

Acoustic Design Review

30 Queen Victoria Street, Reading, RG1 1TG

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REVISION HISTORY

Issue	Date of Issue	Author	Reviewed	Approved
R0	08/09/2025			
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Issue	Comment
R0	First Issue

1.0 INTRODUCTION

Clement Acoustics has been commissioned by ERS Consultants Ltd to undertake an acoustic design review relating to the proposed development at 30 Queen Victoria Street, Reading.

The proposed development site comprises a four-storey building that was previously in use as office relating to financial services, but is currently vacant. Plans are to create 3 No. residential units on first to third floors, and a ground floor retail unit.

This assessment considers the sound insulation performance of separating elements between the proposed ground floor retail unit and the first floor residential apartment above. The assessment considers the requirements of Approved Document E of the Building Regulations and Planning Condition 7 of Decision Notice PL/24/0876.

The following sections describe the acoustic review for the design of the separating elements for the development, based on the information received to date, and provides recommendations on upgrade works in order to meet the required criteria stated in Section 2.0.

2.0 SOUND INSULATION DESIGN CRITERIA

A design that would meet standard Approved Document E [ADE] Building Regulation requirements, as well as typical Local Authority requirements, has been established as the main client requirement. Design targets for the separating floor have been established accordingly.

2.1 Approved Document E of the Building Regulations

In order to satisfy the requirements of ADE of the Building Regulations, the sound insulation performance criterion as shown in Table 2.1 should be met by the floor constructions separating the proposed commercial use from residential dwellings as a minimum. For this development the requirements for change of use developments apply.

Element	Airborne Design Criteria	Impact Design Criteria
Floor	$D_{nT,w} + C_{tr} \geq 43 \text{ dB}$	-

Table 2.1 Approved Document E design criteria for party elements

It should be noted that ADE has provisions for separations between residential and commercial spaces in Clause 0.8 of the document, which states:

“A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal 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.”

Based on the proposed use of the commercial unit as retail unit, an improvement over the minimum requirements would be considered essential. Further consideration will also be given to requirements of the Local Authority, as described in Section 2.2.

2.2 Local Authority Planning Condition

The stated requirements of Planning Condition 7 of Decision Notice PL/24/0876 are summarised in Table 2.2.

Planning Condition	Summary of Requirements
Condition 7	No development shall commence on site until a detailed scheme for protecting the dwellings from noise emissions from the commercial use hereby approved and informed by an assessment of the likely noise emissions from the approved commercial use, has been submitted to and approved in writing by the Local Planning Authority. The scheme itself shall be designed, specified and constructed so that the sound insulation performance of the separating floor/ceiling between the uses achieves a minimum airborne sound insulation performance of greater than or equal to 55 dB (Dntw +Ctr) and ensures that the noise levels within the property do not exceed the values specified in BS8233:2014 with appropriate penalties and adjustments for the character of the noise. The scheme shall make suitable provision for insulation from structure borne noise.

Table 2.2 Summary of relevant planning conditions

2.3 Established Design Targets

According to the requirements of the planning condition, and guidance of ADE, an airborne sound insulation performance of $D_{n,T,w} + C_{tr}$ 55 dB will be targeted for the floor separating the proposed retail unit from the residential apartment at first floor.

Furthermore, British Standard 8233: 2014: ‘Guidance on sound insulation and noise reduction for buildings’ [BS 8233] gives acceptable internal noise levels in residential dwellings during daytime and night-time hours These levels are shown in Table 2.3.

Activity	Location	Design Range $L_{eq,T}$	
		Daytime (07:00 - 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB(A)	-
Dining	Dining Room/Area	40 dB(A)	-
Sleeping	Bedroom	35 dB(A)	30 dB(A)

Table 2.3 BS 8233: 2014 recommended internal noise levels

It is anticipated that the retail unit would only be in use during daytime hours.

Assuming worst case conditions, of the adjacent room being for a bedroom, BS 8233: 2014 recommends 35 dB(A) as being acceptable internal resting conditions during daytime hours.

In order to ensure that noise due to the retail unit is inaudible in typical residential conditions, as well as addressing any potential tonal elements of noise, we propose setting an internal ambient noise target of **NR15** in first floor residential rooms.

If there is any obligation to improve on the requirements of ADE and the Local Authority, a reassessment may be necessary.

3.0 SOUND INSULATION ASSESSMENT OF SEPARATING FLOOR

3.1 Existing Construction and Currently Proposed Works

Section drawings drawn by Ian Benbow indicate that the separating floor is based on retained 300 mm timber joists, with existing suspended ceilings to be removed. Relevant parts of the section drawing are shown in Figure 3.1.

