

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Piccadilly Warehouse

Tender acoustic design report

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Summary

Sandy Brown has been appointed to provide acoustic advice in relation to Piccadilly Warehouse. The scheme includes the refurbishment and redevelopment of Mindel House and 11 Bloom Street on the corner of Bloom Street and Minshull Street, Manchester.

The scheme must meet the requirements of the Building Regulations Approved Document E and the requirements of Manchester City Council.

This report provides a summary of the acoustic performance requirements in relation to:

- Building envelope: The control of noise ingress via the building facade to acceptable levels within spaces. The control of vertical sound transmission between floors and horizontal flanking sound transmission between adjacent spaces on the same floor.
- Sound insulation: Airborne sound insulation of internal walls, floors, ceilings and doors to suitably control sound transmission within the building. Impact sound insulation through floors to control footfall generated noise will also need to be considered.
- Sound absorbent finishes: The acoustic environment within each space will need to be compatible with the proposed uses, in particular the control of reverberation and noise build-up.
- Building services: The control of noise and vibration from building services plant and systems to suitable levels, both inside and outside the development.

This document forms the Employer's Requirements relating to acoustics which the Contractor shall be responsible for meeting throughout the development. This shall be read in conjunction with the other Employer's Requirements and specifications for the scheme.

The Contractor is ultimately responsible for meeting and providing all necessary evidence as required to satisfy:

- The Employers Requirements – all acoustic performance and testing requirements as out within this document
- The Local Authority planning requirements
- Building Regulations.

Any deviations from the acoustic performance standards or testing regimes set out in this document would need to be submitted and agreed with the Client.

The minimum requirements of ADE2003 for dwellings formed by material change of use are likely not achievable due to structural, fire and heritage restrictions on partition head and base details. Though since both buildings are listed, ADE2003 only requires sound insulation to be improved as far as practically possible.

Sound absorbent finishes are normally required to common areas that give direct access to residents, as per ADE2003. It is understood the corridor soffits must be exposed due to

heritage restrictions. As such, it is proposed to uplift the door performances (to R_w 35 dB) to compensate for potential increased reverberant noise build-up within corridors. This approach will need to be agreed with Building Control.

The proposed floor strategy does not allow for suitable isolation of washing machines. This is not a statutory requirement, though the Client should be made aware of risk of structure-borne noise transfer between apartments.

The key acoustic items where further coordination is needed are:

- The roof build-ups will need to be developed to ensure suitable sound insulation performances are achieved.
- Allowance shall be made for enhanced roof build-up to any rooftop plant areas, based on rooftop plant equipment being controlled to NR 70, with low frequency limits L_{eq} 65 dB at 63 Hz and L_{eq} 70 dB at 125 Hz.
- The facade interface details will need to be reviewed as the design develops.
- It is understood that the substation is proposed to be housed in a concrete room. This will need to be developed as the design progresses.
- Any existing wall constructions to be retained will need to be reviewed as the design progresses. Enhancements may be required to ensure suitable sound insulation performances are achieved.
- The 11 Bloom Street lightwell will need to provide suitable airborne sound insulation performance, as well as vertical and horizontal flanking sound transmission performances. Proposed details will need to be reviewed as the design progresses.
- Allowance shall be made for high performance acoustic laminate double glazing between the 11 Bloom Street back-of-house stairwell and bedrooms.
- Appropriate interface details will need to be developed as the design progresses.
- Building services equipment will need to be designed to ensure the internal building services noise criteria and plant noise egress criteria are achieved. An assessment will need to be carried out once equipment selections become available to demonstrate compliance with the noise criteria.
- Allowance shall be made for in-duct attenuation to MVHR supply and extract terminations (to be positioned within the services cupboard) and to MVHR intake and exhaust terminations (to be positioned close to the facade). Allowance shall be made for acoustic lagging with minimum mass layer 5 kg/m² for any lengths of duct between the facade and attenuator.
- Allowance shall be made for lagging and independent boxing for any pipework which passes through bedrooms or living rooms. Enhanced mitigation will be required for any soil vent pipes through living rooms or bedrooms.

Contents

1 Introduction 5

2 Basis of review 5

3 Building envelope 8

4 Floors 11

5 Partitions.....11

6 Doors.....13

7 Lightwell.....13

8 Interface detailing.....14

9 Sound absorbent finishes 15

10 Building services noise and vibration 15

11 Testing requirements.....20

12 Construction (Design and Management) Regulations.....21

Appendix A.....22

 Glossary of terms 22

Appendix B 25

 Partition and door sound insulation mark-ups.....25

1 Introduction

Sandy Brown has been appointed to provide acoustic advice in relation to Piccadilly Warehouse. The scheme includes the refurbishment and redevelopment of Mindel House and 11 Bloom Street on the corner of Bloom Street and Minshull Street, Manchester.

The development comprises 80 apartments formed from a material change of use. Mindel House and 11 Bloom Street are both Grade II listed. There are planning conditions associated with internal noise levels and plant noise egress to discharge.

The scheme must meet the requirements of the Building Regulations Approved Document E and the requirements of Manchester City Council (with the below exceptions).

The minimum requirements of ADE2003 for dwellings formed by material change of use are likely not achievable due to structural, fire and heritage restrictions on partition head and base details. Though since both buildings are listed, ADE2003 only requires sound insulation to be improved as far as practically possible.

Sound absorbent finishes are normally required to common areas that give direct access to residents, as per ADE2003. It is understood the corridor soffits must be exposed due to heritage restrictions. As such, it is proposed to uplift the door performances (to R_w 35 dB) to compensate for potential increased reverberant noise build-up within corridors. This approach will need to be agreed with Building Control.

This report provides the acoustic performance requirements for building envelope, internal sound insulation, sound absorbent finishes, and building services.

2 Basis of review

2.1 Design information

This report is based on the following design information:

- GAs received via email on 24 April 2024
- Elevations received via email on 13 March 2024
- Initial ventilation layouts received via email on 18 April 2024
- 024322-R01-A *Environmental noise survey report* dated 21 March 2024
- 024322-R02-A *Acoustic design strategy report* dated 26 March 2024
- 024322-M001-A *Guidance on internal partitions and doors* dated 30 April 2024.

2.2 Standards/design guidelines

2.2.1 Statutory requirements

The statutory requirements of the scheme are based on:

- Approved Document E 2003 Edition (including 2004, 2010 and 2015 amendments) to the Building Regulations 2010
- Manchester City Council Planning and Noise Technical Guidance (October 2022)
- Planning Conditions 5 and 6 of 119374/FO/2018.

It is understood that Approved Document O 2021 Edition (to the Building Regulations 2010) is not applicable for this development.

2.2.2 Other standards/design guidelines

The following standards/design guidelines have been considered in preparation of this report:

- Association of Noise Consultants (ANC) *Acoustics Ventilation and Overheating, residential Design Guide* (2020)
- ProPG *Planning & Noise* (Professional Practice Guidance on Planning & Noise), New Residential Development, 2017
- BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (referred to as BS 4142)
- The Chartered Institute of Building Services Engineers (CIBSE) Guide A 2015 *Environmental design*
- CIBSE Guide B4: *Noise and vibration control for building services systems*, 2016
- BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (referred to as BS 8233)
- BS 6472-1: 2008 *Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*
- The Control of Noise at Work Regulations 2005
- The Construction (Design and Management) Regulations 2015
- The Disability Discrimination Act 2004.

2.3 Approved Document E 2003

2.3.1 Requirement E1 (sound insulation around and between dwellings)

Requirement E1 states that dwelling houses, flats, and rooms for residential purpose shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings. The minimum performance standard for walls floors and stairs that have a separating function for dwellings from by material change of use are set out in Table 1.

Table 1 Performance standards for between and around dwellings formed by material change of use

Separating element	Airborne sound insulation ($D_{nT,w} + C_{tr}$)	Impact sound insulation ($L'_{nT,w}$)
Walls	≥ 43 dB	-
Floors and stairs	≥ 43 dB	≤ 64 dB

However, as Mindel House and 11 Bloom Street are Grade II listed, ADE 2003 states the following with reference to listed buildings:

‘In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings.’

A proportion of the separating walls and floors will need to be tested on site to demonstrate compliance with the requirements of ADE2003. The precise number of tests is determined in agreement with Building Control but typically involves testing two individual walls and two floors in around 10% of dwellings. See Section 11.1.

2.3.2 Requirements E2 (Sound insulation of walls within dwellings)

Requirements E2 of ADE2003 states that dwelling houses, flats and rooms for residential purposes shall be constructed in such a way that the following provide reasonable resistance to sound. This applies to:

- Internal walls between a bedroom or a room containing a water closet, and other rooms
- Internal floors (none currently proposed).

This requirement does not apply to any internal wall which contains a door, or internal walls which separate an en-suite toilet from the associated bedroom.

To meet this requirement, internal walls to which it applies should have a minimum laboratory sound insulation rating of R_w 40 dB. See Section 5.

2.3.3 Absorption in common areas

ADE2003 specifies under requirement E3 that:

‘The common internal parts of buildings which contain flats or rooms for residential purposes shall be designed and constructed in such a way as to prevent more reverberation around common parts than is reasonable’

This means that there is a certain amount of sound absorbent finishes normally required in corridors, hallways, entrance halls and stairwells that give direct access to flats. See Section 6.1.

2.3.4 Doors to corridors

ADE2003 requires that the doors between dwellings and corridors have a certain level of resistance to the passage of sound.

One of the following methods are normally used (see Section 6.1):

- Install doors which have been tested in a laboratory and shown to achieve an acoustic rating of at least R_w 29 dB; or
- Install doors which meet the following parameters:
 - Door leaf to have a minimum mass per unit area of 25 kg/m²
 - Door to have good perimeter seals, including a threshold seal where practicable.

2.4 Local Authority requirements

2.4.1 Noise ingress – Planning Condition 5

Planning Condition 5 of 119374/FO/2018 is set out below:

‘5) Before the development commences a scheme for acoustically insulating and mechanically ventilating the residential accommodation against noise from adjacent roads shall be submitted to and approved in writing by the City Council as local planning authority.

The approved noise insulation scheme shall be completed before any of the dwelling units are occupied. Prior to occupation a post completion report to verify that all of the recommended mitigation measures have been installed and effectively mitigate any potential adverse noise impacts in the residential accommodation shall be submitted and agreed in writing by the City Council as local planning authority. Prior to

occupation any non compliance shall be suitably mitigated in accordance with an agreed scheme.

Reason - To secure a reduction in noise in order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.'

See building envelope sound insulation requirements in Section 3 and Local Authority testing requirements in Section 11.2.

2.4.2 Noise ingress – MCC Planning and Noise Technical Guidance 2022

The Manchester City Council (MCC) internal noise criteria for residential developments is set out in Table 2.

Table 2 Manchester City Council internal noise criteria for residential developments

Internal space	Internal noise limit, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Living rooms	35	-
Bedrooms	-	30 ^[1]

^[1] Individual noise events in bedrooms should not exceed L_{Amax} 45 dB by more than 15 times.

The levels in Table 2 above are the cumulative noise levels to be achieved by:

- external noise ingress via the facade (see Section 3.1)
- Noise from mechanical ventilation systems (see Section 10.1).

Where noise from entertainment venues is the dominant noise source, the facade sound insulation should be sufficient such that internal noise levels in bedrooms at night do not exceed 42 dB and 36 dB at 63 Hz and 125 Hz respectively. See Section 3.1.1.

2.4.3 Noise egress – Planning Condition 6

Planning condition 6 of 119374/FO/2018 is set out below:

'6) Prior to occupation of the development a scheme for the acoustic insulation of any externally mounted ancillary equipment associated with the residential development shall be 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 (L_{Aeq}) below the typical background (LA_{90}) level at the nearest noise sensitive location. The approved scheme shall be completed before the premises is occupied and a verification report submitted for approval by the City Council as local planning authority and any non compliance suitably mitigated in accordance with an agreed scheme prior to occupation. The approved scheme shall remain operational thereafter.

Reason - To secure a reduction in noise in order to protect future residents from noise nuisance, pursuant to policies SP1, H1 and DM1 of the Core Strategy.'

See plant noise egress criteria in Section 10.2 and Local Authority testing requirements in Section 11.2.

2.4.4 Noise egress – MCC Planning and Noise Technical Guidance 2022

The MCC criteria in relation to plant noise egress is set out below:

'Any noise assessment needs to consider not only the overall level of noise emitted, but also its particular characteristics. The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

See Section 10.2.

2.5 Sound insulation

2.5.1 Calculation of rating values

Laboratory and site sound insulation performance parameters referred to in this report shall be calculated in accordance with BS EN ISO 717-1:2020 *Acoustics – rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation*.

2.5.2 Laboratory sound insulation

Measurements of the laboratory sound insulation of building elements shall be carried out in accordance with BS EN ISO 10140-2: 2021 *Acoustics – laboratory measurement of sound insulation of building elements, Part 2: Measurement of airborne sound insulation*.

Measurements of the laboratory flanking transmission of building elements shall be carried out in accordance with BS EN ISO 10848: 2017 Parts 1 and 2: *Acoustic – Laboratory measurement of the flanking transmission of airborne and impact sound between adjoining rooms, Part 1: Frame document and Part 2: Application to light elements when the junction has a small influence*.

2.5.3 Site sound insulation

In-situ sound insulation performances shall be measured in according to BS EN ISO 140-4: 1998 *Acoustics – Measurements of sound insulation in buildings and of building elements* or BS EN ISO 16283-1: 2021 *Acoustics – Field measurements of sound insulation in buildings and of building elements*.

