

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

20477-R01-C

12 February 2021

47 Peter Street, Manchester

Stage 4 acoustic design report

London, Manchester, Edinburgh, Birmingham, Belfast

Sandy Brown Associates LLP

Registered in England & Wales

No. OC 307504

Registered Office: 55 Charterhouse Street, London EC1M 6HA

post@sandybrown.com

www.sandybrown.com

Version	Date	Comments	Author	Reviewer
A	18 Dec 20	Draft issue for coordination	Kane Mitchell	James Atha
B	29 Jan 21	Updated with latest design information	Kane Mitchell	James Atha
C	12 Feb 21	Updates to Section 6	Kane Mitchell	James Atha

Disclaimer

This report has been prepared for the sole benefit and use of our client based on their instructions and requirements. Sandy Brown Associates LLP extends no liability in respect of the information contained in the report to any third party.

Summary

Sandy Brown has been appointed by Medlock FRB to provide acoustic advice in relation to the redevelopment of 47 Peter Street in Manchester to a hotel.

This report sets out the specified acoustic criteria for the development, along with details of the Stage 4 acoustic design strategy, in relation to the following key items:

- Building envelope acoustic performance requirements
- Internal sound insulation requirements for separating floors, walls & doors
- Reverberation and noise control
- Building services noise & vibration control.

A glossary of useful acoustic terminology is provided in Appendix A.

A full set of mark-ups indicating the minimum acoustic ratings for internal partitions and doors are provided in Appendix B.

Key items which require further development are set out below:

- Final architectural package confirming the items to be developed as discussed within the body of this report
- Confirmation that building control accept the proposed $D_{nT,w}+C_{tr}$ 43 dB performance between level 1 guestrooms and restaurant / lobby
- Confirmation of the enhanced floor constructions
- Confirmation of the proposed facade strategy, including which glazed elements are to be replaced and which are to be 'made good'
- Confirmation of plant deck construction and details
- Confirmation of plant noise egress mitigation strategy (screening, attenuator schedule)
- Updated MEP package including updated FCU locations and routing
- Confirmation of density/materials of existing floorboards, beams and trusses
- Locations of roof vents.

Contents

1 Introduction5

2 Basis5

3 List of key outstanding items/information6

4 Environmental noise survey6

5 Building envelope6

6 Floors11

7 Partitions.....13

8 Doors.....15

9 Interface details15

10 Sound absorbent finishes19

11 Building services noise & vibration.....19

12 Operational noise28

13 Construction (Design and Management) Regulations.....29

Appendix A.....30

 Glossary of useful acoustic terminology.....30

Appendix B33

 Sound insulation mark-ups – partitions and doors33

1 Introduction

Sandy Brown has been appointed by Medlock FRB to provide acoustic design advice on the redevelopment of 47 Peter Street in Manchester to a hotel.

This report sets out the specified acoustic requirements for the development along with details of the Stage 4 acoustic design strategy.

2 Basis

2.1 Design information

The following design information has been reviewed and forms the basis of this report:

- Architectural drawing package dated 21 April 2020
- MEP services layouts dated 21 April 2020.
- MEP Stage 2 drawings received from Zerum on 26 May 2020
- Additional architectural details and information received from Tract Architecture on 29 May 2020.
- FCH architectural package received 19 November 2020, and plant screening clarifications via email on 7 December 2020.
- M&E plant selection and layouts from Zerum downloaded on 3 December 2020.
- Updated FCH architectural package received 25 January 2021
- Outcomes from design meetings and discussions

2.2 Design standards and guides

The following standards and guidance have been used:

- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings
- Approved Document E (2003 Edition including all amendments up to and including 2015) to the Building Regulations 2010 (ADE2003)
- World Health Organisation Guidelines for Community Noise (WHO Guidelines)
- BS 4142:2014 ‘Method of rating and assessing industrial and commercial sound’
- BS 6472 Part 1: 2008 Guide to evaluation of human exposure to vibration in buildings: Part 1 Vibration sources other than blasting
- The Chartered Institute of Building Services Engineers (CIBSE) Guide A 2006 Environmental criteria for design
- DEFRA Noise from pubs and clubs report dated 2005
- The Control of Noise at Work Regulations 2005
- The Construction (Design and Management) Regulations 2007.

The requirements of Manchester City Council have also been taken into account.

2.1 Sound insulation

2.1.1 Calculation of rating values

Laboratory and site sound insulation performance parameters referred to in this report should be calculated in accordance with BS EN ISO 717-1:2013 *Acoustics – rating of sound insulation in buildings and of building elements – part 1: airborne sound insulation*.

2.1.2 Laboratory sound insulation

Measurements of the laboratory sound insulation of building elements should be carried out in accordance with BS EN ISO 10140-2: 2010 *Acoustics – laboratory measurement of sound insulation of building elements, Part 2: Measurement of airborne sound insulation*.

2.1.3 Site sound insulation

In-situ sound insulation performances should 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: 2014 *Acoustics – Field measurements of sound insulation in buildings and of building elements*.

2.2 Sound absorption

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

2.3 Site tolerances

The following minimum tolerances set out in Table 1 shall be used when selecting elements based on weighted sound reduction index (R_w) values measured under laboratory conditions:

Table 1 Site tolerances

Element	Sound insulation site tolerance
Separating walls to guestrooms	$R_w + C_{tr} \geq D_{nT,w} + C_{tr}$ 9 dB
Drywalls elsewhere	$R_w \geq D_{nT,w} + 5$ dB
Doors	$R_w \geq R'_w + 2$ 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 should be used.

Where laboratory sound insulation performances have been specified the on-site performance shall be in line with the above tolerances.

Interface details between elements shall be constructed to ensure in-situ sound insulation values are not compromised. In some instances, heritage requirements to expose beams,

columns and trusses is expected to limit the achievable in-situ sound insulation. This is discussed in Section 2.4 and Section 9.

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 should be installed such that the laboratory measured performance is not degraded.

2.4 Historic buildings and ADE 2003

ADE 2003 states the following in relation to Historic Buildings (which include listed buildings such as 47 Peter Street):

‘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 in Tables 1a and 1b. The need to conserve the special characteristic of such buildings needs to be recognised, and in such work the aim should be to improve sound insulation to the extent that 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. In arriving at an appropriate balance between historic building conservation and improving sound insulation, it would be appropriate to take into account the advice of the local authority’s conservation officer. In such cases, it will be reasonable to improve the sound insulation as much as is practical and to affix a notice showing the sound insulation value(s) obtained by testing in accordance with Regulation 41 or 20(1) and (50), in a conspicuous place inside the building.’

On this basis, where existing features are to be retained for conservation purposes, an acoustic performance lower than that set out in ADE 2003 may be acceptable in some cases.

Any deviations from the requirements of ADE 2003 for reasons outlined above shall be agreed with the client and the Building Control office.

3 List of key outstanding items/information

The following design information should be provided for review / needs to be developed during Stage 5:

- Final Stage 4 architectural package confirming the items to be developed as discussed within the body of this report
- Confirmation of the proposed facade strategy, including which glazed elements are to be replaced and which are to be ‘made good’
- Confirmation of plant deck construction and details
- Confirmation of plant noise egress mitigation strategy (screening, attenuator schedule)
- Updated MEP package including updated FCU locations and routing
- Confirmation of density/materials of existing floorboards, beams and trusses
- Locations of roof vents.

4 Environmental noise survey

An environmental noise survey has been carried out at the site to determine the existing noise climate.

The methodology and results of the environmental noise survey are provided in Sandy Brown report 17513-R01-H Acoustic planning report dated 6 November 2020.

The facade noise levels expected based on the survey results are in the region of L_{Aeq} 69-70 dB outside guestrooms on the Peter Street elevation, ranging to L_{Aeq} 64-65 dB for guestrooms on the Bootle Street elevation.

The representative background sound levels measured during the survey were $L_{A90,5min}$ 56 dB during the daytime and $L_{A90,5min}$ 54 dB at night.

5 Building envelope

5.1 Internal noise level – noise ingress

5.1.1 Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS 8233:2014 Sound insulation and noise reduction for buildings, and is also provided by the World Health Organisation. The guidance given by BS 8233 and WHO is shown in Table 1.

Hotel guestrooms are typically considered as bedrooms during the night and living rooms during the day.

Table 1 Internal noise criteria for sleeping/resting

Internal space	Indoor ambient noise level L_{Aeq} (dB)		
	BS 8233 (07:00 to 23:00)	BS 8233 (23:00 to 07:00)	WHO
Living rooms	35	-	30/35 ¹
Dining room	40	-	-
Bedrooms	35	30 ²	30 ²

[1] WHO does not differentiate between different types of living spaces, but recommends L_{Aeq} 30 dB in relation to sleep disturbance and L_{Aeq} 35 dB in relation to speech intelligibility. WHO provides a 16 hour time base when referring to speech intelligibility and an 8 hour time base when referring to sleep disturbance.

[2] BS 8233 notes that individual noise events can cause sleep disturbance, and that a guideline value may be set depending on the character and number of events per night, although no specific limit is provided. Section 3.4 of the WHO guidelines for community noise suggests that good sleep will not generally be affected if internal levels of L_{Amax} 45 dB are not exceeded more than 10-15 times per night.

5.1.2 Local Authority requirements

Manchester City Council stipulates the criteria provided in Table 2 with regards to internal noise in residential developments. Hotel guestrooms are typically considered as bedrooms during the night and living rooms during the day.

Table 2 MCC internal noise criteria for residential developments

Internal space	Internal noise limit, L_{Aeq} (dB)	
	Day time (07:00 to 23:00)	Night-time (23:00 to 07:00)
Living rooms	35	-
Bedrooms	-	30

It is also stipulated that individual noise events in bedrooms should not exceed L_{AFmax} 45 dB more than 15 times per night (ie, between 23:00 and 07:00).

In addition, where entertainment noise is a factor in the noise climate, MCC states the following for residential developments:

‘Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47 dB and 41 dB (L_{eq}), respectively’.

Although MCC do not specifically stipulate the entertainment noise criteria for hotels, this is a useful reference for assessing noise transfer from the restaurant below.

5.1.3 Hotel operator requirements

KRO Hospitality Limited, the hotel operator, have confirmed that meeting the criteria set out above are sufficient, and as such these shall be achieved.

5.1.4 Other areas

Environmental noise ingress to other areas of the development shall be controlled to meet with the following limits:

- L_{Aeq} 40 dB in the reception
- L_{Aeq} 45 dB in circulation.

5.2 Facade sound insulation

This section discusses internal noise level criteria and assesses the required facade sound insulation performance. In principle, the required facade specification depends on two factors – the external noise levels at the site, and the internal noise criteria.

The following assessment is based on achieving the internal noise levels set out in BS 8233 and required by MCC, which are set out in Section 5.1.

5.2.1 External noise levels

From the survey results, the predicted external noise levels have been grouped into four zones which are marked-up in Figure 1 and set out in Table 3. These zones apply on all levels of the proposed development.

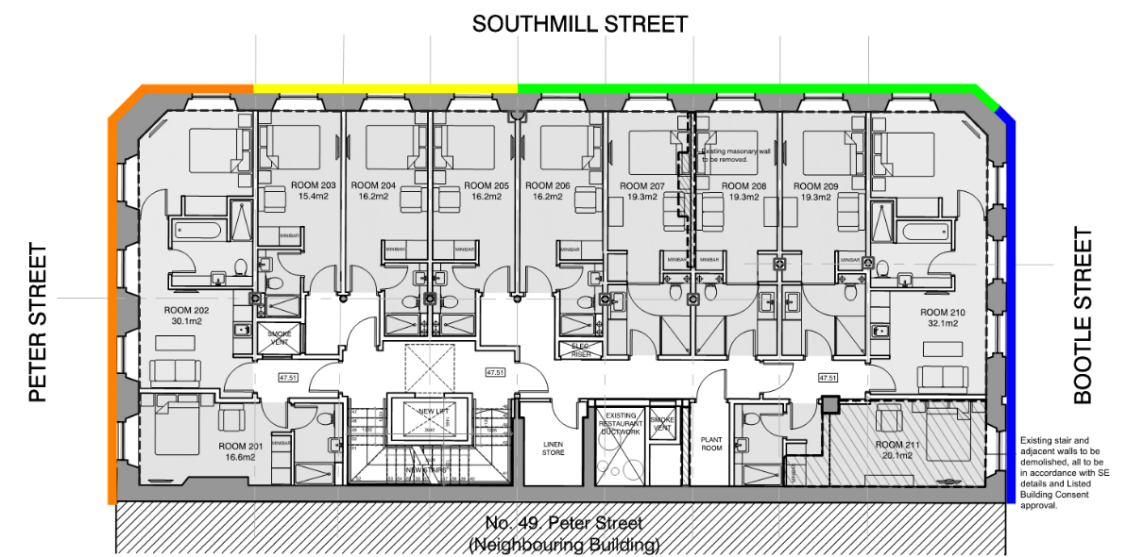


Figure 1 Facade noise level zones

Table 3 Predicted facade noise levels by zone

Facade zone	Daytime $L_{Aeq,16hr}$ (dB)	Night time $L_{Aeq,8hr}$ (dB)	Night time L_{AFmax} (dB) not normally exceeded
Zone A	69	70	87
Zone B	67	68	85
Zone C	66	67	84
Zone D	64	65	82

5.2.2 Minimum overall requirements

To achieve the internal noise criteria given in section 5.1 for the guestrooms, minimum facade sound insulation requirements have been determined, based on the external noise levels at each facade zone stated above.

The minimum sound insulation performances for guestrooms in the different facade zones are given in Table 4.

Table 4 Facade sound insulation performance requirements

Facade zone	Overall sound insulation performance R'_w+C_{tr} (dB)
Zone A	40 (42 for dual aspect rooms)
Zone B	38
Zone C	35
Zone D	33

5.2.3 Ventilation strategy

All guestrooms are proposed to be mechanically ventilated with no reliance upon opening windows or ventilators in the facade or roof for ventilation purposes.

5.2.4 Existing facade sound insulation

The existing facades provide a sound insulation performance of approximately R'_w+C_{tr} 23 dB, which does not meet the requirements. The performance is limited by the existing windows.

The existing external walls were noted to consist of solid brick masonry at least 400 mm thick. This shall be made good and on this basis are expected to be capable of providing a sound insulation performance of at least R'_w+C_{tr} 52 dB.

The proposal is to retain the facade and install secondary glazing to guestrooms and either provide new primary glazing or make-good the existing /with new rooflights above guestrooms.

5.2.5 Secondary glazing

To ensure the overall sound insulation requirements are met, 6 mm secondary glazing shall be installed to guestroom windows throughout the development (excluding the rooflights).

A minimum 100 mm cavity shall be provided between primary and secondary glazing.

Primary glazing (including framing) is to be made-good, well-sealed or replaced.

5.3 Roof

5.3.1 Airborne sound insulation

The roof above guestrooms shall be designed to ensure that environmental noise ingress is controlled to meet with the relevant internal noise criteria. The roof shall provide the minimum sound insulation performances set out in Table 4, depending on the facade zone the guestroom is located in.

Noise associated with rooftop plant shall be controlled to ensure that the relevant internal noise criteria are not exceeded. Further comments on this are provided in Section 5.3.5.

5.3.2 Proposed construction

The roof above guestrooms will need to control environmental and plant noise ingress in line with the relevant internal noise criteria. As such, the roof above guestrooms will need to provide a minimum sound insulation performance of R'_w+C_{tr} 42 dB to control environmental noise ingress.

The FCH drawings indicate that the proposed roof construction consists of slates on timber battens with a 50 mm cavity, 12 mm plywood, 50 mm Rockwool insulation, 150 mm Kingspan K107 foam insulation and 32.5 mm Kingspan K118 Insulated plasterboard lining below (not labelled but assumed based on previous Tract proposal) as shown in Figure 2.

