The Winchester
206 Archway Road
Highgate
N6 5BA

Sound Insulation Test Report (2)

On behalf of

Mulberry One Capital Ltd

Project Reference: 89965 | Revision: -- | Date: 5th October 2021

T: 01252 519881
W: noisesolutions.co.uk
E: hello@noisesolutions.co.uk
Noise Solutions Ltd Unit 5 Oriel Court, Omega Park, Alton, Hampshire GU34 2YT Reg no. 3483481

Document Information

Project Name	:	**The Winchester**
Project Reference	:	**89965**
Report Title	:	**Sound insulation test report**
Doc Reference	:	**89965/SIT2**
Date	:	**5th October 2021**

	Name	Qualifications	Initials	Date
Prepared by:	Aiden Quinn	BA(Hons), AMIOA	AQ	5th October 2021
Reviewed and approved by:	Dean Bowden	BSc(Hons), MIOA	DMB	6th October 2021
For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

Reg no. 3483481 Trading office Unit 5 Oriel Court, Omega Park, Alton Hampshire GU34 2YT

Contents

Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Mulberry One Capital Ltd to undertake airborne and impact sound insulation testing between the Winchester public house along Archway Road and the adjoining residential properties located above and below.

1.2. Works have recently been completed to improve the sound insulation between the public house (which is being renovated) and the adjoining residential premises. Sound insulation testing was required to determine whether the sound insulation of the separating walls, floors and ceilings has met the project design criteria.

1.3. This report contains details of the sound insulation tests conducted and the results achieved.

1.4. A glossary of acoustic terminology is given in **Appendix A**.

2.0 Site details

2.1. The Winchester public house occupies part of the ground floor and basement of a mainly residential building. The rear function room has residential properties above and below. At ground floor level the function room adjoins a communal corridor in the residential part of the building. The main public house area at ground floor adjoins one flat at ground floor level and three above. The public house basement is adjoined to one flat at basement level.

3.0 Assessment criteria

Building Regulations Approved Document E

3.1. The 2003 Edition (incorporating 2004, 2010, 2013 and 2015 amendments) of the Building Regulations 2010 gives minimum standards for airborne and impact sound insulation between dwellings, and between dwellings and other occupancies, and are primarily aimed at controlling domestic noise transfer.

3.2. The residential dwellings within the Winchester building have been formed by a material change of use. Therefore, under the requirements of Approved Document E, the airborne sound insulation of a separating wall must be at least 43dB $D_{nT,w}+C_{tr}$, the airborne sound insulation of a separating floor must be at least 43dB $D_{nT,w}+C_{tr}$ and the impact sound insulation of a separating floor must be no more than 64dB $L'_{nT,w}$.

3.3. Approved Document E of the Building Regulations contains the following regarding non-domestic uses:

"0.8 The performance standards set out in Tables 1 a and 1 b 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."

BS 8233:2014

3.4. The minimum standards in the Building Regulations may not be sufficient to control noise, if the noise levels in the non-residential premises may be higher than would usually be expected for a dwelling. Guidance is therefore sought from BS 8233:2014 – *'Guidance on sound insulation and noise reduction for buildings'*.

3.5. Section 7.5 '*Internal Sound Insulation*' of BS 8233: 2014, states the following:

"... sound from adjacent spaces can affect the intended use, depending on the noise activity, noise sensitivity and privacy requirement. A matrix may be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space. An example matrix, which can be adapted according to the specific building use, is given in Table 3. Each room may be both a source and a receiving room. Where adjacent rooms have different uses, the worst case sound insulation should be specified.'

Table 3 **Example on-site sound insulation matrix (dB $D_{nT,w}$)**

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 [A)]
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

*NOTE Background noise can also influence privacy. See also **7.7.6.3**.*

[A)] $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

3.6. There is an element of professional judgement required with regard to the acoustic categorization of each space.

3.7. As a worst case, the function room could be considered as a space which is not private and with an activity noise level between the "high" and "very high" categories. The residential properties above can be considered as spaces with a high level of sensitivity.

3.8. Based on these considerations, the sound insulation of the partition separating these spaces should not be lower than 57dB $D_{nT,w}$ based on the matrix table in BS 8233:2014.

3.9. This requirement is in addition to the criterion in Building Regulations.

4.0 Sound insulation testing

Floor, ceiling and partition wall constructions

4.1. The following separating partitions have been tested between the function room and primary public house area, and the residential properties on the 1st floor, ground floor and lower ground floor levels.