2.6 Sound absorption

Sound absorbent finishes shall be rated in accordance with BS EN ISO 11654: 1997 *Acoustics – Sound absorbers for use in buildings – Rating of sound absorption*.

2.7 Site tolerances

The in-situ sound insulation performances represent the acoustic criteria for the project. However, the indicative tolerances set out in Table 3 shall be used when selecting elements based on weighted sound reduction index (R_w) values (including $+C_{tr}$ corrections where relevant).

Table 3 Indicative site tolerances for sound insulating elements

Element	Sound insulation site tolerance
Masonry walls with C_{tr} correction	$R_w + C_{tr} \geq D_{nT,w} + C_{tr} + 4 \text{ dB}$
Masonry walls	$R_w \geq D_{nT,w} + 2 \text{ dB}$
Drywalls with C_{tr} correction	$R_w + C_{tr} \geq D_{nT,w} + C_{tr} + 9 \text{ dB}$
Drywalls	$R_w \geq D_{nT,w} + 7 \text{ dB}$
Internal glazing	$R_w \geq R'_w + 3 \text{ dB}^{[1]}$
Doors	$R_w \geq R'_w + 2 \text{ dB}^{[1]}$

^[1] If laboratory tests on single doors are used as the basis for selecting leaf-and-a-half or double doors, an overall tolerance of at least 5 dB shall be used.

Interface details between elements shall be constructed to ensure in-situ sound insulation values are not compromised.

It is accepted that where doors are present in partitions, the overall site performance may be reduced.

Where weighted sound absorption coefficients (α_w) are specified, elements shall be installed such that the laboratory measured performance is not degraded.

3 Building envelope

3.1 Noise ingress criteria

External noise ingress via the facade shall be controlled to achieve the internal noise criteria set out in Table 4.

Table 4 Environmental noise ingress criteria

Internal space	Internal noise level due to environmental noise ingress, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Living rooms	32	-
Bedrooms	-	27 ^[1]

^[1] Individual noise events in bedrooms shall not exceed L_{AFmax} 45 dB by more than 15 times.

Total internal noise levels (including external noise ingress via the facade and noise from mechanical ventilation systems) shall achieve the criteria set out in Section 2.4.2.

3.1.1 Entertainment noise ingress

Noise from entertainment venues is not considered the dominant noise source at the site, therefore the MCC entertainment noise ingress criteria at 63 Hz and 125 Hz in Section 2.4.2 are not considered applicable.

3.2 Facade sound insulation

Minimum airborne sound insulation requirements for the facades are given in Table 5. These requirements are applicable under background ventilation conditions.

Table 5 Minimum overall facade sound insulation requirements

Facade zone	Overall minimum sound insulation performance, $R'_w + C_{tr}$ (dB)		
	Living areas		Bedrooms
	Single aspect	Dual aspect	
Bloom Street	31	34	36
Minshull Street	32	35	36
Richmond Street	32	35	36
Car park	28	31	32
Alley	28	31	32

3.3 Facade construction, glazing, and background ventilation strategy

3.3.1 Non glazed construction

The existing non-glazed facade is understood to be masonry with a depth of at least 400 mm. Existing masonry walls shall be made good and well-sealed. Any holes, gaps, cracks etc shall be made good or replaced with an equivalent material as appropriate.

Any areas of cladding proposed as part of the curtain walling to 11 Bloom street fifth floor shall achieve the glazing minimum sound insulation performances set out in Table 6.

3.3.2 Glazed construction

The minimum glazing sound insulation requirements are set out in Table 6.

Table 6 Glazing sound insulation performance requirements

Facade	Glazing minimum sound insulation performance, R'_w+C_{tr} (dB)		
	Living areas		Bedrooms
	Single aspect	Dual aspect	
<i>Mindel House</i>			
Bloom Street	27	29	31
Minshull Street	27	30	31
Richmond Street	28	31	32
Alley	27	27	28
<i>11 Bloom Street</i>			
Bloom Street (ground floor)	29	32	34
Bloom Street (first to fourth floor)	27	29	31
Bloom Street (fifth floor)	31	34	36
Richmond Street (ground to fourth floor)	27	30	31
Richmond Street (fifth floor)	32	35	36
Alley (ground to fourth floor)	27	27	28

Facade	Glazing minimum sound insulation performance, R'_w+C_{tr} (dB)		
	Living areas		Bedrooms
	Single aspect	Dual aspect	
Alley (fifth floor)	28	31	32
Car park	N/A	N/A	N/A

Example glazing configurations that could achieve the required glazing sound insulation performances set out in Table 6 are provided in Table 7.

Existing glass is understood to be 4 mm thick.

Table 7 Example glazing configurations

Glazing sound insulation, R'_w+C_{tr} (dB)	Example glazing configuration
27	6 mm glass /16 mm cavity/6 mm glass OR Existing 4 mm glazing/50 mm cavity/6 mm glass
28-29	8 mm glass/16 mm cavity/6 mm glass OR Existing 4 mm glazing/100 mm cavity/6 mm secondary glazing
30-31	8 mm glass/16 mm cavity/6 mm glass OR Existing 4 mm glazing/150 mm cavity/6 mm secondary glazing
32	6.8 mm acoustic laminate glass/16 mm cavity/6 mm glass OR Existing 4 mm glazing/150 mm cavity/6 mm secondary glazing
34	8.8 mm acoustic laminate glass/16 mm cavity/6 mm glass OR Existing 4 mm glazing/150 mm cavity/8 mm secondary glazing OR Existing 4 mm glazing/200 mm cavity/6 mm secondary glazing
35-36	8.8 mm acoustic laminate glass/16 mm cavity/10 mm glass

3.3.3 Ventilation strategy

It is understood that mechanical ventilation is proposed, and opening windows will not be relied upon for ventilation.

Existing ventilation opening within the facade will need to connect to sound attenuated ducted ventilation systems to control crosstalk noise transfer between apartments or be removed and filled to the full depth with a material that is at least the same density as the wall.

Building services noise and vibration is discussed in Section 10.

3.4 Roof sound insulation

3.4.1 General

The roof shall provide a minimum sound insulation performance at least 5 dB higher than the facade sound insulation performance for that space (as per Table 5 above).

3.4.2 Rooftop plant

Where rooftop plant is located above occupied spaces the roof sound insulation must be sufficient to ensure suitable internal noise levels within internal spaces are achieved.

Plant noise transfer via the roof shall be controlled to at least 10 dB below the maximum building services noise criterion in Section 10.1.

At this stage allowance shall be made for the roof below any rooftop plant areas to achieve a minimum sound insulation performance of $R'_w + C_{tr}$ 50 dB. This is based on rooftop plant noise being controlled to NR 70, with low frequency limits L_{eq} 65 dB at 63 Hz and L_{eq} 70 dB at 125 Hz. This will need to be reviewed further depending on the proposed rooftop plant equipment. See initial guidance in Section 3.4.5.

3.4.3 Mindel House roof linings

Roof linings shall be provided beneath the existing slate roof to Mindel House to achieve the minimum sound insulation performance requirements above. An example lining comprises:

- 2 x 12.5 mm plasterboard to 150 mm cavity containing 25 mm mineral fibre insulation.

It is understood that lath and plaster ceilings may be required to Mindel House fourth floor, due to heritage restrictions. This could be provided in place of the 2 layers of plasterboard, provide this has equivalent surface mass (16 kg/m²) and well-sealed.

Party walls shall break the roof lining and meet the underside of the existing slate roof (roof linings shall be individual to each apartment).

3.4.4 11 Bloom Street new roof

The proposed new roof build-up to 11 Bloom Street shall be designed to achieve the minimum sound insulation performance requirements above. An example build-up comprises:

- Weatherproof membrane
- 50 mm insulation
- 18 mm ply
- 100 mm cavity containing 25 mm mineral fibre insulation
- 2 x 12.5 mm plasterboard.

Party walls shall break the 2 x 12.5 mm plasterboard lining and meet the underside of the 18 mm ply (plasterboard linings shall be individual to each apartment).

3.4.5 Rooftop plant area enhancements

Allowance shall be made for enhanced ceilings/soffit linings to apartments beneath rooftop plant. An example enhanced build-up comprises:

- 2 x 15 mm fire rated or dense plasterboard (≥ 780 kg/m³) to 150 mm cavity formed with resilient hangers containing 25 mm mineral fibre insulation.

3.5 Flanking sound transmission

Where internal partitions abut the facade, the sound insulation it provides between horizontally adjacent rooms needs to be such that it does not undermine the sound insulation provided by internal walls.

Where internal floors abut the facade, the sound insulation it provides between vertically adjacent rooms needs to be such that it does not undermine the sound insulation provided by separating floors.

At fifth floor 11 Bloom Street (with new curtain walling proposed), the curtain walling is required to achieve a horizontal flanking sound transmission performance of $D_{n,f,w} + C_{tr}$ 48 dB.

The facade interface details will need to be reviewed as the design develops.

3.6 Self-noise

Any changes, repairs or modifications to the building envelope shall be constructed in a way that prevents noise arising from thermal movement, rattling, whistling or other attention-catching noise inside or outside the building arising from air movement over its surface.

Suitable flexible elements and movement joints are likely to be required which major cladding contractors should be familiar with.

Where relevant, consideration will need to be given to potential resonance effects as a result of airflow across any externally protruding elements.

In addition, consideration will need to be given to the control of rainfall noise. In any location where lightweight cladding panels are proposed a damping layer (eg compressed mineral fibre insulation) shall be provided to help limit noise from rainfall.

4 Floors

4.1 Sound insulation criteria

The airborne and impact floor sound insulation requirements between apartments are set out in Section 2.3.1.

Enhanced sound insulation performance requirements are summarised below:

- Between apartments and plant/substation areas: $D_{nT,w} + C_{tr}$ 50 dB
- Between apartments and bike store: $D_{nT,w} + C_{tr}$ 50 dB.

The performance requirements for floors relates to that within the finished building between dwellings. It should be noted that the performance needs to be achieved by the whole floor build-up (ie, floor slab, ceiling, and floor finish build up).

4.2 Floor constructions

4.2.1 Floated floors

Floated floors shall be provided to ensure the minimum airborne and impact floor sound insulation requirements are achieved.

An example floated floor construction comprises:

- 2 layers of board (eg, 12 mm cement board, minimum density 950 kg/m³) directly on top of the existing floor
- Resiliently mounted timbers forming a 50 mm cavity containing 25 mm mineral fibre insulation
- 2 layers of board (eg, 18 mm ply, minimum density 560 kg/m³).

Where hard floor finishes are proposed, a resilient layer shall be included within the floor build-up, beneath the floor finish.

It is understood that floated floors cannot be constructed individually to each apartment due to structural/fire constraints. Therefore, it is proposed that resilient layers (minimum performance ΔL_w 22 dB, at least 10 mm thick) and 1 layer of 18 mm ply will be individual to each apartment. Dense mineral fibre void barrier (at least 100 mm thick, 100 kg/m³ density) shall be provided beneath the party wall lines.

Resilient flanking strips (min 5 mm thick) shall be provided around the perimeter of the flooring board to structurally isolate floors from walls and skirting.

This approach will limit the sound insulation performance achievable between horizontally adjacent apartments due to flanking sound transmission beneath partitions. The minimum requirements of ADE2003 for dwellings formed by material change of use are likely not achievable with this approach, though since both buildings are listed, ADE2003 only requires sound insulation to be improved as far as practically possible.

4.2.2 Ceilings

It is understood that timber floorboards are to be exposed and a shadow gap/deflection head detail is proposed, due to heritage restrictions. This will limit the sound insulation performance achievable between horizontally adjacent apartments due to flanking sound transmission above partitions. As above, since both buildings are listed, ADE2003 only requires sound insulation to be improved as far as practically possible.

4.2.3 Apartment to plant/substation and bike-store

Where apartments are above plant/substation areas an enhanced build-up will be required to achieve the enhanced sound insulation performance requirements.

An example ceiling construction comprises:

- 2 x 15 mm fire rated or dense plasterboard (≥ 780 kg/m³) on a suspended metal grid forming 200 mm cavity containing 25 mm mineral fibre insulation.

It is understood that the substation is proposed to be housed in a concrete shell. This will need to be developed as the design progresses.

5 Partitions

5.1 Sound insulation criteria

The partition sound insulation requirements to apartments are provided in Section 2.3.

Mark-ups of partition and door sound insulation performance requirements are provided in Appendix B.

The minimum site performance requirements of ADE2003 for dwellings formed by material change of use are likely not achievable since:

- Floated floors cannot be constructed individually to each apartment due to structural/fire constraints (see Section 4.2.1)
- Timber floorboards are to be exposed at partitions heads due to heritage restrictions (see Section 4.2.2).

Since both buildings are listed, ADE2003 only requires sound insulation to be improved as far as practically possible.

5.1.1 Structure-borne noise transfer

Where kitchens are adjacent to bedrooms across a party wall independent leaf partition construction (eg, twin studs) shall be provided to assist in the control of potential structure-borne noise transfer between apartments.

The movement of goods, bins and refuse disposal at the 11 Bloom Street upper ground floor level has the potential to result in increased structure-borne noise transfer to adjacent apartments. To help mitigate this low-level guard rails/resilient bumpers shall be provided to prevent impact the walls/columns.