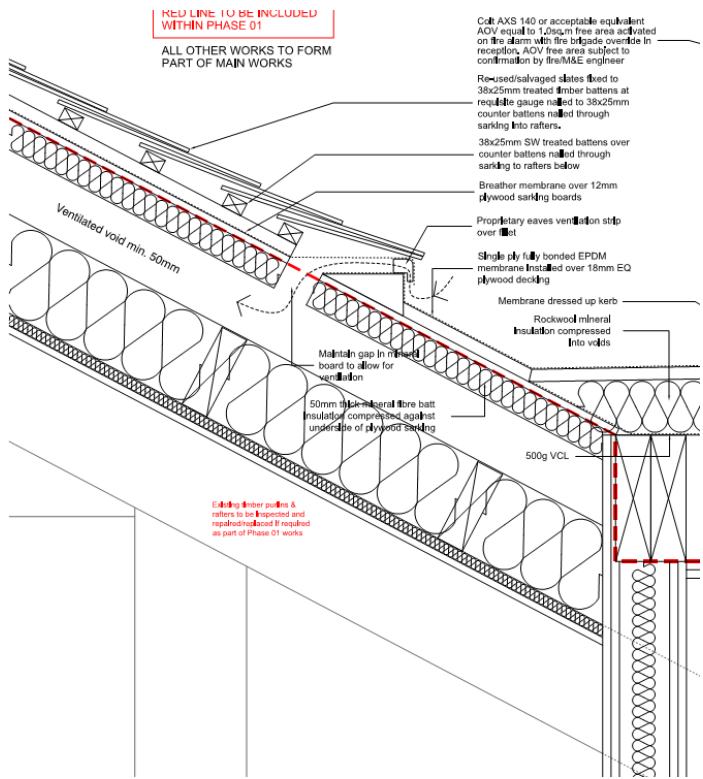


Figure 2 Proposed roof build-up

This roof construction is expected to be capable of providing a sound insulation performance in the region of R_w+C_{tr} 40 dB on the basis it is well-sealed.

To enhance the sound insulation performance of the roof to meet the minimum airborne sound insulation requirements to control environmental noise ingress, and help control flanking 15 mm thick SoundBloc (or equivalent) should be provided to the room-side, fixed to the underside of insulated plasterboard lining. It is understood that this is proposed although not shown on the drawing above.

The roof void is to be ventilated via vents in the roof construction, as shown in Figure 3. Noise ingress via these vents will need to be suitably controlled, particularly if located near the rooftop plant area. Ideally, these vents should be sealed if at all possible.

If not, acoustically rated vents could be provided. These should achieve a minimum sound insulation performance of $D_{n,e,w}$ 35 dB. This will need to be reviewed once the proposed locations of the vents are provided.

Example suppliers of acoustically rated vents are given below:

- Titon - www.titon.com
- Rytons - www.rts.vents.co.uk
- Greenwood - www.greenwood.co.uk

In addition, these vents should not be located near the rooftop plant area in order to limit noise ingress via the vents.

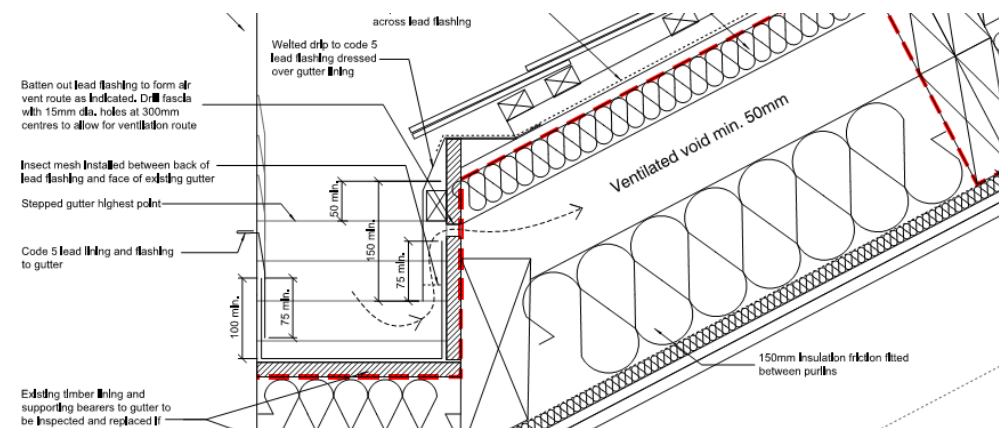


Figure 3 Roof void ventilation detail

5.3.3 Access hatches and automated vents

An openable vent and access hatch is proposed to the common / escape staircase, which lead to the roof and rooftop plant deck. In order to control noise ingress these shall be selected to achieve a sound insulation performance of R_w 35 dB.

A suitable vent which can achieve this level of sound insulation performance would be the Colt CL natural louvred ventilator (www.colinfo.co.uk), though other vents which can achieve this performance are available.

5.3.4 Rooflights

New double glazing is proposed for the roof-lights to guestrooms. They will need to be selected to ensure the overall facade sound insulation performances in Table 4 to be met.

On this basis the minimum airborne performance for each rooflight that to control environmental noise ingress only is given below (based on rooflight location references shown on FCH drawing 6106 rev P2):

- W401 - $R'_w + C_{tr}$ 35 dB
- W402 - $R'_w + C_{tr}$ 35 dB
- W403 - $R'_w + C_{tr}$ 35 dB
- W404 - $R'_w + C_{tr}$ 35 dB
- W405 - $R'_w + C_{tr}$ 35 dB
- W406 - $R'_w + C_{tr}$ 35 dB
- W407 - $R'_w + C_{tr}$ 35 dB
- W408 - $R'_w + C_{tr}$ 35 dB
- W409 - $R'_w + C_{tr}$ 35 dB
- W410 - $R'_w + C_{tr}$ 33 dB.

Laminated double glazing constructions shall be provided to minimise rain noise drumming. It should be noted however, that rain noise drumming will be audible in guestrooms with roof-lights.

5.3.5 Rooftop plant deck

A rooftop plant area which includes a Heat Recovery Unit and cooling units is proposed above the core areas, and guestrooms.

There are three key issues for consideration with the rooftop plant from an acoustic perspective:

- 1) Ensuring plant is appropriately selected/mitigated to meet the requirements of Manchester City Council outside the nearby noise sensitive receptors. This is assessed in Section 11.
- 2) Ensuring the plant/deck is appropriately isolated with anti-vibration mounts/framing to minimise structure-borne noise and vibration transfer to the 47 Peter Street building
- 3) The roof/deck build-up and rooflights will need to be capable of controlling airborne noise ingress to the building.

Details of the roof build-up below the plant area have not been received. It is understood that a new timber plant deck is proposed spanning between the roof structure and the external wall construction will be extended to support it (as shown in Figure 4 highlighted in blue). As such, it will be fully independent from the neighbouring building.

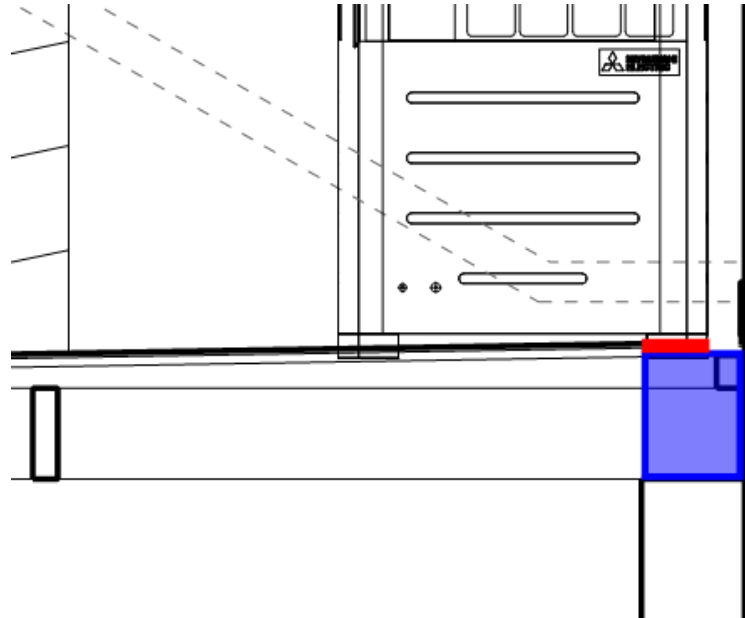


Figure 4 Plant deck external wall

The overall roof build-up below the plant area shall provide a minimum sound insulation performance of $R'_w + C_{tr}$ 50 dB. The following build-up is capable of providing this:

- 28 mm thick screed board (minimum density 1100 kg/m³)
- 22 mm plywood/OSB
- Minimum 300 mm structural/cavity (timber joists) containing 100 mm thick mineral fibre insulation
- Roof build-up discussed in Section 5.3 below on independent structure.

All vibration producing plant shall be appropriately isolated as per Section 11.7.

Isolation bearings shall be provided for any connections between the plant deck and the structure. The interface detail between the plant deck and roof is shown in Figure 5, though it is not clear how this is structurally supported. Again, vibration and structure borne noise transfer into the spaces below will need to be controlled. To do this, a possible would be to provide a isolation joint between the plant deck and beam, with no rigid connections between the plant deck and the surrounding roof structure.

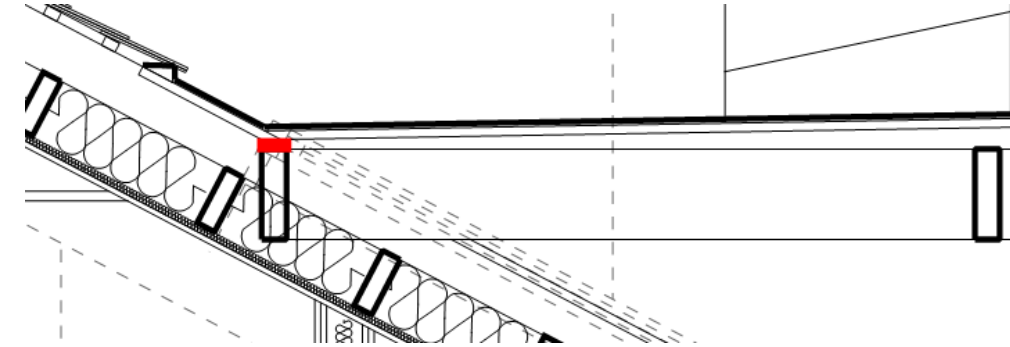


Figure 5 Plant deck and roof interface detail

Example suppliers of isolation materials are provided below:

- Christie and Grey - www.christiegrey.com
- Farrat - www.farrat.com
- Mason - www.mason-uk.co.uk

The overall noise from plant shall be limited to be no higher than L_{Aeq} 55 dB outside roof-lights to guestrooms below, with a low frequency limit of 65 dB at 63 Hz and 60 dB at 125 Hz. The plant selections, mitigation and acoustic screening shall be appropriately designed to ensure these limits bare met.

5.3.6 Acoustic screening

Acoustic screening shall be provided between the rooftop plant and roof-lights/roof above guestrooms to control noise transfer. This is discussed further in Section 11.4.6.

5.4 Reception and restaurant

The facade to the reception should provide a minimum sound insulation performance of $R'_w + C_{tr}$ 30 dB to control environmental noise ingress.

5.5 Circulation

The facade to the circulation areas should provide a minimum sound insulation performance of $R'_w + C_{tr}$ 25 dB to control environmental noise ingress.

5.6 Flanking sound insulation

5.6.1 Roof

Based on the roof construction noted in Section 5.3.2, an additional layer of 15 mm Soundbloc will need to be provided to guestrooms in order to help control flanking sound transmission. This may be proposed but not shown on the drawing except noted.

5.6.2 External wall interfaces

It is understood that external walls consist of 350 mm thick solid brick. This construction is expected to be sufficient in controlling flanking sound transmission without enhancement on the basis it is made-good with well-sealed partition/floor interfaces.

If plasterboard linings are proposed, they shall be on metal furring channels (rather than dabs) with 25 mm mineral fibre cavity insulation, and will need to be broken along separating floor/wall lines with the separating elements abutting and well-sealed to the brick.

6 Floors

6.1 Approved Document E

6.1.1 Separating floors

The guestrooms proposed shall achieve the ADE2003 requirements for *rooms for residential purposes* formed by material change of use. These apply separating floors, stairs that have a separating function, together with associated flanking constructions. The requirements are set out in Table 5.

Table 5 Approved Document E sound insulation standards – rooms for residential purposes, material change of use

	Airborne sound insulation $D_{nT,w}+C_{tr}$ (dB) (minimum values)	Impact sound insulation $L'_{nT,w}$ (dB) (maximum values)
Separating floors and stairs	≥ 43	≤ 64

6.1.2 Building Regulations ADE2003 Internal floors (Req. E2)

Requirement E2 of ADE2003 states that *rooms for residential purposes* shall be constructed in such a way that internal floors provide reasonable resistance to sound.

In order to satisfy requirement E2 of the Building Regulations, internal floors to which the regulation applies should have a minimum laboratory sound insulation rating of R_w 40 dB.

6.2 Level 1 floor below guestrooms

ADE 2003 states the following regarding residential to non-residential adjacencies:

‘A higher standard of sound insulation may be required between spaces for normal domestic purposes and common or non-domestic purposes. In these situations, the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and if so, to determine the appropriate level.’

It was recommended that an enhanced sound insulation performance of $D_{nT,w}+C_{tr}$ 50 dB with a performance of D_{125Hz} 46 dB to provide a good level of control to noise transfer from the restaurant to the guestrooms above.

Further to recent discussions with the hotel operator and project manager, it is understood that the previously recommended enhanced level of sound insulation between the GF restaurant / lobby and L1 areas is not to be pursued. Both the restaurant and guestrooms will be managed by the hotel operator rather than different tenants. It is understood that the standard sound insulation performance noted in ADE 2003 *rooms for residential purposes* is being targeted which is a sound insulation performance of $D_{nT,w}+C_{tr}$ 43 dB.

The restaurant and lobby spaces will need to be carefully managed in order to minimise the risk of disturbance to occupants of the level 1 guestrooms. Things to be considered as part of the management strategy are further discussed in Section 12.1.

It should be noted that this approach will need to be submitted to and agreed with building control. The hotel operator will need to be made aware that careful management of the restaurant space and guestrooms directly above will be required to reduce risk of disturbance.

6.3 Enhanced floors

The following adjacencies will require an enhanced sound insulation performance compared to the minimum ADE 2003 requirements.

- Level 1 guestrooms to refuse store
- Level 1 guestrooms to lift
- Level 2 guestroom to refuse store
- Level 3 mezzanine guestroom above level 2 plant room.

A minimum sound insulation performance of $D_{nT,w}+C_{tr}$ 50 dB is expected to suitably control noise transfer for these adjacencies.

It should be noted that all voids above plant rooms should be closed off. A screengrab of a potential void above a plant room is shown in Figure 6 highlighted in green.

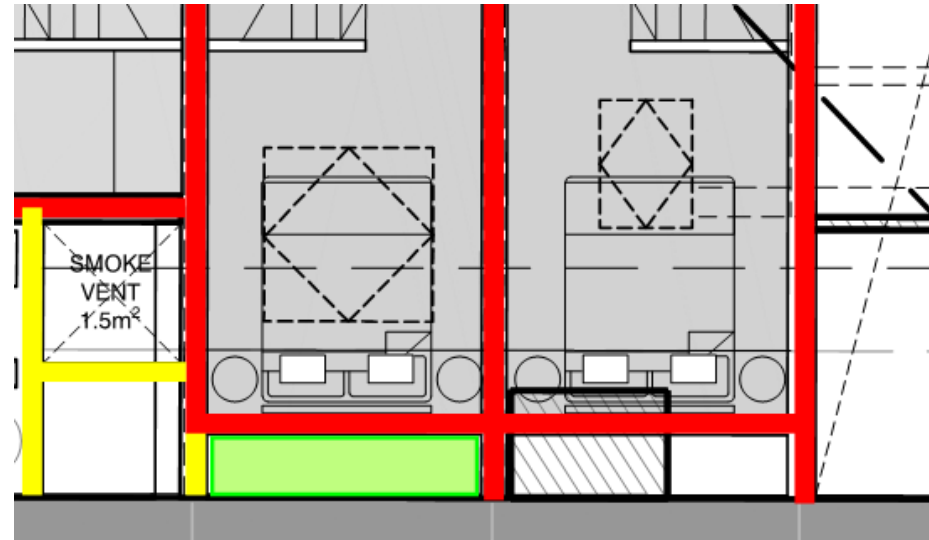


Figure 6 Potential void above plant room

6.4 Floor constructions

The following section sets out the proposed floor constructions. It is understood that it is preferable to provide a Brio system as part of the floor construction rather than the Monarfloor constructions previously proposed.