Table 1 Tested partitions between the Winchester and the adjoining residential properties

Test ref	Partition type	Source room	Receive room
A1/I1	Floor	Function room	Lower ground floor, Flat 1 – bedroom room
A2	Ceiling	Function room	1st floor, Flat 7 – Living room
A3	Ceiling	Primary public house area	1st floor, Flat 4 – Living room
A4	Ceiling	Primary public house area	1st floor, Flat 6 – Living room
A5	Internal wall	Primary public house area	Ground floor, Flat 3 – Living room
A6	Internal wall	Primary public house area	Lower Ground floor, Flat 2 – En Suite/ Bedroom

Measurement methodology

4.2. The sound insulation testing was undertaken on Wednesday 29th September 2021. The following instrumentation was used during the testing;

Table 2 Details of sound insulation test equipment

Equipment Description	Type/Number	Manufacturer	Calibration certificate no.	Date of Last Calibration
Noise Generator	Minirator MR-PRO	NTI	-	N/A
Powered loudspeaker	IX15	Turbosound	-	N/A
Tapping machine	EM50	Look-Line	-	N/A
Class 1 Sound level meter	Svantek 977/ 97446	Svantek	Factory conformation certificate	12/02/2021
Condenser microphone	Microtech MK255 / 20194			
Preamplifier	Svantek SV12L / 106487			
Calibrator	Svantek SV 40A / 10843		1500732-1	29/07/2021
Class 1 Sound level meter	Svantek 977/ 69747	Svantek	14015672	20/08/2020
Condenser microphone	ACO Pacific 7052E / 70829			
Preamplifier	Svantek SV12L / 73687			
Calibrator	Svantek SV 40A / 10843		1500732-1	29/07/2021

4.3. The meters used were calibrated before and after testing using the Svantek SV40A Class 1L Acoustical Calibrator with a level of 114dB at 1000Hz applied to the measurement equipment. The readings were not found have deviated by more than +/-0.1dB.

4.4. Table 3 below provides details of the sound insulation tests performed.

Table 3 Details of sound insulation testing

Test	Source Room	Receiver Room	Element	Type
A1	Function room	Lower ground floor, Flat 1 – bedroom room	Floor	Airborne
I1	Function room	Lower ground floor, Flat 1 – bedroom room	Floor	Impact
A2	Function room	1st floor, Flat 7 – Living room	Ceiling	Airborne
A3	Main Public House area	1st floor, Flat 4 – Living room	Ceiling	Airborne
A4	Main Public House area	1st floor, Flat 6 – Living room	Ceiling	Airborne
A5	Main Public House area	Ground floor, Flat 3 – Living room	Wall	Airborne
A6	Public House basement	Lower Ground floor, Flat 2 – En Suite/ Bedroom	Wall	Airborne

Testing methodology

4.5. Measurements of airborne sound insulation between rooms were undertaken in accordance with BS EN ISO 16283-1:2014 *'Acoustics: Field measurement of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation',* with the exception of the averaging procedure which follows the guidance advocated in Annex B (Paragraph B2.6) in Approved Document E of the Building Regulations 2000.

4.6. Pink noise was generated in the source room during testing using a loudspeaker. Two separate one-third octave band sound pressure levels were measured in the source room and two in the receiver room using a moving microphone. The measurement time with each individual microphone position was 30 seconds. Two 30-second background sound pressure levels were undertaken in the receiver room using a moving microphone.

4.7. Reverberation times were measured in the receiving room, twice at each of three microphone positions using an interrupted noise source.

4.8. The following separation distances were respected during the testing:

- 0.5m between any microphone position and the room boundaries;
- 1.0m between any microphone position and the loudspeaker.

4.9. Measurements of impact sound insulation between rooms were undertaken in accordance with ISO 140-7:1998. The airborne sound insulation ratings were calculated in accordance with BS EN

ISO 717-2:2013 *'Acoustics – Rating of sound insulation in buildings and of building elements – Part 2 Impact sound insulation'*. A tapping machine was placed on the floor in the source room at no fewer than four positions and measurements, of at least ten seconds, were made at no fewer than six positions in the receive room.

Sound insulation test results

4.10. The results of the sound insulation test are provided in **Appendix B**. Table 4, below, summarises the assessment of the test results against the design criteria detailed in Section 3.0.