5.2 Partition constructions

Example partition constructions are set out in Table 8.

High density plasterboard is based on a minimum board density of 848 kg/m³ and standard plasterboard is based on a minimum board density of 640 kg/m³.

140 mm medium solid medium density blockwork (≥ 1450 kg/m³) would be suitable as an alternative to R_w 50 dB drywall.

Table 8 Example drywall partition constructions

Minimum site sound insulation performance	Minimum laboratory sound insulation performance	Example drywall partition
$D_{nT,w} + C_{tr}$ 50 dB	$R_w + C_{tr}$ 59 dB	2 x 15 mm high density plasterboard to both sides of a twin frame construction comprising independent metal 'I' studs with 100 mm mineral fibre insulation in the cavity (overall width 250 mm)
$D_{nT,w} + C_{tr}$ 43 dB (independent leaf)	$R_w + C_{tr}$ 52 dB	2 x 15 mm high density plasterboard to both sides of a twin frame construction comprising independent metal 'I' studs with 50 mm mineral fibre insulation in the cavity (overall width 200 mm)
$D_{nT,w} + C_{tr}$ 43 dB	$R_w + C_{tr}$ 52 dB	2 x 15 mm high density plasterboard to both sides of a twin frame construction comprising metal 'C' studs with 50 mm mineral fibre insulation in the cavity (overall width 200 mm)

Minimum site sound insulation performance	Minimum laboratory sound insulation performance	Example drywall partition
N/A	R_w 50 dB	2 x 12.5 mm standard plasterboard to both sides of a 70 mm 'C' stud with 50 mm mineral fibre insulation in cavity (overall width 122 mm)
N/A	R_w 45 dB	2 x 15 mm standard plasterboard to both sides of a 48 mm 'C' stud (overall width 110 mm)
N/A	R_w 40 dB	2 x 12.5 mm standard plasterboard to both sides of a 48 mm 'C' stud (overall width 100 mm)

5.2.1 Risers

The minimum sound insulation requirement for riser walls are:

- R_w 42 dB to electrical risers
- R_w 45 dB for bathroom risers within dwellings
- R_w 47 dB to mechanical risers.

Example drywall constructions are provided in Table 9. Alternatively, 100 mm medium solid medium density blockwork (≥ 1450 kg/m³) would be suitable.

Table 9 Example shaftwall constructions

Location	Sound insulation performance	Example construction
Electrical/drainage	R_w 42 dB	Gypframe 70 mm 'I' stud framework with Gyproc CoreBoard between studs, secured by Gypframe retaining channel. 2 x 15 mm Fireline board to non-shaft side
Bathroom riser	R_w 45 dB	Gypframe 92 mm 'I' stud framework with Gyproc CoreBoard between studs, secured by Gypcrete retaining channel. 2 x 12.5 mm Fireline board to non-shaft side
Mechanical risers	R_w 47 dB	Gypframe 92 mm 'I' stud framework with Gyproc CoreBoard between studs, secured by Gypframe retaining channel. 25 mm mineral fibre insulation in cavity, 2 x 12.5 mm Fireline board to non-shaft side

5.3 Wall linings

To avoid low frequency resonances, a gap of at least 35 mm shall be maintained between masonry walls and partition linings, with at least 25 mm mineral fibre in the cavity.

5.4 Existing elements

Any existing walls to be retained shall be made good and well-sealed. Any openings will need to be suitably infilled to maintain the sound insulation performance of the wall.

Any existing wall constructions to be retained will need to be reviewed as the design progresses. Enhancements may be required to ensure suitable sound insulation performances are achieved.

5.5 Internal glazing

Internal glazing is required between the back-of-house staircase and apartment bedrooms within 11 Bloom Street to provide natural light.

Allowance shall be made for either of the following to achieve an overall on-site sound insulation performance $D_{nT,w}+C_{tr}$ 43 dB, in line with ADE2003:

1. R_w+C_{tr} 46 dB glazing, based on R_w+C_{tr} 52 dB drywall partition
OR
2. R_w+C_{tr} 40 dB glazing, based on R_w+C_{tr} 59 dB drywall partition.

This is based on a window up to 1.5 m².

Example internal glazing build-ups are as follows:

- R_w+C_{tr} 46 dB: 12.8 mm acoustic laminate glass/20 mm cavity/16.8 mm acoustic laminate glass
- R_w+C_{tr} 40 dB: 8.8 mm acoustic laminate glass/20 mm cavity/10 mm glass.

6 Doors

Mark-ups of recommended partition and door sound insulation performances are provided in Appendix B.

6.1 Apartment entrance doors

As discussed in Section 2.3.4, ADE2003 requires that the doors between dwellings and corridors have a certain level of resistance to the passage of sound. Apartment front doors should normally be selected to achieve R_w 29 dB.

As discussed in Section 2.3.3, sound absorbent finishes are normally required to common areas that give direct access to residents as per ADE2003. It is normally recommended that all entrance halls, corridors and hallways are covered with an area equal to or greater than the floor area with a Class C absorber or better, to meet the requirements of ADE2003.

It is understood the corridor soffits must be exposed due to heritage restrictions, and sound absorbent treatment cannot be applied. As such, it is proposed to uplift the door performances to compensate for potential increased reverberant noise build-up within corridors. This has been agreed with building control on similar schemes in Manchester.

The mark-ups include R_w 35 dB apartment front doors, to compensate for potential increased reverberant noise build-up within corridors, due to exposed soffits.

To achieve R_w 35 dB the following construction is typically required:

- Solid door: 54 mm solid-core timber door closing onto a rebated frame with full perimeter compressible seals along the head, jambs and threshold.
- Threshold seal to close onto hard threshold strip.
- The door must be side hinged rather than pivoted.
- For double doors, meeting jambs must be rebated and fitted with seals.
- Door leaf weights vary with supplier but are typically around 35 kg/m². Lighter doors with composite constructions are available from some suppliers.

6.2 Utility cupboard doors

Where utility cupboard doors open onto living rooms, there shall be no passive vents or undercuts.

Ventilation shall be provided via acoustically lined ductwork or acoustically rated grilles to the cupboard, to ensure the door performance is maintained.

6.3 External doors

External doors shall meet the minimum facade sound insulation requirements set out in Section 3.2.

7 Lightwell

The 11 Bloom Street lightwell shall achieve minimum sound insulation performance R'_w+C_{tr} 32 dB. An example build-up comprises 6.8 mm acoustic laminate glass/16 mm cavity/6 mm glass.

The lightwell will need to provide minimum horizontal and vertical flanking sound transmission performances of $D_{n,f,w}+C_{tr}$ 48 dB.

It is understood that windows will not extend full height nor full width of the lightwell. Proposed details will need to be reviewed as the design progresses.

8 Interface detailing

All interfaces between sound insulating elements and other adjacent elements shall be made in such a way that the sound insulation performance of the sound insulating element is not degraded, and that the site sound insulation requirements are met. These adjacent elements include:

- Other partitions
- Glazing
- Mullions
- Door frames
- Floors
- Suspended ceilings
- Service penetrations.

All connections to adjacent elements shall incorporate flexible airtight sealing using non-hardening sealant or other seal acceptable to the Architect.

Appropriate details will need to be developed during as the design progresses.

8.1 Partition head details

As discussed in Section 4.2.2, timber floorboards are to be exposed and a shadow gap/deflection head detail is proposed. A suitable partition head detail will need to be developed with partitions well sealed to the underside of the existing timber floors.

Separating partitions between top floor apartments shall break new roof linings with plasterboard linings individual to each apartment. See Section 3.4.

8.2 Partition base details

As discussed in Section 4.2.1, separating partitions between apartments shall be constructed so that the following floor elements are individual to each apartment:

- 1 layer of 18 mm ply (minimum density 560 kg/m³)
- resilient layer (minimum performance ΔL_w 22 dB, at least 10 mm thick)

Dense mineral fibre void barrier (at least 100 mm thick, 100 kg/m³ density) shall be provided beneath the party wall lines.

Resilient flanking strips (min 5 mm thick) shall be provided around the perimeter of the flooring board to structurally isolate floors from walls and skirting.

Internal partitions within apartments could be constructed from the top of the floated floors.

Suitable partition base details will need to be developed.

8.3 Partition facade interfaces

Partitions shall abut the existing masonry walls of the facade directly and break any existing linings. The interface will need to be well sealed.

Allowance shall be made for mullion enhancements (eg metal over-cladding on resilient layer) and plasterboard boxing where partition interface with new curtain walling at fifth floor 11 Bloom Street. Suitable details will need to be developed.

8.4 Floor facade interface

The interface between floated floors and the existing masonry facade shall be well sealed.

8.5 Partition junctions

Where partitions separating dwellings and any other drywall partitions with a rating of $\geq R_w$ 50 dB abut other walls they shall break the internal lining as per the example details in Figure 1.

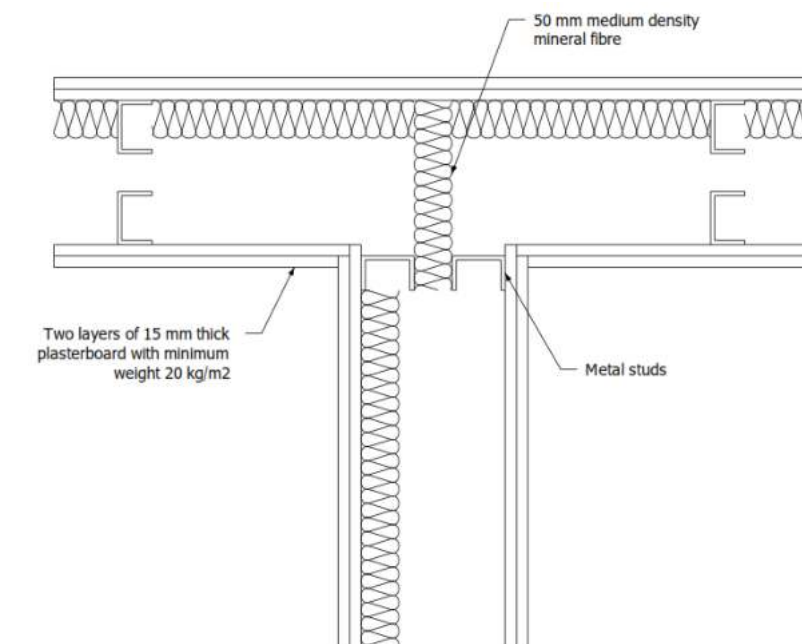


Figure 1 Example sketch detail - Partition junction with adjacent

9 Sound absorbent finishes

As discussed in Section 6.1, it is understood the corridor soffits must be exposed due to heritage restrictions, and sound absorbent treatment cannot be applied.

10 Building services noise and vibration

10.1 Internal noise limits

All plant is to be carefully selected and installed so as not to cause the following maximum internal noise limits to be met. The noise limits apply to all building services operating simultaneously under normal conditions, except where noted.

Table 10 Maximum internal building services noise levels

Space	Maximum internal building services noise level
Bedrooms	L_{Aeq} 27 dB night 23:00-07:00 (approx. NR 22) L_{Aeq} 32 dB day 07:00-23:00 (approx. NR 27)
Living/dining rooms	L_{Aeq} 32 dB (approx. NR 27)
Hallways within dwellings	NR 35
Bathrooms	NR 40
Circulation	NR 40
Store	NR 45
Cycle store	NR 45
Bin store	NR 50
Plant rooms	NR 55 with low frequency limits L_{eq} 55 dB at 63 Hz and 60 dB at 125 Hz
11 Bloom Street lower ground and upper ground plant rooms/substation	NR 70 with low frequency limits L_{eq} 65 dB at 63 Hz and 70 dB at 125 Hz

Noise limits in living rooms and bedrooms are for normal operation. Boost modes on kitchen extracts, for example, are generally not included, but shall be kept within reasonable levels (ie, + 5-10 NR).

It is also important that building services noise has no attention catching characteristics, such as hums, whines, whistles and clicks.

10.1.1 Emergency plant internal noise limits

Emergency plant noise shall be limited to be no higher than 10 NR points above the limits set out above. Emergency plant noise shall be limited to a level which does not impact the audibility/intelligibility of the fire alarm system.

10.2 External noise limits

10.2.1 Normally operating plant

Environmental noise limits for building services plant are set out in order to protect the amenity of nearby noise sensitive premises.

The Local Authority requires the cumulative rating noise level resulting from the operation of all new building services plant to be at least 5 dB below the representative existing background noise level, when assessed at a distance of one meter from the facade of the nearest sensitive premises.

Representative background noise levels at the site are summarised in Table 11. These are facade noise levels. These are based on the worst-case across the 2015/2016 and 2024 surveys.

Table 11 Summary of background noise levels

	Representative background noise level, $L_{A90,15min}$ (dB)	
	Day (07:00-23:00)	Night (23:00-07:00)
Bloom Street	53	46
Minshull Street	53	47
Richmond Street	55	51

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant shall not exceed the limits set out in Table 12.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels.

Table 12 Plant noise limits at 1 m from the nearest noise sensitive premises

Receptor location	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Day (07:00-23:00)	Night (23:00-07:00)
Bloom Street	48	41
Minshull Street	48	42
Richmond Street	50	46

[2] The limits set out in Table 12 do not include any attention catching features. The penalty corrections for attention catching features may be significant, and will need to be considered as the building services design progresses.

The nearest noise sensitive premises to the site are as follows:

- Velvet House (approx. 10 m to the south east)
- Manchester Crown Court (approx. 10 m to the north east)
- Cove apartments (approx. 30 m to the north west).

