26	30	25	26	44

As shown above, this attenuator would more reasonably meet requirements, with the rating level at the nearest residential receiver from the supply ventilation expected to be 44 dB L_{rt}, -8dB relative to the background level.

6.7 Extract Ventilation Assessment

In order to determine the sound power of the CVAT/4-12000/560N D 2.2kW unit to be used for extract, we referred to the manufacturer's datasheet, and converted the provided sound pressure values into sound power values (taking the measurement distance to be 1.5m as described within the datasheet). We have assumed breakout from the ducting at the top of the lightwell, with 2m travel from that point to the nearest residential receiver.

Table 9 - Predicted noise levels in worst affected flat from extract ventilation.

Element	dB(A) Octave Band Centre Frequency (Hz)								L_{wA}
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
CVAT/4-12000/560N D 2.2kW Outlet Sound Power at highest operational state	75	90	90	93	93	90	83	72	98
Down-duct attenuation	-9	-9	-10	-14	-15	-15	-15	-15	n/a
Distance attenuation	-17	-17	-17	-17	-17	-17	-17	-17	n/a
Predicted External Sound Pressure Level without Attenuation	48	63	53	61	61	58	51	40	67

Considering that the background level at the lightwell was measured at 44 dB $L_{A90,T}$. Attenuation should be specified in order to achieve an external free field level 5dB below the background level. The resulting rating level should not exceed 39 dB L_{rt}.

It should be noted that reductions in required attenuation of up to 18dB are feasible if the plant unit can be confirmed to be operating in a lower duty mode. However, we have carried on with this assessment assuming no such confirmations can be obtained.

Considering the IAC Acoustics 10LFS attenuator previously specified for the supply side attenuation, the performance would be as follows:

Table 10 – Predicted attenuation performance for IAC Acoustics 10LFS attenuator applied to extract ventilation outlet.

Element	Minimum Specified Attenuation 1/3 Octave Band Centre Frequency (Hz)								dB LwA
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
IAC Acoustics 10LFS (1800)	-18	-30	-49	-52	-53	-46	-32	-21	-
Predicted External Sound Pressure with Attenuation	30	33	4	9	8	12	19	19	34

This would be below the required level of 39dB L_{rt} by 5dB, and would therefore comfortably meet requirements.

6.8 Commentary regarding required mitigation.

With regards to the previously specified required attenuation, it should be noted that the requirements are based on a highly conservative approach, assuming both the highest possible duty from the units in question, and designing to the background level during the worst case reasonable period (late night).

When installing the ventilation system, caution should be exercised in order to minimise the risk of structural transmission of noise from the ventilation system through the separating floor. This should be achieved through use of vibration isolation to the base of the unit, with flexible connectors to all services to ensure no rigid connection from the plant to the building structure.

APPENDIX A - NOTES FOR QUALITY CONTROL

1. Blockwork

All blockwork is to be mortared to an almost fair faced standard both horizontally and vertically. Only perfect blocks may be used with no pitting or cracks. The blockwork must seal effectively to the underside of the soffit.

Where blockwork walls form a cavity wall, care should be taken to avoid rubble and snots from bridging the cavity. This is especially important where one or more of the leaves is floating.

2. Plasterboard

All plasterboard joints are to be butted tight. The rule of thumb is that the joint should be tight enough over its entire length to prevent a normal business card from being inserted. Multiple layers should be fitted with staggered joints.

Base details and deflection heads are to be as per the British Gypsum White Book unless otherwise stated, and copious amounts of mastic to be used when fitting to the walls, floor and ceiling respectively.

3. Mineral Fibre

Mineral fibre slabs are to be butted tightly together and to boundary structures, to form a homogeneous layer.

4. Windows

All window frames are to be a good tight fit into the building structure with any gaps to be filled both internally and externally with a non-setting mastic in addition to the usual weather proofing seal to the exterior. Any gaps between the frame and building that are greater than 5 mm are to packed with a dense mineral fibre prior to mastic sealing.