6.4.1 Level 1 guestroom floor

Without raised access floor

For the areas where a raised access is not provided, the following floor construction is proposed:

- 33 mm thick Brio WF (approx. 27.5 kg/m² including 23 mm thick 1100 kg/m³ board with 10 mm resilient layer 250 kg/m³) required to control impact noise transfer
- 12 mm Plywood (700 kg/m³)
- 25 mm existing floorboards (700 kg/m³)
- Existing 180 mm timber joists with 100 mm mineral fibre between the joists
- Cement board below the joists (assumed to be 15 mm thick and 1100 kg/m³)
- 250 mm void with ceiling comprising of 2 x 12.5 mm Fireline (10.5 kg/m²) with 25 mm mineral fibre insulation (30 kg/m³).

With raised access floors

For the areas where a raised access is provided, the following enhanced floor construction is recommended:

- 28 mm thick Brio WF (approx. 27.5 kg/m² including 18 mm thick 1100 kg/m³ board with 10mm resilient layer 250 kg/m³) required to control impact noise transfer
- 12mm Plywood (700 kg/m³)
- Raised access floor framework with 600mm void with 100 mm mineral fibre insulation (30 kg/m³)
- 25 mm existing floorboards (700 kg/m³)
- Existing 180 mm timber joists
- Cement board below the joists (assumed to be 15 mm thick and 1100 kg/m³)
- 250 mm void with ceiling comprising of 2 x 12.5 mm Fireline (10.5 kg/m²) with 25 mm mineral fibre insulation (30 kg/m³)

In addition to the above, there should be no rigid connections / fixings between the stairs themselves and any adjacent guestroom party walls in order to control impact noise transfer.

If the above strategy is carried forward, workmanship will need to be carefully monitored in order to ensure the sound insulation performance requirements are achieved.

6.4.2 Between/below guestrooms (separating/party floors)

It is understood that the following floor construction for the separating floors between guestrooms is proposed, and is set out below:

- 28 mm thick Brio WF (approx. 27.5 kg/m² including 18 mm thick 1100 kg/m³ board with 10mm resilient layer 250 kg/m³) required to control impact noise transfer
- 12 mm Plywood (700 kg/m³)
- 25 mm existing floorboards (700 kg/m³)
- Existing 180 mm timber joists
- Ceiling comprising of 2 x 15 mm SoundBloc on resilient bars with 100 mm mineral fibre insulation (30 kg/m³).

6.4.3 Internal floors to guestrooms (on level 3 mezzanine)

Some of the level 3 mezzanine internal guestroom floors extend over corridors, forming party floors in these locations.

A possible floor construction for the internal floors to guestrooms is set out below:

- 28 mm thick Brio WF (approx. 27.5 kg/m² including 18 mm thick 1100 kg/m³ board with 10mm resilient layer 250 kg/m³)
- 22 mm plywood decking on timber joists (TBC sizing/spacing), 100 mm mineral wool insulation (10-36 kg/m³) between joists,
- Ceiling comprising of 2 x 15 mm SoundBloc on resilient bars

This construction is capable of meeting the ADE2003 requirements.

6.4.4 Enhanced floor option

For the adjacencies where an enhanced floor construction is required as listed in Section 6.2, the following floor construction could be provided which is capable of achieving the sound insulation requirement of $D_{nT,w}$ 50 dB:

- 33 mm Brio WF system (comprised of 18 mm thick 1100 kg/m³ board with 10mm resilient layer 250 kg/m³)
- 12.5 mm plywood
- 25 mm existing floorboards (700 kg/m³)
- 180 mm deep timber joists (existing/renewed) assumed to be at 300 mm centres
- 2 x 15 mm SoundBloc on resilient bars with 100 mm mineral fibre insulation (30 kg/m³).

There should be no exposed beams or columns in the adjacent spaces where an enhanced sound insulation requirement has been advised.

6.4.5 Floor constructions elsewhere

It is suggested that a target sound insulation performance in the region of $D_{nT,w}$ 45 dB be considered for non-guestroom floors elsewhere to provide a reasonable level of acoustic separation. Details will be reviewed when available for review.

For floors to other spaces horizontally adjacent to guestrooms, the ceiling and floor enhancements outlined above for the guestroom floors (or similar) should be provided to control horizontal flanking sound transmission.

6.5 Stairs within guestrooms

The following construction is understood to be proposed to the stairs within guestrooms:

- A carpeted finish provided to control impact sound transmission
- A step construction comprising of 1 x 18 mm Plywood (overall 1400 kg/m³) as a minimum
- Continuous 33 mm thick Brio WF system below the stair framing

2 x 18 mm Plywood shall be provided to the step construction in order to control noise drumming. If this is not provided, there is an increased risk of noise drumming and as such, disturbance to occupants of other guestrooms resulting from people walking up and down the stairs.

In addition to the above, there should be no rigid connections between the stairs themselves and any adjacent guestroom party wall. This would involve:

- No rigid connections / fixings between the stairs / raised access floor supporting framework

- A gap of 10 mm be provided between the stairs and any adjacent guestroom party wall. This gap should then be sealed with non-setting acoustic mastic.

6.5.1 Flanking via floor constructions

The floors will need to be individual to each guestroom and party walls constructed from the existing floorboards to the timber joists above and timber blocking under the partition line.

6.5.2 Suspended ceilings

The ceilings noted above are relied upon for acoustics and so recessed services, lighting etc shall be avoided where possible.

6.5.3 Use of resilient bars

A high standard of workmanship is critical with the use of resilient bars to ensure that the sound insulation requirements are met as they can easily be bridged. Resilient hangers could be considered as an alternative to provide a more robust solution.

6.5.4 Flanking sound transmission

Flanking control via lightweight floor build-ups is also a critical consideration. Guidance on interface detailing is provided in Section 9. Floorboards shall be broken along separating wall lines.

7 Partitions

7.1 Approved Document E

7.1.1 Separating walls

The guestrooms proposed shall achieve the ADE2003 requirements for *rooms for residential purposes*. These apply to separating walls, stairs that have a separating function, together with associated flanking constructions. The requirements are set out in Table 5.

Table 6 Approved Document E sound insulation standards – rooms for residential purposes

	Airborne sound insulation $D_{nT,w} + C_{tr}$ (dB) (minimum values)
Separating walls	≥ 43

7.1.2 Building Regulations ADE2003 Internal walls (Req. E2)

Requirement E2 of ADE2003 states that *rooms for residential purposes* shall be constructed in such a way that:

- Internal walls between a bedroom or a room containing a water closet, and other rooms

provide reasonable resistance to sound.

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.

In order to satisfy requirement E2 of the Building Regulations, internal walls to which the regulation applies shall have a minimum laboratory sound insulation rating of R_w 40 dB.

7.2 Sound insulation requirements

7.2.1 Lab-to-site tolerance

Minimum lab-to-site tolerances for partitions are provided in Section 2.3.

7.3 Minimum sound insulation requirements

The minimum sound insulation requirements for the key adjacencies proposed within the scheme are provided in Table 7, and are marked-up in Appendix B.

Table 7 Partition sound insulation performances

Adjacency	Minimum sound insulation performance	
	Lab (assuming drywall)	In-situ
Between guestrooms	R_w+C_{tr} 52 dB	$D_{nT,w}+C_{tr}$ 43 dB
Between guestrooms and circulation/store	R_w+C_{tr} 52 dB	$D_{nT,w}+C_{tr}$ 43 dB
Plant rooms to guestrooms	R_w+C_{tr} 59 dB	$D_{nT,w}+C_{tr}$ 50 dB
Lift shaft to circulation	R_w 50 dB	$D_{nT,w}$ 45 dB
Plant room to circulation	R_w 50 dB	-
Lift lobby to guestroom corridor	R_w 45 dB	-
Refuse room to guestroom corridor	R_w 45 dB	-
Internal walls within guestrooms	R_w 40 dB	-
Risers	See Section 7.7	-

7.4 Limitations due to conservation/heritage requirements

Where existing elements (such as columns / beams) are to be retained for conservation / heritage requirements, there is a risk that the sound insulation performance of separating elements will be limited as a result.

This is set out within Section 9, where specific details which incorporate existing elements are reviewed.

7.5 Proposed wall types

The separating walls to guestrooms are proposed to consist of

- 2 x 15 mm SoundBloc
- 60/72 combination staggered I-studs containing 50 mm mineral fibre insulation
- 2 x 15 mm SoundBloc.

This construction provides a sound insulation performance of R_w+C_{tr} 53 dB as per system reference to A233003/023 from the British Gypsum Whitebook.

7.6 Example drywalls

Example drywall constructions that are capable of providing the sound insulation requirements are set out in Table 8.

Table 8 Example drywall constructions

Sound insulation performance	Example drywall construction
R_w+C_{tr} 59 dB	2 x 15 mm SoundBloc to both sides of twin I-studs with 100 mm thick mineral fibre cavity insulation (overall 250 mm)
R_w+C_{tr} 52 dB	2 x 12.5 mm SoundBloc to both sides of twin I-studs with 50 mm thick mineral fibre cavity insulation (overall 200 mm)
R_w 50 dB	2 x 12.5 mm WallBoard on both sides of 70 mm C-studs containing 50 mm thick mineral fibre insulation (overall 122 mm)
R_w 45 dB	2 x 12.5 mm WallBoard on both sides of 70 mm C-studs (overall 122 mm)
R_w 40 dB	2 x 12.5 mm WallBoard on both sides of 48 mm C-studs (overall 100 mm)

7.7 Risers

The following minimum laboratory sound insulation performances shall be provided for riser wall constructions:

- Risers next to guestrooms R_w 47 dB
- Mechanical, and public health R_w 47 dB
- Electrical R_w 42 dB.

Where risers are located between the guestrooms and corridors the overall riser construction, including the riser doorset, needs to maintain the overall sound insulation performance.

8 Doors

8.1 Approved Document E

ADE2003 requires that the doors to *rooms for residential purposes* have a certain level of resistance to the passage of sound. In order to meet the requirements of ADE2003, one of the following methods must be used:

- 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 have a minimum mass per unit area of 25 kg/m² and good perimeter seals, including a threshold seal where practicable.

8.2 Sound insulation

The sound insulation criteria for doors are set out in Table 9. Mark-ups are provided in Appendix B.

Table 9 Sound insulation requirements for doors

Room	Minimum sound insulation performance, R_w (dB)
Plant rooms	40 ¹
Guestroom entrance doors	29 (lobbied), 33 (non-lobbied)
Refuse/bin room to corridor	29

^[1] ¹Plant room door ratings can be reviewed providing the internal noise requirements are met.

Doors to risers shall be solid-core with full perimeter acoustic seals.

No interconnecting doors between separate guestrooms are currently proposed but if they are introduced, will need to ensure that the ADE 2003 separating wall requirements between guestroom are maintained.

8.2.1 Example door details

A 45 mm solid-core timber door closing onto a rebated frame with full perimeter seals along the head, jambs and threshold would be capable of meeting R_w 29 dB. The door would need to be side hinged rather than pivoted.

R_w 33 dB would typically require a 54 mm thick solid-core door closing onto a rebated frame with full perimeter seals along the head, jambs and a drop threshold seal.

For double doors, meeting jambs need to be rebated and fitted with seals to meet the requirements.

Doors to guestrooms and doors in guestroom corridors shall be fitted with appropriate closers to minimise ‘banging’ particularly late at night.

Specialist proprietary door-sets with full perimeter acoustic seals would typically be required to achieve R_w 40 dB.

9 Interface details

Details shall be provided to ensure that all interfaces between the partitions and floors and all other adjacent elements are made in such a way that the sound insulation performance of the wall is not degraded. These adjacent elements may include:

- Partitions
- Door/ window frames
- Glazing
- External walls and cladding
- Floors
- Service penetrations
- Columns and beams
- Roofs
- Ceilings.

All connections to adjacent elements shall incorporate a flexible airtight sealing using non-hardening sealant. All acoustically rated partitions shall be built full-height (floor to floor/roof).

Advice on interface details between separating walls/floors and the building envelope provided in Section 5.6.

9.1 Partition and floor interface details

9.1.1 Guestroom party wall and roof interface detail

The proposed guestroom party wall and roof interface detail is provided in Figure 7.

This detail is expected to be capable of controlling flanking via the roof void on the basis it is well-sealed and the void barriers are appropriately selected.

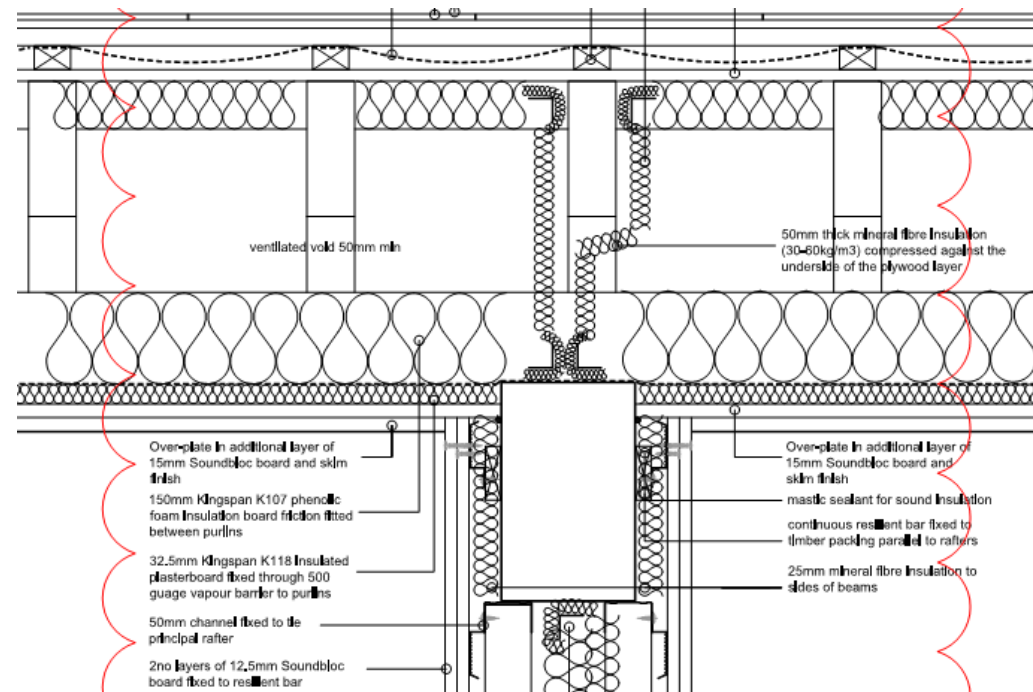


Figure 7 Mezzanine party wall / roof junction detail

9.1.2 Mezzanine floor and guestroom party wall interface detail

The proposed mezzanine floor and guestroom party wall junction interface detail is shown in Figure 8. Similar details are also provided for other adjacencies (e.g. corridor to guestroom / lobby) but they show similar principals.

This detail is expected to be sufficient to control flanking between rooms via the floor/ceiling void.

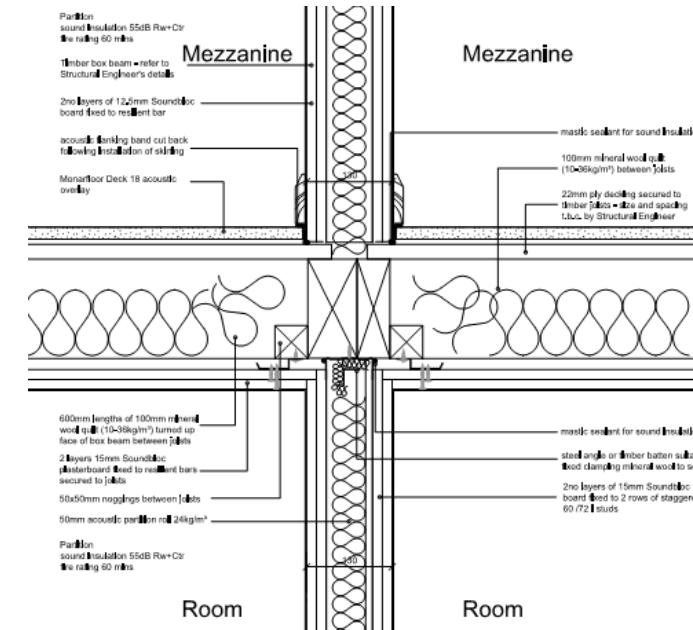


Figure 8 Mezzanine floor / guestroom party wall junction

9.1.3 Boxed-in beams

Beams are proposed to be boxed-in for fire purposes with 2 x 12.5 mm Fireline, as per the detail shown in Figure 9, which is a typical detail for a guestroom to guestroom adjacency.

