

ASDA
Retail Unit T4
Circle Square
Oxford Road
Manchester

Sound Insulation Test Report

On behalf of



Project Reference: 91461 | Revision: 00 | Date: 27th November 2023

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Document Information

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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by City Building Engineering Services to undertake airborne sound insulation testing of the separating floor between the proposed ASDA store at Retail Unit T4, Circle Square, Manchester and the residential flats above.
- 1.2. Indicative roll cage testing has been undertaken to make qualitative assessment of the transfer of noise and vibration on the residential flats above the proposed ASDA.
- 1.3. This report contains details of the sound insulation test conducted with the results achieved and recommendations for improvement.
- 1.4. [Appendix A](#) contains a guide to common acoustic terminology.

2.0 Details of development

- 2.1. The ASDA store is located along Oxford Road, at Retail Unit T4, and occupies the ground floor and mezzanine levels of a multi-storey property.

3.0 Assessment criteria

Building Regulations Approved Document E

- 3.1. Building Regulations Approved Document E *Resistance to the Passage of Sound* 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. Under the requirements of Approved Document E, the airborne sound insulation provided by the separating wall or floor between a residential dwelling and any other part of the same building must be at least $45 \text{ dB } D_{nT,w} + C_{tr}$.
- 3.3. The Approved Document E requirements for impact sound insulation apply only when the dwelling is below the separating floor, and therefore need not be considered in this case.
- 3.4. Building Regulations do not give specific guidance on any enhancement to the sound insulation that may be required where, for example, noise levels in a commercial unit are higher than would be expected in a dwelling.

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

- 3.5. The standards in the Building Regulations are not applicable in this instance given that testing was between non-residential premises. Guidance is therefore sought from BS 8233:2014 – ‘Guidance on sound insulation and noise reduction for buildings’.
- 3.6. Section 7.5 ‘Internal Sound Insulation’ of BS 8233, 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.

- 3.7. There is an element of professional judgement required with regard to the acoustic categorisation of each space.
- 3.8. As a worst case, the ASDA store could be considered as a space which is not private and with a high activity noise level. The residential flats above can be considered as spaces with a high level of sensitivity.
- 3.9. Based on these considerations, the sound insulation of the partition separating these spaces should not be lower than 47dB $D_{nT,w}$ based on the matrix table in BS8233.

4.0 Airborne sound insulation testing

- 4.1. The following separating partition has been tested between the ASDA Store and the residential flats.

Table 1 Tested partitions between Asda store and residential area

Partition type	Source room	Receive room
Floor	ASDA Sales Floor	Flat 107 Living Room

Measurement methodology

- 4.2. The sound insulation testing was undertaken on Thursday 23rd November 2023. The following instrumentation was used during the testing;

Table 2 Details of sound insulation test equipment

Equipment Description	Type/Number	Manufacturer	Serial Number	Date of Last Calibration
Noise Generator	Minirator MR-PRO	NTI	-	N/A
Powered loudspeaker	IX15	Turbosound	-	Powered loudspeaker
Powered loudspeaker	ProMaxx12a	FBT	-	Powered loudspeaker
Class 1 Sound level meter	Svantek 977D / 99070	11/05/2023	Factory conformation certificate	Class 1 Sound level meter Condenser microphone Preamplifier
Condenser microphone	ACO Pacific 7052E / 81197	ACO Pacific	70829	
Preamplifier	Svantek SV18A / 130661	Svantek	73687	
Calibrator	Rion NC-74 / 35094453	06/09/2023	1503192-1	Calibrator

- 4.3. The sound level meter was calibrated before and after testing using the Svantek SV40A Class 1L Acoustical Calibrator with a level of 94dB at 1000Hz applied to the measurement equipment. The readings were found not to have deviated.
- 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	ASDA Sales Floor	Flat 107 Living Room	Floor	Airborne

- 4.5. The test detailed in Table 3, above, was undertaken generally 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*'.

Testing methodology

- 4.6. Measurements of airborne sound insulation between rooms were undertaken and the airborne sound insulation rating was calculated in accordance with BS EN ISO 717-1:2013 '*Acoustics – Rating of sound insulation in buildings and of building elements – Part 1 Airborne sound insulation*'.
- 4.7. Pink noise was generated in the source room during testing using three loudspeakers. One-third octave band sound pressure levels were measured in the source room and in the receiver room using a moving microphone. The measurement time with each individual microphone position was at least 30 seconds. Background measurements using an integration period of 1 minute were undertaken in the receiver room using a moving microphone.
- 4.8. Reverberation times were measured in the receiver room, three times at each of three microphone positions, using an impulse as the noise source.
- 4.9. The following separation distances were respected during the testing:
- 0.5 m between any microphone position and the room boundaries;
 - 1.0 m between any microphone position and the loudspeaker

Sound insulation test results

- 4.10. The results of the sound insulation test are provided in [Appendix B](#). Table 4 and Table 5 summarise the test results and compares them with the criteria established previously in this report.