5. Electrical Sockets

Electrical sockets must not be fitted back to back and removed areas of blockwork and plasterboard should be kept to an absolute minimum.

6. Water Pipes

All water pipes (and any other pipework) are to be resiliently mounted to avoid “water hammer”. This is particularly important for plasterboard walls.

7. Penetrations

Penetrations are to be dealt with as described in this report. Details for specific services penetrations may be supplied upon request.

8. Approved Samples and Inspections

Samples of each individual acoustic element should be provided for inspection at the beginning of its installation. Once approved, the Clerk of Works must ensure that the same level of quality continues throughout construction.

APPENDIX B - DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq}. Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An}. It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) $L_{max,}$ dB $L_{Amax,}$ etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.

APPENDIX C - SOUND INSULATION CERTIFICATES

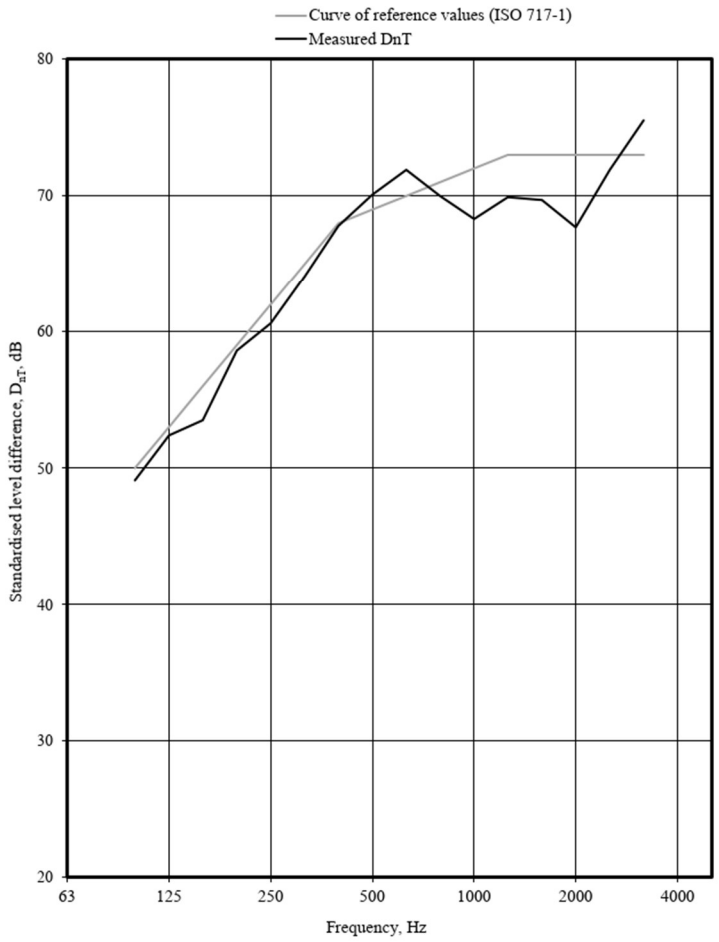
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Forty Eight M Limited **Date of Test:** 09 October 2024
Address: Florence Farm, Woodford Lane, Macclesfield, SK10 4LH

Description of tested construction, test arrangement and direction of measurement :
Source Room: Flat 3 Living Room
Reciever Room: Basement Room

Floor Construction (Notional)
Assumed Approved Document E Type 1 (concrete base with ceiling and soft floor covering).