Table 4 Summary of airborne and impact sound insulation test results

Test	Source Room	Receiver Room	Measured Sound Insulation	Recommended Performance	Pass / Fail
	Description	Description			
A1	Function room	Lower ground floor, Flat 1 – bedroom room	57dB $D_{nT,w}$	(BS 8233:2014) 57dB $D_{nT,w}$	Pass
			49dB $D_{nT,w} + C_{tr}$	(Building Regulations) 43dB $D_{nT,w} + C_{tr}$	Pass
I1	Function room	Lower ground floor, Flat 1 – bedroom room	38dB $L'_{nT,w}$	(Building Regulations) 64dB $L'_{nT,w}$	Pass
A2	Function room	1st floor, Flat 7 – Living room	59dB $D_{nT,w}$	(BS 8233:2014) 57dB $D_{nT,w}$	Pass
			54dB $D_{nT,w} + C_{tr}$	(Building Regulations) 43dB $D_{nT,w} + C_{tr}$	Pass
A3	Main Public House area	1st floor, Flat 4 – Living room	57dB $D_{nT,w}$	(BS 8233:2014) 57dB $D_{nT,w}$	Pass
			48dB $D_{nT,w} + C_{tr}$	(Building Regulations) 43dB $D_{nT,w} + C_{tr}$	Pass
A4	Main Public House area	1st floor, Flat 6 – Living room	61dB $D_{nT,w}$	(BS 8233:2014) 57dB $D_{nT,w}$	Pass
			52dB $D_{nT,w} + C_{tr}$	(Building Regulations) 43dB $D_{nT,w} + C_{tr}$	Pass
A5	Main Public House area	Ground floor, Flat 3 – Living room	69dB $D_{nT,w}$	(BS 8233:2014) 57dB $D_{nT,w}$	Pass
			61dB $D_{nT,w} + C_{tr}$	(Building Regulations) 43dB $D_{nT,w} + C_{tr}$	Pass

Test	Source Room	Receiver Room	Measured Sound Insulation	Recommended Performance	Pass / Fail
	Description	Description			
A6	Public House basement	Lower ground floor Flat 2 – bedroom/ En suite	57dB $D_{nT,w}$	(BS 8233:2014) 57dB $D_{nT,w}$	Pass
			43dB $D_{nT,w} + C_{tr}$	(Building Regulations) 43dB $D_{nT,w} + C_{tr}$	Pass

6.0 Discussion of results

6.1. The airborne and impact sound insulation tests conducted show that every tested building element has met the minimum Building Regulations standard and the project design criteria defined using BS 8233:2014.

6.2. Although the testing has demonstrated compliance with the design criteria, there are two areas where further investigation is required;

- Main public house to Flat 2: some noise transfer was audible through an untreated section of wall at lower ground level (see Figure 1 below). It is recommended that the SoundBloc wall treatments be extended from the ground floor into the basement in order to mitigate against future complaints. Additionally, there appears to be an attenuated duct opening through the partition wall; ideally this should be blanked off and enclosed within the SoundBloc wall treatment.

- Function room to Flat 1: this floor performed well during testing, however, the NSL engineer on site did note that there was a substantial amount of creaking that could be heard in the bedroom when the floor was walked upon. This creaking did not occur during the impact test, however, it was the professional opinion of the NSL engineer that the creaking could result in complaints if not rectified. The creaking could be the result of bowing or movement in the floor as a load is imposed on it (note – very little load is imposed on the floor during the impact tapping test). It is recommended that the structural integrity of this floor should be investigated further. Additional treatments may be required to strengthen the floor and resolve.

Figure 1 Photograph of untreated wall at lower ground level

7.0 Conclusion

7.1. Noise Solutions Ltd (NSL) has been commissioned by Mulberry One Capital Ltd to undertake airborne and impact sound insulation testing between the Winchester public house along Archway Road and the adjoining residential properties located above and below.

7.2. Works have recently been completed to improve the sound insulation between the public house (which is being renovated) and the adjoining residential premises. Sound insulation testing was required to determine whether the sound insulation of the separating walls, floors and ceilings has met the project design criteria.

7.3. The airborne and impact sound insulation tests conducted show that every tested building element has met the minimum Building Regulations standard and the project design criteria defined using BS 8233:2014.

7.4. Although the testing has demonstrated compliance with the design criteria, there are two areas where further investigation is required to minimise the risk of noise complaints in the future. Full details have been provided in Section 6.0.

Appendix A Acoustic terminology

Parameter	Description
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$D_{nT,w}$	Weighted standardized level difference. Single-number quantity that characterizes the airborne sound insulation between rooms.
C_{tr}	Spectrum adaption term applied to $D_{nT,w}$ (and similar) parameters to mimic the frequency content of traffic noise sources. Also used in England and Wales Building Regulations to control low frequency noise between dwellings.

Appendix B Results of sound insulation tests

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E
Field Measurements of Airborne Sound Insulation Between Rooms

