

Cannon Hall Museum

Stable Block New Museum Shop and Cafe

Barnsley Metropolitan Borough Council - Museum
Services

Project number: 60627297
AC/01

15th October 2020

Quality information

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1. Introduction

AECOM have been commissioned to undertake an assessment of potential noise impact from the proposed relocation of the museum shop and the introduction of a proposed café seating area into the 1st floor of the stable block building at the Cannon Hall Museum, Cawthorne, Barnsley.

The stable block directly adjoins the neighbouring residential property at 1st floor level and the planning authority have requested that the planning application be accompanied by a noise report that assesses the potential impact resulting from the proposed museum shop and additional café seating on the residential amenity of the adjoining property.

The intention of this report is to present the results of the acoustic testing undertaken and to assess the potential noise impact of the proposed relocation of the museum shop and café seating within the stable block 1st floor area.

A brief overview of acoustic perception and definitions of acoustic terminology used in the report is included in Appendix A.

2. Proposed Development

The proposed re-development includes for the existing museum shop, which is located within the main Cannon Hall building, to move into the 1st floor area of the stable block along with new overspill seating area for the main café that would be located on the ground floor of the stable block.

It is understood that the proposed operating hours of the shop and café would align with normal daytime working hours and would not operate during the late evening. It is also understood that there would be no amplified background music played within the shop or café.

The 1st floor of the stable block is currently used as an educational group space and is also used for occasional functions and weddings that include amplified music entertainment which can extend into the late evening. It is understood that, with the exception of these two uses, the space is not currently occupied for prolonged periods.

There is no separating wall at ground floor level due to the underpass to the stable courtyard. Elevations of the stable block and adjoining property are shown in Figure 1 and Figure 2.



Figure 1: Courtyard elevation of stable block building and adjoining residential property



Figure 2: Western elevation of stable block building and adjoining residential property

Once the new museum shop and café has been opened, the stable block would no longer be used for wedding receptions. The proposed layout plans of the ground and first floor of the stable block are shown in Appendix B.

3. Criteria and Noise Guidance

3.1 Approved Document E – Building Regulations 2010

Although compliance with Approved Document E¹ (ADE) would not apply in this case as the works do not constitute a material change of use as defined within the Building Regulations, the standards set out for sound insulation between dwellings are considered useful for comparative purposes. With regards to sound insulation between residential properties, Table 1 sets out the standards that would be required.

Table 1: Approved Document E performance standards (ref: Table 1a of ADE)

ADE classification	Separating Element	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	Wall	45	-
	Floors and stairs	45	62
Dwelling-houses and flats formed by material change of use	Wall	43	-
	Floors and stairs	43	64

Source: Table 1a, Section 0, ADE

In relation to adjacencies of a residential property and a non-domestic use, such as in this case, Section 0.8 of ADE also suggests that a higher standard than that listed in Table 1 may be appropriate. Section 0.8 of ADE states;

0.8 The performance standards set out in Tables 1a and 1b are appropriate for walls, floors and stairs that separate spaces used for normal domestic purposes. 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.

With regard to separating wall between the proposed museum shop / café overspill seating area and the residential property, were Building Regulations compliance applicable, an appropriate level of sound insulation could be considered to be a minimum 5 dB improvement on the standard ADE requirements for dwellings formed by material change of use (i.e. $D_{nT,w} + C_{tr} \geq 48$ dB and $L'_{nT,w} \leq 59$ dB).

3.2 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

In order to assess the potential impact of the proposed museum shop and café use of the stable block 1st floor area on the adjoining residential property, the guidance set out in BS 8233:2014² (BS 8233) has been adopted.

BS 8233 provides guidance on the control of steady external noise ingress to living rooms, dining rooms and bedrooms of dwellings. The recommended levels for daytime resting conditions are set out below in Table 2.

Table 2: BS 8233:2014 indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$

¹ The Building Regulations 2010, Approved Document E: Resistance to the passage of sound (2003 edition with 2004 and 2010 amendments), Office of the Deputy Prime Minister.

² BS 8233:2014 Guidance on sound insulation and noise reduction for buildings, British Standards Institution, 2014

Section 7.7.1 of BS 8233:2014 states;

“This subclause applies to external noise as it affects the internal acoustic environment from sources without a specific character, previously termed “anonymous noise”. Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions.”

and;

“NOTE Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate.”

As the residents of the adjoining residential property have previously complained about noise from the current use of the stable block, and have also raised concerns about potential noise issues from the new museum shop and café, it is considered appropriate to set lower noise limits than those in Table 2 for this assessment.

Based on the guidance, the following criterion is considered applicable to the development proposals. Sound from the museum shop and café seating area should not normally exceed the limits set out in Table 3 within the neighbouring property when operating at full capacity.

Table 3: Museum shop and café noise limits within adjacent residential property

Location	Time period	Criterion
Inside adjacent property	Daytime Operating Hours	25 dB $L_{Aeq,T}$

This limit is 10 dB below the daytime limit given in BS 8233 for resting conditions within a living room in order to account for the raised sensitivity of the residential property and account for the potential for sound from the 1st floor museum shop and café seating area to have some distinguishable or irregular acoustic feature sufficient enough to attract attention.

4. Acoustic Testing

4.1 Test Details

A series of acoustic tests were carried out at the property on the 16th July 2020.

The tests were carried out by Nicholas Barber who is a Principal Acoustic Consultant with AECOM, member of the institute of acoustics (MIOA) and has extensive experience in undertaking building acoustic testing. Nicholas is also a registered tester on the Association of Noise Consultants (ANC) pre-completion sound insulation testing scheme.