Frequency Hz	D_{nT} (one-third octave) dB
50	
63	
80	
100	49.1
125	≥ 52.4
160	≥ 53.5
200	≥ 58.6
250	≥ 60.6
315	≥ 64.1
400	≥ 67.8
500	≥ 70.1
630	≥ 71.9
800	≥ 70.0
1000	≥ 68.3
1250	≥ 69.9
1600	≥ 69.7
2000	≥ 67.7
2500	≥ 71.9
3150	≥ 75.5
4000	
5000	



Rating According to ISO 717-1

$D_{nT,w}$ (C; Ctr) ≥ **69** -2 -5 **dB**

Evaluation based on field measurement results obtained by an engineering method

No. of Test Report: 1 **Name of Test Institute :** PDA Ltd, 3 Bridgewater Court, Barsbank Lane, Lymm, Cheshire, WA13 0ER

Date: 18 October 2024

Notes:

≥ - measurement limited due to background

Signature :

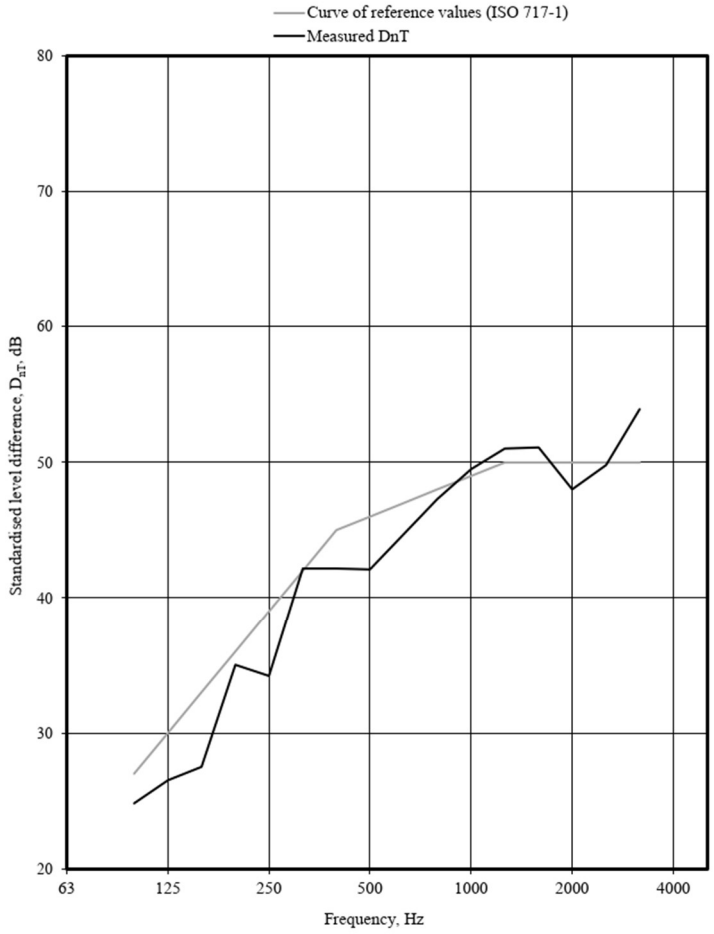
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Forty Eight M Limited **Date of Test:** 09 October 2024
Address: Florence Farm, Woodford Lane, Macclesfield, SK10 4LH

Description of tested construction, test arrangement and direction of measurement :
Source Room: Flat 3 Living Room
Reciever Room: Fire Escape

Wall Construction (Notional)
Assumed Approved Document E Type 4 (framed walls with absorbent material).

Frequency Hz	D_{nT} (one-third octave) dB
50	
63	
80	
100	24.8
125	26.5
160	27.5
200	35.0
250	34.2
315	42.2
400	42.2
500	42.1
630	44.7
800	47.3
1000	49.5
1250	51.0
1600	51.1
2000	48.0
2500	49.8
3150	53.9
4000	
5000	



Rating According to ISO 717-1

$D_{nT,w}$ (C; Ctr) = **46** -2 -7 **dB**

Evaluation based on field measurement results obtained by an engineering method

No. of Test Report: 2 **Name of Test Institute :** PDA Ltd, 3 Bridgewater Court
Barsbank Lane, Lymm
Cheshire, WA13 0ER

Date: 18 October 2024

Notes:

≥ - measurement limited due to background

Signature :