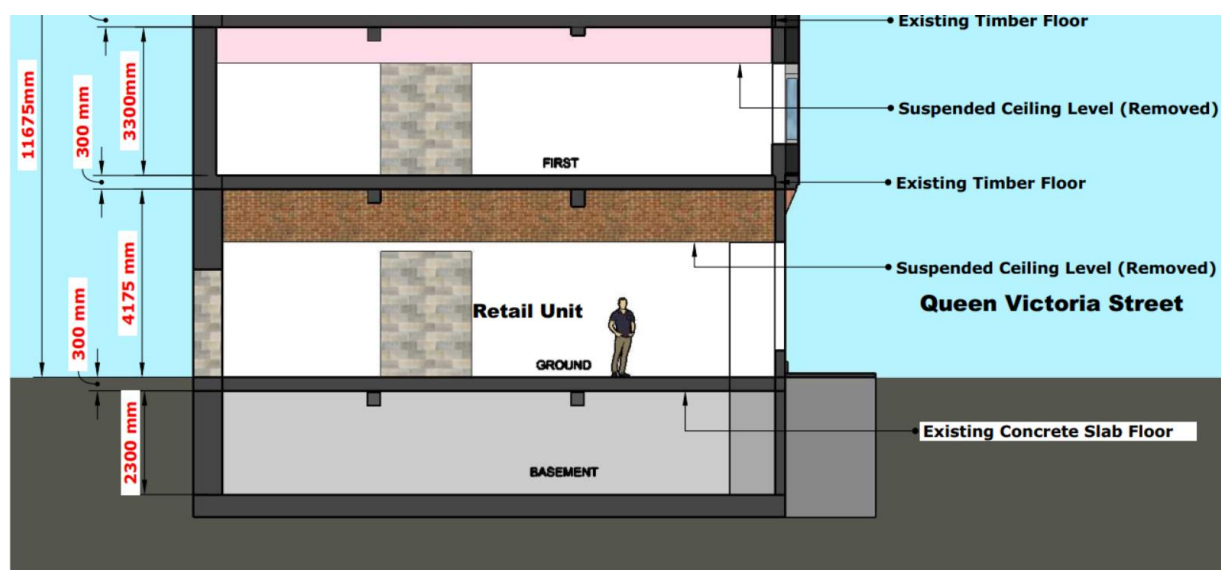


Figure 3.1 Section view showing existing timber joist area and removed suspended ceiling

The Building Regulations Specification document, issued by Ian Benbow, indicates that proposed works to separating floors will be undertaken in accordance with Floor Treatment 2, as defined in Diagram 4.6 of ADE.

The proposed treatment of floors as stated in Building Regulations Specification is shown in Figure 3.2.

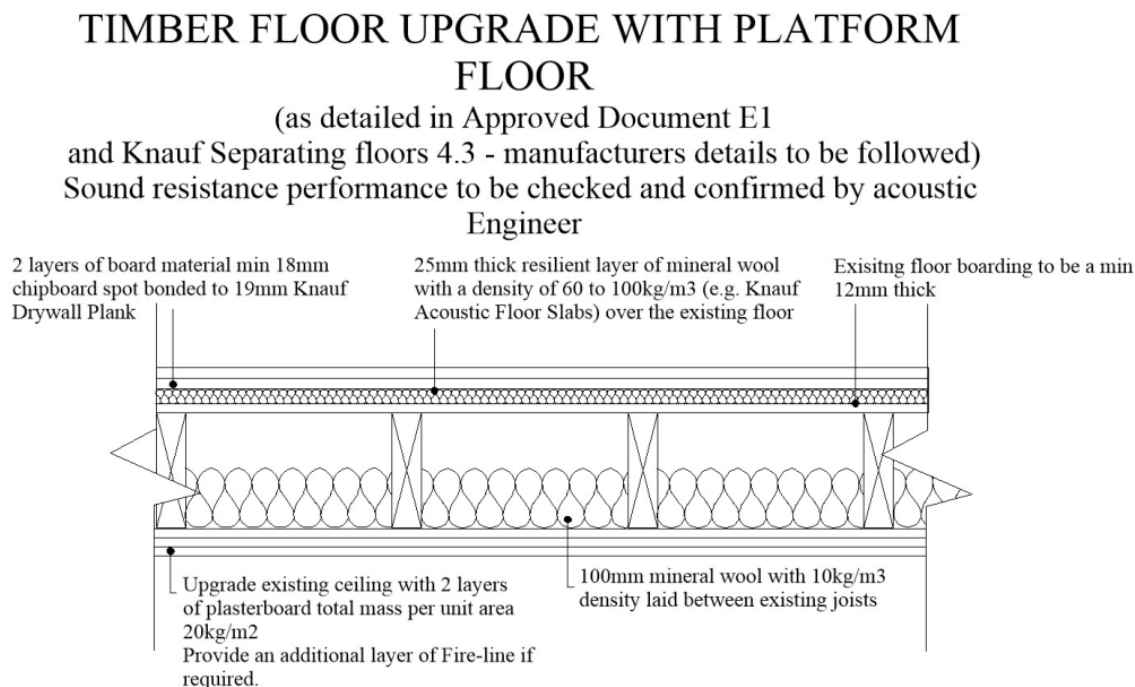


Figure 3.2 Section view of proposed separating floor treatment

It should be noted that in previous projects, separating floors designed in accordance with ADE Floor Treatment 2 perform poorly, and often fail to meet the minimum requirements for residential floors. It is therefore considered that the floor treatment would be sufficient, particularly where an uplift for the commercial use is proposed.