The tests included;

- One airborne sound insulation test on the separating wall between the 1st floor stable block and residential property study.
- One impact sound insulation test³ with the tapping machine placed on the 1st floor walking surface in the stable block and the impact sound pressure level measured in the horizontally adjacent 1st floor study room of the residential property.
- Measurement of general ambient noise levels within the stable block 1st floor area and the study of the residential property.
- Reverberation time of the 1st floor stable block hall and the study of the residential property.

All sound insulation tests were carried out in general accordance with Annex B of ADE and the procedures set out in BS EN ISO 140-4⁴ and BS EN ISO 140-7⁵, with results rated in full accordance with BS EN ISO 717-1⁶ and BS EN ISO 717-2⁷.

The test rooms were fully furnished as normal for their current use.

Background noise in the rooms during the testing was noted to predominantly comprise of vehicle movements associated with the museum and farm café car parks and voices of visitors to the respective facilities.

Details of all the equipment used for the acoustic testing is provided in Appendix B.

It was not considered necessary to undertake vibration measurements as part of the testing regime. Given that the proposed use of the space directly adjoining the neighbouring residential property is a shop and café seating area (rather than its previous use which included occasional weddings and other similar functions) it is considered that the airborne and impact sound insulation testing which has been carried out is sufficient to assess the potential for disturbance to the neighbouring property.

³ Impact sound insulation requirements in ADE only apply to separating floors and not walls, and impact sound insulation tests are normally only carried out on separating floors. In this case the test has been carried out for indicative purposes.

⁴ BS EN ISO 140-4 'Acoustics – Measurement of sound insulation in buildings and of building elements', Part 4, 'Field measurements of airborne sound insulation between rooms', British Standards Institute, 1998.

⁵ BS EN ISO 140-7 'Acoustics – Measurement of sound insulation in buildings and of building elements', Part 7, 'Field measurements of impact sound insulation of floors', British Standards Institute, 1998.

⁶ BS EN ISO 717-1 'Acoustics – Rating of sound insulation of buildings and of building elements', Part 1, 'Airborne sound insulation', British Standards Institute, 1997.

⁷ BS EN ISO 717-2 'Acoustics – Rating of sound insulation of buildings and of building elements', Part 2, 'Impact sound insulation', British Standards Institute, 1997.

4.2 Test Results

4.2.1 Airborne Sound Insulation

The direction of the airborne sound insulation test was as shown in Table 4.

Table 4: Wall airborne sound insulation test arrangement

Source Room	Approx. Room Vol. (m ³)	Receive Room	Approx. Room Vol. (m ³)	Wall surface area (m ²)
1 st floor stable block hall	200	Study, residential property	22	7

The results of the sound insulation test are presented in Table 5. The chart showing the full test results in provided in Appendix D.

Table 5: Measured sound level difference

D_w * dB	$D_w + C_{tr}$ dB	Level Difference (D), dB @ octave band centre frequency						
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
52	41	25	26	44	50	57	63	70

*As the receive room was fully furnished, the weighted level difference (D_w) value has been used to represent the in-situ level of sound insulation between the two spaces. In this case the D_w value can be directly compared to the ADE $D_{nT,w}$ criterion.

It can be seen that, when compared to ADE criterion (section 3.1), the measured airborne sound insulation level of 41 dB $D_w + C_{tr}$ would fail to meet the minimum requirements for a dwelling formed by material change of use by 2 dB. When compared to the recommended enhanced level of sound insulation, as discussed in section 3.1, for an adjacency with a non-domestic use, the measured level would fall short by 7 dB.

It is, however, re-iterated that compliance with ADE is not applicable in this case as the works do not constitute a material change of use with respect to Building Regulations.

Subjective perception of audible sound transfer during the test was that the dominant sound path was direct sound transmission through the wall construction with little sound transferring via the external wall. However, it should be noted that, due to the high ceiling, listening tests close to the ceiling and wall junction could not be undertaken.

4.2.2 Impact Sound Insulation

The result of the impact sound insulation test is detailed in Table 6.

Table 6: Impact sound insulation result

Source Room	Receive Room	Result $L'_{nT,w}$ dB
1 st floor stable block hall	Study, residential property	44

The chart showing the full test result is provided in Appendix D.

It can be seen that, when compared to ADE, the measured impact sound insulation of 44 dB $L'_{nT,w}$ would pass the minimum requirements for a dwelling formed by material change of use and also the enhanced recommendation as discussed in section 3.1. It is noted however that the impact sound insulation requirements in ADE only strictly apply to separating floors and not walls. In this case the test has been carried out for indicative purposes and to aid with assessing potential structure borne noise from one side of the separating wall to the other.

Subjective perception of audible sound transfer during the test was that the dominant sound path was airborne through the wall construction with minimal sound being perceived through the structure. However, it should be noted that, due to the high ceiling, listening tests close to the ceiling and wall junction could not be undertaken.

4.2.3 Indoor Ambient Sound Levels

The measured indoor ambient sound level within both the test rooms when unoccupied are presented in Table 7.

Table 7: Indoor ambient sound levels

Test Room	Ambient Sound Level $L_{Aeq,T}$ dB	Audible sound
1 st floor stable block	28	Vehicle movements associated with the museum and farm café car parks and voices of visitors
Residential property study	27	Fridge unit in the corner of the room

The measured ambient sound level in both rooms when unoccupied is relatively low when compared to the recommended daytime upper limit of 35 dB $L_{Aeq,T}$ for living rooms set out in BS 8233.

