



Central Club,
36-42 London
Street, Reading

Acoustic Design Review

April 2023



Ref: 22-9213
ADR

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<i>Revision</i>	<i>ADR</i>
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1. Executive Summary

A sound insulation assessment has been carried out in relation to the internal sound insulation at the **Central Club, 36-42 London Street, Reading**. The proposed scheme involves the erection of a 4-storey building with art centre at ground fronting London Street, 17 residential units and associated works.

The site is located in a mixed commercial and residential area close to the centre of Reading. To the north of the site, across the A329 Queen's Road, is the Oracle Shopping centre, a large commercial district with a plant area directly opposite the proposed development site. The area to the east and the south of the site, along A327 London Street, is predominantly commercial with a number of pubs and restaurants close to the site, including the Great Expectations pub directly to the east of the proposed site. To the west of the site, the area is a mix of commercial and residential properties.

The purpose of this sound insulation assessment has been to determine the effectiveness of the sound insulation provided by the currently proposed construction of the building in order to ensure that the future internal acoustic climate is acceptable.

The assessment has also shown that the internal sound insulation at the development should achieve the requirements of ADE and the Local Authority, subject to a high quality of workmanship.

It is important to note that, as with any construction project, the ability to meet the specification will rely upon the quality of the built structure. As such the works should be carried out to a high standard of workmanship to ensure that any sound insulation measures are not breached, for example by installing a rigid connection across an isolated connection (such as resilient bars). Additionally, any joints between different walls and the party wall and the ceiling/floor should be carefully filled with acoustic mastic.

2. Introduction

This report has been prepared to assess the external and internal sound insulation for the mixed-use development at **Central Club, 36-42 London Street, Reading**. The proposed scheme involves the erection of a 4-storey building with art centre at ground fronting London Street, 17 residential units and associated works.

The purpose of this sound insulation assessment has been to determine the effectiveness of the sound insulation provided by the currently proposed construction of the building in order to ensure that the future internal acoustic climate is acceptable.

A glossary of acoustic terms is provided in **Appendix 1**.

The site is located in a mixed commercial and residential area close to the centre of Reading. To the north of the site, across the A329 Queen's Road, is the Oracle Shopping centre, a large commercial district with a plant area directly opposite the proposed development site. The area to the east and the south of the site, along A327 London Street, is predominantly commercial with a number of pubs and restaurants close to the site, including the Great Expectations pub directly to the east of the proposed site. To the west of the site, the area is a mix of commercial and residential properties.

The location of the proposed development site is provided in **Figure 2.1** and the proposed layout plans are shown in **Figures 2.2 to 2.5**.