Recommendations are made in subsequent sections.

3.2 Recommendations for Separating Floor Construction

In order to provide a floor construction that is suitable for the intended use, we would recommend removing the suspended ceiling and constructing a new independent ceiling below a primary plasterboard ceiling.

We would recommend installing mineral wool, density 45 kg/m³, within the 300 mm timber joist void to a thickness of half the void depth. We would then recommend lining the joists with a double layer of dense plasterboard, to provide a total mass per unit area of at least 25 kg/m².

We would then recommend installing a secondary, independent ceiling below the primary ceiling, with new timber joists supported from surrounding walls only. It is anticipated that timber joists a minimum of 175 mm deep would be required, and a minimum 25 mm separation between the primary ceiling and secondary joists is recommended.

We would recommend installing 100 mm mineral wool, density 45 kg/m³ between the joists, before lining the secondary joists with a single layer of 15 mm SoundBloc plasterboard or equivalent.

It should also be ensured that the timber deck at first floor level is a minimum of 14 kg/ m².

The proposed construction has been modelled using proprietary sound insulation software INSUL, with a section view shown in Figure 3.3. It should be noted that INSUL represents independent joists as separate joists at the top and bottom of the void, whereas in reality there will be larger joists at the bottom edge of the void only.

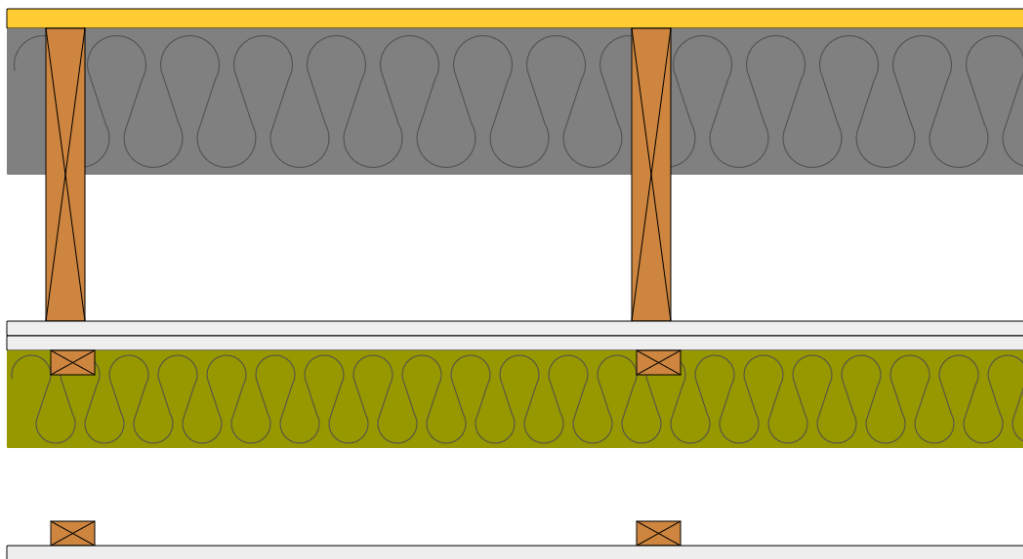


Figure 3.3 Section view of proposed separating floor build up

The modelling exercise indicates a predicted laboratory sound insulation performance of $R_w + C_{tr}$ 67 dB. Allowing for typical onsite factors including flanking noise and workmanship limitations, the predicted sound insulation performance is therefore in the region $D_{nT,w} + C_{tr}$ 57-62 dB.

The predicted level of sound insulation is therefore inline with the recommended design target; however, the level of noise transmission into residential spaces must also be considered.

3.2.1 Noise Transmission Calculations

In order to assess the noise impact from the proposed commercial use, library data has been used of noise measured in a busy bar area.

As the library data comprises sources including speech and music, this is considered to provide a particularly robust assessment for the proposed retail use.

The noise emissions levels used are shown in Table 3.1.