Client: The Winchester

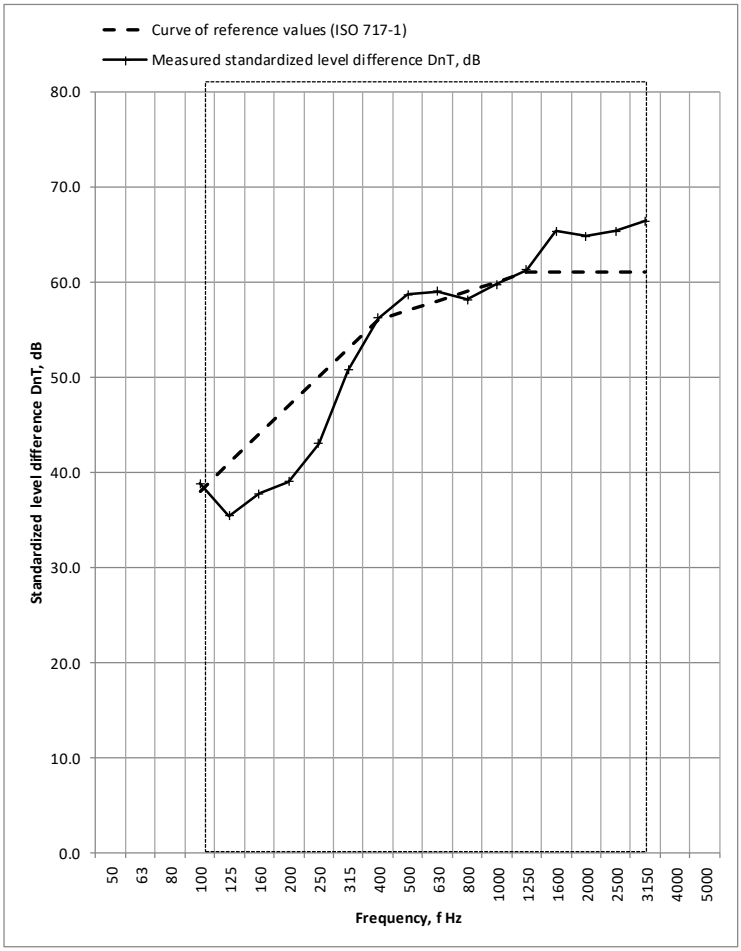
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Function Room
Receiving Room: Flat 1, Master Bedroom
Test Element: Floor

No of test report: A1

Description of Building Construction:

Frequency f, Hz	D_{nT} (1/3 octave) dB
50	
63	
80	
100	38.8
125	35.4
160	37.7
200	39.0
250	43.0
315	50.7
400	56.2
500	58.6
630	59.0
800	58.1
1000	59.7
1250	61.2
1600	65.3
2000	64.8
2500	65.3
3150	66.4
4000	
5000	



Rating in accordance with ISO 717-1

$D_{nT,w}$ (C;Ctr) = 57 (-3 ; -8) dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	A1	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn

Standardized Impact Sound Pressure Levels According to ISO 140-7:1998 and Approved Document E
Field Measurements of Impact Sound Insulation of Floors

Client: The Winchester

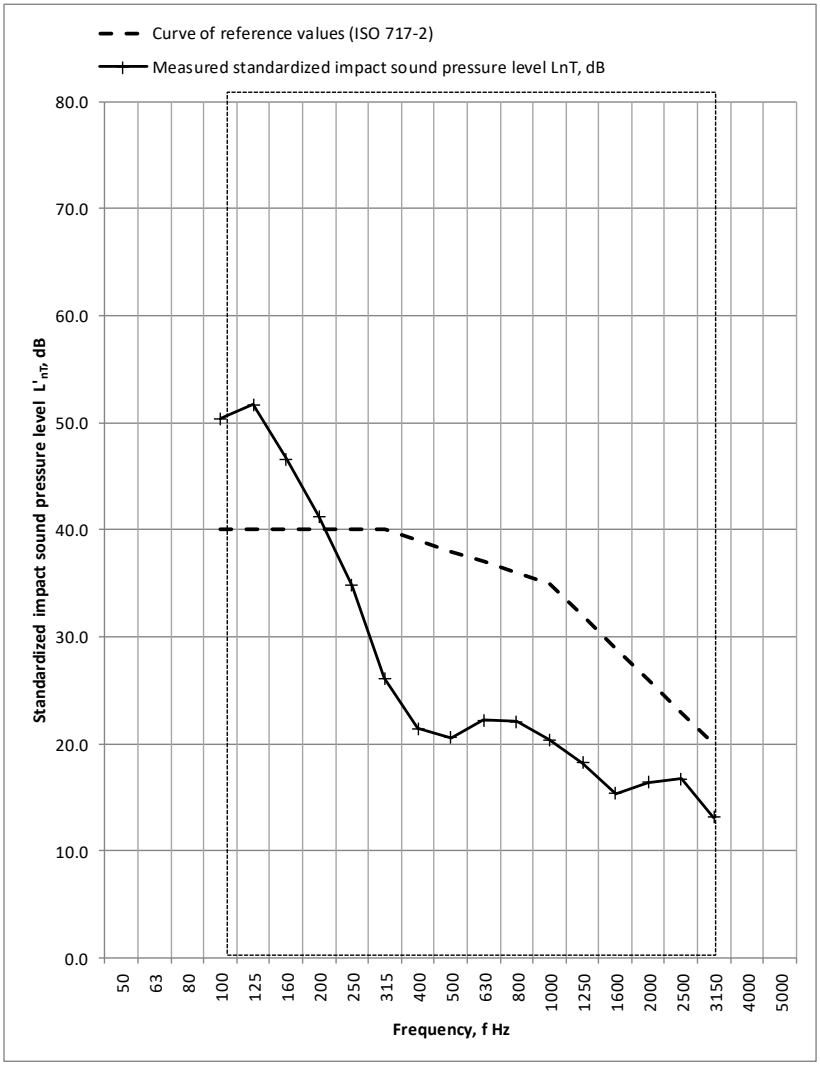
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Function Room
Receiving Room: Flat 1, Master Bedroom
Test Element: Floor