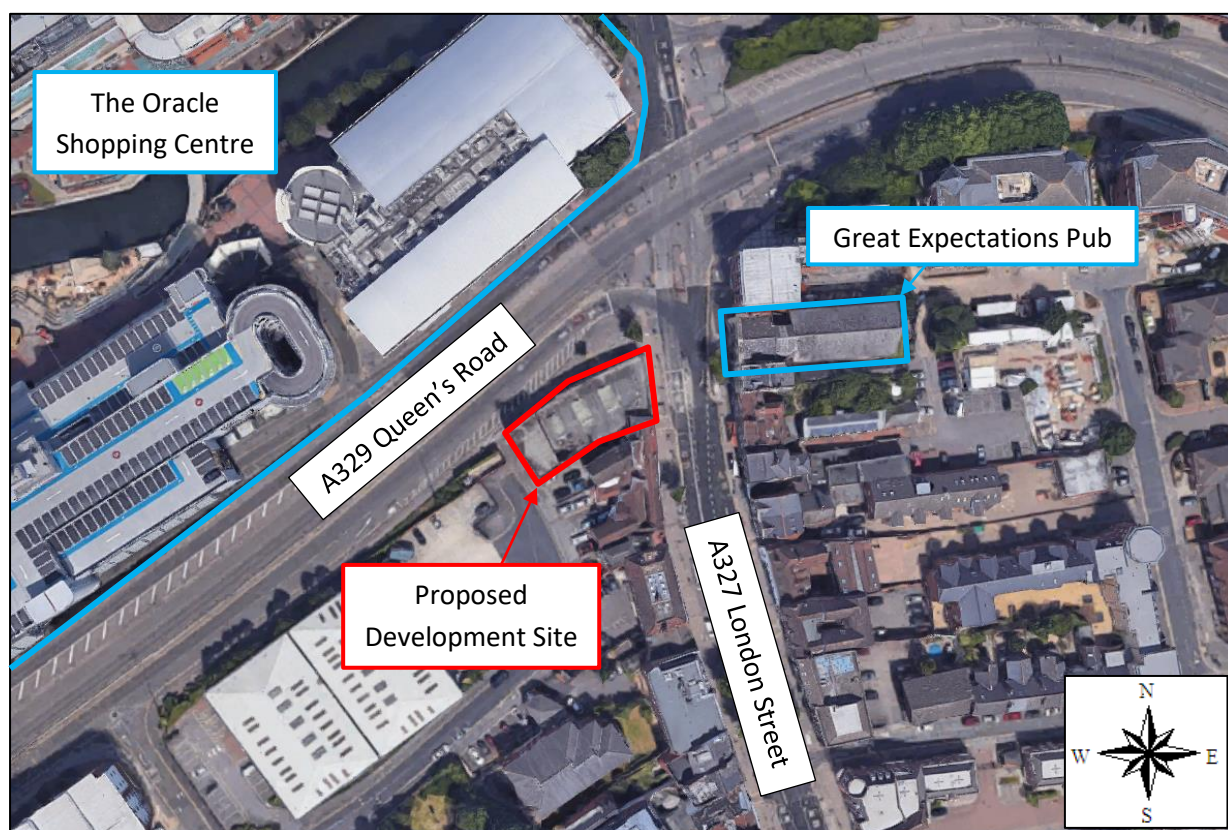


Figure 2.1: Site Location

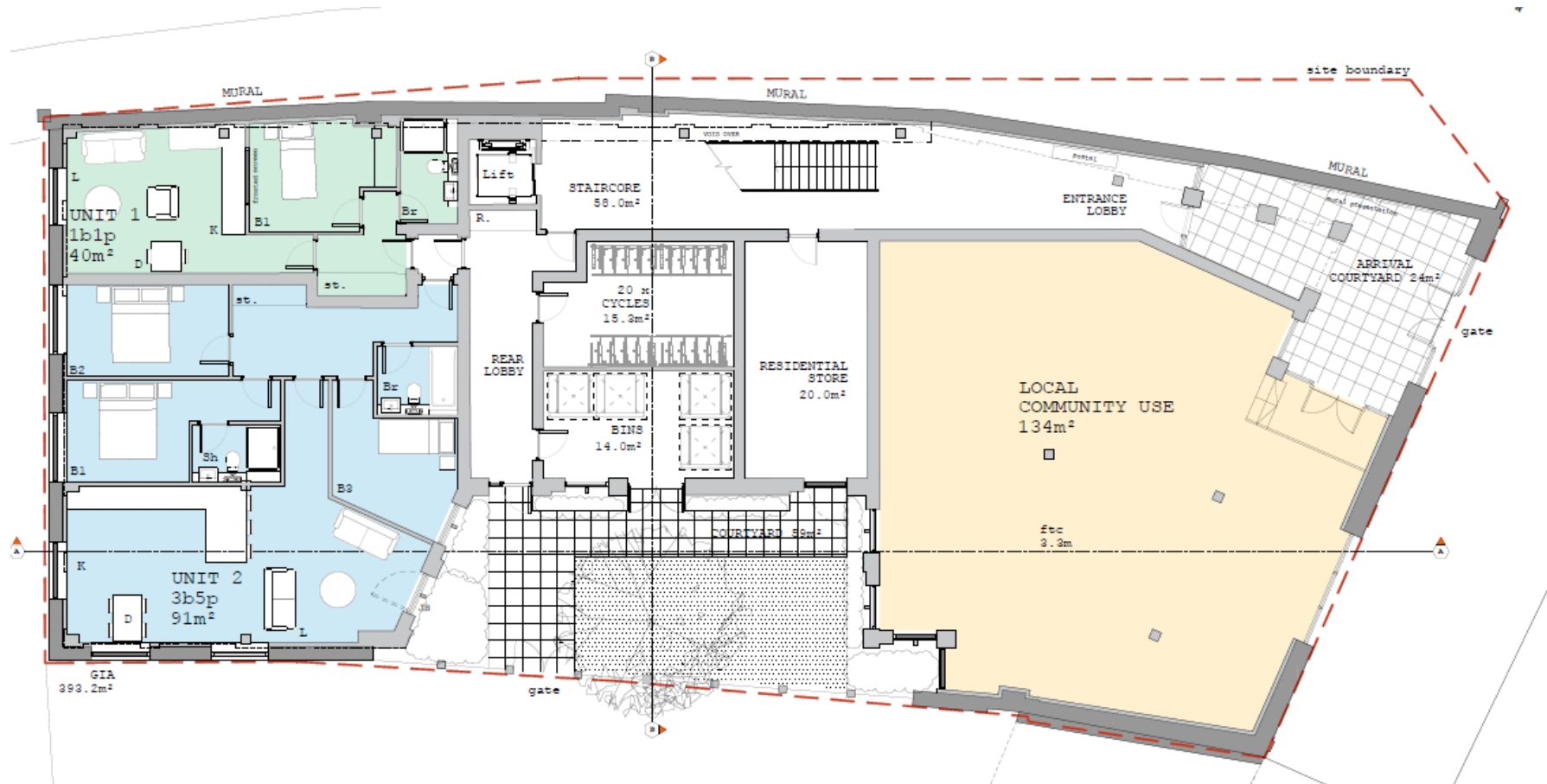


Figure 2.2: Proposed Ground Floor Layout

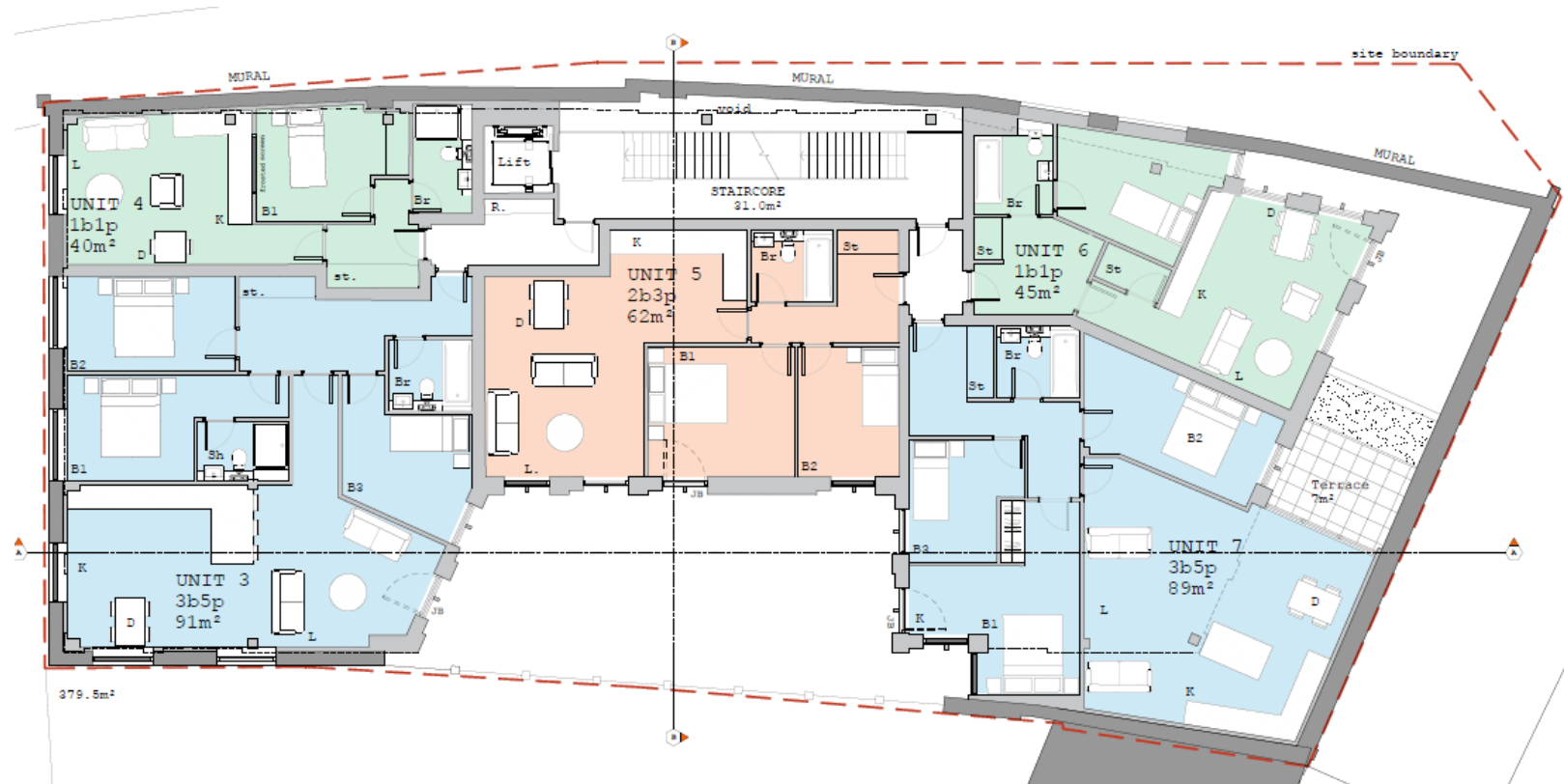


Figure 2.3: Proposed First Floor Layout

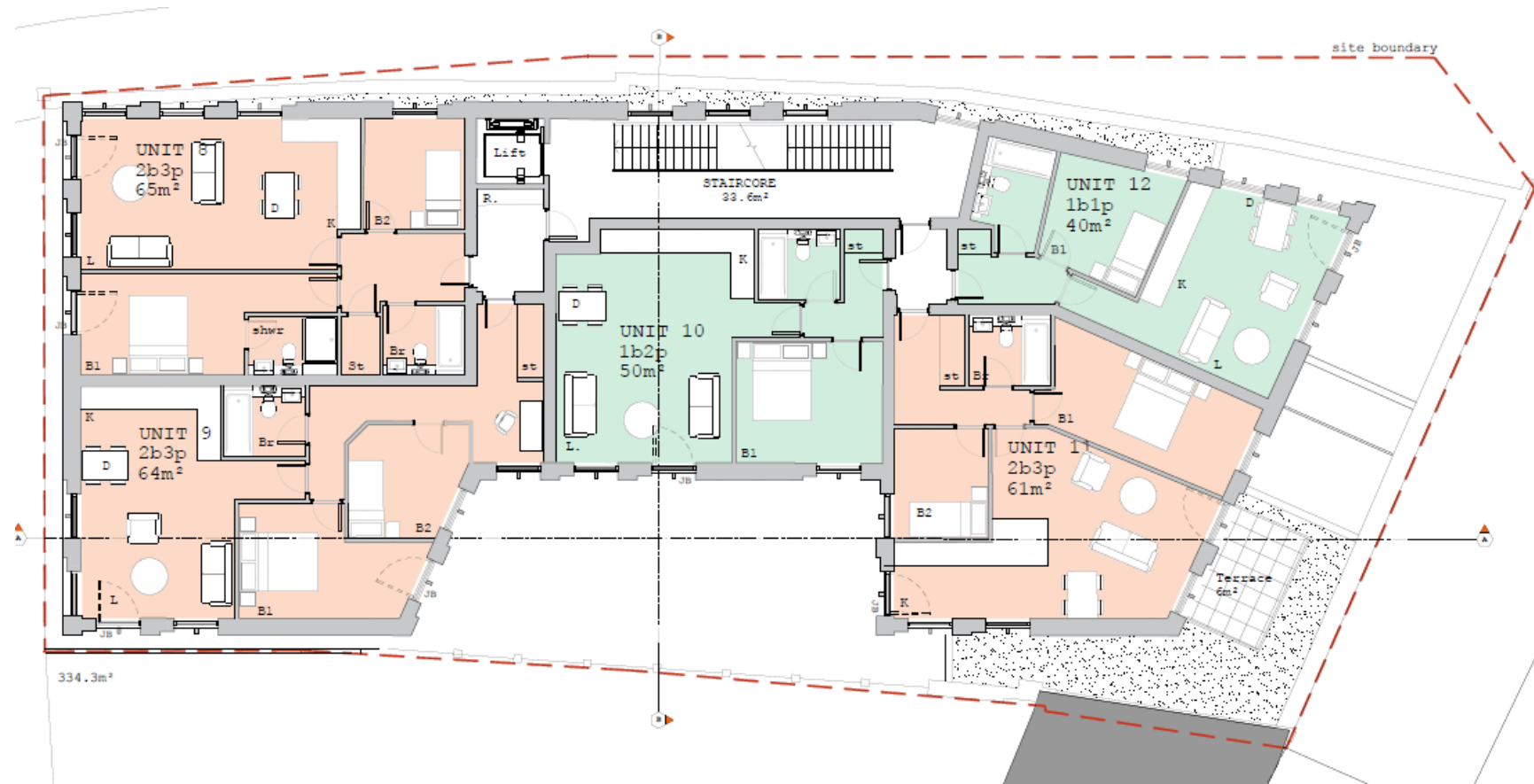