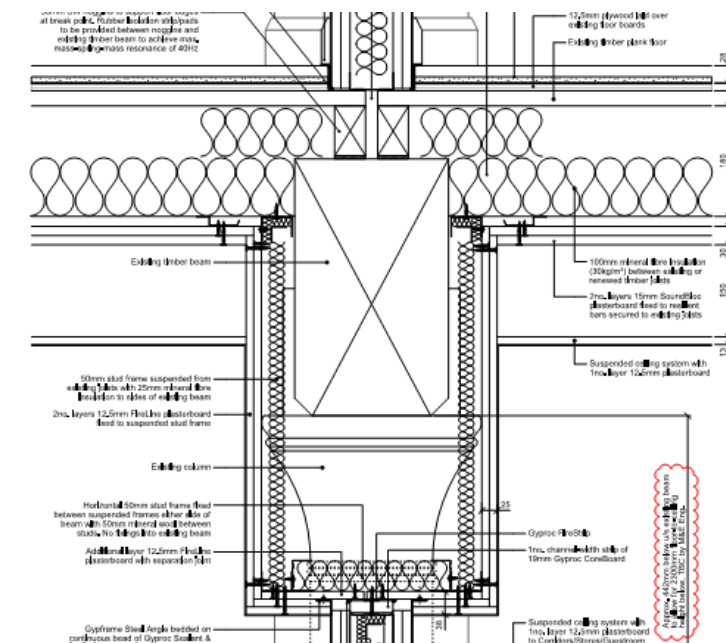


Figure 9 Guestroom beam and partition base detail

A similar detail is proposed between the bar and restaurant as well as between the restaurant and L1 guestrooms.

9.1.4 Party wall interface with beam

The partition construction is understood to comprise of 2 x 15 mm SoundBloc either side of twin 60/72 'I' studs, with 50 mm mineral fibre within the cavity.

The proposed beam detail is expected to be capable of achieving the sound insulation performance requirement of $D_{nT,w}+C_{tr}$ 43 dB between guestrooms.

9.1.5 Beams in party floors

In line with our previous recommendations, isolation strips/pads are shown between the timber noggins and the beam. These should be selected to achieve a maximum mass-spring-mass resonance of 40 Hz (as shown). It is recommended that material selection/thickness be discussed with suppliers.

Assuming a floor build-up comprising of 1 x 12 mm plywood, a 28 mm Brio WF system (comprised of 18 mm thick 1100 kg/m³ board with 10mm resilient layer 250 kg/m³), above the existing 25 mm thick timber floor boards with mineral fibre provided between the joists and the beam being constructed from a solid hardwood (e.g. oak) with a minimum density of 750 kg/m³ and the beams boxed in as per Figure 9, this detail is expected to be capable of achieving the sound insulation performance requirement of $D_{nT,w}+C_{tr}$ 43 dB between guestrooms.

9.1.6 Exposed trusses

It is understood that at the third floor mezzanine level, timber trusses form part of the guestroom party walls and are to be exposed for conservation purposes as per Figure 10.

Shortfalls of approximately 3 dB are predicted for the sound insulation performance of party walls due to the exposed trusses. Any gaps between boards and the trusses should be no more than 12 mm and sealed with a non-setting acoustic mastic. If any deflection joints are needed, metal cover plating would need to be included.

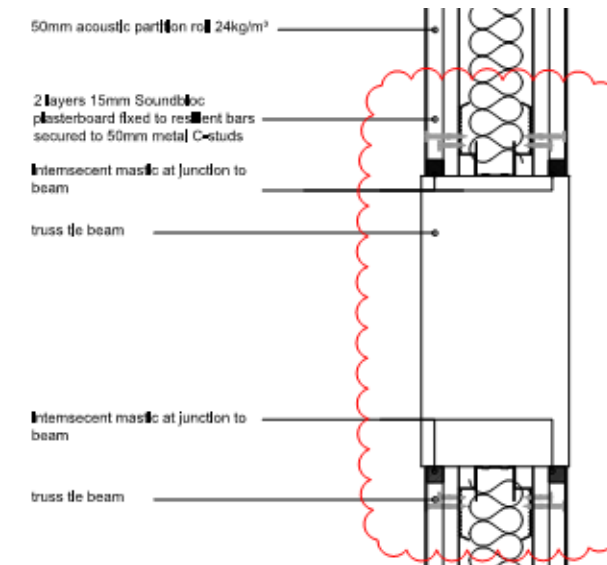


Figure 10 Mezzanine party wall with exposed truss

9.1.7 Drywall junctions

Figure 11 indicates a plan detail indicating the principles of the junction between two lightweight separating walls.

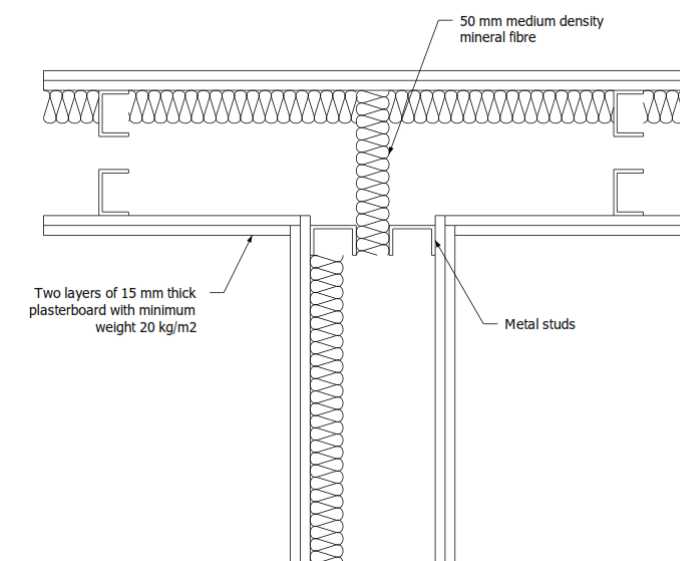


Figure 11 Indicative separating wall junction with adjacent separating wall

9.1.8 Columns

Where separating walls interface with structural beams or columns, the structural elements shall be boxed around with cavity of at least 25 mm containing dense mineral fibre insulation. The boarding to the boxing shall be equivalent to the partition.

It is understood that the existing columns are to be boxed as per Figure 12.

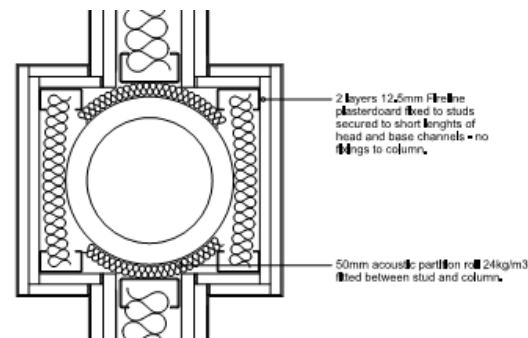


Figure 12 Boxing in of existing columns

This detail is acceptable from an acoustic perspective when proposed between guestrooms.

The proposed detail for beams interface details and partition base detail for partitions to communal spaces is shown in Figure 13. This is suitable from an acoustic perspective on the basis that they are proposed between communal spaces only. This detail would not be suitable between guestroom and corridor, for example where level 3 mezzanine guestrooms floors are located above level 3 corridors.

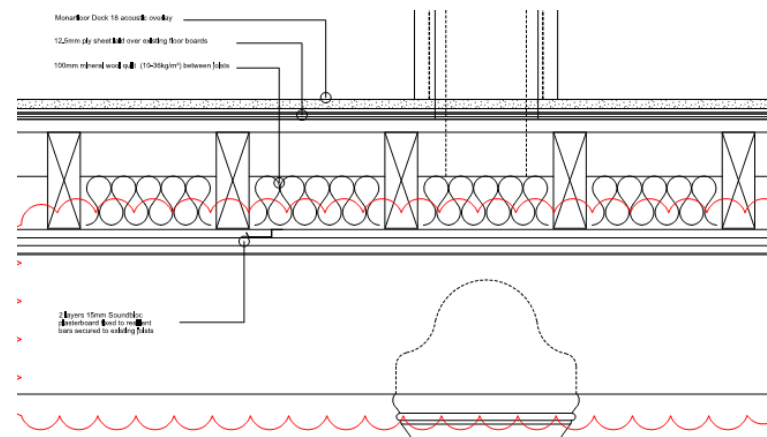


Figure 13 Communal space ceiling and exposed beam detail

The exposed beam detail for communal spaces is shown in Figure 14. This is suitable from an acoustic perspective on the basis that it is only proposed between communal spaces.

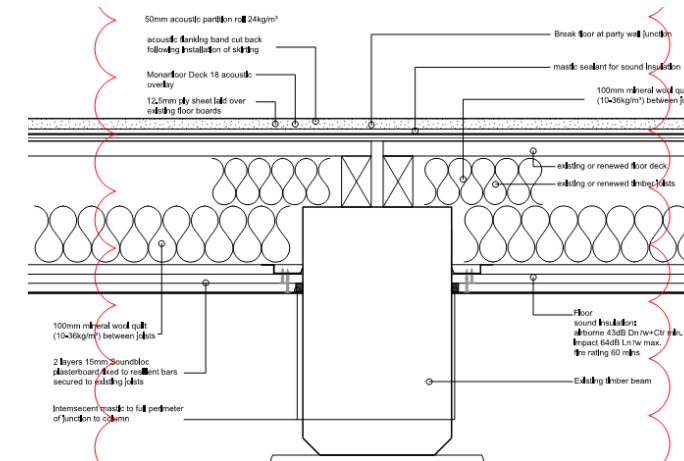


Figure 14 Communal space ceiling and exposed beam detail

9.1.9 Secondary glazing

A section of the first floor glazing is shown in Figure 15, similar details are proposed to the other floors. This detail appears suitable from an acoustic perspective. It will need to be ensured that the combination of primary and section glazing achieve the facade sound insulation performances previously set out.

Ideally manufactures data should be provided for the proposed secondary glazing systems with predictions made for the systems in combination with the existing primary glazing.

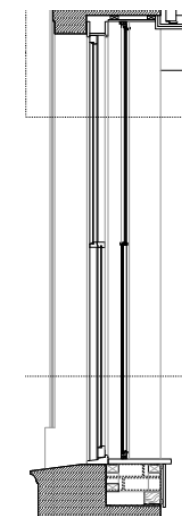


Figure 15 First floor secondary glazing section detail

10 Sound absorbent finishes

10.1 Approved Document E requirements

Approved Document E 2003 Edition (including all amendments up to 2015) to the Building Regulations 2010 (referred to here as 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 required in corridors, hallways, entrance halls and stairwells that give direct access to rooms for residential purposes.

10.2 Design proposals

No specific sound absorbent treatment is proposed to common corridors leading to guestrooms.

It has been confirmed by Building Control in email correspondence dated 8 December 2020 that this is acceptable for this project.

Either lobbied entrances (2 door sets) or enhanced acoustic ratings for single entrance door-sets to guestrooms are proposed to compensate for additional flanking via the corridors, and increased noise build-up in the corridors.

11 Building services noise & vibration

11.1 Internal noise criteria

11.1.1 Limits

The limits for building services noise are set out below. All plant shall be appropriately selected to ensure these limits are met.

Table 10 Maximum internal building services noise limits

Room	Building services noise limit
Guestrooms	NR 25
En-suites/bathrooms	NR 35
Corridors	NR 40
Reception	NR 40

Room	Building services noise limit
Lobby	NR 40
Stairwells	NR 45
Linen room	NR 45
Bin/refuse store	NR 45
Plant rooms	NR 70 with low frequency limits of 80 dB in the 63 Hz, 125 Hz and 250 Hz octave bands

The noise criteria shall apply at any point greater than 1 m from an enclosing surface (floor, wall or ceiling) unless the designed use of the space necessitates occupancy within this zone.

11.1.2 Characteristics

Building services noise shall have no attention catching characteristics, such as hums, whines, whistles and clicks.

11.2 External noise criteria

11.2.1 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 ‘Methods for rating and assessing industrial and commercial sound’.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains ‘attention catching features’ such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

11.2.2 Local Authority criteria

MCC provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* document dated December 2015 states the following in relation to plant noise egress:

‘The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.’

Corrections for tonal or attention catching characteristics would need to be applied to the rating level in accordance with BS4142.

11.2.3 Limits – Normally operating plant

An environmental noise survey has been carried out and is detailed in Sandy Brown report 17513-R01-G. The results from the environmental noise survey have been used to determine the representative background sound levels in the vicinity of the site, which are $L_{A90,5min}$ 56 dB during the daytime and $L_{A90,5min}$ 54 dB at night.

Based on the Local Authority requirements and BS 4142, the cumulative noise level from the operation of all new plant should not exceed 5 dB below the A-weighted representative background sound level at the nearest noise sensitive premises. The cumulative plant noise limits are set out in Table 11.

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

Table 11 Plant noise limits at 1 m from the nearest noise sensitive premises

Time period	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,5min}$ (dB)
Daytime (07:00-23:00)	51
Night-time (23:00-07:00)	49

The limits set out in Table 11 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered in line with BS4142.

In addition, plant noise egress, 1 m from any louvre, vent or grille, in any publicly accessible area shall not exceed L_{Aeq} 55 dB.

11.2.4 Limits – Emergency plant

A 10 dB relaxation to the limits set out above shall be achieved for life-safety systems.

11.2.5 Characteristics

The noise from building services plant and systems should 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.

11.3 Design strategy

An external rooftop plant deck area with heat rejection and air handing plant is proposed with a surrounding acoustic screen. Guidance on the plant deck and isolation is provided in Section 5.3.5. A review of noise egress from the plant with advice on mitigation is provided in Section 11.4.

The guestrooms are proposed to be mechanically ventilated with supply to the rear of an FCU (heat pump) concealed in the ceiling voids, and extract via the bathrooms. Secondary sacrificial ceilings will need to be provided to conceal FCUs, ie, the sound insulating ceiling shall not be utilised for this.

Internal plant rooms are shown at level 1-3 which is proposed to house hot water pumps and a bin store extract fan which terminates in the rooftop plant area.

All plant shall be carefully selected and attenuated as required to ensure that the relevant noise and vibration criteria are met.

11.4 Plant noise egress review

A review of the proposed rooftop plant equipment has been carried out at Stage 4. Calculations have been undertaken to predict the noise egress levels outside the nearby noise sensitive premises.

11.4.1 Nearby noise sensitive premises

The nearest noise sensitive premises is immediately adjacent to the plant deck, the commercial building at 49 Peter Street. The gable end of this building overlooks the plant area. It is assumed that this gable end does not contain any windows (none are shown on the Southmill St elevation) and on this basis, the gable end would not be considered noise sensitive receptor. However, the Peter Street and Bootle Street elevation of 49 Peter Street both contain windows above the roof level and as such noise egress to these will need to be controlled, and carefully considered.

In addition, the following are also considered noise sensitive premises.