No of test report: I1

Description of Building Construction:

Frequency f, Hz	L'_{nT} (1/3 octave) dB
50	
63	
80	
100	50.4
125	51.7
160	46.6
200	41.2
250	34.8
315	26.1
400	21.4
500	20.6
630	22.2
800	22.0
1000	20.4
1250	18.2
1600	15.4
2000	16.4
2500	16.8
3150	13.1
4000	
5000	



Rating in accordance with ISO 717-2

$L'_{nT,w}$ = 38 dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	I1	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E
Field Measurements of Airborne Sound Insulation Between Rooms

Client: The Winchester

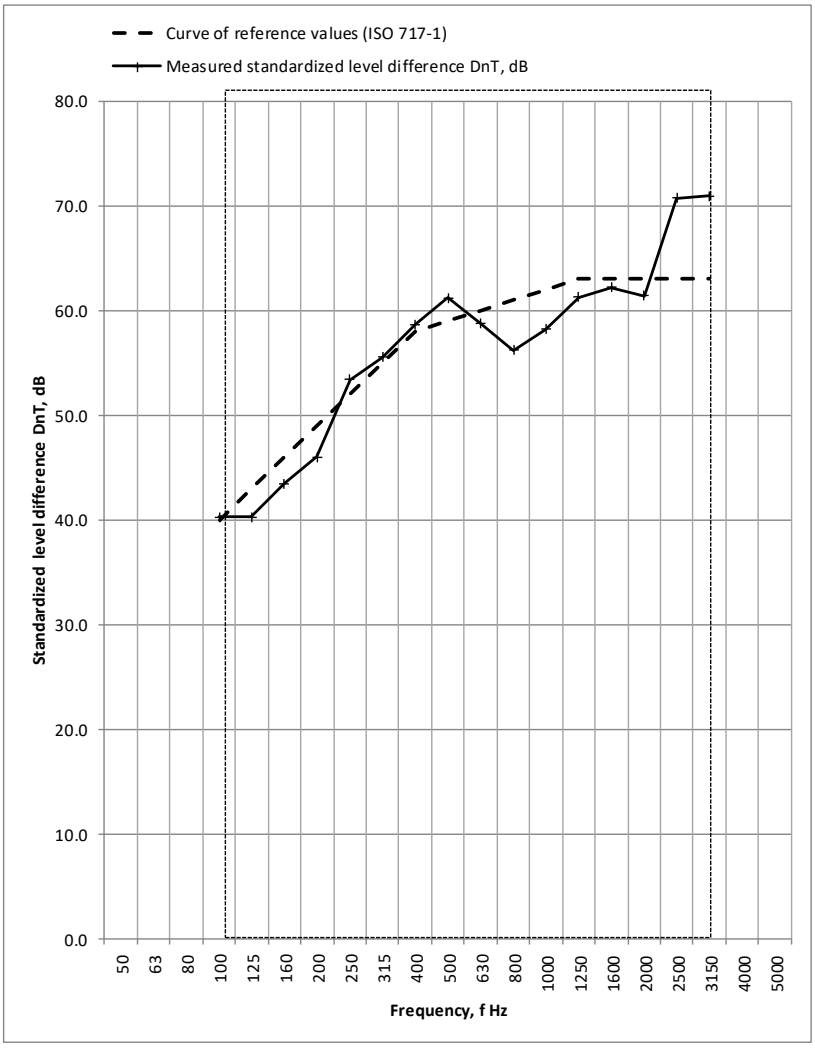
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Function Room
Receiving Room: Flat 7, Living Room
Test Element: Ceiling

No of test report: A2

Description of Building Construction:

Frequency f, Hz	D_{nT} (1/3 octave) dB
50	
63	
80	
100	40.3
125	40.3
160	43.5
200	46.0
250	53.4
315	55.5
400	58.6
500	61.2
630	58.7
800	56.2
1000	58.2
1250	61.3
1600	62.2
2000	61.4
2500	70.7
3150	70.9
4000	
5000	



Rating in accordance with ISO 717-1

$D_{nT,w}$ (C;Ctr) = 59 (-1 ; -5) dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	A2	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E
Field Measurements of Airborne Sound Insulation Between Rooms