4.2.4 Reverberation Time Measurements

The measured reverberation times (average of results in 50 Hz – 5 kHz bands) are presented in Table 8.

Table 8: Measured reverberation time

Test Room	Reverberation time, seconds (50 Hz – 5 kHz)
1 st Floor Stable Block	1.0
Study, residential property	0.2

5. Noise Assessment

5.1 Prediction of Sound Transfer

5.1.1 Typical Sound Levels in Museum Shop and Cafe

As the inside of the Cannon Hall museum was not open to visitors at the time of the tests, it was not possible to measure typical sound levels inside the existing museum shop. On an initial site walk over on Monday 10th February at 13:30 hours (prior to Covid 19 related restrictions), the existing museum shop was noted to be subjectively quiet with few customers. The new shop location will include overspill seating for the café towards the back of the hall on the opposite side of the room to the separating wall with the residential property. The proposed layout of the ground and first floor of the stable block is shown in Appendix B.

In order to undertake a reasonable worst-case assessment of likely sound transfer, reverberant sound levels measured within a busy restaurant environment have been selected from the AECOM database. The typical reverberant ambient sound levels in Table 9 have been used to represent what might occur within the shop area during peak times.

Table 9. Museum shop and café overspill seating area representative reverberant sound pressure levels

Sound Level Descriptor	Overall A-weighted level dB	Sound pressure level, dB @ octave band centre frequency						
		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
$L_{eq,T}$	76	74	73	72	76	69	67	65

Source: AECOM

5.1.2 Predicted Sound Transfer

Based on the measured level of airborne sound insulation between the two spaces (Table 5) and the representative sound levels in the museum shop (Table 9), the calculated sound level in the adjacent study is given in Table 10.

Table 10: Calculated museum shop sound level within study room

	Descriptor	Overall A-weighted level dB	Sound pressure level, dB @ octave band centre frequency						
			63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
[A] Reverberant sound level in museum shop	$L_{eq,T}$	76	74	73	72	76	69	67	65
[B] Sound Insulation Level Difference	D	-	25	26	44	50	57	63	70
[A – B] Reverberant Sound Level in residential property	$L_{eq,T}$	32	49	47	28	26	12	4	-5

5.2 Assessment of Sound Transfer

A comparison of the calculated sound transfer against the assessment criteria is presented Table 11.

Table 11: Comparison against assessment criteria

	$L_{Aeq,T}$ dB
Museum shop sound level in residential property study	32
Proposed assessment criterion (Table 3)	≤ 25
Excess over criteria	+ 7

Table 11 shows that the calculated level of sound from the museum shop and overspill seating exceeds the proposed assessment criterion by 7 dB.

When compared to the existing measured ambient sound level of 27 dB $L_{Aeq,T}$ from Table 7, the calculated level is 5 dB higher which indicates that during busy periods sound from within the proposed museum shop and overspill cafe seating area would be clearly audible in the adjoining rooms of the residential property. It is also likely that speech would be audible though may not be intelligible.

In conclusion, the assessment indicates a potential for adverse impact on the amenity of the adjoining residential property as a result of the museum shop and café seating use during busy periods.

It is therefore recommended that remedial measures are incorporated into the proposed works to improve the level of sound insulation of the separating wall to meet the assessment criterion in the adjoining residential property. Advice on how the required minimum level of additional sound insulation could be achieved is discussed in the following sections.

6. Recommendations for Remedial Treatment

6.1 Existing Structure

The existing wall construction is understood to consist of 100mm thick brick with a wet plaster finish to the museum side. On the residential property side the wall is finished with a layer of plasterboard that is dissected in sections by exposed timber beams. Whether there is a cavity between the brick and plasterboard is currently unknown. A picture of the separating wall is included in Appendix E.

The inner lining of the external wall appeared to be plastered masonry.

The composition of the junction of the separating wall with the external wall and pitched ceiling is currently unknown, although it is thought that the inner brick lining of the external wall is likely to be continuous as part of the original stable construction.

The pitched ceiling layer which is formed in between the timber roof beams is not continuous between the properties, however, the timber roof beams do appear to be continuous through the wall construction.

It was not possible to ascertain whether the main timber floor beams were continuous between the properties, although the stable block 1st floor and the residential property floor appeared to be at different levels which suggests there are no continuous or shared floor joists. It is understood that the floor cavity contains some form of insulation which was installed for thermal reasons.

6.2 Separating Wall Remedial Treatment

Based on the current understanding of the existing structure it is recommended that the separating wall is improved by installation of an independent plasterboard lining to the museum side of the wall, comprising 2 no. layers of 15mm thick acoustic dense plasterboard (min. 12.5 kg/m² per layer) fixed to a metal or timber stud to form a minimum 100mm cavity with 50mm mineral wool insulation within the cavity.

The plasterboard independent lining should be formed against the entire wall area from structural floor level up to ceiling level and sealed around the entire perimeter with proprietary acoustic sealant. The general arrangement would be as shown in Figure 3.