- Office block on Southmill approximately 12 m to the west (highlighted in red in Figure 16)

- Office block on Central Street, approximately 45 m to the north (highlighted in blue in Figure 16)
- Radisson Hotel on Peter Street, approximately 53 m to the south (highlighted in orange in Figure 16)

The site in relation to the sensitive premises is outlined in yellow in Figure 16

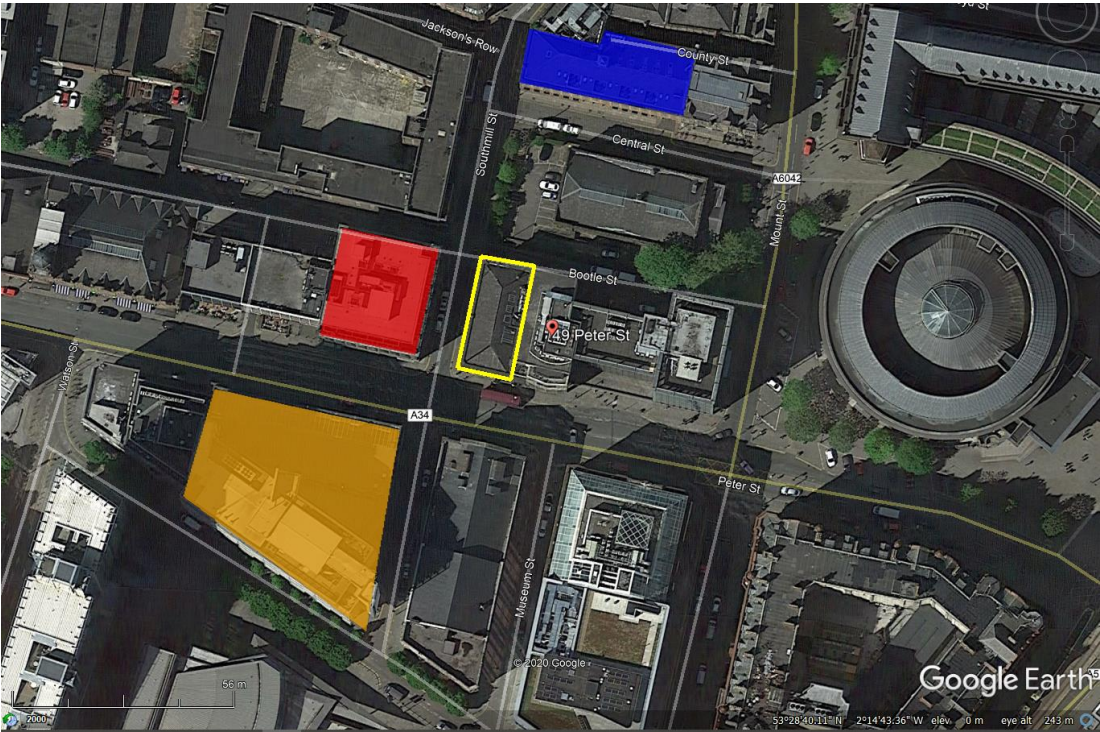


Figure 16 Aerial view of site (courtesy of Google Earth Pro)

11.4.2 Plant proposals

The following items of plant are proposed to the rooftop of the building in an independent structure.

- 4 x Panasonic u-8MF3E8 (highlighted in blue in Figure 17)
- 2 x Mitsubishi CAHV-P500YA-HPB (highlighted in green in Figure 17)
- 1 x Nuaire AVT1-R (highlighted in pink in Figure 17)
- 1 x Nuaire XBC75-V-NES(highlighted in yellow in Figure 17)

Acoustic screening is proposed to the south, west and north of the roof top plant. Based on the M&E layouts and comments from the architect, the screening is proposed to be 2m high above the deck level and indicated in red in Figure 17.

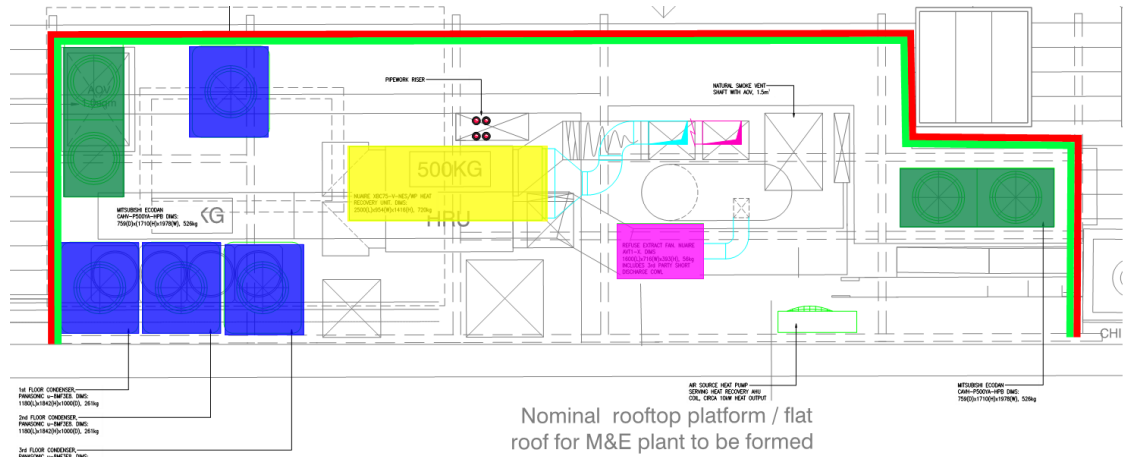


Figure 17 Rooftop plant and item locations (Excerpt from 3278-AER-XX-Z-DR-M-5302 plant space services layout)

The manufacturer’s acoustic data for the proposed items of plant are provided in Table 12 and Table 13.

Table 12 Acoustic data for the proposed items of plant

Item of plant	Sound pressure levels at 1 m, L_p (dB), per octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Mitsubishi CAHV-P500YA-HPB	66	60	66	60	52	50	56
Panasonic u-8MF3E8	64	63	56	52	46	39	35

Table 13 Acoustic data for the proposed items of plant

Item of plant	Sound power level, L_w (dB), per octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Nuaire AVT1-R	75	70	68	71	71	66	60
Nuaire XBC75-V-NES							
Breakout	64	56	53	51	42	34	35
Induct intake	70	69	68	71	64	58	52
Induct discharge	74	73	68	76	75	67	60

11.4.3 Noise egress calculations

The predicted noise rating levels at the nearest noise sensitive premises take into account the following:

- Attenuation due to distance and screening.
- The unit operating continually and simultaneously (worst case).
- The location of the plant and directivity due to reflection from nearby surfaces.
- 3 dB correction for facade reflection at the nearest noise sensitive premises.
- 2 m high solid screen with minimum mass of 15kg/m² and sound absorbent lining to inner face as indicated in red and light green in Figure 17
- No attention catching characteristics/features (with reference to BS4142).
- Mitigation measures indicated below.

11.4.4 Mitigation measures

3 dBA of attenuation is required to the discharge termination of the Nuair XBC75-V-NES (HRU). This could be provided by a rectangular elbow internally lined with 25 mm sound absorbent material, or 1m long ductwork with 25mm sound absorbent material could provide this or a proprietary 600 mm attenuator.

In addition, it is recommended sound absorbent lining with minimum α_w 0.9 (typically 50-100 thick) be provided to the inner face if the acoustic screen to control reverberant noise build-up and reflections within plant area as indicated in light green in Figure 17. The screen should be solid with a minimum weight of 15 kg/m².

11.4.5 Predicted noise egress levels at receptors

Based on the above, the predicted noise rating levels are given in Table 14.

Table 14 Predicted noise levels at the nearest noise sensitive premises

Nearest noise sensitive premises	Predicted rating level at 1m from the worst affected sensitive premises, L_{Aeq} (dB)
49 Peter St (Peter St elevation)	49
49 Peter St (Bootle St elevation)	46
Office block on Southmill (west)	44
Office block on Central Street (north)	49
Radisson Hotel (south)	44

The predicted rating levels meet the day and night-time noise egress criteria.

11.4.6 Noise transfer assessment

The assessment takes into consideration the following:

- Acoustic screen around plant area as set out above.
- The rooftop plant deck is an independent structure designed to minimise the structure borne and items of plant are adequately vibration isolation mounted.
- The plant deck provides a minimum sound insulation performance of R'_w+C_{tr} 50 dB as per Section 5.3.5.
- The proposed roof construction above guestrooms providing a sound insulation performance of at least R'_w+C_{tr} 42 dB, as indicated roof construction in Figure 3 of 20477-M001-A Key items for design development and enhanced with 15 mm thick SoundBloc layer (or equivalent) to the room-side, fixed to the underside of insulated plasterboard lining.
- The roof and roof-lights above guestrooms being fully screened from the plant.
- Rooflights capable of providing the sound insulation performance required to control environmental noise ingress as per my colleague James Atha's email on 7 December 2020.

Based on the above, noise transfer to the worst affected guestrooms is expected to meet with the specified internal noise criteria.

11.5 Internal building services noise review

11.5.1 Guestroom Fan coil units (FCUs)

A number of fan coil units are proposed. The fan coil data provided is summarised in Table 15. Data was not provided for the S-22MM1E5A unit, however for the purpose of this assessment it is assumed it produces similar noise levels to the S-22MK2E5A unit.

For the S-22MM1E5A and S-22MK2E5A units, data for various duties was provided. It is assumed that background ventilation/cooling will be provided with the unit operating in 'low' duty mode. This data has been used for the purposed of this assessment.

Table 15 Review of internal plant items

	Sound pressure level L_{eq} (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
S-22MM1E5A – measured at 1 m	24	31	26	27	26	22	18
S-22MK2E5A – measured at 1 m	24	31	26	27	26	22	18
S-28MM1E5A – measured at 1.5 m	-	18	21	27	22	18	10

The above data equates to NR26, NR26 and NR24 for each of the units.

The sound pressure data provided is for the FCU intake / supply and casing breakout noise together. The test arrangement for the S-28MM1E5A is shown in Figure 18.

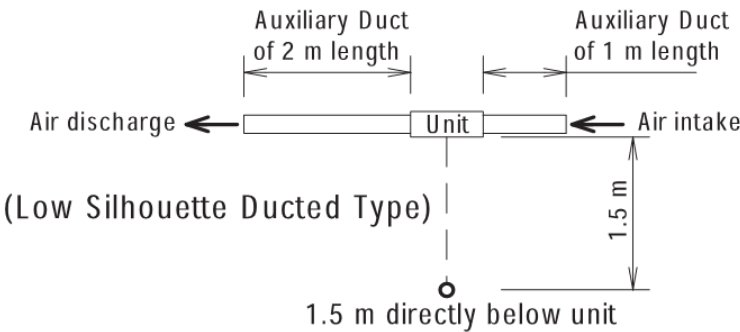


Figure 18 FCU testing arrangement

In order to more accurately assess noise emissions from the FCUs, ideally separate noise data should be provided for each FCU noise source.

It is understood that some of these FCUs are to be located within plasterboard bulkheads, then ducted to their respective guestroom. This bulkhead is assumed to comprise of 2 x 12.5mm plasterboard.

Other FCUs are to be wall mounted behind joinery, however details of their arrangements have not yet been received and will be reviewed as the design progresses.

For the FCUs located within plasterboard bulkheads, the FCU supply ductwork should be sealed within to the bulkhead, with no gaps meaning casing breakout noise will not be able to transfer into the room (except via the bulkhead / FCU itself).

Based on an equal contribution assumption for each FCU noise source (intake, casing and supply), the following noise levels are expected resulting from the FCUs:

- S-22MM1E5A – NR25
- S-22MK2E5A – NR25
- S-28MM1E5A – NR19.

Based on the above, it is expected that the building services noise limits will be achieved by the proposed FCUs without any additional attenuation being required.

It is however recommended that a 50 mm tissue faced mineral fibre or open melamine foam lining be provided to one face of the bulkhead containing the FCU in order to reduce reverberant noise build-up within it. This will also aid in controlling supply noise from the rooftop HRU. It is expected a similar arrangement would also benefit the wall mounted FCUs, with the sound absorbent lining providing to one of the joinery walls.

It is understood that in some locations, particularly in mezzanine guestrooms, there is insufficient room within the ceiling voids to accommodate the FCUs. As such, they are likely to be wall mounted located behind joinery. This will need to be reviewed once proposed details are provided.

11.5.2 Plant rooms

It is understood that plantrooms are to be located adjacent to guestrooms as highlighted in red within Figure 19.

It is not entirely clear what the plantroom arrangement will be (as it appears that they are currently continuously open to the smoke vent, from level 1 to roof level). This will need to be clarified as the design progresses.

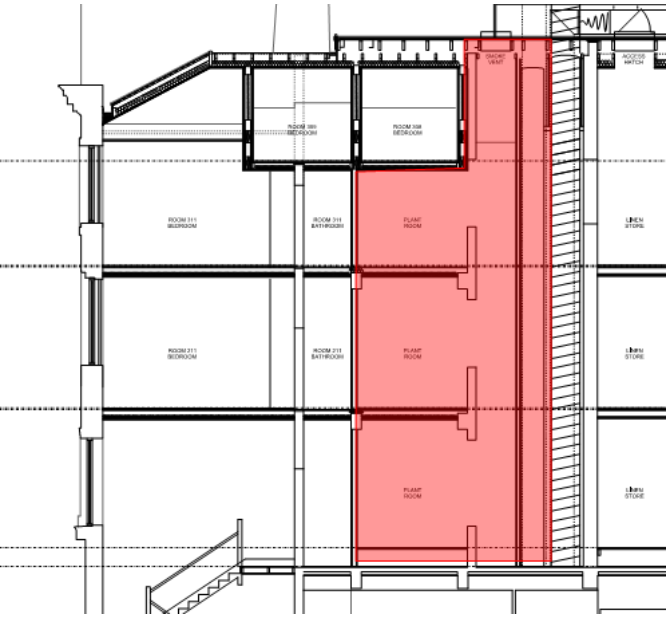


Figure 19 Plant room locations

A screengrab of the third floor plantroom is shown in Figure 20. It is understood that the other internal plantrooms are similar in their arrangement and the plant items which they contain. The third floor plantroom is shown to contain a thermal store and heat exchanger unit along with pumps.

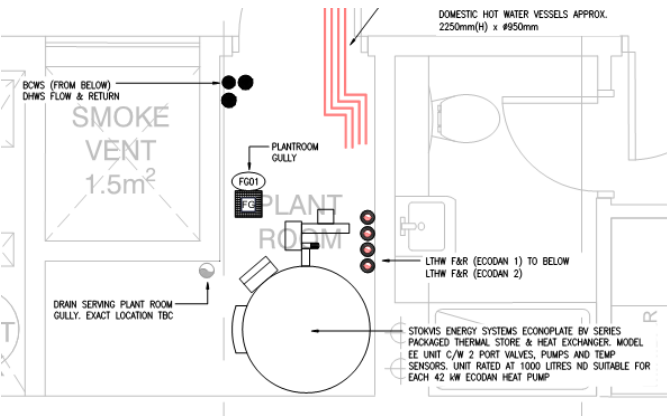


Figure 20 Third floor plantroom layouts

11.5.3 Assessment of noise transfer from plant rooms

It is assumed that all beams / columns will be boxed in for partitions and floors separating guestrooms from plant rooms. The boxing should comprise of 2 x 15 mm Soundbloc and be infilled with mineral fibre insulation.

Noise data for the plantroom equipment has not been provided however as a worst-case assessment, an internal noise level of NR70 with low frequency limits of 80dB at 63 Hz and 125 Hz has been assumed. A revised assessment will be undertaken once specific plant data is provided.

Based on this, in order to suitably control noise transfer into guestrooms, separating partitions would need to achieve an enhanced sound insulation performance of R_w+C_{tr} 59 dB, in order to achieve $D_{nT,w}+C_{tr}$ 50 dB on-site. This can be achieved with a partition construction comprising of 2 x 15 mm Soundbloc either side of twin 70 mm ‘I’ studs with 100 mm mineral fibre provided to the cavity.

For the separating floor between the mezzanine guestrooms and level 3 plantroom, this will be required to achieve the same sound insulation performance. A suitable floor construction is noted in Section 6.4.4.

It will need to be ensured that all plant items which produce vibration or structure-borne noise (particularly the pumps) are adequately isolated with anti-vibration mounts.

11.5.4 Rooftop plant – room side attenuation

It is understood that a 1 x Nuaire XBC75-V-NES HRU (highlighted in yellow in Figure 17) will serve the guestrooms.

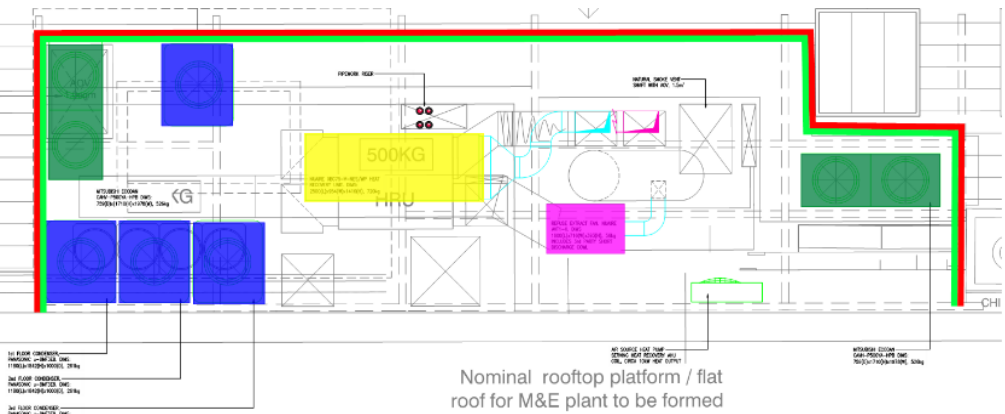


Figure 21 Rooftop plant and item locations (Excerpt from 3278-AER-XX-Z-DR-M-5302 plant space services layout)

Room side sound power data for this unit is provided in Table 13. This data is understood to be for proposed design duty.