Client: The Winchester

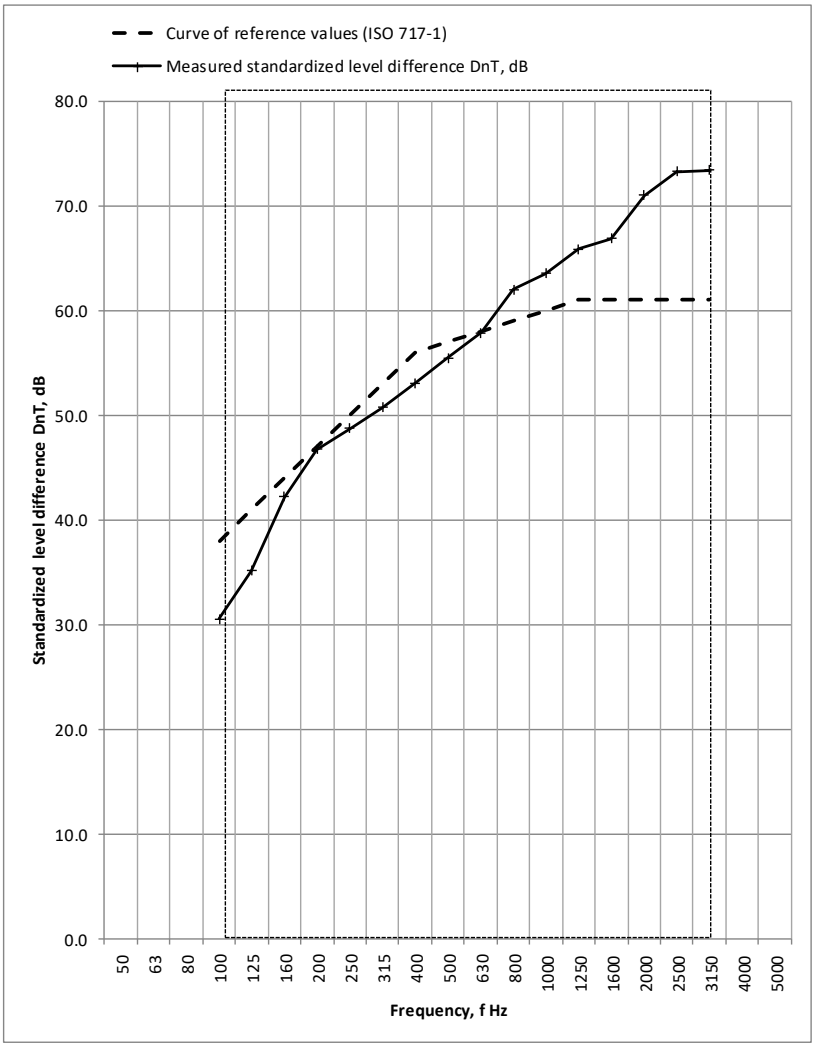
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Public House (Main Room)
Receiving Room: Flat 4, Living Room
Test Element: Ceiling

No of test report: A3

Description of Building Construction:

Frequency f, Hz	D_{nT} (1/3 octave) dB
50	
63	
80	
100	30.5
125	35.1
160	42.2
200	46.8
250	48.7
315	50.7
400	53.1
500	55.5
630	57.8
800	62.0
1000	63.5
1250	65.9
1600	66.9
2000	71.0
2500	73.3
3150	73.4
4000	
5000	



Rating in accordance with ISO 717-1

$D_{nT,w}$ (C;Ctr) = 57 (-2 ; -9) dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	A3	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E
Field Measurements of Airborne Sound Insulation Between Rooms