Source	Sound Pressure Level (at source, dB) in each Frequency Band, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Busy Bar Area	69	70	69	73	71	67	61	53	75

Table 3.1 Library sourced noise emissions levels

Calculations have been undertaken according to the acoustic formula for room-to-room noise transmission shown in Equation 3.1.

$$SPL_{Receiver} = SPL_{Source} - SRI + 10 \log\left(\frac{S}{A}\right)$$

Equation 3.1 Formula for room to room noise transmission

Taking into account the noise levels stated in Table 3.1, the sound insulation performance of the separating floor (as detailed in Section 3.2), and typical receiver room dimensions, the resulting noise level in the first floor residential space would be as shown in Table 3.2.

Element	Sound Pressure Level (dB) in each Frequency Band, Hz								
	63	125	250	500	1k	2k	4k	8k	NR
Calculated Receiver Noise Level	38	28	12	4	0	0	0	0	7
Criterion: NR15	47	35	26	19	15	12	9	7	15

Table 3.2 Calculated receiver noise level due to commercial activity

As shown in Table 3.2, receiver noise levels are expected to be below the established requirements in all frequency bands.

4.0 JUNCTION DETAILING

4.1 Junction With External Walls

The Building Regulations Specification indicates that existing external walls are brickwork, with proposals to line the walls with 25 mm timber battens lined with 62.5 mm Kingspan Kooltherm K118 insulated panels to provide a suitable thermal performance.

Based on the existing wall comprising solid brickwork as shown, this would be considered an acceptable solution.

Should further works indicate that external walls differ from the current understanding (e.g. low density blocks or cavities present), this should be confirmed to Clement Acoustics so that the proposals can be reviewed further.

4.2 Junction with Separating Walls

It is understood from the Building Regulations Specification that existing separating walls to adjacent buildings are 215 mm solid blockwork with a density of at least 1840 kg/m³. Proposals are to line separating walls with a layer of plasterboard with a mass per unit area of at least 10 kg/m².

Based on the existing wall comprising solid, high density blockwork as described, this would be considered an acceptable solution.

Should further works indicate that external walls differ from the current understanding (e.g. low density blocks or cavities present), this should be confirmed to Clement Acoustics so that the proposals can be reviewed further.

4.3 Structural Columns

Where masonry columns are exposed in the ground floor space, we would recommend forming a lining as follows, to minimise structural noise transmission:

- Existing masonry column
- Framework, independent of the column or wall, forming minimum 50 mm void around each face of the column or inner face of wall
 - 25 mm mineral wool infill (45 kg/m³)
- Lining formed of 2 layers of 15 mm SoundBloc plasterboard

4.4 Boxing in of Steels/Beams

In order to minimise mid to high frequency noise being transmitted through any steel framework, it is important to ensure any steelwork is sufficiently boxed in.

We would typically recommend the following as a minimum:

- Lag the steel support in 25 mm mineral wool
- Box in using a barrier with building boards that have a total minimum mass per unit area of 22 kg/m² (e.g. 2 layers of 12.5 mm SoundBloc plasterboard)

It is acceptable for ceiling linings to count as the boxing-in enclosure, provided it is ensured that the steel beam and ceiling layers are structurally independent.

4.5 Ducts and Pipework

Where pipes and ducts pass through separating elements, there is a possibility for flanking noise through the pipework itself.

In order to minimise the effects of this, we would recommend following the below advice:

- Where ducts or pipework penetrate a separating element, we would recommend first lagging the pipework in mineral wool (25 mm thick, minimum density 25 kg/m³), before boxing in with 2 layers of 12.5 mm plasterboard.
- Where pipework penetrates through a separating masonry element, it should be ensured that there is no rigid contact, but an airtight seal should be achieved using non-hardening mastic. Any fire stopping should also allow for a flexible, rather than rigid contact.
- Avoid 90° bends in vertical water-carrying pipework (e.g. Soil Vent Pipes)

4.6 Services

The recommended primary and secondary ceilings should not be penetrated by services such as ventilation grilles or downlights. Where such services are proposed, we would recommend introduction of a sacrificial ceiling, suspended from the independent joists only, to accommodate service penetrations.

The primary and secondary ceilings should remain unperforated.

5.0 LIMITATIONS

It should be noted that this assessment has been undertaken at an early stage, to provide information for the purposes of discharging planning conditions. The assessment is based on information provided to us at the time of writing, and assumptions regarding proposed operations.

We would recommend that site visits are undertaken as designs and works progress, to ensure that constructions and junction details are suitable according to the existing building elements.

It should also be noted that this assessment relates to the separating floor between ground floor and first floor only, in line with the requirements of the Decision Notice.

6.0 GENERAL

It should be noted that where junctions are sealed with mastic, the mastic does not need to be specifically 'acoustic'. Provided the mastic is silicone-based and remains flexible when set (i.e. does not crack) it should be acceptable for use.

The sound insulation performance predictions and advice provided in this document assume that there will be no major mistakes in workmanship regarding the acoustic detailing and finishing of the party elements proposed in this development.