10.2.2 Emergency plant

Where new plant will run only in an emergency, or under controlled periods of testing, its cumulative noise egress level (L_{Aeq}) for any time of the day should be designed to be no more than 10 dB above the representative background noise level (L_{A90}), when measured at 1 m from the facade of the nearby noise sensitive receptors (subject to agreement with MCC).

Based on the results of the environmental noise survey, and the criteria, the cumulative noise levels from the operation of new plant shall not exceed the limits set out in Table 13.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels.

Table 13 Emergency plant noise limits at 1 m from the nearest noise sensitive premises

Receptor location	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)	
	Day (07:00-23:00)	Night (23:00-07:00)
Bloom Street	63	56
Minshull Street	63	57
Richmond Street	65	61

The limits set out in Table 13 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses.

It is recommended that emergency plant testing takes place during the day when it is least likely to disturb residents.

10.2.3 Characteristics

The noise from building services plant and systems shall not contain any distinguishable, discrete, continuous notes (whine, hiss, screech, hum, etc) or distinct impulses (bangs, clicks, clatters or thumps) and should not be irregular enough to attract attention.

10.3 Plant selection and noise control measures

All plant associated with the development will need to be carefully selected and appropriate measures will need to be adopted to ensure that the noise criteria are achieved. Measures that should be considered include:

- Low noise equipment selections
- Plant room connections to atmosphere to be ducted via attenuators
- Double-skin casings to air-handling plant
- In-duct attenuators, primary in-duct attenuators to plant items, near the plant item or as ductwork penetrates plant room walls
- Acoustic louvres/screens
- Acoustic packages to any external cooling plant
- Acoustic lagging and linings to ductwork within plant rooms (particularly prior to in-duct attenuators)
- Select diffusers to have manufacturer ratings at least 5 NR points below the relevant room criteria.
- Generator enclosures
- Ductwork/pipework connected to plant supported from resilient brackets
- Select attenuators of appropriate width and height so that maximum pressure drops do not exceed 30 Pa
- Select attenuators so that regenerated noise from the attenuator does not increase the resultant noise level
- Limit airflow across louvres to no more than 2 m/s.

An assessment will need to be carried out once equipment selections become available to demonstrate compliance with the noise criteria.

10.4 MVHRs

Allowance shall be made for in-duct attenuation to MVHR supply and extract terminations (to be positioned within the services cupboard) and to MVHR intake and exhaust terminations (to be positioned close to the facade). Allowance shall be made for acoustic lagging with minimum mass layer 5 kg/m² for any lengths of duct between the facade and attenuator. This will need to be reviewed as the design progressed, depending on final ventilation layouts and unit selections.

The following allowances shall also be made:

- Avoid locating the MVHR mounted on a partition backing onto a bedroom. If this must occur, the partition may need to be enhanced to a staggered-stud partition to help control structure-borne sound transfer.
- Accessing the MVHR cupboard via a hallway (rather than a living area), wherever possible. Accessing the MVHR cupboard from a sensitive space will require a door with enhanced sound insulation (ie, threshold and perimeter seals, no undercutting for air transfer)
- Access to utility cupboards, containing MVHR units, from bedrooms to be avoided.
- Services routed via walls containing doors wherever possible.

10.5 Limiting air flow velocities

To minimise regenerated noise and maintain internal noise criteria, maximum duct air velocities set out in Table 14.

Table 14 Maximum air velocities in ducts [adapted from ASHRAE Handbook 2011: HVAC Applications, Chapter 48]

Noise target	Supply Outlet	Extract Inlet	Final runout to outlet (m/s)			Branch duct (m/s)			Maximum (m/s)		
			within occupied room	above acoustic ceiling	above drywall ceiling	within occupied room	above acoustic ceiling	above drywall ceiling	within occupied room	above acoustic ceiling	above drywall ceiling
Rectangular Ductwork											
NR25	1.8	2.3	2.4	3.0	4.3	3.8	4.8	6.8	4.8	6.0	8.5
NR30	2.3	2.5	2.8	3.5	5.0	4.4	5.6	8.0	5.5	7.0	10.0
NR35	2.5	3.0	3.6	4.4	6.3	5.8	7.0	10.0	7.3	8.8	10.0
NR40	2.8	3.4	4.1	5.3	7.3	6.6	8.4	10.0	8.3	10.0	10.0
NR45	3.1	3.8	5.0	6.3	8.8	8.0	10.0	10.0	10.0	10.0	10.0
Circular Ductwork											
NR25	1.8	2.3	4.3	5.0	6.3	6.8	8.0	10.0	8.5	10.0	10.0
NR30	2.3	2.5	5.3	6.0	7.3	8.4	9.6	10.0	10.0	10.0	10.0
NR35	2.5	3.0	6.5	7.5	8.8	10.0	10.0	10.0	10.0	10.0	10.0
NR40	2.8	3.4	8.0	9.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0
NR45	3.1	3.8	9.8	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

10.6 Building services routing strategy, crosstalk and penetration details

There shall be no service penetrations to separating walls between residential dwellings.

Where building services pass out of plantrooms or through walls, floors or ceilings separating spaces, care shall be taken to avoid the degradation of the sound insulation between these spaces. Holes that are required to accommodate the duct, pipe, trunking or conduit shall be designed with the minimum clearance that is practicable and will need to be fully sealed.

Where services pass through twin or staggered leaf wall constructions a resilient connector shall be provided to ensure that the cavity between the two leaves are not bridged.

Where ducts pass through sound insulating elements, cross-talk attenuators will need to be considered as required to ensure that the sound insulation of the element is not degraded.

Service penetrations through partitions and other sound insulating elements will need to be acoustically sealed in such a way that the acoustic integrity of the structure is maintained and vibration transfer is minimised.

A typical acoustic penetration detail for a duct/pipe through a twin wall is provided below.

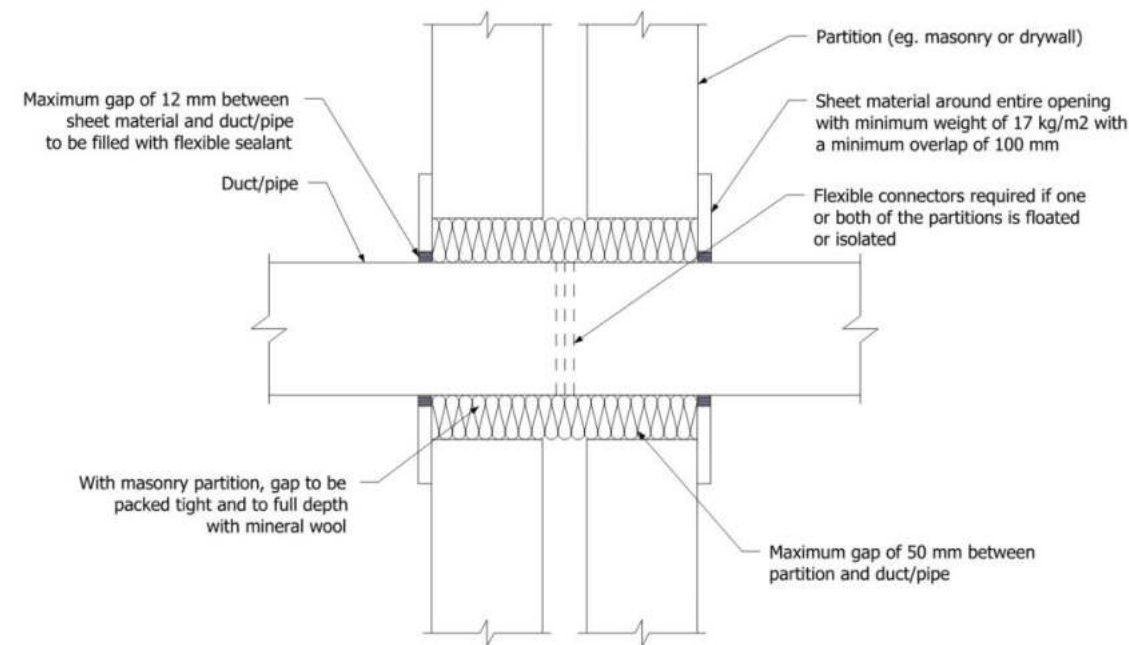


Figure 2 Example sketch penetration detail

10.7 Drainage and plumbing

Rainwater drainage pipework and other drainage routes shall be located within self-contained risers where possible. In any location where a pipe passes through spaces with an internal noise limit of NR 35 or lower, it will need to be lagged and independently boxed in.

Horizontal transfers of pipework shall be avoided, particularly above bedrooms or living rooms, as there is a considerable risk that noise will be audible due to the abrupt change in direction of water and waste. Where this is not possible, the client should be made aware of the potential noise impact, and the guidance in the following subsections should be followed.

Syphonic drainage should be avoided wherever possible and it should not pass spaces with an internal noise limit of NR 40 or lower.

10.7.1 Penetrations within floor slabs

Penetrations through the separating floor construction shall be boxed in, in accordance with the typical detail from ADE2003 shown in Figure 3.

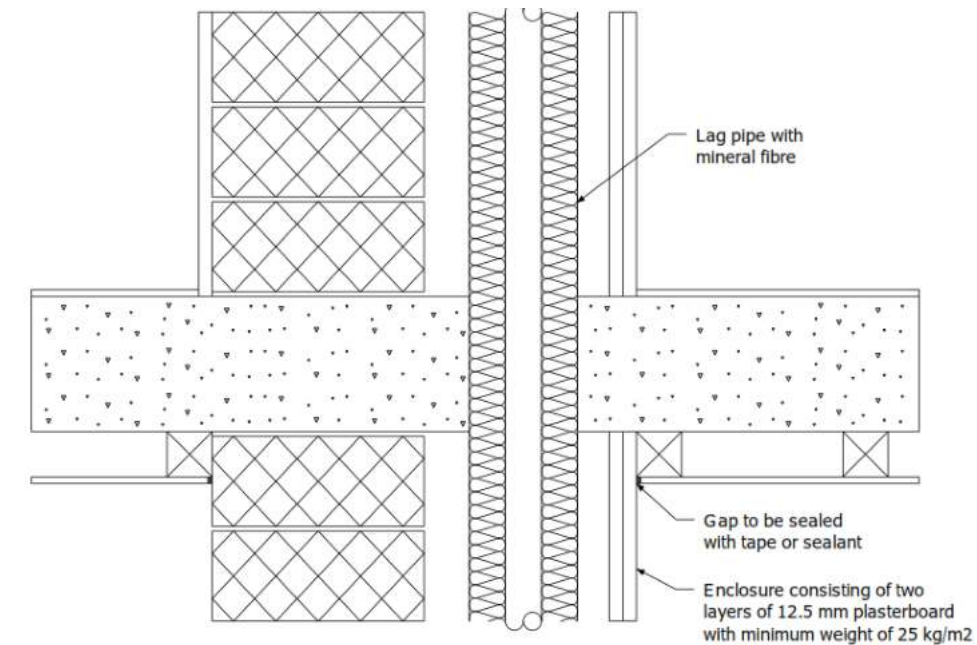


Figure 3 Indicative pipe penetration through separating floor

Wherever possible soil stacks etc shall not run through habitable rooms. Where pipes must penetrate separating floor slabs, the penetrations shall be suitably detailed to minimise noise transfer via this route.

10.7.2 Routing of soil vent pipes through living rooms

Where routing through a living room cannot be avoided the following mitigation measures shall be provided:

- Wrap full length of pipe within the room with specialist lagging consisting of 25 mm mineral fibre and barrier mat material (surface density $> 4.5 \text{ kg/m}^2$, use specialist acoustic pipe such as Polypipe Terrain Acoustic dB12 or Marley dBlue (wrapped in 25 mm fabric-wrapped mineral wool).
- Enclose pipe with dense board material $> 25 \text{ kg/m}^2$ (eg, 2x15 mm dense plasterboard) with 25 mm thick mineral wool in the stud cavities. The enclosure's studs cannot touch the pipe.
- Avoid any changes of direction unless providing a third layer of 15 mm dense plasterboard (for a total surface density of 37.5 kg/m^2).
- Penetrations through walls and floors must be acoustically sealed.
- Pipe mounts should incorporate a resilient element (eg, rubber gaskets or rubber turret mounts) to reduce transfer of energy to the structure).

For vent-only pipes, it may be acceptable for the surrounding construction to be downgraded to that detailed in Figure 3, subject to a review of the layout.

10.7.3 Routing of soil vent pipes through bedrooms

Soil vent pipes must be avoided in bedrooms, however, if they absolutely cannot be rerouted, ensure the client understands there will be an inherent, though minor, risk of complaint, but provide the following as acknowledgment of the situation:

- Wrap pipe with specialist lagging consisting of 25 mm mineral fibre and barrier mat material (surface density > 9 kg/m²), such as SuperLag PipeLag 10/25 from CMS or MuftiLag P10/25 from Tap. Alternatively, use specialist acoustic pipe such as Polypipe Terrain Acoustic dB12 or Marley dBlue (wrapped in SuperLag PipeLag 5/25 from CMS or MuftiLag P5/25 from Tap).
- Enclose pipe with board material > 37.5 kg/m² (eg, 3x15 mm dense plasterboard) with 25 mm thick material wool in the stud cavities. The enclosure's studs cannot touch the pipe.
- Avoid any changes of directions. If unavoidable, the radius must be 3x the diameter of the pipe.
- Penetrations through walls and floors must be acoustically sealed.
- Pipe mounts should incorporate a resilient element (eg, rubber gaskets or rubber turret mounts) to reduce transfer of energy to the structure).