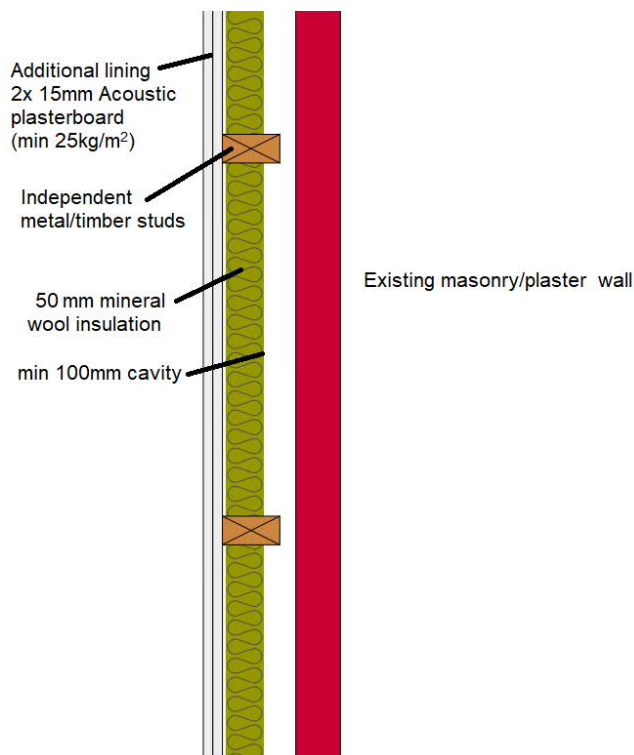


Figure 3: Separating wall remedial treatment general arrangement

This treatment is likely to mean that that existing varnished timber box/display frame (as seen in Appendix E) will need to be removed and the new lining will need to be formed around whatever structure is being enclosed by this frame. Should there be any gaps or openings within the existing masonry wall behind the display frame these will need to be made good prior to installation of the new independent lining.

It is recommended to infill the floor void between the joists underneath the line of the new independent lining with dense mineral wool or rockwool batts in order to minimise sound transfer through the open gaps between the existing floorboards into the newly formed cavity behind the new lining boards.

6.3 Flanking Sound Detailing

Sound can pass from one space to another through the structure of a building. The overall sound insulation between two spaces depends both on a suitable separating wall construction as well as adequate flanking construction details. In this case the parts of a structure that will be responsible for flanking sound transmission are roof/ceiling elements, external wall inner linings and any continuous floor structure.

6.3.1 Ceiling/roof flanking remedial treatment

From visual inspection of this junction it was not clear if there was a significant void behind the ceilings of the two rooms which may be allowing flanking sound transmission. There are exposed timber roof beams on the residential side that are forming part of the separating wall junction.

As part of the wall lining installation works it is recommended to open up a small area of ceiling layer close to the existing separating wall to examine if there is a clear cavity within the roof void, where this is found to be the case it is recommended that the void is filled with dense mineral wool or rockwool batts to form a cavity closer which should be then sealed with proprietary acoustic sealant to the surrounding structure.

The large timber roof beams that penetrate through the wall construction are not considered to be transferring significant flanking sound and therefore we would not recommend any specific remedial treatment to these at this stage.

6.3.2 External wall inner lining

The external wall inner lining is thought to be a plastered masonry which runs continuously between the two rooms. It is also thought that this inner lining ties into the masonry of the separating wall. At this stage, given that the subjective listening test concluded that there was no significant flanking sound via this path, no remedial treatment is considered necessary.

6.3.3 Floor void

From visual inspection of this junction it was not clear if there were any open voids between the stable block 1st floor and the residential property timber floor which might be allowing significant flanking sound transmission.

It is expected that the existing masonry of the separating wall is supported off the structural masonry wall that extends up from the ground floor that forms the gable wall of the stable block which means it is unlikely that there is any open voids between the two floor structures.

In order to ensure this is the case, as part of the wall lining installation works, it is recommended to open the floorboards next to the existing separating wall to examine if there is a clear cavity through to the floor void of the residential property. Where this is found to be the case it is recommended that the void is in-filled with masonry and mortar if possible or, if this is not possible, dense mineral wool or rockwool batts to form a cavity closer which should be then sealed with proprietary acoustic sealant to the surrounding structure.

6.4 Impact Sound Discussion

The impact sound insulation result (Table 6) was found to pass the standard that would be expected from ADE. Subjective perception of audible sound transfer during the test was that the dominant sound path was airborne sound through the wall construction with minimal sound being perceived through the structure. Therefore, at this stage there would be no remedial treatment considered necessary to control impact sound associated with footfall from patrons and staff within the new museum shop and overspill seating.

It is noted that the impact test undertaken does not test for other sources of impact sound such as chair scraping or door slams etc. Such sources could only be assessed once the development works are completed.

Should chair scraping within the overspill seating areas become an issue, simple effective remedial treatments would include laying carpet within the seating area or soft felt pads on the feet of chairs and tables.

Impact sound from doors closing can be treated by installing soft door closers.

7. Conclusions

AECOM have been commissioned to undertake an assessment of potential noise impact from the proposed relocation of the museum shop and introduction of café overspill seating into the 1st floor of the stable block building at the Cannon Hall Museum, Cawthorne, Barnsley.

A series of acoustic tests have been undertaken to measure the current level of sound insulation between the 1st floor of the stable block and the adjoining residential property. Ancillary acoustic tests of ambient background sound level and reverberation times have also been undertaken.

Based on the results of acoustic testing on site and in the absence of any remedial measures, it is predicted that the operation of the proposed museum shop and overspill seating area during busy periods is likely to result in an adverse noise impact on the residential amenity of the adjacent property.

Detailed information on proposed remedial treatments to reduce the predicted level of sound transfer and future impact on residents have been recommended. These include treatments on both the separating wall construction and flanking constructions.

Appendix A : Perception and Acoustic Terminology

General

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascals, Pa). Because of this wide range, a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB. The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A-weighting' and annotated as dB(A). The table below lists the sound pressure level in dB(A) for common situations.