Table 16 Sound power data for HRU

Item of plant	Sound power level L_w , (dB)						
	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
<i>Nuaire XBC75-V-NES HRU</i>							
Supply	71	67	61	68	65	55	39
Extract	68	62	60	62	57	52	48

In order to control noise emissions from the HRU supply / extract, in-duct attenuators will be required. Attenuators are currently shown on the rooftop plant layouts. Minimum insertion losses required by these attenuators are provided in Table 17.

Table 17 HRU in-duct attenuator insertion losses

Item of plant	Attenuator insertion loss (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
<i>Nuaire XBC75-V-NES HRU</i>							
Supply	6	8	13	21	29	39	20
Extract	6	8	13	21	29	39	20

The above insertion losses are typically achievable with 1500 mm attenuators. Regenerated noise via the attenuators will need to be suitably controlled such that the internal building services noise criteria are not exceeded. It is recommended that face velocities be limited to be no higher than 2 m/s to minimise regenerated noise.

The attenuation requirements for the HRU may be able to be relaxed subject to review of crosstalk attenuators / internal duct linings being provided to common guestroom ductwork. This will need to be reviewed further once the updated MEP drawings become available.

11.6 Ventilation strategy and crosstalk

MEP routing directly between guestrooms shall avoided, i.e. services shall enter guestrooms via the room-front.

Generally, ductwork enter the rooms via the room-fronts and not through adjacent rooms, except for the third floor mezzanine, which has penetrations through all cross-walls. The ductwork shall be rerouted within the individual guestrooms, such as via the mezzanine floors, rather than through the walls separating guestrooms.

Where common ductwork/ventilation openings are to be formed in sound insulating partitions, these shall be appropriately attenuated such that the partition performance is not degraded.

Crosstalk attenuation will need to be provided to any common ductwork to maintain the performance of acoustically rated elements.

Based on our initial assessment, the minimum octave band crosstalk attenuator requirements to maintain the performance of the crosswalls are presented in Table 18.

Table 18 Minimum octave band attenuation requirements for common ductwork

Location	Sound reduction index (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Level 3 Mezz ductwork ^[1]	6	13	25	27	24	34	22
General ductwork ^[2]	4	10	21	19	13	27	10

^[1] Typically achieved by a 2400 mm attenuator

^[2] Typically achieved by a 1500 mm attenuator

The crosstalk attenuation requirements could be split into two separate attenuators to reduce the lengths required e.g. shorter attenuators to each termination branch rather than a single attenuator between the rooms. Alternatively, internally lined ductwork (with a 25 mm internal sound absorbent lining) could be provided to replace / reduce the requirements of the crosstalk attenuators. These requirements may need to be updated subject to review of the updated ventilation layouts. Dimensions of the proposed ductwork should also be provided for review.

11.6.1 Service penetrations

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.

Size builders work holes to accommodate the duct, pipe, trunking or conduit with the minimum clearance that is practicable. Typical acoustic seal details of services penetrations through partitions are shown in Figure 22 and Figure 23. Similar details shall be used where services penetrate sound insulating floors and ceilings.

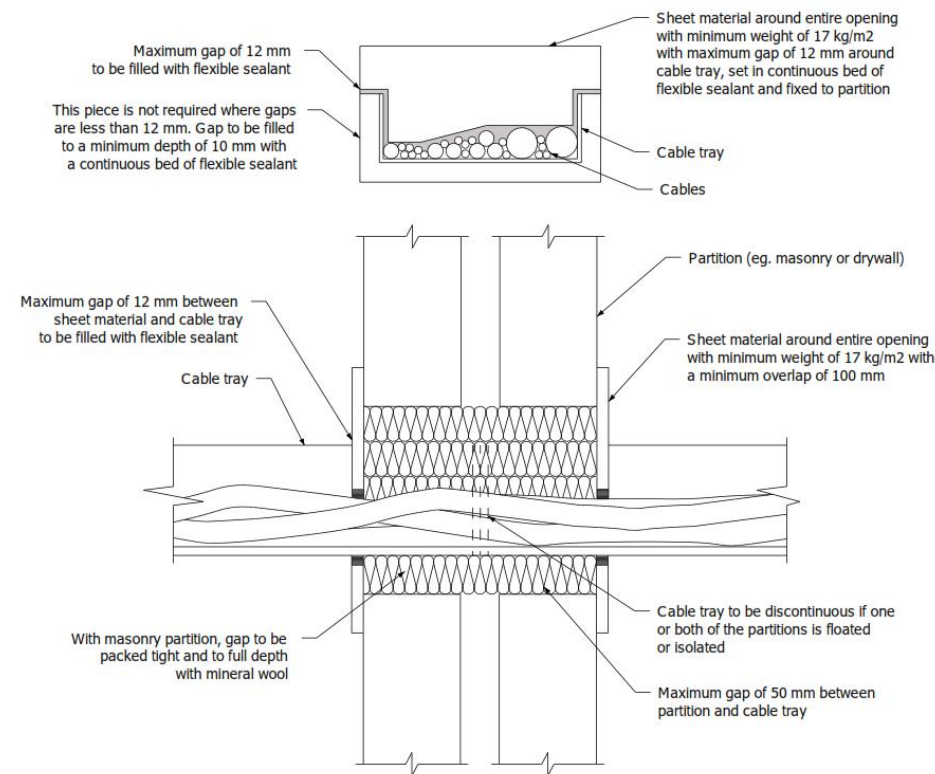


Figure 22 Cable tray penetration detail

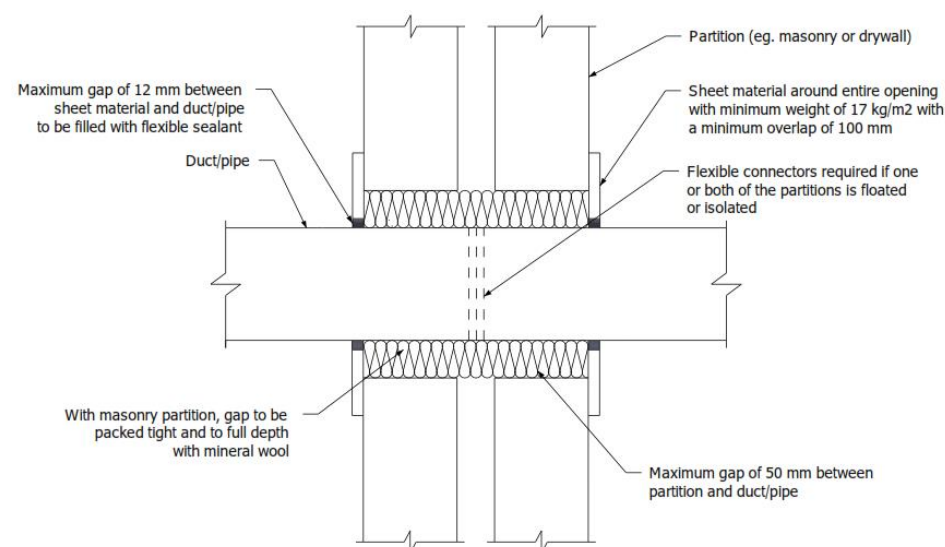


Figure 23 Duct or pipe penetration detail

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

11.6.2 Recessed lighting

Recessed lighting to sound insulating ceilings shall be avoided/minimised wherever possible as this has the potential to undermine the sound insulation requirements.

Recessed lighting is however proposed in the following locations:

- Guestrooms i.e. within the Soundbloc sound insulating ceiling
- Reception / lobby at ground floor level including within the sound insulating ceilings below guestrooms forming party floors.
- Secondary ceilings within guestroom entrance lobbies
- Common circulation areas (some located within ceilings forming party floors to guestrooms above)

Appropriately selected acoustic hoods or boxing shall be provided to recessed lighting where the sound insulating elements form party floors. Care will need to be taken to ensure that resilient elements are not bridged as a result of the recessed lighting or boxing treatments and as such, a high level of workmanship will need to be provided.

11.6.3 Recessed services

Recessed services (sockets etc) shall be avoided for separating walls to the guestrooms.

Where this is not possible, they shall not be mounted back-to-back, (must be staggered by at least 600 mm, or in line with manufacturers' recommendations).

Plasterboard wall linings should 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 providing they are of an appropriate specification for the location in which they are proposed.

Where practicable, electrical sockets should be installed within furniture (eg, credenzas/tables) or surface mounted trunking.

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

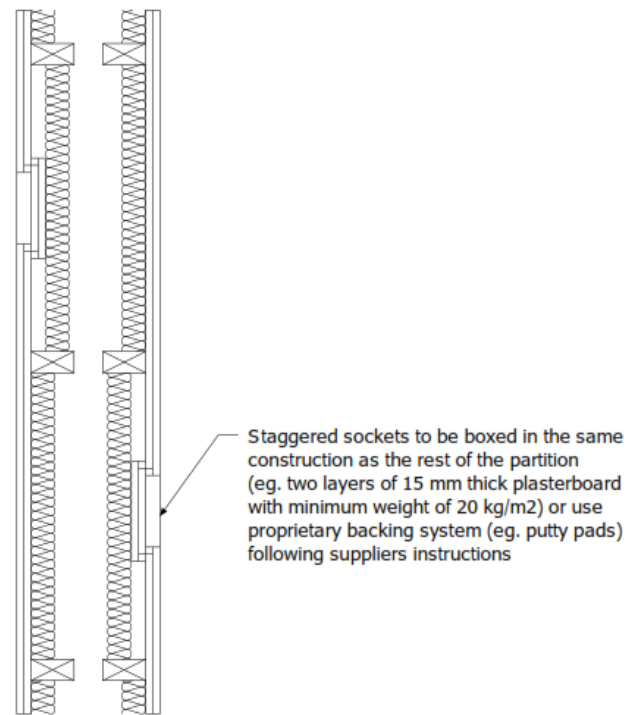


Figure 24 Electrical socket strategy

11.6.4 Drainage routes

Drainage pipework shall be in self-contained risers wherever possible. In any location where it passes through occupied spaces, it will need to be lagged and independently boxed in.

Rainwater, soil and waste pipework shall not run in noise sensitive spaces with criteria of NR 40 or less. Where this is unavoidable the pipework shall be lagged with 25 mm thick mineral fibre insulation and be independently boxed in with board material which has a minimum mass per unit area of 25 kg/m². This could be achieved using two layers of 15 mm dense plasterboard.

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

Penetrations through the separating floor slab should be boxed in, in accordance with the typical detail from ADE2003 shown in Figure 25.

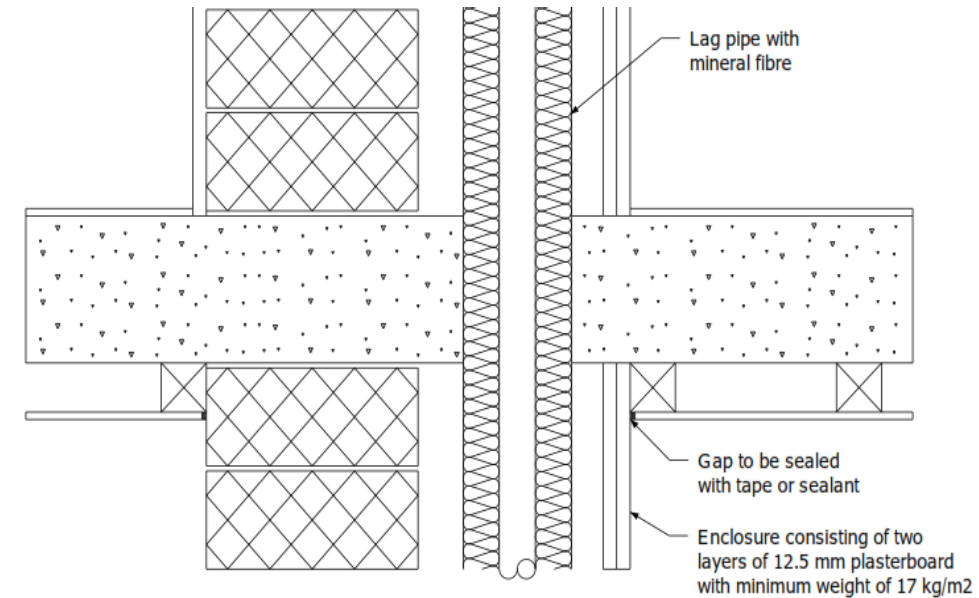


Figure 25 Indicative pipe penetration through separating floor

11.6.5 SVP transfers above guestrooms

SVPs generally stack, located in self-contained risers. In a few locations however, it is understood SVPs offset in guestroom ceiling voids. In order to help control intrusive noise from flow within the pipes, the following measures are recommended in these instances:

- Two individual 45-degree bends should be used for transitions (rather than a single 90 degree bend).
- SVPs should be wrapped with 25 mm mineral fibre acoustic lagging which has a mass layer of at least 5 kg/m².
- Lagged pipes should then be boxed in with 2 layers of 12.5 mm SoundBloc (or equivalent), with 25 mm mineral fibre within the encasement cavity.

Alternatively, if there is space within the floor void to run the pipes without interfering with other elements, then the boxing-in can be provided by the sound insulating ceiling beneath, though the angle of bends and lagging should be maintained, and the resilient bars cannot be bridged as a result. Running SVPs within floor voids might also present an issue with access, and so should be fully reviewed.

The same approach is also recommended for guestroom pipework dropping through the level 1 floor above the restaurant. However, the acoustic lagging and 45-degree bends could be omitted here.

11.6.6 Risers

All flues, pipework and ductwork within risers shall be vibration isolated from the building structure in order to mitigate structure-borne noise transmission.

11.6.7 Noise control measures

Appropriate measures shall be adopted to ensure that the noise criteria are achieved. Measures to be considered include:

- Plant room connections to atmosphere to be ducted via attenuators
- Low noise equipment
- Double-skin casings to air-handling plant
- In-duct attenuators
- Acoustic lagging and lining to ductwork
- 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.

11.7 Vibration

11.7.1 Criteria

Vibration due to building services associated with the development shall not cause:

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

Maximum permissible vibration amplitudes from building services associated with the development shall not:

- a) exceed a Vibration Dose Value (VDV) of $0.1 \text{ m/s}^{1.75}$ as given in BS 6472 Part 1: 2008 "Guide to evaluation of human exposure to vibration in buildings : Part 1 Vibration sources other than blasting" in any guestroom
- b) exceed a Vibration Dose Value (VDV) of $0.4 \text{ m/s}^{1.75}$ as given in BS 6472 Part 1: 2008 "Guide to evaluation of human exposure to vibration in buildings : Part 1 Vibration sources other than blasting" in any other occupiable space
- c) be of a magnitude which causes the maximum noise criteria to be exceeded.

In addition, vibration transfer from plant to occupied areas shall not exceed 0.01 m/s^2 peak acceleration, based on W_b weighting as defined in clause 3.3 of BS 6472-1:2008.

11.7.2 Anti-vibration measures

Suitable anti-vibration measures shall be provided to any vibrating plant items to ensure that this criteria is achieved.

All mechanical plant shall be isolated from the building structure using efficient anti-vibration mountings (AVMs).

Plant mounted on AVMs shall be isolated by flexible connections from ducts, pipes and conduits.

Where water tanks are located in close proximity to sensitive spaces with criteria of NR 40 or less, anti-vibration pads shall be provided to minimise water flow noise.

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

11.8 Lifts

11.8.1 Noise limits

The following noise limits shall be achieved by the lifts:

- 55 dBA in the lift lobby at 1 m from the landing entrance doors
- 55 dBA in lift cars at maximum velocity
- 75 dBA in lift machine rooms over the complete cycle of lift operation.

11.8.2 Vibration limits

The following vibration limits shall be achieved by the lifts:

- Horizontal vibration – Maximum RMS acceleration level in any one-third octave band (1-80 Hz) not to exceed 0.12 m/s^2
- Vertical vibration – Maximum RMS acceleration level in any one-third octave band (1-80 Hz) not to exceed 0.12 m/s^2 at maximum speed and 0.15 m/s^2 during acceleration/deceleration and start/stop periods.