For vent-only pipes, it may be possible for the surrounding construction to be downgraded in line with the requirements for living rooms, subject to a review of the layout.

Rainwater pipes should be avoided in bedrooms. Where routing of a rainwater pipe through a bedroom cannot be avoided, provide the same requirements as living rooms.

10.8 Electrical sockets and lighting/ventilation controls

Recessed services in high performance walls, floors and ceilings shall generally be avoided.

The mounting of services etc can cause weaknesses in wall constructions, particularly in lightweight walls.

Ideally, recessed fixtures and fittings (sockets and switches etc) should be avoided in separating walls. Where this is not possible, they must not be mounted back to back, (must be staggered by at least 500 mm, or in line with manufacturers' recommendations), and they must also be suitably boxed.

Plasterboard wall linings shall be returned around the rear of sockets to maintain sound insulation. Proprietary backing pads are an acceptable alternative to returning linings around the rear of sockets.

Where practicable, electrical sockets shall be on internal walls rather than walls separating dwellings.

Sockets and switches chased into masonry walls shall be located and detailed such that they do not undermine the sound insulation performance of the wall in which they are located.

10.9 Washing machines

The proposed floor strategy does not allow for suitable isolation of washing machines. The Client should be made aware of risk of structure-borne noise transfer between apartments.

10.10 Building service vibration

10.10.1 Criteria

Vibration associated with the building services shall not cause:

- disturbance in terms of perceptibility
- the maximum noise criteria to be exceeded in terms of structure-borne noise.

When all building services are operating at normal duty they shall not:

- Exceed a Vibration Dose Value (VDV) of 0.1 m/s^{-1.75} as given in BS 6472-1: 2008 in any residential dwelling
- Exceed a Vibration Dose Value (VDV) of 0.4 m/s^{-1.75} as given in BS 6472-1: 2008 in all other occupiable spaces
- be of a magnitude which causes the internal noise criteria to be exceeded
- be of a magnitude which causes the vibration criteria for specific equipment to be exceeded.

In addition, vibration transfer from plant to occupied areas shall not exceed 0.01 m/s² peak acceleration, based on W_b weighting as defined in clause 3.3 of BS 6472-1: 2008.

10.10.2 Vibration control measures

All rotating and reciprocating plant such Fans, motors, chillers, AHUs, MVHRs and all other vibration producing equipment shall be fitted with suitable anti-vibration equipment (anti-vibration mounts, flexible connections, resilient hangers etc) to reduce the transmission of vibration. The degree of vibration isolation should be such that the noise and vibration criteria are met.

Ductwork and pipework in the plant rooms and ductwork and pipework in contact with structures bounding occupiable areas shall be supported on anti-vibration hangers/supports.

MVHRs shall not be mounted on partitions directly adjacent to bedrooms.

All anti-vibration equipment shall be specifically selected for the duty it has to perform.

10.11 Lifts

10.11.1 Noise limits

The following maximum noise limits shall be achieved:

- L_{AFmax} 25 dB in bedrooms
- L_{AFmax} 30 dB in living rooms
- L_{AFmax} 35 dB other occupiable residential rooms (ie kitchens / bathrooms)
- L_{AFmax} 55 dB in the lift lobby at 1 m from the landing entrance doors
- L_{AFmax} 55 dB in lift cars at maximum velocity
- L_{AFmax} 75 dB in lift machine rooms over the complete cycle of lift operation.

10.11.2 Vibration limits

The following vibration limits shall be achieved:

- Horizontal vibration – Maximum RMS acceleration level in any one-third octave band (1-80 Hz) not to exceed 0.12 m/s²
- Vertical vibration – Maximum RMS acceleration level in any one-third octave band (1-80 Hz) not to exceed 0.12 m/s² at maximum speed and 0.15 m/s² during acceleration/deceleration and start/stop periods.

11 Testing requirements

11.1 Pre-completion sound insulation testing (ADE2003)

Sufficient pre-completion testing of residential separating walls and floors shall be carried out to demonstrate compliance with *Approved Document E 2003 Edition* (including 2004, 2010 and 2015 amendments) to the Building Regulations 2010.

Tests are to be carried out to at least 10% of the separating constructions and of each apartment subset type as defined by Approved Document E at locations to be agreed with the employer's acoustician.

All tests are to be carried out by a competent person/organisation accredited to a relevant UKAS/ANC scheme.

11.2 Local Authority planning conditions

The following post-completion testing is stipulated by MCC in the planning conditions:

- Post-completion internal ambient noise measurements (planning condition 5)
- Post-completion plant noise measurements (planning condition 6).

11.2.1 Internal ambient noise measurements

The following testing shall be carried out to demonstrate compliance with planning condition 5:

- Sample measurements of at least 15 minutes each during the daytime period in the living rooms and night-time period for the bedrooms to a selection of at least 10% of apartments.
 - The location of the apartments to be assessed to be selected on the basis of apartments that are most exposed to the dominant external noise sources, to be agreed with the employer's acoustician.
 - The ventilation system in each apartment should be balanced, commissioned and operational throughout the measurements.
 - Carry out attended noise level measurements in apartments (living rooms and bedrooms) between 16:00-19:00 (ie, at a time when road traffic noise levels are considered to be typical) and between 23:00-01:00
 - Measure average noise levels in the living rooms and bedrooms (L_{Aeq}) and maximum noise levels in bedrooms at night-time (L_{AFmax}) over 15 mins.
- Unattended noise level measurements in a single bedroom and single living room over a 24 hour period.

- Carry out reverberation time measurements in apartments (living rooms and bedrooms) to assess any correction required based upon furnishing the rooms.

11.2.2 Plant noise measurements

The following testing shall be carried out to demonstrate compliance with planning condition 6:

- Undertake sample noise measurements at safely accessible externally mounted plant/atmosphere side terminations. Where plant equipment/terminations are not safely accessible, available noise data for the equipment shall be used
- Predict noise egress at the applicable locations based on the measurement results and compare to the Local Authority requirements.

Assessment shall be carried out in line with BS412:2014-A1:2019 with measurements at nearby receptors where feasible, or with measurements at the source to inform calculations at the receptors if direct measurements are not possible.

12 Construction (Design and Management) Regulations

The Construction (Design and Management) Regulations 2015 places legal duties on virtually everyone involved in construction work. Those with legal duties are commonly known as 'dutyholders' and include clients, designers, contractors and workers.

Typical risks specifically associated with acoustic design are:

- Access at height to install and to maintain such elements as acoustic absorbers
- Manual handling of heavy building elements such as high density concrete blocks.

Acoustic treatment is proposed which will require installation at height, eg, soffit of spaces. However, this would be required in any event for installation of ceiling finishes, lighting, etc and is therefore not a risk specifically related to the acoustic design.

Man-made mineral fibres (MMMF) are used extensively in the construction industry and these are sometimes specified for their acoustic properties. When contractors make use of MMMF they should act on relevant legislation and the latest guidance issued by the Health and Safety Executive.

The above risks are not unusual and would be appropriately managed by a competent contractor.

Appendix A

Glossary of terms

General terms

Absorptive material	Material that absorbs sound energy. Soft or porous finishes such as mineral fibre are effective sound absorbers.
Acoustic absorption	The conversion of sound energy, often by the use of a porous material. It is a term used to describe the amount of sound absorbed by a finish or object within a room.
Airborne sound	Sound propagating through the air.
Airborne sound insulation	The ability of building elements or structures to reduce airborne sound transmission.
Density	Mass per unit volume, expressed in kilograms per cubic metre (kg/m³).
Direct sound transmission	The process in which sound that is incident on one side of a building element is radiated by the other side.
Flanking element	Any building element that contributes to the sound transmission between rooms in a building that is not the separating element in question. It is typically an element which continues past the separating element
Flanking sound transmission	Sound transmitted between rooms via flanking elements instead of directly through separating elements, or along any path other than the direct path.
Floating/isolated layer	A surface that rests on a resilient layer or other resilient element and is therefore isolated from the main structure (see also ‘Floating/isolated floor’ and ‘Resilient layer’).
Frequency	The number of cycles per second. The unit of frequency is the Hertz (Hz). Frequency gives a sound its distinctive tone.
Frequency band	A continuous range of frequencies between stated upper and lower limits (see also ‘Octave band’ and ‘One-third octave band’).
Impact sound	Sound resulting from direct impact (such as footsteps) on a building element.
Impact sound insulation	The ability of building elements or structures to reduce impact sound transmission.
Independent ceiling or lining	A ceiling or lining which is mounted independently of (ie with no direct physical connections to) a separating floor or wall.
Isolation	The absence of rigid connections between two or more building elements.
Mass per unit area	The mass per unit area, expressed in terms of kilograms per square metre (kg/m²). Also known as ‘surface density’.
Resilient layer/element	A layer or other resilient element that isolates a floating layer from a base floor and the surrounding walls.
Resiliently mounted ceiling or lining	A ceiling or lining which is mounted resiliently from (ie connected only via specialist resilient hangers or ties) a separating floor or wall.
Reverberation	The persistence of sound in a space after a sound source has stopped.
Reverberation time	The time, in seconds, taken for the sound in a room to decay by 60 dB after a sound source has been stopped.

Separating element	An element (such as a wall, floor, door, window) which separates buildings or parts of buildings.
Sound pressure level	A logarithmic measure of the effective sound pressure of a sound relative to a reference value, measured in decibels, dB. Sound pressure levels are dependent on the conditions under which they are measured.
Sound power level	A logarithmic measure of the sound power in comparison to specified reference level, measured in decibels, dB. Unlike sound pressure, sound power is not room or distance dependent.
Spectrum	The composition of a particular sound in terms of separate frequency bands.
Surface density	The surface density, expressed in terms of kilograms per square metre (kg/m²). Also known as ‘mass per unit area’.
Structure-borne sound	Sound which is transferred by vibration via the structure of a building.

Acoustic parameters

‘A’ weighting	Frequency weighting based on the frequency response of the human ear which has been found to correlate well with the subjective response to sound.
C_{tr}	The correction to a sound insulation quantity (such as R_w or $D_{nT,w}$) to take account of a specific sound spectrum with low frequency sound energy.
Decibel (dB)	A logarithmic unit used for many acoustic values to indicate the level with respect to a reference level
$D_{n,f,w}$, $D_{n,c,w}$	A single number weighted quantity which characterizes the airborne sound insulation between rooms via a specified flanking path. $D_{n,c,w}$ relates specifically to ceilings but has been superseded by $D_{n,f,w}$ which can relate to any specified path. A higher numerical quantity represents a better performance.
D_{nT}	The difference in sound level between a pair of rooms, in a stated frequency band, normalized for the reverberation time. A higher numerical quantity represents a better performance.
$D_{nT,w}$	A single number weighted quantity which characterizes the airborne sound insulation between rooms, corrected for reverberation time. A higher numerical quantity represents a better performance.
Hz	Hertz (Hz) is the unit of frequency (see also ‘Frequency’)
$L'_{nT,w}$	A single number weighted quantity used to characterise the impact sound insulation of floors. A lower numerical quantity represents a better performance. The ASTM parameter, IIC, rates the performance of the floor, meaning a higher numerical quantity represents a better performance).
$L_{A90,T}$	The A-weighted sound pressure level exceeded 90% of the measurement period (T) over which a noise is measured (ie, the quietest 10% of the period). When not weighted it is denoted $L_{90,T}$. This parameter is generally considered to be representative of a constant noise source, or background noise level.

$L_{Aeq,T}$	Equivalent A-weighted sound pressure level of a steady noise that has the same acoustic energy as a fluctuating noise over the measurement period (T). When not weighted it is denoted $L_{eq,T}$.
$L_{Amax,T}$	The highest A-weighted sound pressure level measured in the period (T) with either fast (L_{AFmax}) or slow (L_{ASmax}) time weightings. When not weighted it is denoted L_{Fmax} or L_{Smax} .
NR	Noise rating. Single figure term used to reflect the spectral content of noise. This is generally applied within rooms in relation to building services noise.
Octave band	A frequency band in which the upper limit of the band is twice the frequency of the lower limit.
One-third octave band	A frequency band in which the upper limit of the band is the cube root of two times the lower limit of the band or more simply one third of an octave band.
R	Sound reduction index. A quantity, measured in a laboratory, which characterises the airborne sound insulation of a material or building element in a stated frequency band. A higher numerical quantity represents a better performance.
R_w	Weighted sound reduction index. A single number quantity which characterises the airborne sound insulation of a material or building element in the laboratory. A higher numerical quantity represents a better performance.
R'	Apparent sound reduction index. The on-site equivalent of the sound reduction index, R , which is measured in the presence of flanking paths. A higher numerical quantity represents a better performance.
R'_w	Apparent weighted sound reduction index. The on-site equivalent of the weighted sound reduction index, R_w . A higher numerical quantity represents a better performance.
T_{mf}	The arithmetic average of the reverberation time in the 500 Hz, 1 kHz and 2 kHz octave bands (see also 'Reverberation time').
α_w	Weighted absorption coefficient – a quantity characterising the effectiveness of a sound absorbing surface. The proportion of sound energy absorbed is given as a number between zero (for a fully reflective surface) and one (for a fully absorptive surface).
ΔL_w	The measured improvement of weighted impact sound insulation resulting from the installation of a floor covering or floating floor on a test floor in a laboratory. A higher numerical quantity represents a better performance.