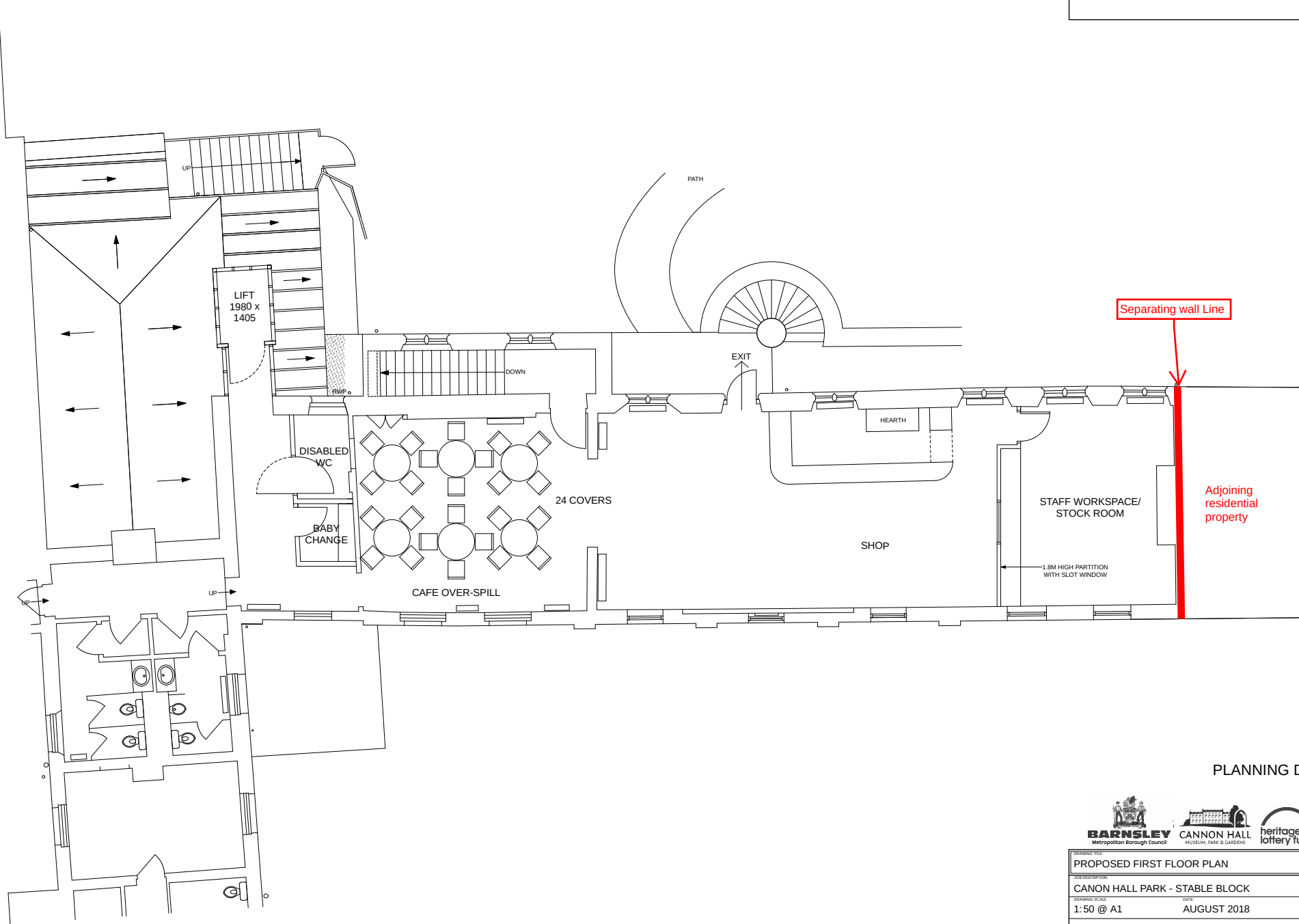
Approximate Sound Pressure Level dB(A)	Example
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery, boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m, vacuum cleaner at 3m
80	General factory noise level
100	Pneumatic drill at 5m
120	Discotheque – 1m in front of loudspeaker
140	Threshold of pain

Definitions of specific terminology that may be used in this report are listed below.

Airborne Sound Insulation	Sound insulation that reduces transmission of airborne sound such as spoken voice, speakers, instruments, etc. between buildings or parts of buildings.
Impact Sound Insulation	Sound insulation that reduces transmission of impact induced structure borne noise such as that from footfall, weights hitting the floor, door slams, etc. on a floor into the room directly below.
$D_{nT,w}$	The Weighted Standardised Level Difference is a single number quantity which characterises the in-situ airborne sound insulation between rooms, adjusted to a reference reverberation time to represent the finished and furnished room conditions. It is measured in accordance with BS EN ISO 140 part 4 or BS EN ISO 16283-1:2014 and rated in accordance with BS EN ISO 717-1:2013.
D_w	The Weighted Level Difference is a single number quantity which characterises the in-situ airborne sound insulation between rooms. It is measured in accordance with BS EN ISO 140 part 4 or BS EN ISO 16283-1:2014 and rated in accordance with BS EN ISO 717-1:2013.
R_w	Single number quantity which characterises the airborne sound insulating properties of a material or building element as measured within a laboratory in accordance with BS EN ISO 10140-2:2010. Typically used to specify the sound insulation properties of materials such as partitions or windows for the manufacturer or designer to match with a performance requirement specification.
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level is a single number quantity, which characterises the in-situ impact sound insulation between two rooms separated by a separating floor. It is measured in accordance with BS EN ISO 140 part 7 or BS EN ISO 16283-2:2015 and rated in accordance with BS EN ISO 717-2:2013.
ΔL_w	Weighted reduction of Impact Sound Pressure Level is a single number quantity, of the difference between the weighted normalised impact sound pressure levels of a reference floor with and without a floor covering. This parameter is typically used to define the level of improvement a floor covering has on the impact sound insulation of standard timber and concrete floor constructions.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level determined over a time interval T . Typically used as the standard measurement parameter for the assessment of environmental noise and occupational noise exposure.