Figure 2.4: Proposed Second Floor Layout

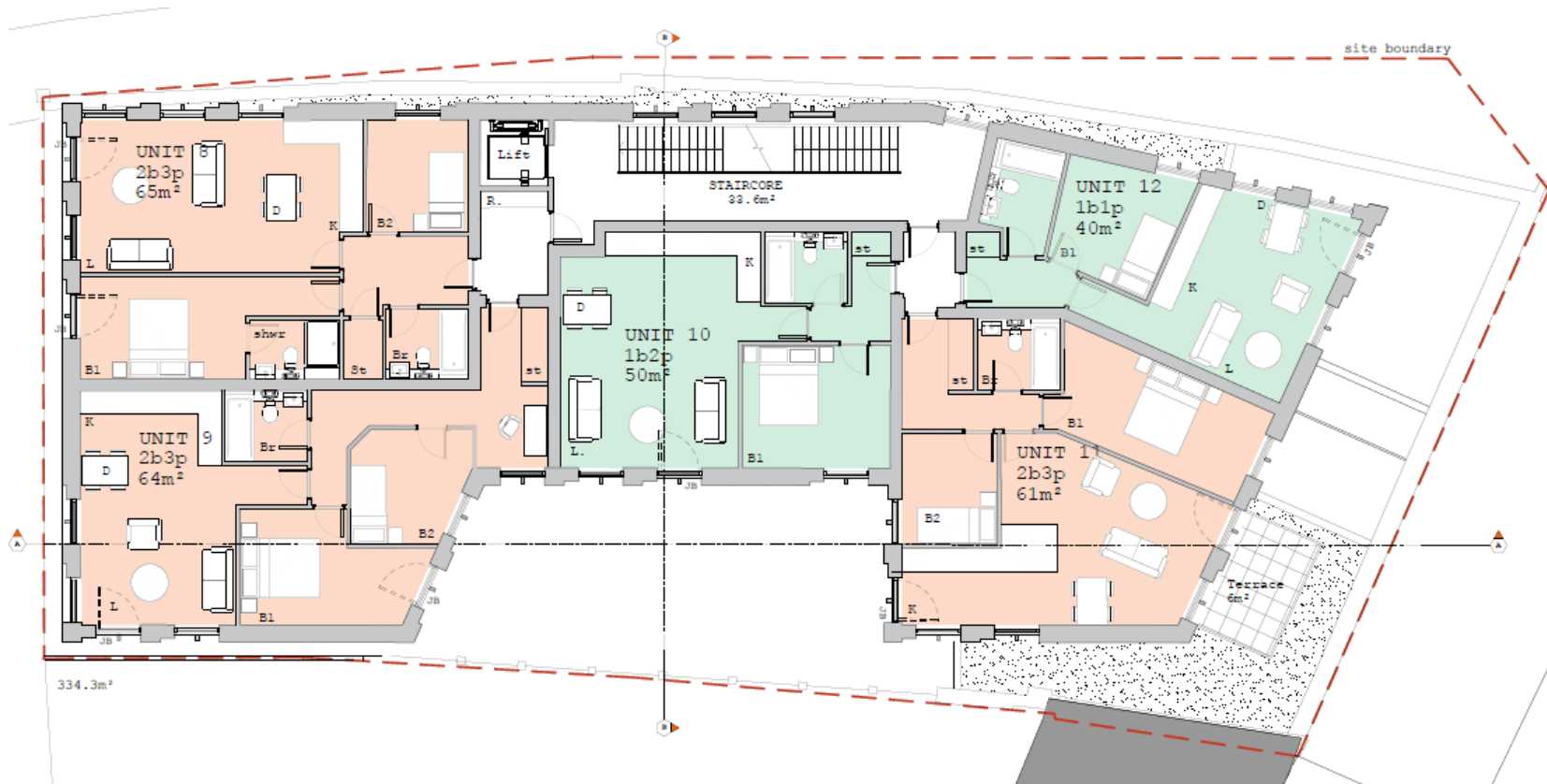


Figure 2.5: Proposed Third Floor Layout

3. Local Authority Requirements and Guidance Documents

3.1. Local Authority Requirements

As part of the consultation on the planning application for this scheme, the Environmental Health Department at Reading Borough Council have provided the following comments and proposed planning conditions in relation to internal sound insulation:

“Noise transfer within building (mixed use scheme)”

The submitted noise assessment did not include assessment of the potential impact of noise from the ground floor use to the floors above. This will need to be carried out. I recommend this is carried out prior to approval, but if it cannot be, then I recommend the following condition.