12 Operational noise

12.1 Restaurant management strategy

By not providing the previously advised enhanced level of acoustic separation between the restaurant and L1 spaces as discussed in Section 6.2, there is an increased risk of disturbance resulting from noise transfer. Given the higher noise levels expected in the restaurant, the following may be necessary to minimise the potential for disturbance to occupants of the L1 guestrooms:

- Manage the use of the restaurant and L1 guestrooms (i.e. have attendees to an event / party taking place in the restaurant stay in the L1 guestrooms) or during particularly noisy events, do not hire out the L1 guestrooms.
- Controlling/managing noise levels from music, staff and customers within the restaurant to a level which does not disturb occupants of the L1 guestrooms
- Minimising any penetrations to the plasterboard restaurant ceiling and avoiding use of ceiling mounted speakers, with speakers mounted to the walls/furniture etc instead

The operations noise mitigation measures outlined above are likely to be more effective when complaints would be most likely. e.g. when people are trying to sleep late into the evening and early in morning.

12.2 Deliveries

Deliveries to the premises shall be restricted to be daytime only to minimise the risk of noise disturbance.

13 Construction (Design and Management) Regulations

The Construction (Design and Management) Regulations 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 (MMMMF) 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 useful acoustic terminology

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.
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.
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.

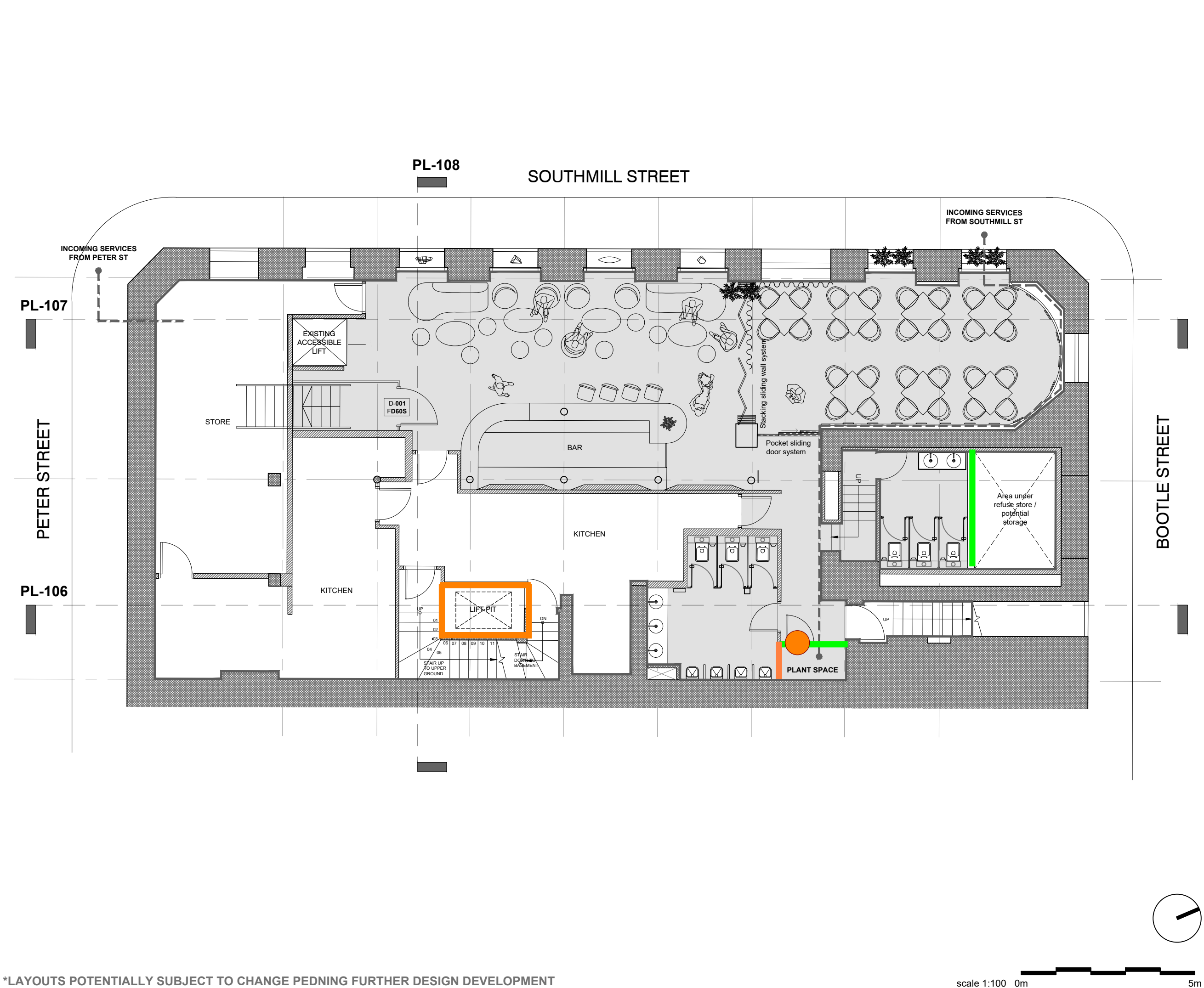
Acoustic parameters

‘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.
$D_{n,e,w}$	A single number weighted quantity which characterizes the airborne sound insulation via a specified small element. 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.
$L_{A90,T}$	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.
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'_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.
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

Sound insulation mark-ups – partitions and doors



Title	Internal laboratory sound insulation performance requirements
Project	47 Peter Street
Project no.	20477
Version	A
Marked-up by	Kane Mitchell
Reviewed by	James Atha
Date	18 December 2020
Mark-up key of minimum laboratory ratings	
—	$R_w + C_{tr}$ 59 dB partition
—	$R_w + C_{tr}$ 52 dB partition
—	R_w 50 dB partition
—	R_w 47 dB partition
—	R_w 45 dB partition
—	R_w 42 dB partition
—	R_w 40 dB partition
●	R_w 40 dB door
●	R_w 29 dB guestroom door (lobbied)
●	R_w 33 dB guestroom door (not lobbied)
SANDY BROWN Consultants in Acoustics, Noise & Vibration	

TRACT
WWW.TRACTARCHITECTURE.COM

PROJECT NUMBER + TITLE
47 PETER STREET, MANCHESTER

DRAWING
LOWER GROUND FLOOR PLAN AS PROPOSED

DRAWING NUMBER
PL-99

DRAWING REVISION
D

DRAWING PURPOSE
PLANNING

SCALE
1:100 @ A3

DATE
9.10.20

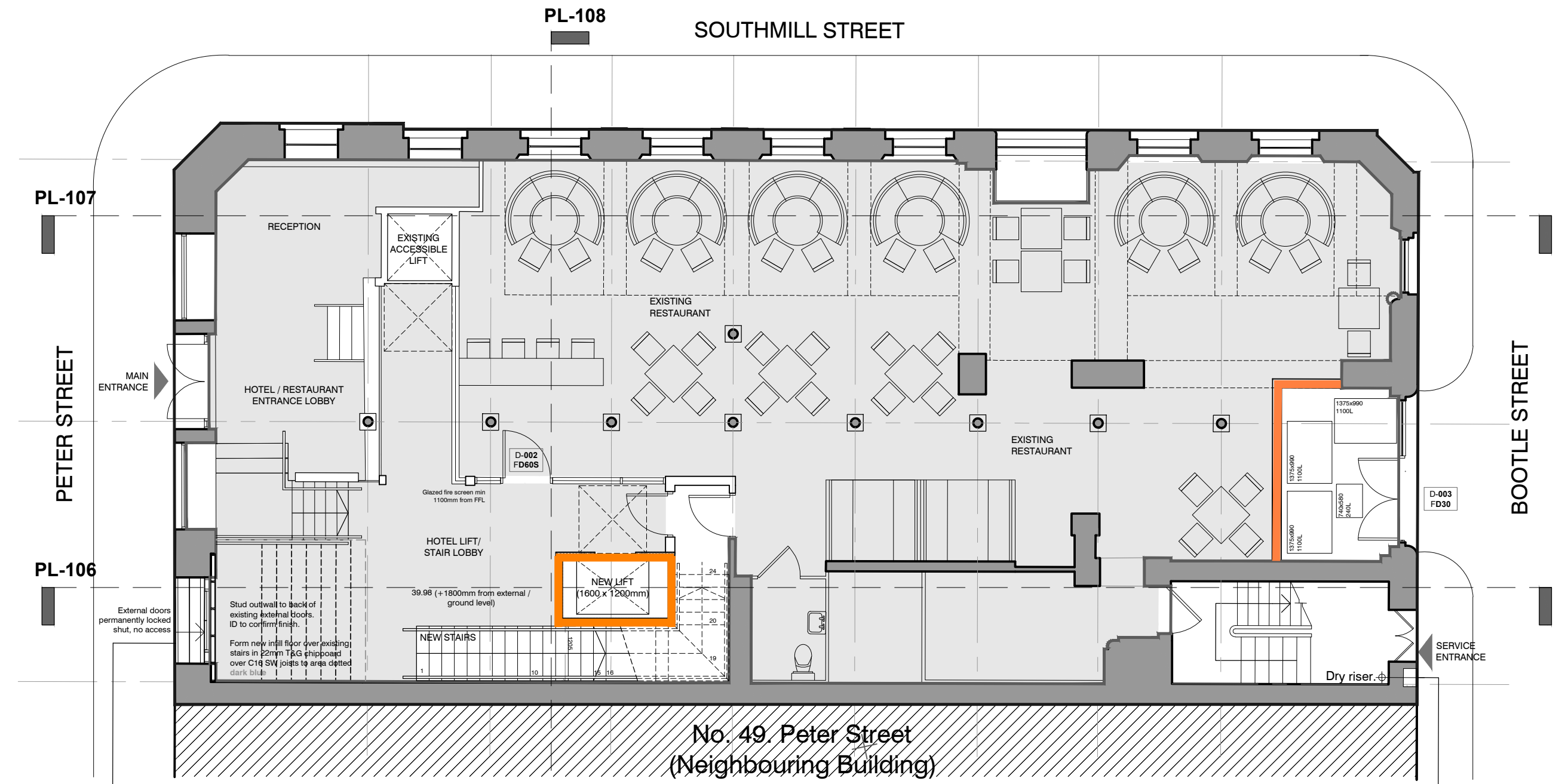
DRAWN
JC

CHECKED
-

*LAYOUTS POTENTIALLY SUBJECT TO CHANGE PEDNING FURTHER DESIGN DEVELOPMENT

scale 1:100 0m 5m

Title	Internal laboratory sound insulation performance requirements
Project	47 Peter Street
Project no.	20477
Version	A
Marked-up by	Kane Mitchell
Reviewed by	James Atha
Date	18 December 2020
Mark-up key of minimum laboratory ratings	
	$R_w + C_0$ 59 dB partition
	$R_w + C_0$ 52 dB partition
	R_w 50 dB partition
	R_w 47 dB partition
	R_w 45 dB partition
	R_w 42 dB partition
	R_w 40 dB partition
	R_w 40 dB door
	R_w 29 dB guestroom door (lobbied)
	R_w 33 dB guestroom door (not lobbied)
SANDY BROWN <i>Consultants in Acoustics, Noise & Vibration</i>	



Existing entrance doors to be replaced with outward opening fire escape doors and side panels formed from glazed polyester powder coated aluminium frames, colour TBC.

Location of dry riser inlet valve cabinet to be built into the existing wall, all in accordance with SE details.

TRACT
WWW.TRACTARCHITECTURE.COM

PROJECT NUMBER + TITLE
47 PETER STREET, MANCHESTER

DRAWING
GROUND FLOOR PLAN AS PROPOSED

DRAWING NUMBER
PL-100

DRAWING REVISION
1

DRAWING PURPOSE
PLANNING

SCALE
1:100 @ A3

DATE
9.10.20

DRAWN
JC

CHECKED
-

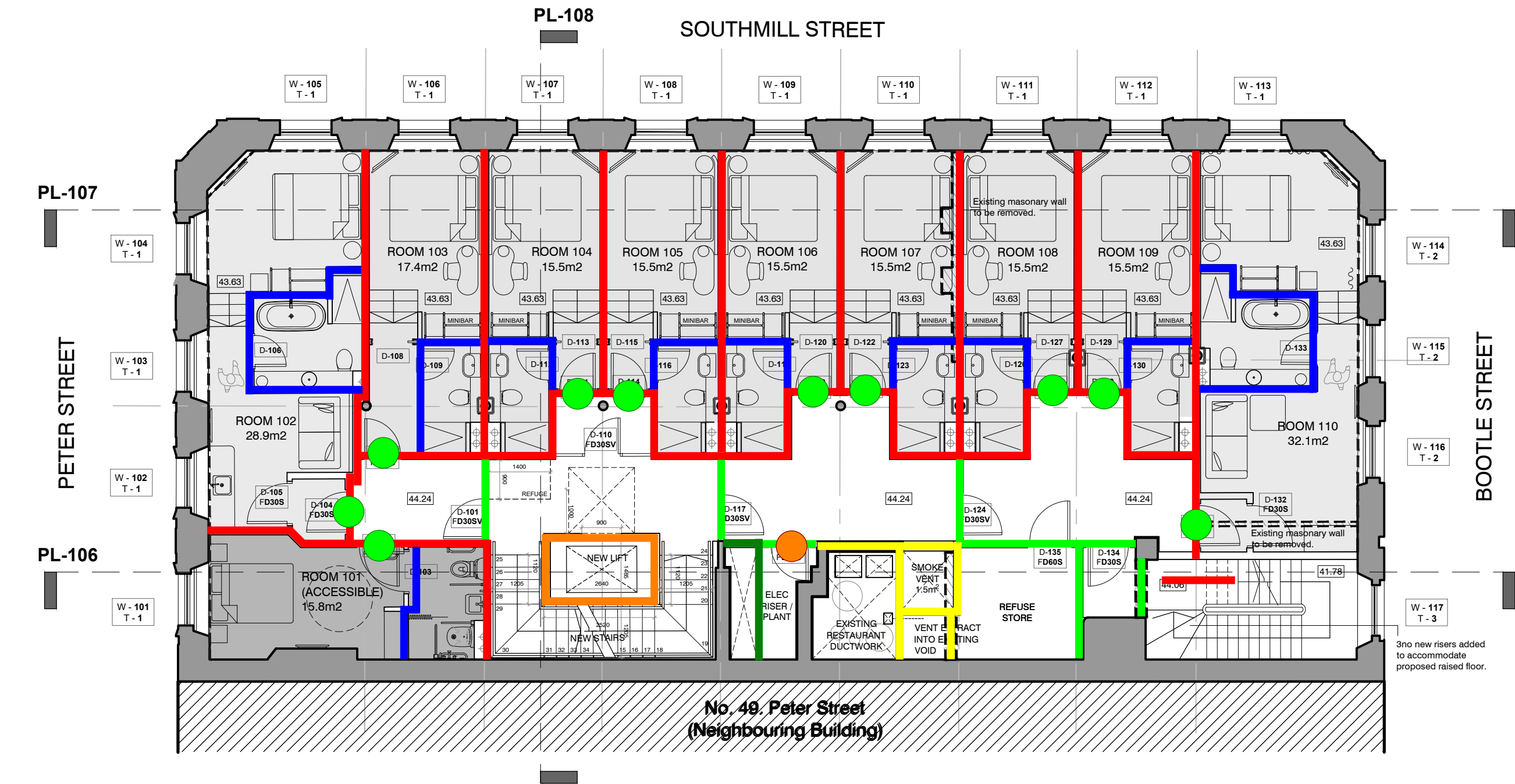
*LAYOUTS POTENTIALLY SUBJECT TO CHANGE PEDNING FURTHER DESIGN DEVELOPMENT

scale 1:100 0m 5m

Title	Internal laboratory sound insulation performance requirements
Project	47 Peter Street
Project no.	20477
Version	A
Marked-up by	Kane Mitchell
Reviewed by	James Atha
Date	18 December 2020

Mark-up key of minimum laboratory ratings	
—	$R_w + C_w$ 59 dB partition
—	$R_w + C_w$ 52 dB partition
—	R_w 50 dB partition
—	R_w 47 dB partition
—	R_w 45 dB partition
—	R_w 42 dB partition
—	R_w 40 dB partition
●	R_w 40 dB door
●	R_w 29 dB guestroom door (lobbied)
●	R_w 33 dB guestroom door (not lobbied)