Appendix B : Proposed Floor Plans

REVISION	DATE	DESCRIPTION



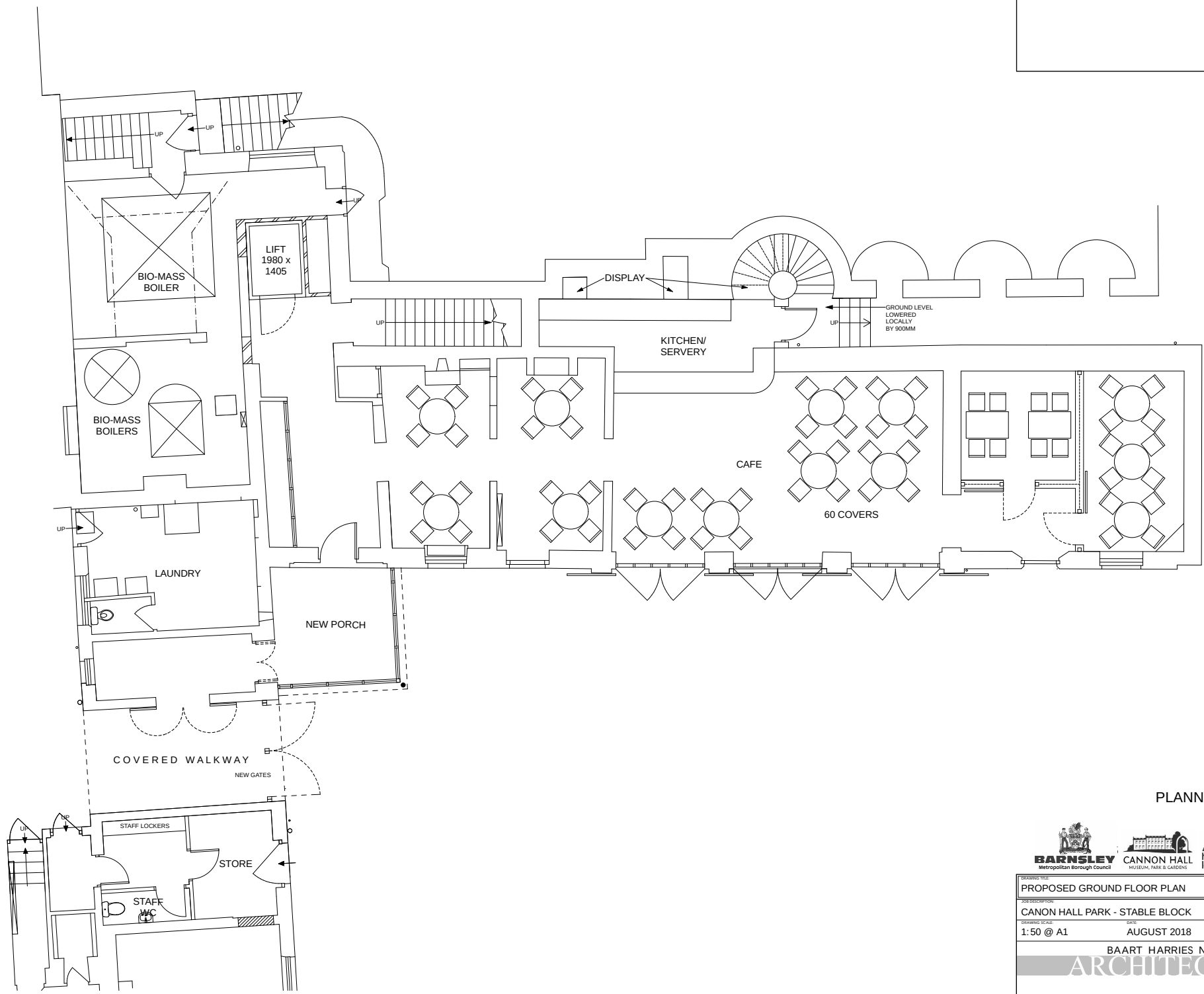
PLANNING DRAWINGS






PROPOSING TITLE PROPOSED FIRST FLOOR PLAN		
JOB DESCRIPTION CANON HALL PARK - STABLE BLOCK		
DRAWING SCALE 1:50 @ A1	DATE AUGUST 2018	FORMER REF 2645.07
ARCHITECTS BAART HARRIES NEWALL ARCHITECTS		
3 WILDERMORE HOUSE PODCHET LANE BELL BUSBY JANESBURGH S10 1TL TEL: 0114 265 9944 FAX: 0114 265 9944 WWW.BHARCHITECTS.CO.UK		

REVISION	DATE	DESCRIPTION



Court yard
vehicle
access.