Table 4 Summary of airborne sound insulation test results (Building Regulations)

Test	Source Room	Receiver Room	Measured Sound Insulation	Required minimum performance	Pass / Fail
	Description	Description			
A1.1	ASDA Sales Floor	Flat 107 Living Room	59dB $D_{nT,w} + C_{tr}$	45dB $D_{nT,w} + C_{tr}$	Pass

Table 5 Summary of airborne sound insulation test results (Recommendation from BS 8233)

Test	Source Room	Receiver Room	Measured Sound Insulation	Recommended Performance	Pass / Fail
	Description	Description			
A1.1	ASDA Sales Floor	Flat 107 Living Room	62dB $D_{nT,w}$	(BS 8233:2014) 47dB $D_{nT,w}$	Pass

Discussion of results and recommendations

- 4.11. The performance of the separating floor/ceiling between the proposed store and the flats above has been established to be 62dB $D_{nT,w}$ and 59dB $D_{nT,w}+C_{tr}$. This surpasses both the requirement within Building Regulations and the guidance provided in BS 8233:2014.

5.0 Internal noise survey

- 5.1. Noise Solutions attended site between 15.00 and 17.00 hours on Thursday 23rd November 2023. Access was provided to both the ASDA store and the residential property (Flat 107) above. The roll cage was loaded and moved around the sales floor while an NSL engineer witnessed and measured noise levels within the sales floor and the residential flat.
- 5.2. Noise measurements were taken within the bedroom and living room of Flat 107. The following noise monitoring equipment was used during the survey.

Table 6 Details of noise monitoring equipment

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977D / 99070	11/05/2023 ACO Pacific Svantek	Factory conformation certificate 70829 73687
Condenser microphone	ACO Pacific 7052E / 81197		
Preamplifier	Svantek SV18A / 130661		
Calibrator	Rion NC-74 / 35094453	06/09/2023	1503192-1

- 5.3. Both broadband and 1/3-octave band frequency data was measured. Noise measurements were taken over short durations (i.e. 20 – 30 seconds) in order to minimise the influence of extraneous noise on the measurement results.
- 5.4. The results of the various noise measurements within the flat are summarised in Table 7 below. Full result can be found in [Appendix C](#).

Table 7 Summary of internal noise survey

Activity	Location	L _{Aeq} , dB	L _{Amax} , dB	Subjective impressions
Full cage on sales floor	Sales Floor	51	59	Clearly audible
	Flat 107 Living Room	<30	<39	Inaudible

- 5.5. The absolute levels of noise intrusion are low, being below 30dBA in the residential flat, and would not cause sound levels within the flat to be in excess of the BS 8233:2014 guidance levels for bedrooms at night. Maximum L_{max} levels are also not in excess of 45dB(A). While the guidance provided within BS 8233:2014 is for anonymous non-intrusive noises the resulting sound levels are significantly below the guidance values and are likely to be acceptable, particularly as activities at night in the store will be rare.

6.0 Summary

- 6.1. Noise Solutions Ltd (NSL) has been commissioned by Asda to undertake airborne sound insulation testing of the separating floor between the Asda store at Circle Square and the residential flats above, and to provide guidance on internal noise transfer.
- 6.2. Roll cage testing has been undertaken to determine the internal noise levels in the flats above. Sound levels do not exceed BS 8233:2014 guidance levels for bedrooms at night.
- 6.3. The result of the sound insulation test has demonstrated that the composite sound insulation of the floor construction does meet the minimum performance levels required in Building Regulations Approved Document E and recommended under the guidance given in BS 8233:2014.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10}(s_1/s_2)$. 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 $20\mu\text{Pa}$. 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.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$D_{nT,W}$	Weighted standardised level difference. Single-number quantity which characterises the airborne sound insulation between rooms.
T	Reverberation Time. time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
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 test