N24 NOISE MITIGATION SCHEME (INTERNAL) - MIXED USE (TO BE SUBMITTED)

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 ($D_{nt,w} + C_{tr}$) 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.

Thereafter, the development shall not be carried out other than fully in accordance with the approved scheme which shall be completed before any part of the accommodation hereby approved is first occupied and shall be retained and maintained as such at all times thereafter.

REASON: In order to safeguard the amenity of occupiers of the residential accommodation in accordance with Policies CC8 and EN16 of the Reading Borough Local Plan 2019.

Noise between residential properties – sound insulation of any building

Informative

To minimise the disturbance by noise of future residential occupiers of the flats and its effect on neighbouring residents, residential accommodation must be designed and constructed or converted so as to achieve the insulation requirements set out in Building Regulations Approved Document E. “

3.2. British Standard BS 8233:2014

BS 8233: *Sound Insulation and Noise Reduction for Buildings – Code of Practice* has a number of design criteria and limits for intrusive external noise. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and good listening conditions in other rooms and the most appropriate to the residential environment are reproduced in **Table 3.1**.

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

Table 3.1: Indoor Ambient Noise Levels for Dwellings

3.3. The Building Regulations Approved Document E “Resistance to the passage of sound” (ADE)

The requirements under Part E of Schedule 1 to the Building Regulations 2000 are from 1st July 2003 as follows:

‘E1. Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings.’

The minimum values for airborne and impact sound insulation for walls and floors between ‘dwelling-houses and flats’ that are ‘purpose built’ are provided in Table 0.1a of ADE and are reproduced in **Table 3.2** below.

	Partition Type	Airborne sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
Purpose built dwelling-houses and flats	Walls	45	-
	Floors and stairs	45	62

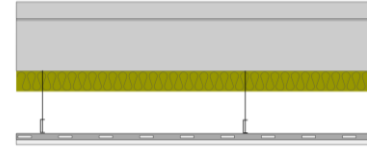
Table 3.2: Approved Document E Performance Standards

4. Proposed Constructions

4.1. Proposed Party Walls & Floors

The proposed internal wall and floor construction strategy have been advised to Syntegra by *Colony Architects*. Syntegra have determined appropriate wall and floor constructions based on this strategy. Several wall and floor types have been proposed and these are presented in **Table 4.1**.

The sound insulation properties of the proposed floors have been determined utilising the INSUL software programme and standard acoustic formulae.

Partition Reference	Plan of Partition	Description of Partition	$R_w [C_{tr}]$ (dB)	$L'_{n,w}$ (dB)
1: Separating Floor between Ground Floor Arts Centre and First Floor Residential		50mm screed over 100mm insulated layer with underfloor heating. 300mm concrete block (lightweight concrete density 1300 kg/m³ assumed as a worst-case assumption for modelling purposes). 200mm cavity with mineral wool type sound insulation (minimum 10 kg/m², but higher recommended). - Class D absorption ceiling tiles suspended on a light steel grid.	70 [-5]	[n/a]
2: Separating Floor between Residential Flats		50mm screed over resilient layer. 150mm concrete block (lightweight concrete density 1300 kg/m³ assumed as a worst-case assumption for modelling purposes). 200mm cavity with mineral wool type sound insulation (minimum 10 kg/m²). 1x15mm Soundblock plasterboard suspended on a light steel grid.	66 [-4]	60

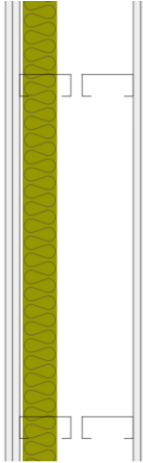
Partition Reference	Plan of Partition	Description of Partition	$R_w [C_{tr}]$ (dB)	$L'_{n,w}$ (dB)
3: Separating Wall between Residential Flats		- Double steel stud (total cavity width 200mm) with mineral wool type sound insulation (minimum 10 kg/m²). 2x12.5mm Soundblock plasterboard each side.	64 [-8]	n/a

Table 4.1: Sound Insulation Properties

4.2. Workmanship

It is important to note that, as with any construction project, the ability to meet the specification will rely upon the quality of the built structure. As such the works should be carried out to a high standard of workmanship to ensure that any sound insulation measures are not breached, for example by installing a rigid connection across an isolated connection (such as resilient bars). Additionally, any joints between different walls and the party wall and the ceiling/floor should be carefully filled with acoustic mastic.