Appendix B

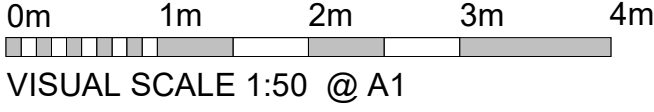
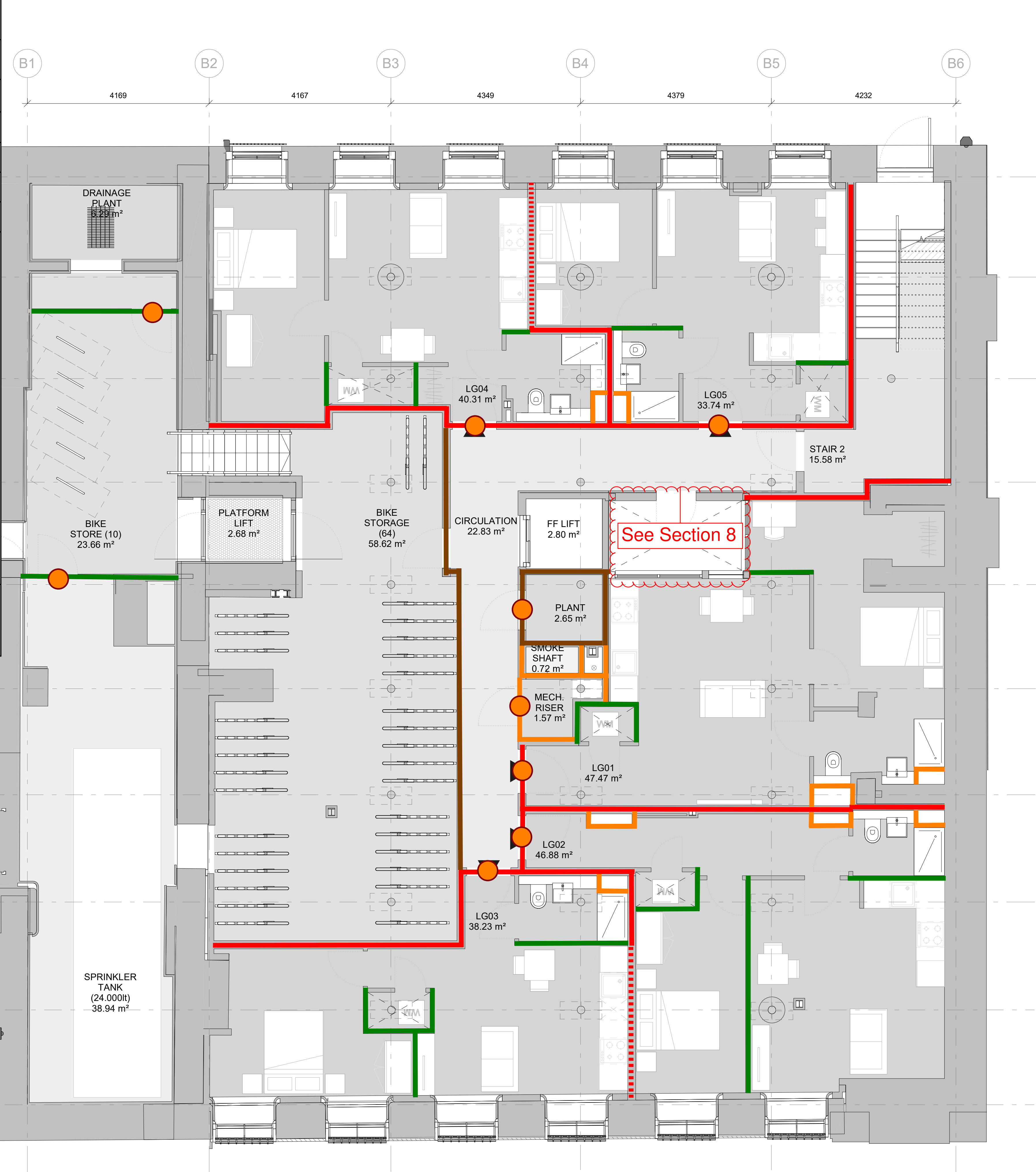
Partition and door sound insulation mark-ups

Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

- $D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition
- $D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



BS - LOWER GROUND FLOOR - AREA
1:50

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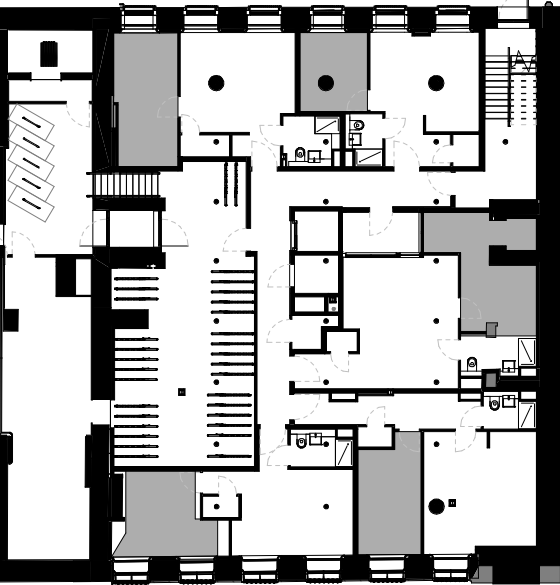
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BEDROOM TYPE



- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	24006
Suitability	S0 WORK IN PROGRESS
Status	

Client:
Beech Holdings

Project:
**PICCADILLY WAREHOUSE
Bloom Street**

Sheet Name:		Lower Ground Floor_GAS	
Drawing No.		Rev.	
24006-HFR-BS-LG-DR-A-2006		T1	
Drawn By	MM	Scale	As indicated @ A1
Created			

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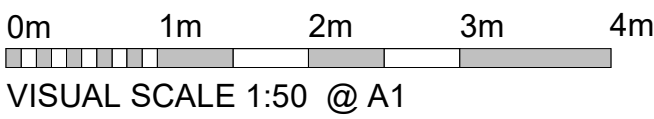
Level 12, Tower 12, 18-22 Bridge Street, Manchester, M3 3BZ
t +44 (0) 161 242 1140
w www.fletcher-rae.com
e info@fletcher-rae.com

Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

- $D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition
- $D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



BS - 00 - UPPER GROUND FLOOR
1 : 50

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- PROJECT NOTES:**
- Unverified dimensions
 - To be read in conjunction with retention, demolition and structural drawings.
 - All setting-out information to be reviewed by Contractor on site.
 - Dimensions of all footings and foundations to be confirmed by SE upon completion of site investigation works.
 - Contractor to set out internal walls on all floors using gridlines as reference and confirm dimensions on site before any builders work is carried out. Any discrepancy should be highlighted and made clear to relevant consultants.

BEDROOM TYPE

- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	24006
Suitability	SO WORK IN PROGRESS
Status	

Client:
Beech Holdings

Project:
**PICCADILLY WAREHOUSE
Bloom Street**

Sheet Name:			
Upper Ground Floor_GAS			
Drawing No.		Rev.	
24006-HFR-BS-UG-DR-A-2000		T1	
Drawn By	MM	Scale	As indicated @ A1
Created			

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Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

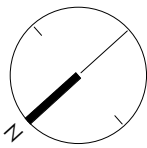
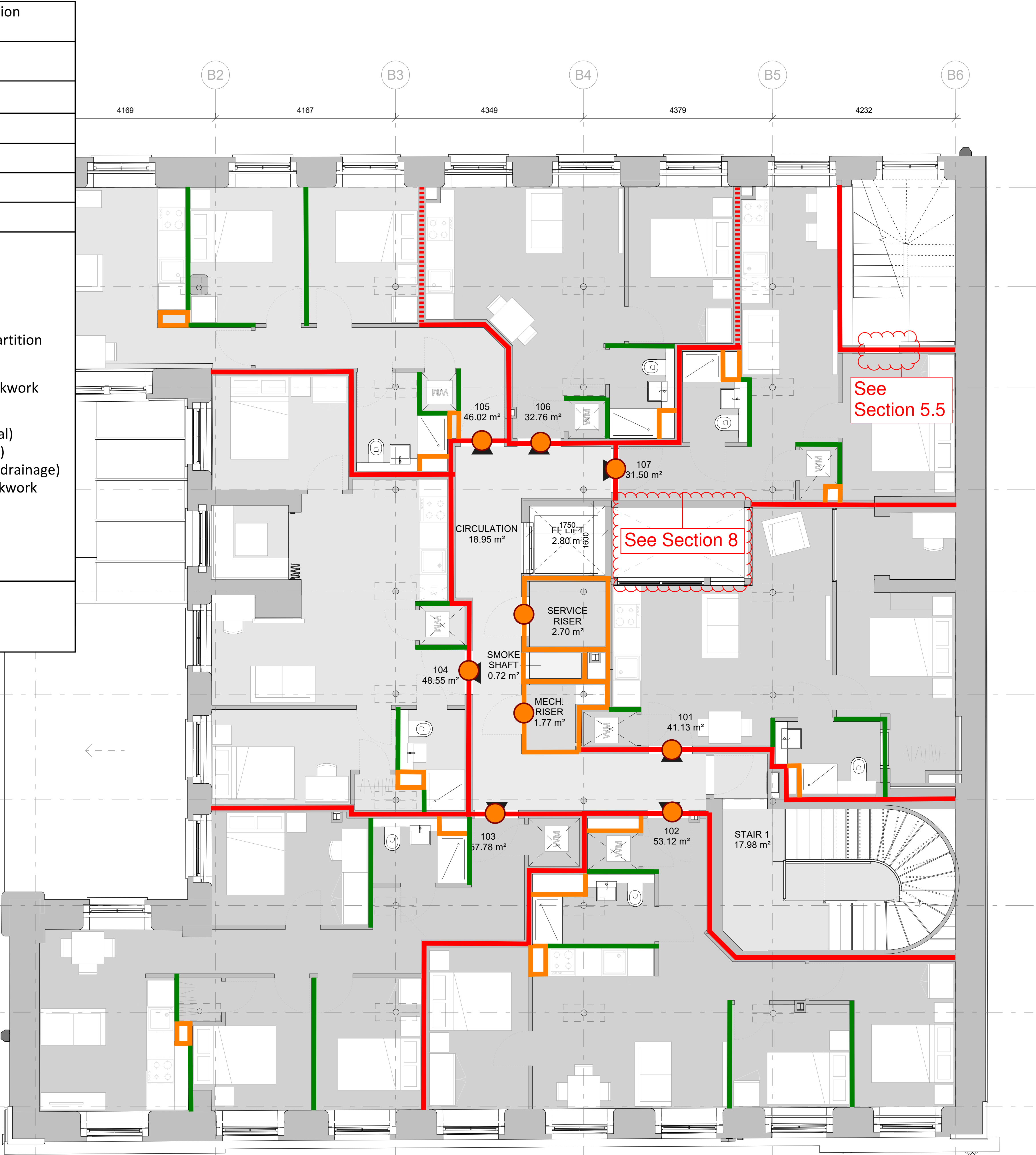
Mark-up key laboratory ratings

- $D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition
- $D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration

0m 1m 2m 3m 4m
VISUAL SCALE 1:50 @ A1

BF 2431
BG 2469
BH 2475
BJ 2174
BK



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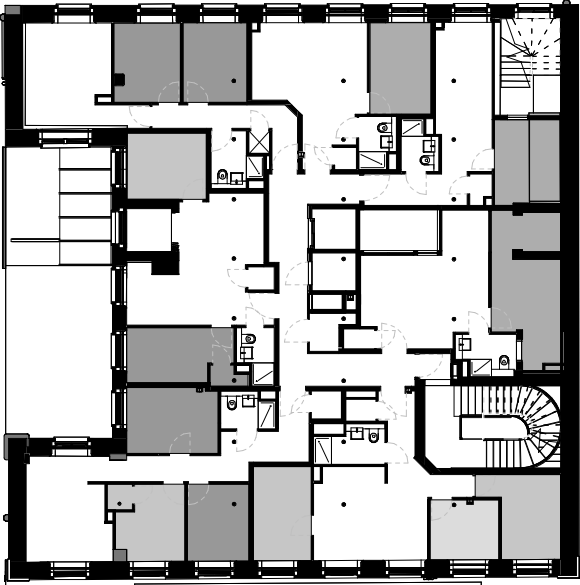
SOFTWARE INTEROPERABILITY
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BEDROOM TYPE



- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chk'd

Project No.	24006
Suitability	SO WORK IN PROGRESS
Status	

Client:

Beech Holdings

Project:

PICCADILLY WAREHOUSE
Bloom Street

Sheet Name:

First Floor_GAs

Drawing No.	Rev.
24006-HFR-BS-01-DR-A-2001	T1
Drawn By	Scale
MM	As indicated @ A1
Created	

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BS - 01 - First Floor
1 : 50

Title

Partition and door sound insulation performances

Project

Piccadilly Warehouse

Project no.