PLANNING DRAWINGS



PROPOSED GROUND FLOOR PLAN		
CANON HALL PARK - STABLE BLOCK		
DRAWING SCALE 1:50 @ A1	DATE AUGUST 2018	REVISION REF 2645.06
BAART HARRIES NEWALL ARCHITECTS		
3 WILDERMORE HOUSE PODWINTRY GARDENS BELL BUSBY JANESBURGH CV3 9TL TEL: 0121 35 56564 FAX: 0121 35 56564 WWW.BAARTHARRIES.CO.UK		

Appendix C : Equipment Calibration Details

Details of all the equipment used for the acoustic testing is provided in Table 12.

Table 12: Equipment used for acoustic testing

Description	Manufacturer	Model	Serial No.	Date of Calibration	Calibration Certificate	Calibration Expiration
Sound Level Analyser	Norsonic	140	1403883	03/03/2020	UCRT20/1264	03/03/2022
Microphone	Norsonic	1225	142426	03/03/2020	UCRT20/1264	03/03/2022
Pre-amp	Norsonic	1209	13113	03/03/2020	UCRT20/1264	03/03/2022
Loudspeaker	Mackie	SRM350	n/a	n/a	n/a	n/a
Noise Generator	NTi	MR-Pro	n/a	n/a	n/a	n/a
Tapping Machine	Norsonic	211A	29729	17/06/2019	UCRT19/1698	17/06/2021
Sound Level Calibrator	Brueel & Kjaer	4231	2656635	21/01/2020	UCRT20/1080	21/01/2021

Appendix D : Sound Insulation Test Charts

Client: *Cannon Hall Museum*

Site Address: *Cannon Hall Museum*

Tester: *Nicholas Barber*

Test Date: *16/07/20*

Test Number: *60627297 / 1*

Test Element: *Separating Wall*

Description: *The existing wall construction is understood to consist of 100mm thick brick with a wet plaster finish to the museum side. On the residential property side the wall is finished with a layer of plasterboard that is dissected in sections by exposed timber beams. The cavity depth is unknown.*

Source room volume: *180.0 m³*

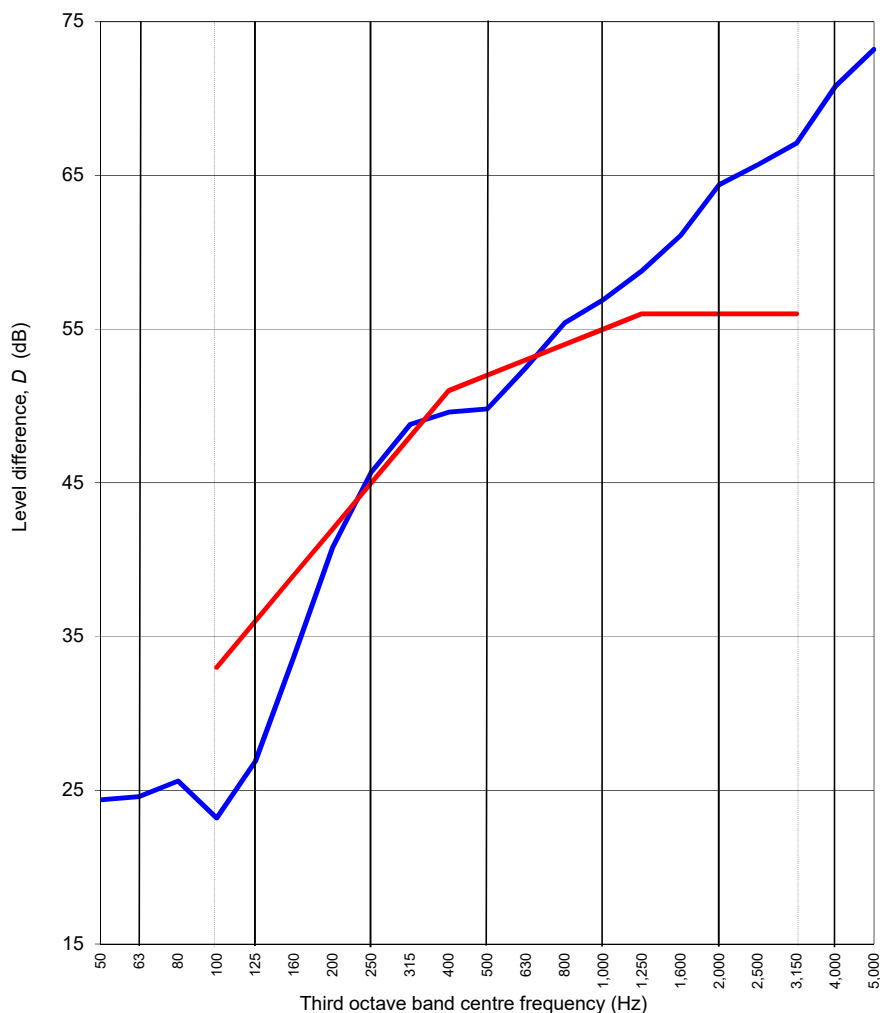
Receive room volume: *22.2 m³*

Area of test element: *7.0 m²*

Source room reference: *Cannon Hall Stables Hall*

Receiver room reference: *Residential Property Study*

Frequency (Hz)	<i>D</i> One-third octave (dB)
50	≥ 24.4
63	24.6
80	25.6
100	23.2
125	26.9
160	33.7
200	40.8
250	45.7
315	48.8
400	49.6
500	49.8
630	52.5
800	55.4
1,000	56.9
1,250	58.8
1,600	61.1
2,000	64.4
2,500	65.7
3,150	67.1
4,000	70.8
5,000	≥ 73.2