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

Client: ASDA

Date of Test: 23/11/2023

Address of Test: Retail Unit T4, Circle Square, Oxford Road, Manchester

Source Room: Sales Floor

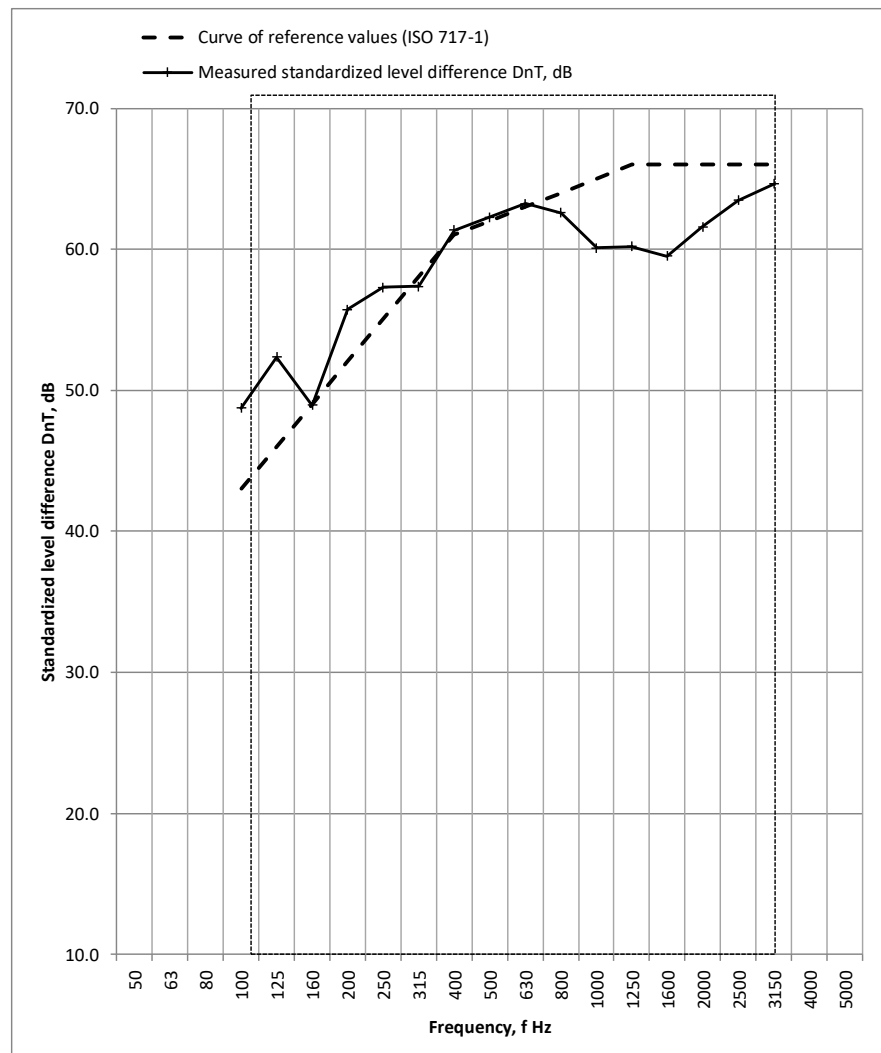
Receiving Room: Flat 107, Living Room

Test Element: Floor

No of test report: A.1

Description of Building Construction:
Unknown existing construction

Frequency f, Hz	D _{nT} (1/3 octave) dB
50	
63	
80	
100	48.7
125	52.3
160	48.9
200	55.7
250	57.3
315	57.4
400	61.4
500	62.3
630	63.2
800	62.6
1000	60.1
1250	60.2
1600	59.5
2000	61.6
2500	63.5
3150	64.6
4000	
5000	



Rating in accordance with ISO 717-1

$$D_{nT,w}(C;Ctr) = 62 \text{ (-1 ; -3) dB}$$

Evaluation based on field measurement
results obtained by an engineering method

No of test report

A.1

Name of testing organisation:

Noise Solutions Ltd

Date

23/11/2023

Signature:

Zach Jensen

Appendix C Roll cage assessment data

Roll cage assessment data

Location	Type of Measurement	Ambient sound level (dBA)	Residual sound level (dBA)	Specific sound level (dBA)
Sales Floor	L _{Aeq}	61	60	51
	L _{Amax}	68	68	59
Flat 107, Living Room	L _{Aeq}	31	34	<30*
	L _{Amax}	45	44	<39*

**Measurements affected by residual sound levels. Values stated represent the upper limit of the possible range of values.*