Client: The Winchester

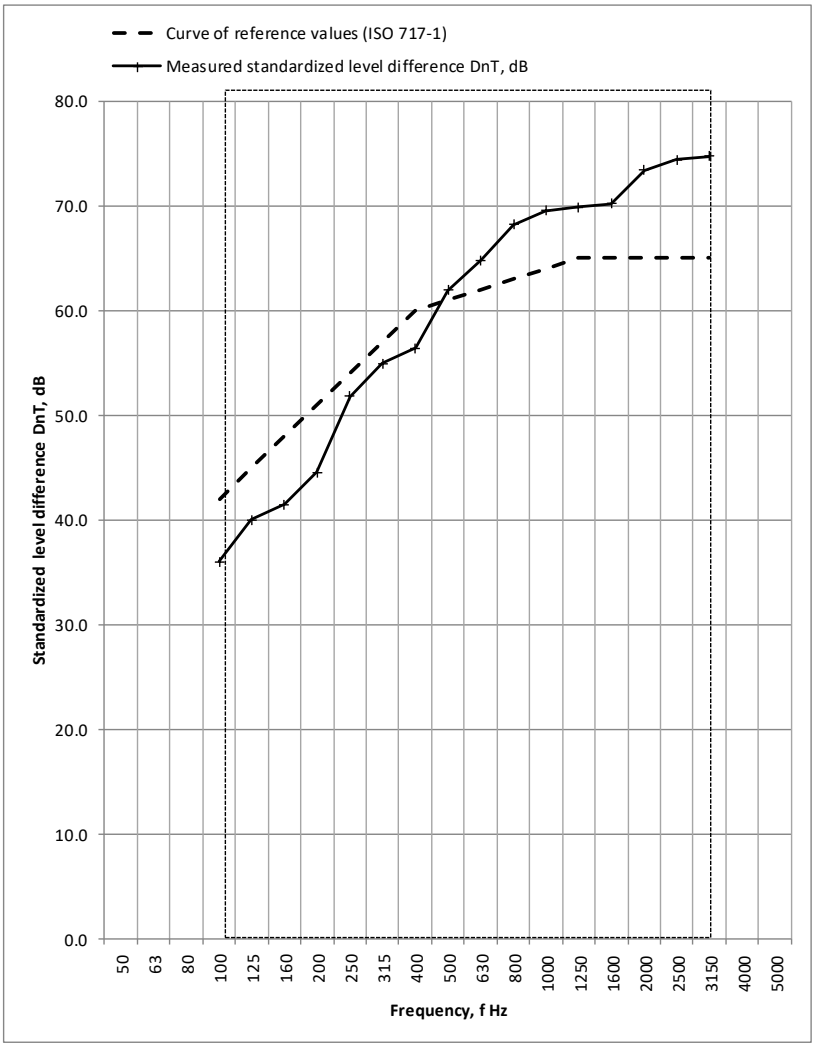
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Public House (Main Room)
Receiving Room: Flat 6, Living room
Test Element: Ceiling

No of test report: A4

Description of Building Construction:

Frequency f, Hz	D_{nT} (1/3 octave) dB
50	
63	
80	
100	36.0
125	40.0
160	41.5
200	44.5
250	51.8
315	54.9
400	56.4
500	61.9
630	64.8
800	68.2
1000	69.5
1250	69.9
1600	70.2
2000	73.4
2500	74.4
3150	74.7
4000	
5000	



Rating in accordance with ISO 717-1

$D_{nT,w}$ (C;Ctr) = 61 (-3 ; -9) dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	A4	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E
Field Measurements of Airborne Sound Insulation Between Rooms

Client: The Winchester

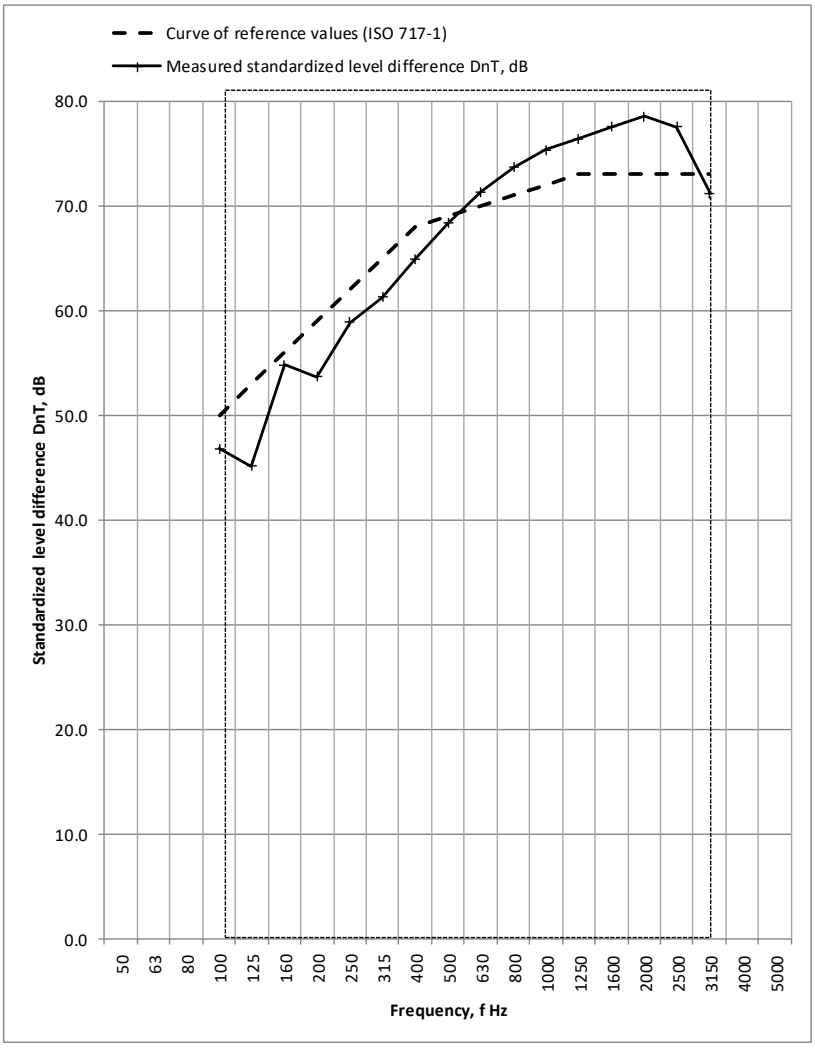
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Public House (Main Room)
Receiving Room: Flat 3, Living Room
Test Element: Wall