Rating according to BS EN ISO 717-1 :

$D_w (C; C_{tr}) = 52 (-4; -11) \text{ dB}$

$D_w = 52 \text{ dB}$

$C_{50-3150} = -5 \text{ dB}$

$C_{tr,50-3150} = -13 \text{ dB}$

$C_{50-5000} = -4 \text{ dB}$

$C_{tr,50-5000} = -13 \text{ dB}$

$C_{100-5000} = -3 \text{ dB}$

$C_{tr,100-5000} = -11 \text{ dB}$

Evaluation based on field measurement results obtained by an engineering method

Date: *21/08/20*

Signature: *[Signature]*

Based on the data provided in ISO 140-2 it is estimated that the measurement uncertainty shall not exceed $\pm 1 \text{ dB}$ for the single figure ratings

$(D_{nT,w}, R'_{w}, L'_{nT,w})$ and shall not exceed the values in Table A1 of ISO 140-2 for the data in the individual third octaves (D_{nT}, R', L'_{nT})

Client: Cannon Hall Museum

Site Address: Cannon Hall Museum

Tester: Nicholas Barber

Test Date: 16/07/20

Test Number: 60627297 / 2

Test Element: Separating Wall

Description: The existing wall construction is understood to consist of 100mm thick brick with a wet plaster finish to the museum side. On the residential property side the wall is finished with a layer of plasterboard that is dissected in sections by exposed timber beams. The cavity depth is unknown.
The floor finish was exposed timber floor board laid direct onto the existing timber joists which spanned between the main timber floor beams.

Source room volume: 180.0 m³

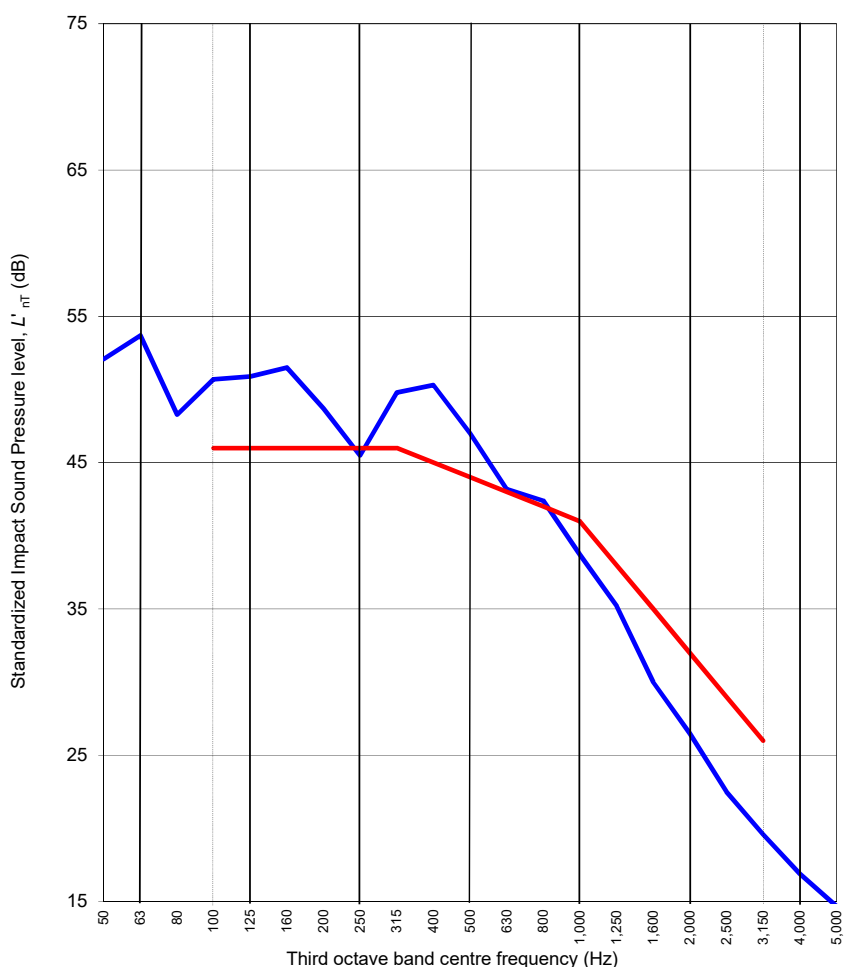
Receive room volume: 22.2 m³

Area of test element: 7.0 m²

Source room reference: Cannon Hall Stables Hall

Receiver room reference: Residential Property Study

Frequency (Hz)	L'_{nT} One-third octave (dB)
50	≤ 52.1
63	53.7
80	48.3
100	50.7
125	50.9
160	51.5
200	48.7
250	45.5
315	49.8
400	50.3
500	47.0
630	43.2
800	42.4
1,000	38.7
1,250	35.2
1,600	30.0
2,000	26.5
2,500	22.5
3,150	≤ 19.6
4,000	≤ 16.9
5,000	≤ 14.7



Rating according to BS EN ISO 717-2 :

$L'_{nT,w}$ = 44 dB

Evaluation based on field measurement results obtained by an engineering method

Date: 21/08/20

Signature:

Based on the data provided in ISO 140-2 it is estimated that the measurement uncertainty shall not exceed ± 1 dB for the single figure ratings

($D_{nT,w}$, R'_{wT} , $L'_{nT,w}$) and shall not exceed the values in Table A1 of ISO 140-2 for the data in the individual third octaves (D_{nT} , R'_T , L'_{nT})

Appendix E : Separating wall from museum side