024322

Version

C

Marked-up by

Thomas Dent

Reviewed by

Matthew Robinson

Date

13 May 2024

Mark-up key laboratory ratings

$D_{nT\overline{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition

$D_{nT\overline{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition

R_w 50 dB drywall partition
140 mm medium density blockwork

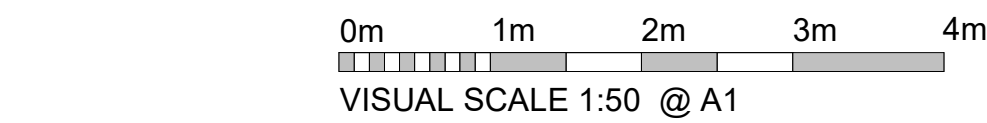
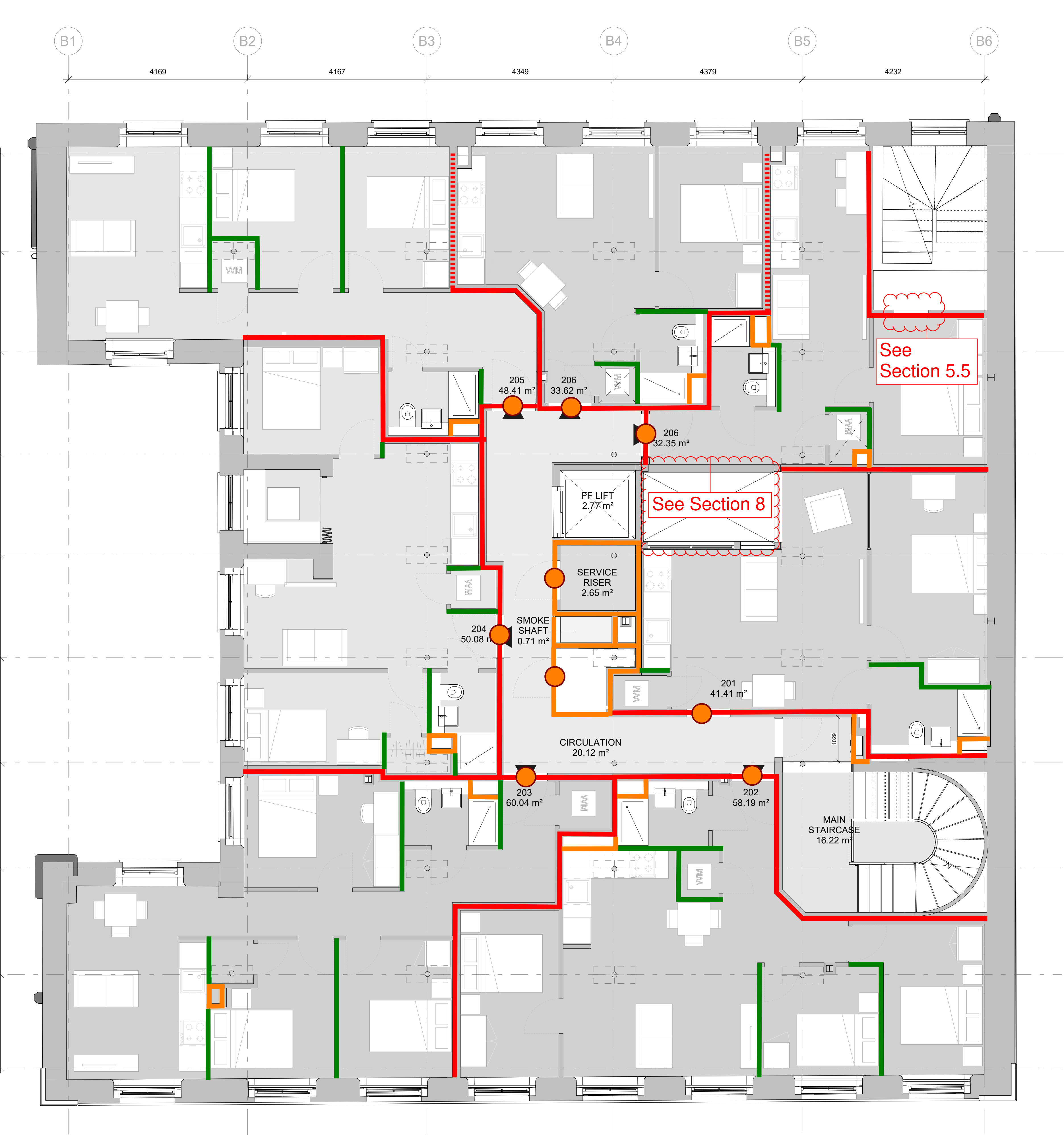
Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork

R_w 40 dB drywall partition

R_w 35 dB doorset

SANDY BROWN

Consultants in Acoustics, Noise & Vibration



BS - 02 - SECOND FLOOR - AREA
1:50

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- Unverified dimensions
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T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	24006
Suitability	SO WORK IN PROGRESS
Status	

Client:
Beech Holdings

Project:
**PICCADILLY WAREHOUSE
Bloom Street**

Sheet Name:		Second Floor_GAs	
Drawing No.	24006-HFR-BS-02-DR-A-2002	Rev.	T1
Drawn By	MM	Scale	1 : 50 @ A1
Created			

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Title

Partition and door sound insulation performances

Project

Piccadilly Warehouse

Project no.

024322

Version

C

Marked-up by

Thomas Dent

Reviewed by

Matthew Robinson

Date

13 May 2024

Mark-up key laboratory ratings

$D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)

independent leaf partition

$D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition

R_w 50 dB drywall partition
140 mm medium density blockwork

Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork

R_w 40 dB drywall partition

R_w 35 dB doorset

SANDY BROWN

Consultants in Acoustics, Noise & Vibration



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- PROJECT NOTES:**
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 - Contractor to set out internal walls on all floors using gridlines as reference and confirm dimensions on site before any builders work is carried out. Any discrepancy should be highlighted and made clear to relevant consultants.

BEDROOM TYPE

- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1 Stage 4 - First Issue

MM 22.04.24

Rev

Revision Details

Drawn

Date

Chk'd

Project No.

24006

Suitability

SO WORK IN PROGRESS

Status

Client:

Beech Holdings

Project:

PICCADILLY WAREHOUSE
Bloom Street

Sheet Name:

Third Floor GAs

Drawing No.

24006-HFR-BS-03-DR-A-2003

Rev.

T1

Drawn By

MM

Scale

As indicated @ A1

Created

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VISUAL SCALE 1:50 @ A1

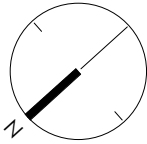
BS - 03 - Third Floor _GAs
1 : 50

Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

- $D_{nT\bar{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) independent leaf partition
- $D_{nT\bar{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 - R_w 47 dB shaftwall (mechanical)
 - R_w 45 dB shaftwall (bathroom)
 - R_w 42 dB shaftwall (electrical/drainage)
 - 100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



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T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	24006
Suitability	S0 WORK IN PROGRESS
Status	

Client:

Beech Holdings

Project:

**PICCADILLY WAREHOUSE
Bloom Street**

Sheet Name:

Fourth Floor_GAs

Drawing No.	Rev.
24006-HFR-BS-04-DR-A-2004	T1
Drawn By	Scale
MM	1: 50 @ A1
Created	

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0m 1m 2m 3m 4m
VISUAL SCALE 1:50 @ A1

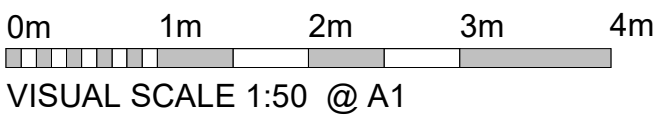
BS - 04 - FOURTH FLOOR - AREA
1: 50

Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

- $D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition
- $D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

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BS - 05 - Fift Floor_GAs
1: 50

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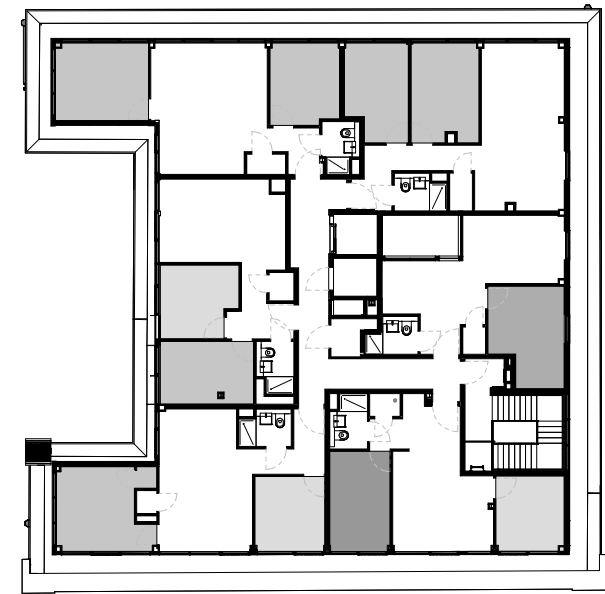
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BEDROOM TYPE



- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	24006
Suitability	SO WORK IN PROGRESS
Status	

Client:
Beech Holdings

Project:
**PICCADILLY WAREHOUSE
Bloom Street**

Sheet Name:	
Fifth Floor_GAs	
Drawing No.	Rev.
24006-HFR-BS-05-DR-A-2005	T1
Drawn By MM	Scale As indicated @ A1
Created	

HORIZON
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w www.fletcher-rae.com
e info@fletcher-rae.com

Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

$D_{nT\bar{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition

$D_{nT\bar{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition

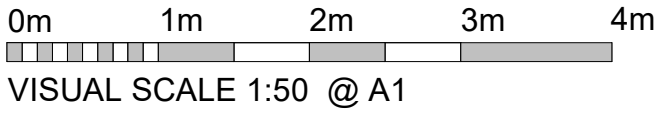
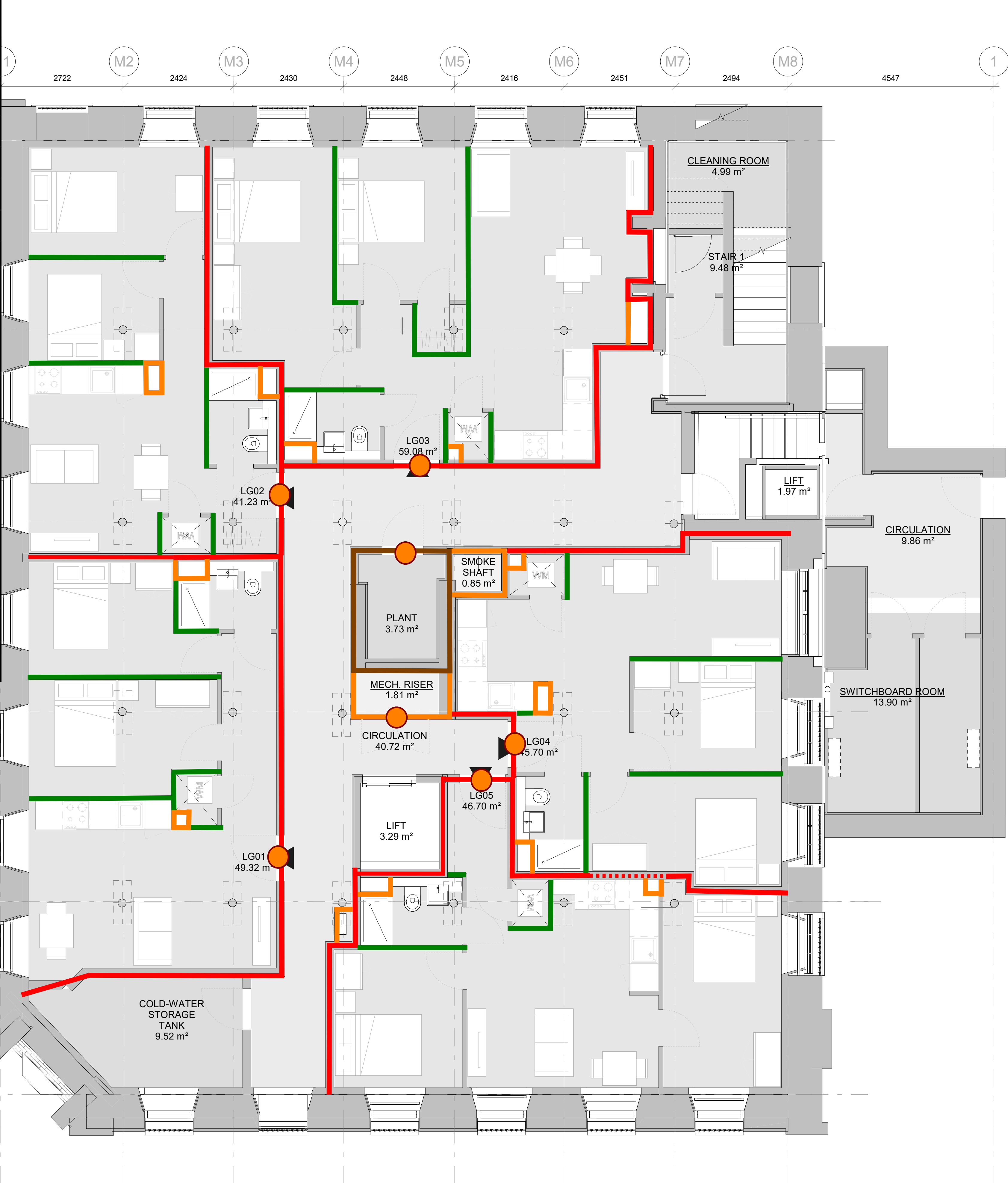
R_w 50 dB drywall partition
140 mm medium density blockwork

Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork

R_w 40 dB drywall partition

R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



MH - B1 - LOWER GROUND FLOOR
1 : 50

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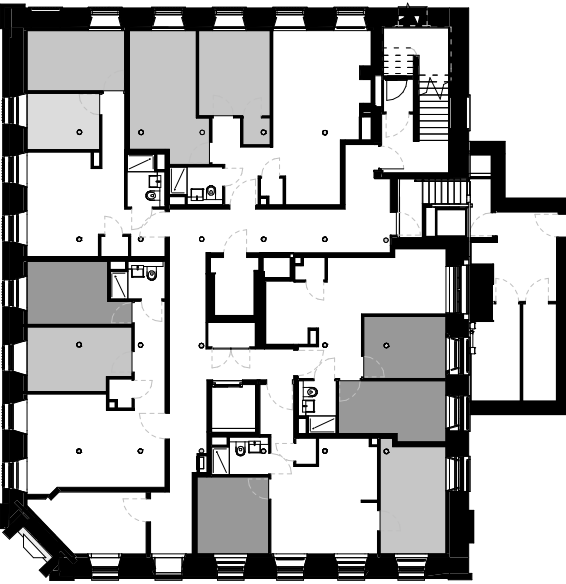
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PROJECT NOTES:

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BEDROOM TYPE



- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	
Suitability	SO WORK IN PROGRESS
Status	

Client:
Beech Holdings

Project:
**PICCADILLY WAREHOUSE
Mindel House**

Sheet Name:		Lower Ground Floor_GAs	
Drawing No.		Rev.	
24006-HFR-MH-LG-DR-A-2005		T1	
Drawn By	MM	Scale	As indicated @ A1
Created			

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Title

Partition and door sound insulation performances

Project

Piccadilly Warehouse

Project no.