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



- Existing walls to be retained
- Brickwork to remain exposed
- New walls
- Elements to be demolished
- Elements to be encased

*LAYOUTS POTENTIALLY SUBJECT TO CHANGE PEDNING FURTHER DESIGN DEVELOPMENT

scale 1:100 0m 5m

TRACT
WWW.TRACTARCHITECTURE.COM

PROJECT NUMBER + TITLE
47 PETER STREET, MANCHESTER

DRAWING
FIRST FLOOR PLAN AS PROPOSED

DRAWING NUMBER
PL -101

DRAWING REVISION
H

DRAWING PURPOSE
PLANNING

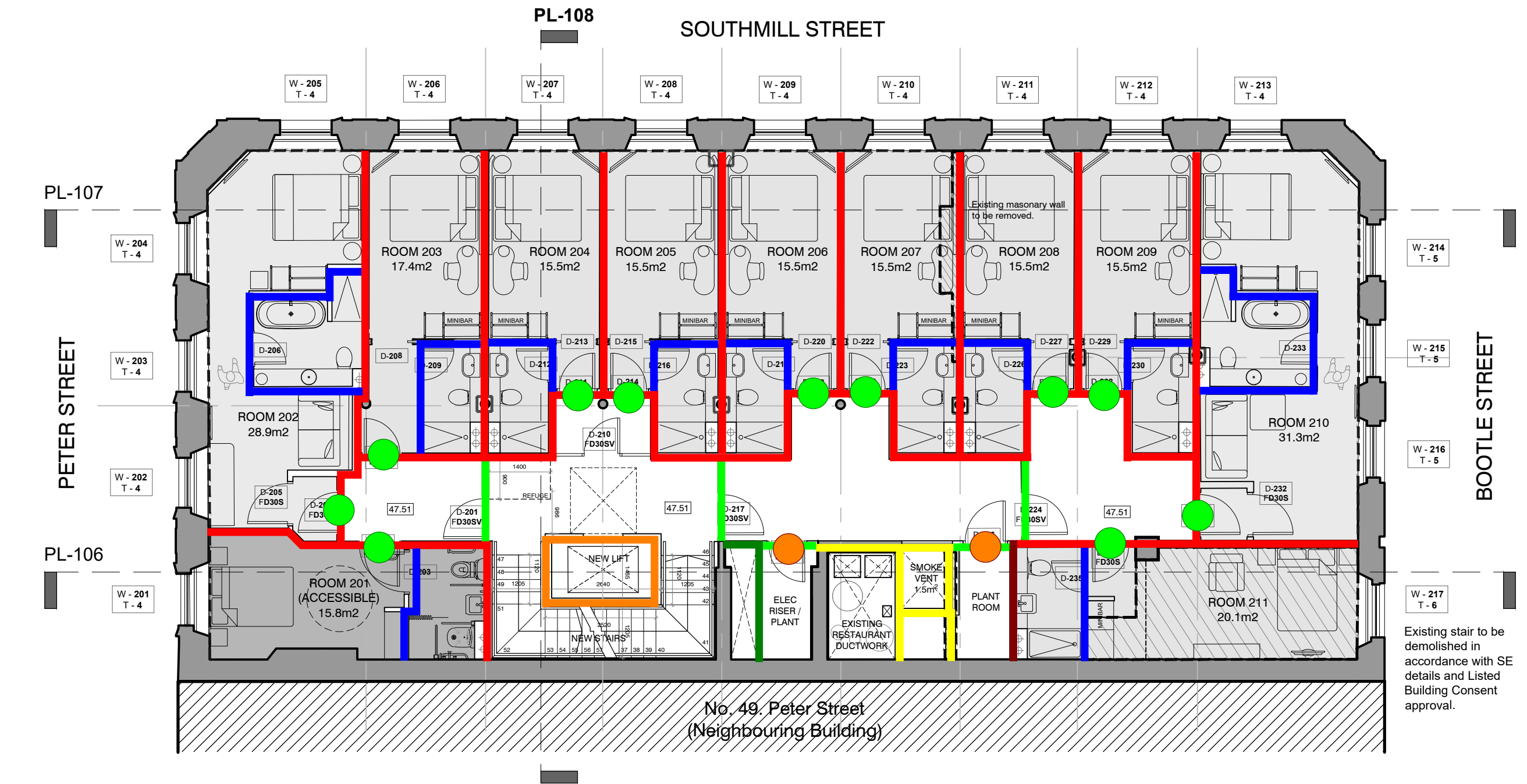
SCALE
1:100 @ A3

DATE
9.10.20

DRAWN
JC

CHECKED
-

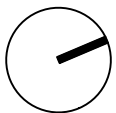
Title	Internal laboratory sound insulation performance requirements
Project	47 Peter Street
Project no.	20477
Version	A
Marked-up by	Kane Mitchell
Reviewed by	James Atha
Date	18 December 2020
Mark-up key of minimum laboratory ratings	
	$R_w + C_w$ 59 dB partition
	$R_w + C_w$ 52 dB partition
	R_w 50 dB partition
	R_w 47 dB partition
	R_w 45 dB partition
	R_w 42 dB partition
	R_w 40 dB partition
	R_w 40 dB door
	R_w 29 dB guestroom door (lobbied)
	R_w 33 dB guestroom door (not lobbied)
SANDY BROWN <i>Consultants in Acoustics, Noise & Vibration</i>	



- Existing walls to be retained
- Brickwork to remain exposed
- New walls
- Elements to be demolished
- Elements to be encased

*LAYOUTS POTENTIALLY SUBJECT TO CHANGE PEDNING FURTHER DESIGN DEVELOPMENT

scale 1:100 0m 5m



TRACT
WWW.TRACTARCHITECTURE.COM

PROJECT NUMBER + TITLE
47 PETER STREET, MANCHESTER

DRAWING
SECOND FLOOR PLAN AS PROPOSED

DRAWING NUMBER
PL-102

DRAWING REVISION
J

DRAWING PURPOSE
PLANNING

SCALE
1:100 @ A3

DATE
9.10.20

DRAWN
JC

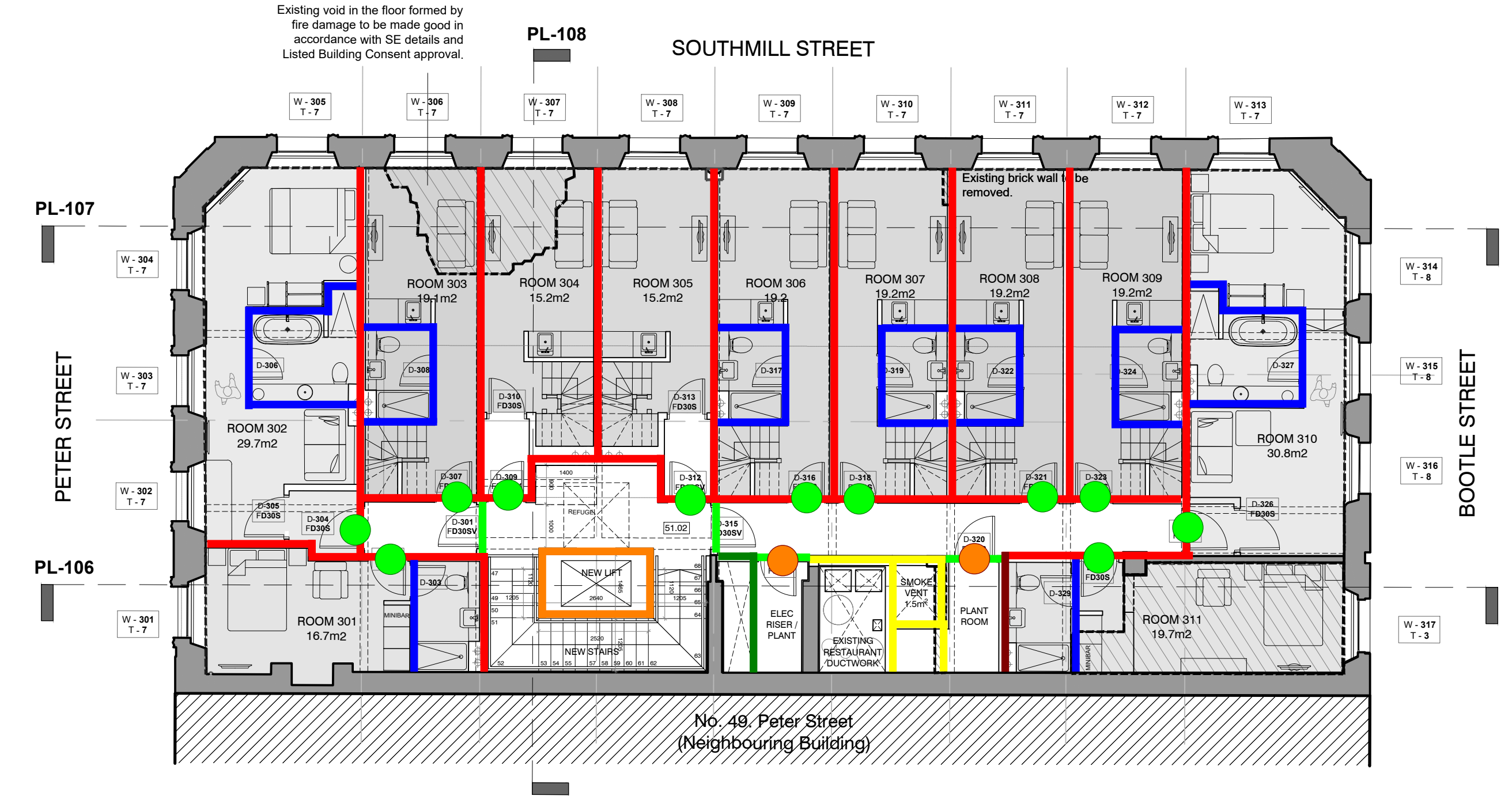
CHECKED
-

Title	Internal laboratory sound insulation performance requirements
Project	47 Peter Street
Project no.	20477
Version	A
Marked-up by	Kane Mitchell
Reviewed by	James Atha
Date	18 December 2020

Mark-up key of minimum laboratory ratings

- $R_w + C_w$ 59 dB partition
- $R_w + C_w$ 52 dB partition
- R_w 50 dB partition
- R_w 47 dB partition
- R_w 45 dB partition
- R_w 42 dB partition
- R_w 40 dB partition
- R_w 40 dB door
- R_w 29 dB guestroom door (lobbied)
- R_w 33 dB guestroom door (not lobbied)

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



- Existing walls to be retained
- Brickwork to remain exposed
- New walls
- Elements to be demolished
- Elements to be encased

*LAYOUTS POTENTIALLY SUBJECT TO CHANGE PEDNING FURTHER DESIGN DEVELOPMENT

scale 1:100 0 5m

TRACT
WWW.TRACTARCHITECTURE.COM

PROJECT NUMBER + TITLE
47 PETER STREET, MANCHESTER

DRAWING
THIRD FLOOR PLAN AS PROPOSED

DRAWING NUMBER
PL -103

DRAWING REVISION
G

DRAWING PURPOSE
PLANNING

SCALE
1:100 @ A3

DATE
27.9.20

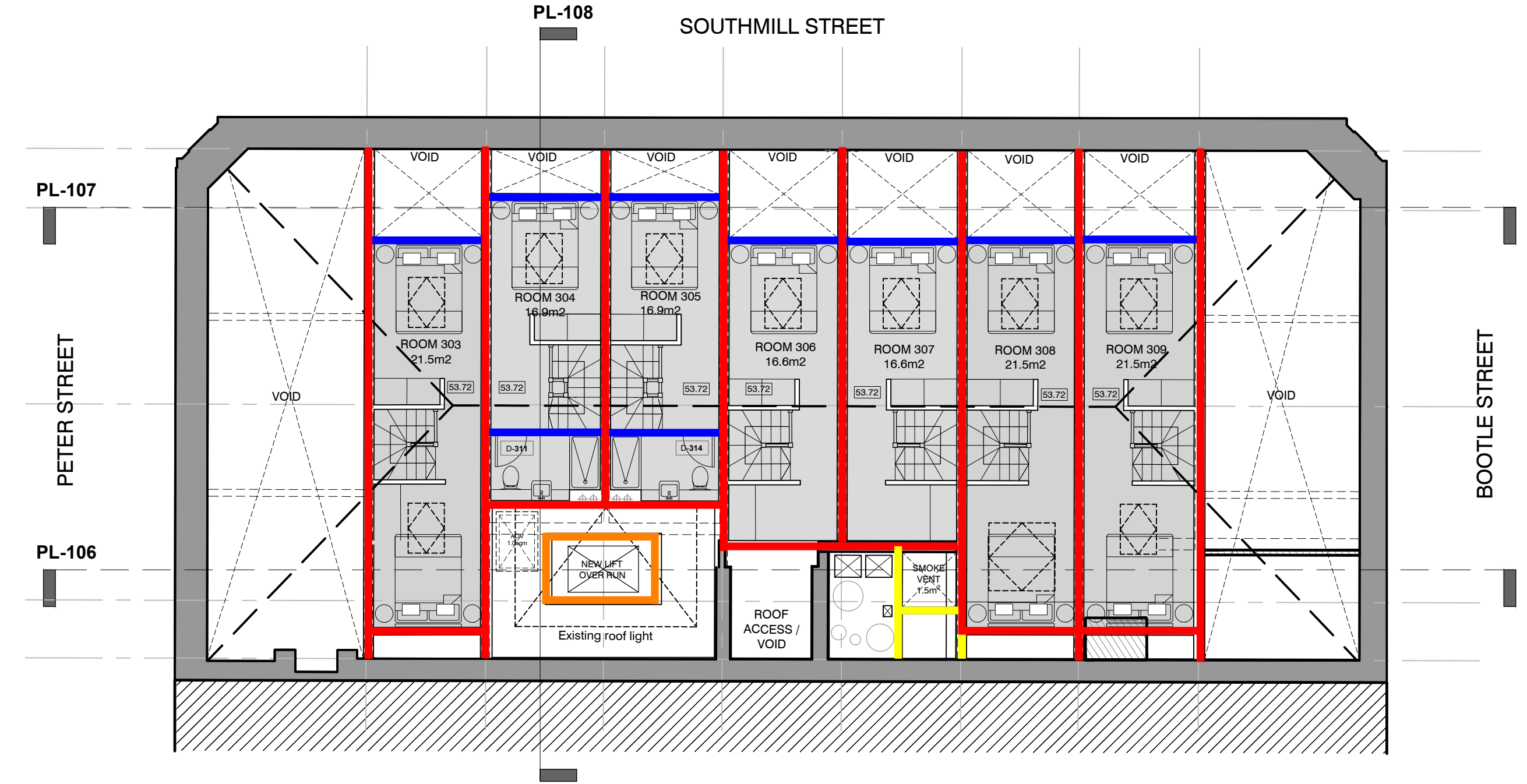
DRAWN
JC

CHECKED
-

Title	Internal laboratory sound insulation performance requirements
Project	47 Peter Street
Project no.	20477
Version	A
Marked-up by	Kane Mitchell
Reviewed by	James Atha
Date	18 December 2020

Mark-up key of minimum laboratory ratings	
	$R_w + C_{tr}$ 59 dB partition
	$R_w + C_{tr}$ 52 dB partition
	R_w 50 dB partition
	R_w 47 dB partition
	R_w 45 dB partition
	R_w 42 dB partition
	R_w 40 dB partition
	R_w 40 dB door
	R_w 29 dB guestroom door (lobbied)
	R_w 33 dB guestroom door (not lobbied)

SANDY BROWN
Consultants in Acoustics, Noise & Vibration



- Existing walls to be retained
- Brickwork to remain exposed
- New walls
- Elements to be demolished
- Elements to be encased

*LAYOUTS POTENTIALLY SUBJECT TO CHANGE PEDNING FURTHER DESIGN DEVELOPMENT

scale 1:100 0 5m

TRACT
WWW.TRACTARCHITECTURE.COM

PROJECT NUMBER + TITLE
47 PETER STREET, MANCHESTER

DRAWING
THIRD FLOOR MEZZ PLAN AS PROPOSED

DRAWING NUMBER
PL -104

DRAWING REVISION
F

DRAWING PURPOSE
PLANNING

SCALE
1:100 @ A3

DATE
24.9.20

DRAWN
JC

CHECKED
-