5. Internal Noise Levels

5.1. Activity Noise Levels

In order to represent noise levels from the use of the Arts Centre, Syntegra have utilised data taken from previous noise measurements. The level takes into account a reasonable volume of music which would be expected as the normal highest levels of music in the relatively small Arts Centre. The activity noise levels that will be utilised for this assessment are summarised in **Table 5.1**.

Activity Noise Levels	Frequency (Hz)							Overall A-weighted L _{Aeq} (dB)
	63	125	250	500	1000	2000	4000	
Typical Music Noise Level (low-medium level amplified music), L _{eq} (dB)	73	73	67	73	73	65	59	76

Table 5.1: Activity Noise Levels

5.2. Predicted Noise Break-In Through Walls and Floors with Community Hall

Noise levels through the internal walls between the Community Hall and example rooms within residential flats above have been predicted utilising standard acoustic formulae. The derived noise levels are presented for the residential flats on the first floor in **Tables 5.2 to 5.4** respectively. **It can be identified that the requirements of the Local Authority will be readily achieved.**

First Floor Flats	Frequency (Hz)							Overall A-weighted L _{Aeq} (dB)
	63	125	250	500	1000	2000	4000	
Typical Music Noise Levels, L _{eq} (dB)	73	73	67	73	73	65	59	76
Floor Area, S (m ²)	13							
Volume of Receiver Room, V (m ³)	32							
Reverberation Time, R (s)	0.5							
Absorption Area, A (m ²) [calculated from Sabine's formula $A = 0.161 \times V/R$]	10.3							
SRI (dB)	42	54	58	66	74	83	91	70
Typical Predicted Residential Corridor Noise Level, L _{Aeq} (dB) ⁽¹⁾	32	20	10	8	0	-17	-31	11
Achievement of Local Authority/ BS 8233 criteria (30 dB L _{Aeq})	-	-	-	-	-	-	-	✓

Table 5.2: Predicted Noise Levels from Arts Centre to Unit 7 Bedroom 1

Note: (1) Calculated using the formula $L2 = L1 + 10\log_{10}(S/A) - SRI$

First Floor Flats	Frequency (Hz)							Overall A-weighted L _{Aeq} (dB)
	63	125	250	500	1000	2000	4000	
Typical Music Noise Levels, L _{eq} (dB)	73	73	67	73	73	65	59	76
Floor Area, S (m ²)	12							
Volume of Receiver Room, V (m ³)	28.8							
Reverberation Time, R (s)	0.5							
Absorption Area, A (m ²) [calculated from Sabine's formula $A = 0.161 \times V/R$]	9.3							
SRI (dB)	42	54	58	66	74	83	91	70
Typical Predicted Residential Corridor Noise Level, L _{Aeq} (dB) ⁽¹⁾	32	20	10	8	0	-17	-31	11
Achievement of Local Authority/ BS 8233 criteria (30 dB L _{Aeq})	-	-	-	-	-	-	-	✓

Table 5.3: Predicted Noise Levels from Arts Centre to Unit 7 Bedroom 2

Note: (1) Calculated using the formula $L_2 = L_1 + 10\log_{10}(S/A) - SRI$

First Floor Flats	Frequency (Hz)							Overall A-weighted L _{Aeq} (dB)
	63	125	250	500	1000	2000	4000	
Typical Music Noise Levels, L _{eq} (dB)	73	73	67	73	73	65	59	76
Floor Area, S (m ²)	38							
Volume of Receiver Room, V (m ³)	92							
Reverberation Time, R (s)	0.5							
Absorption Area, A (m ²) [calculated from Sabine's formula $A = 0.161 \times V/R$]	29.6							
SRI (dB)	42	54	58	66	74	83	91	70
Typical Predicted Residential Corridor Noise Level, L _{Aeq} (dB) ⁽¹⁾	32	20	10	8	0	-17	-31	11
Achievement of Local Authority/ BS 8233 criteria (30 dB L _{Aeq})	-	-	-	-	-	-	-	✓

Table 5.4: Predicted Noise Levels from Arts Centre to Unit 7 Living Room

Note: (1) Calculated using the formula $L_2 = L_1 + 10\log_{10}(S/A) - SRI$

6. Sound Insulation Assessment

The predicted sound insulation values have been calculated using standard acoustic formulae for example rooms across the proposed development is presented in **Tables 6.1** and **6.2**. The predicted sound insulation values are also compared against the assessment criteria provided in **Section 3**.