No of test report: A5

Description of Building Construction:

Frequency f, Hz	D_{nT} (1/3 octave) dB
50	
63	
80	
100	46.8
125	45.1
160	54.8
200	53.7
250	58.9
315	61.2
400	64.9
500	68.3
630	71.3
800	73.7
1000	75.3
1250	76.4
1600	77.5
2000	78.5
2500	77.5
3150	71.2
4000	
5000	



Rating in accordance with ISO 717-1

$D_{nT,w}$ (C;Ctr) = 69 (-3 ; -8) dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	A5	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn

Standardized Level Difference According to ISO 140-4:1998 and Approved Document E
Field Measurements of Airborne Sound Insulation Between Rooms

Client: The Winchester

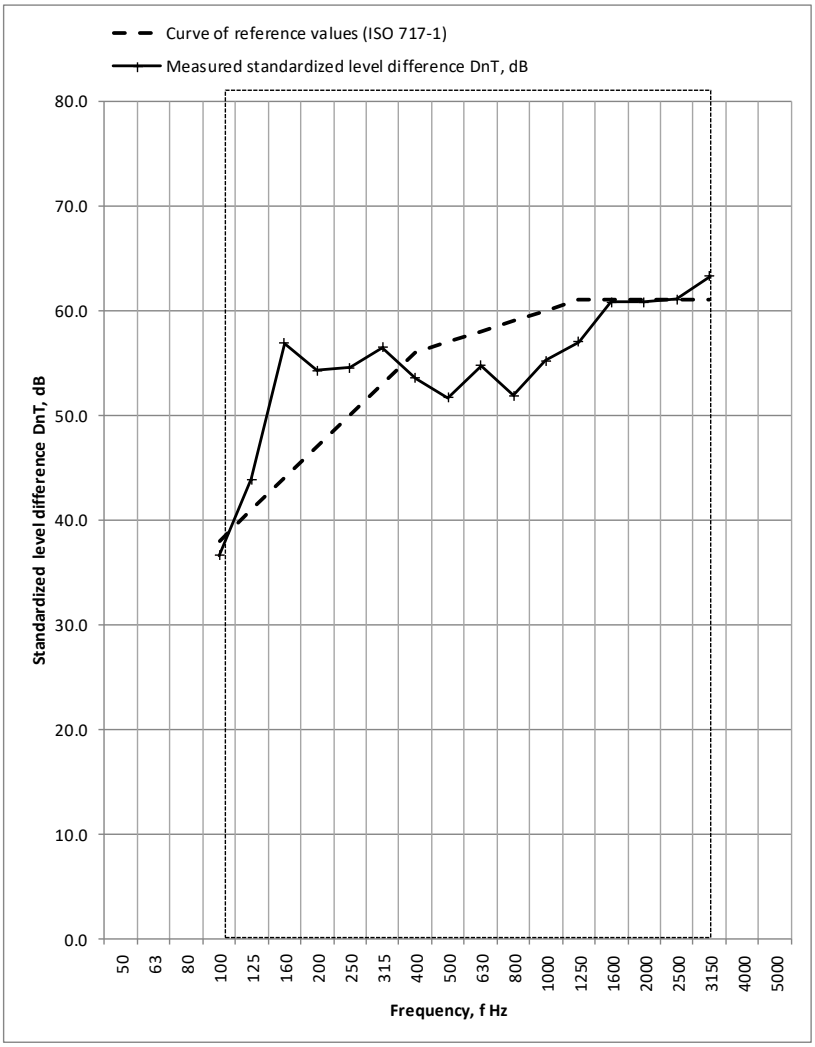
Date of Test: 29/09/2021

Address of Test: The Winchester, 206 Archway Road
Source Room: Public House Basement
Receiving Room: Flat 2, Bedroom/ En Suite
Test Element: Wall

No of test report: A6

Description of Building Construction:

Frequency f, Hz	D_{nT} (1/3 octave) dB
50	
63	
80	
100	36.6
125	43.8
160	56.8
200	54.2
250	54.5
315	56.5
400	53.6
500	51.7
630	54.8
800	51.9
1000	55.2
1250	57.0
1600	60.8
2000	60.8
2500	61.1
3150	63.2
4000	
5000	



Rating in accordance with ISO 717-1

$D_{nT,w}$ (C;Ctr) = 57 (-1 ; -4) dB

Evaluation based on field measurement
results obtained by an engineering method

No of test report	A6	Name of testing organisation:	Noise Solutions Ltd
Date	29/09/2021	Signature:	Aiden Quinn