024322

Version

C

Marked-up by

Thomas Dent

Reviewed by

Matthew Robinson

Date

13 May 2024

Mark-up key laboratory ratings

$D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)

independent leaf partition

$D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition

R_w 50 dB drywall partition

140 mm medium density blockwork

Risers

R_w 47 dB shaftwall (mechanical)

R_w 45 dB shaftwall (bathroom)

R_w 42 dB shaftwall (electrical/drainage)

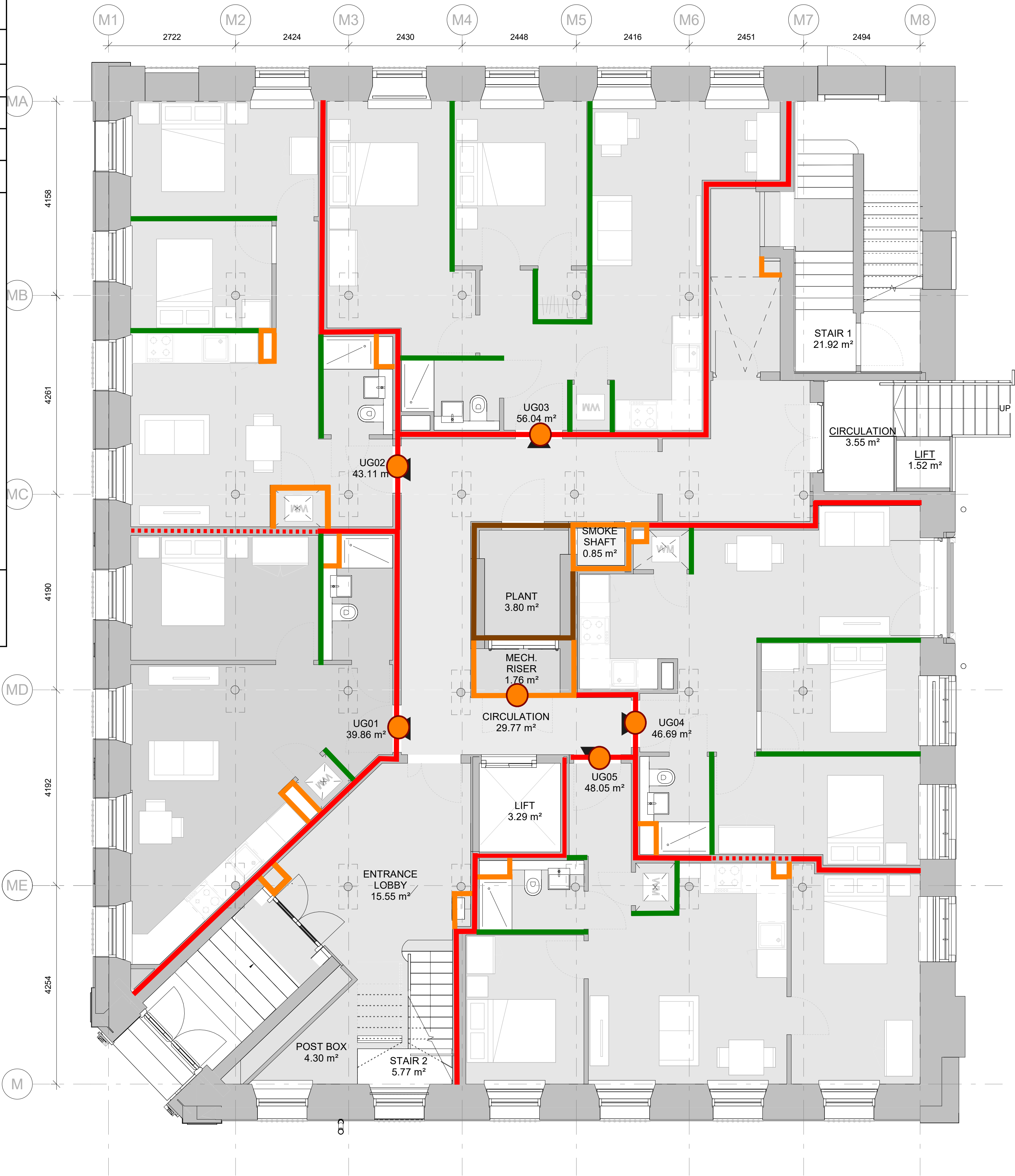
100 mm medium density blockwork

R_w 40 dB drywall partition

R_w 35 dB doorset

SANDY BROWN

Consultants in Acoustics, Noise & Vibration



MH - UG - Upper Ground Floor
1 : 50

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- PROJECT NOTES:**
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BEDROOM TYPE

- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1 Stage 4 - First Issue

MM 22.04.24

Rev Revision Details

Drawn Date Chkd

Project No.

Suitability

Status

Client:

Beech Holdings

Project:

PICCADILLY WAREHOUSE
Mindel House

Sheet Name:

Upper Ground Floor_GAS

Drawing No.

24006-HFR-MH-UG-DR-A-2000

Rev.

T1

Drawn By

MM

Scale

As indicated @ A1

Created

HORIZON

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Title

Partition and door sound insulation performances

Project

Piccadilly Warehouse

Project no.

024322

Version

C

Marked-up by

Thomas Dent

Reviewed by

Matthew Robinson

Date

13 May 2024

Mark-up key laboratory ratings

$D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition

$D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition

R_w 50 dB drywall partition
140 mm medium density blockwork

Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork

R_w 40 dB drywall partition

R_w 35 dB doorset

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Room Area Calculations:

- 101: 60.26 m²
- 102: 43.11 m²
- 103: 36.08 m²
- 104: 40.74 m²
- 105: 47.41 m²
- 106: 47.92 m²
- PLANT: 3.85 m²
- MECH. RISER: 1.77 m²
- LIFT: 3.31 m²
- STAIR 1: 10.99 m²
- STAIR 2: 15.62 m²
- CIRCULATION: 21.49 m²
- SMOKE SHAFT: 0.83 m²

Sound Insulation Ratings:

- $D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) independent leaf partition (dotted red line)
- $D_{nTw}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition (solid red line)
- R_w 50 dB drywall partition 140 mm medium density blockwork (solid brown line)
- Risers: R_w 47 dB shaftwall (mechanical), R_w 45 dB shaftwall (bathroom), R_w 42 dB shaftwall (electrical/drainage), 100 mm medium density blockwork (solid orange line)
- R_w 40 dB drywall partition (solid green line)
- R_w 35 dB doorset (orange circle)

MH - 01 - First Floor_GAs
1 : 50

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PROJECT NOTES:

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BEDROOM TYPE

- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	
Suitability	S0 WORK IN PROGRESS
Status	

Client:

Beech Holdings

Project:

PICCADILLY WAREHOUSE
Mindel House

Sheet Name:

First Floor_GAs

Drawing No.	Rev.
24006-HFR-MH-01-DR-A-2001	T1
Drawn By MM	Scale As indicated @ A1
Created	

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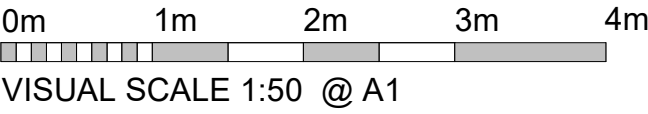
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w www.fletcher-rae.com
e info@fletcher-rae.com

Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

- $D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition
- $D_{nT_w}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



MH - 02 - Second Floor
1:50

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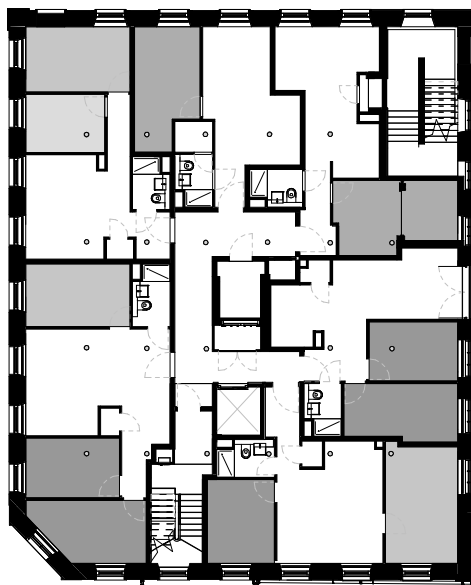
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BEDROOM TYPE



- 3/4 Bed - 1 occupier
- 3/4 Bed (Can fit a Double bed) - 1 occupier
- Double bed - 1 occupier
- Double bed - 2 occupiers

T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	
Suitability	S0 WORK IN PROGRESS
Status	

Client:
Beech Holdings

Project:
**PICCADILLY WAREHOUSE
Mindel House**

Sheet Name:
Second Floor_GAS

Drawing No.	Rev.
24006-HFR-MH-02-DR-A-2002	T1
Drawn By MM	Scale As Indicated @ A1
Created	

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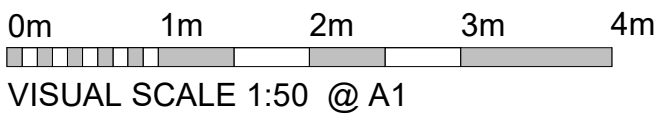
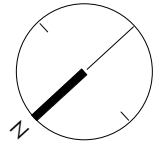
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Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

Mark-up key laboratory ratings

- $D_{nT\bar{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB)
independent leaf partition
- $D_{nT\bar{w}}+C_{tr}$ 43 dB (R_w+C_{tr} 52 dB) partition
- R_w 50 dB drywall partition
140 mm medium density blockwork
- Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
- R_w 40 dB drywall partition
- R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



MH - 03 - Third Floor
1:50

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T1	Stage 4 - First Issue	MM	22.04.24
Rev	Revision Details	Drawn	Date Chkd

Project No.	
Suitability	S0 WORK IN PROGRESS
Status	

Client:

Beech Holdings

Project:

PICCADILLY WAREHOUSE
Mindel House

Sheet Name:

Third Floor_GAS

Drawing No.	Rev.
24006-HFR-MH-03-DR-A-2003	T1
Drawn By	Scale
MM	1:50 @ A1
Created	

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Title	Partition and door sound insulation performances
Project	Piccadilly Warehouse
Project no.	024322
Version	C
Marked-up by	Thomas Dent
Reviewed by	Matthew Robinson
Date	13 May 2024

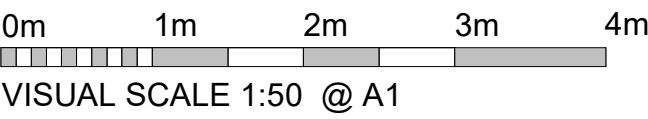
Mark-up key laboratory ratings

-  $D_{nTw} + C_{tr}$ 43 dB ($R_w + C_{tr}$ 52 dB)
independent leaf partition
-  $D_{nTw} + C_{tr}$ 43 dB ($R_w + C_{tr}$ 52 dB) partition
-  R_w 50 dB drywall partition
140 mm medium density blockwork
-  Risers
 R_w 47 dB shaftwall (mechanical)
 R_w 45 dB shaftwall (bathroom)
 R_w 42 dB shaftwall (electrical/drainage)
100 mm medium density blockwork
-  R_w 40 dB drywall partition
-  R_w 35 dB doorset

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



MH - 04 - Fourth Floor
1 : 50



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1	Stage 4 - First Issue	MM	22.04.24	
2	Revision Details	Drawn	Date	Chck'd

Project No.	
Suitability	S0 WORK IN PROGRESS
Status	

Client: **Beech Holdings**

Project:
PICCADILLY WAREHOUSE
Mindel House

Sheet Name:

Fourth Floor_GAS

Drawing No. **24006-HFR-MH-04-DR-A-2004** Rev. **T1**

Drawn By **MM** Scale **1 : 50 @ A1**

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