It can be identified from **Tables 6.1** and **6.2** that the proposed constructions should achieve the requirements of ADE and the Local Authority.

Source Room			Receiver Room			Element	Predicted $D_{nT,w} + C_{tr}$ (dB)	Achievement of Identified Criteria (Minimum 45 dB)	Predicted $L'_{nT,w}$ (dB)	Achievement of Identified Criteria (Maximum 62 dB)
Floor	Flat Number	Room	Floor	Flat Number	Room					
2	11	Bedroom 1	1	7	Bedroom 2	Floor	56	✓	55	✓
2	12	Living Room	1	6	Living Room	Floor	56	✓	56	✓
3	13	Bedroom 1	2	8	Bedroom 1	Floor	56	✓	54	✓
3	14	Living Room	2	9	Living Room	Floor	56	✓	57	✓
1	6	Living Room	1	7	Bedroom 2	Wall	50	✓	n/a	n/a
2	12	Living Room	2	11	Bedroom 1	Wall	50	✓	n/a	n/a
2	9	Living Room	2	8	Bedroom 1	Wall	50	✓	n/a	n/a
3	14	Living Room	3	13	Living Room	Wall	50	✓	n/a	n/a

Table 6.1: Sound Insulation Assessment – Residential

Source Room		Receiver Room			Element	Predicted $D_{nT,w} + C_{tr}$ (dB)	Achievement of Identified Criteria (Minimum 55 dB)
Floor	Room	Floor	Flat Number	Room			
G	Arts Centre	1	7	Bedroom 1	Floor 1	59	✓

Source Room		Receiver Room			Element	Predicted $D_{nT,w} + C_{tr}$ (dB)	Achievement of Identified Criteria (Minimum 55 dB)
Floor	Room	Floor	Flat Number	Room			
G	Arts Centre	1	7	Bedroom 2	Floor 1	59	✓
G	Arts Centre	1	7	Living Room	Floor 1	59	✓

Table 6.2: Sound Insulation Assessment – Arts Centre to Residential

7. Conclusion

A sound insulation assessment has been carried out in relation to the internal sound insulation at the **Central Club, 36-42 London Street, Reading**. The proposed scheme involves the erection of a 4-storey building with art centre at ground fronting London Street, 17 residential units and associated works.

The purpose of this sound insulation assessment has been to determine the effectiveness of the sound insulation provided by the currently proposed construction of the building in order to ensure that the future internal acoustic climate is acceptable.

The assessment has also shown that the internal sound insulation at the development should achieve the requirements of ADE and the Local Authority, subject to a high quality of workmanship.

It is important to note that, as with any construction project, the ability to meet the specification will rely upon the quality of the built structure. As such the works should be carried out to a high standard of workmanship to ensure that any sound insulation measures are not breached, for example by installing a rigid connection across an isolated connection (such as resilient bars). Additionally, any joints between different walls and the party wall and the ceiling/floor should be carefully filled with acoustic mastic.

8. Appendix 1: Glossary of Acoustic Terminology

Term	Description
'A'-Weighting	<i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
Frequency	<i>Frequency is related to sound pitch; frequency equals the ratio between velocity of sound and wavelength.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>
R_w	<i>Weighted sound reduction index, a single number quantity for the airborne sound insulation in buildings and of building elements such as wall, doors and windows. The quantity is intended for rating the airborne sound insulation and for simplifying the formulation of acoustical requirements in building codes, when measured in the presence of flanking sound transmission, denoted R'_w.</i>
D	<i>Arithmetic difference of the SPL between two spaces, for example room (a) and room (b)</i>
$D_{nT,w}$	<i>Weighted value of D, standardised to a constant reverberation time.</i>
C_{tr}	<i>The correction to a sound insulation quantity (such as $D_{nT,w}$) to take account of a specific sound spectra.</i>
$D_{nT,w} + C_{tr}$	<i>A single number quantity which characterises the airborne sound insulation between rooms using noise spectra No.2 as defined in BS EN ISO 717-1:1997</i>
L	<i>Average SPL measured in the receiver room when the floor under test is subject to a standardised impact sound source.</i>
$L'_{nT,w}$	<i>Weighted value of L, standardised to a constant reverberation time.</i>

9. Appendix 2: Professional Statement

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has over ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series. David manages the acoustic department and is responsible for maintaining Syntegra's ANC membership.