ACOUSTIC TECHNICAL NOTE

Reference:	10186.ATN01.PCT.1
From:	Aaron Moroney
Date:	27 July 2023
Project:	8-9 Montague Place, Worthing
Subject:	Sound Insulation Testing for Planning Condition No. 4

1.0 INTRODUCTION

Acoustic testing of the separating floor construction was undertaken between the recently renovated commercial premises at ground and first floor level and the residence (Flat 1) located directly above at second floor level. Acoustic testing was completed with the intention of discharging Planning Condition No.4, applicable to the site planning consent AWDM/1630/19. The site is located at 8-9 Montague Place, Worthing, BN11 3BG.

This report details the relevant planning condition, test methodology and test results.

2.0 PLANNING CONDITION

Planning Condition No.4 is relevant to the level of sound insulation achieved by the premises and states:

> *"The use hereby permitted shall not commence unless and until a sound insulation scheme for protecting the residential property above the development from noise has been submitted to and approved by the Local Planning Authority. The scheme shall achieve a minimum airborne sound insulation value of 50dB (DnTw + Ctr dB). Following implementation of the insulation scheme, a test shall be undertaken to demonstrate that the attenuation measures carried out has achieved the minimum airborne sound insulation criteria. The use of the development shall not commence until test results, demonstrating the minimum sound insulation criteria has been achieved, has been submitted to and approved by the Local Planning Authority.*

3.0 ACOUSTIC TESTS

Acoustic testing of separating floor structure above the premises was undertaken on Wednesday 26 July 2023. We understand that refurbishment works were complete in the commercial premises other than furnishings. The flat above was complete and furnished. Airborne sound insulation tests were conducted between the large open plan area towards the front of the premises and several rooms directly above (a bedroom, living room and dressing room). Full details of the test procedure are outlined in Appendix A.

4.0 RESULTS

The results of the airborne sound insulation measurements made are presented on the attached Figures 1-3.

Although the cafeteria spans across both ground and first floor level, the area at first floor level was used as the location for the sound source and source measurements when conducting the tests, given that the residential adjacency is at second floor level above.

For summary purposes the single figure $D_{nT,w} + C_{tr}$ values are given below:

Table 1 – Separating Wall Airborne Sound Insulation

Test	Source Room		Receive Room		$D_{nT,w} + C_{tr}$ (dB)	Minimum Requirement	Comment
	Plot	Room	Plot	Room			
1	First Floor Commercial Space	Open Plan Front of House Area	Flat 1	Bedroom	49	50	Fail
2				Dressing Room	52	50	Pass
3				Living Room	49	50	Fail

As shown in the table above, one out of three sound insulation tests passed the minimum requirement of 50 dB $D_{nT,w} + C_{tr}$, as specified in Planning Condition No. 4, whilst the other two tests failed to meet the minimum requirement by a small margin of 1dB.

Subjectively, the most dominant sound transmission paths were via the internal walls (expected to be predominantly plastered masonry in both the commercial and residential areas), as well as via the separating floor itself.

It is worth noting that such a fine margin of failure could even be determined by measurement tolerance, which could result in a difference in result by approximately +/- 1dB.

Although each and every individual test has not met the criterion, the target could be met if a mean average was taken of all three tests. Although not strictly how results are usually assessed, this may be considered to be acceptable in this scenario. Had the sound source and source measurement positions been located at ground floor level when the tests were being undertaken, the measured level of sound insulation between ground floor and second floor level would have been higher than that measured from first floor and therefore, would have met the target criterion. As the ground floor area may be a higher noise-generating area (i.e., due to potentially higher day-to-day capacity and given that the kitchen is sited at ground floor) than the first floor area, then it may be more appropriate to consider the overall sound insulation from both the first floor and ground floor areas.

Furthermore, we would usually recommend that an airborne sound insulation of 5dB greater than the usual Building Regulations requirements would be necessary for a cafeteria-to-residential adjacency. Approved Document E (2003 Edition incorporating 2004, 2010 and 2015 amendments) sets the a minimum requirement of 43 dB $D_{nT,w} + C_{tr}$ for the airborne sound insulation performance of separating floors within dwelling-houses and flats formed by material change of use, which could be considered a relevant starting point in this scenario, as the cafeteria is an existing, refurbished building. As such, we would tend to recommend a performance 5dB greater at 48 dB $D_{nT,w} + C_{tr}$. Should the sound insulation be assessed against this target level, all tests would be considered compliant.

5.0 CONCLUSION

RBA Acoustics have undertaken airborne sound insulation testing of the separating floor construction between the first-floor commercial space at 8-9 Montague Place, Worthing and the second-floor flat above. This report details the results of the measurements and provides comparisons with the performance standards stated in Planning Condition No.4.

Of the three tests completed, one of three tests met and exceed the airborne sound insulation standards stated in Planning Condition No.4, whilst the other two tests failed to meet the target by a small margin of 1dB. However, there are a number of reasons why this minor shortfall may be considered acceptable, which we have justified in this report and thus, could be appropriate in practice.

APPENDIX A – TEST METHODOLOGY

The site measurements, analyses and presentation of results were undertaken in accordance with the following British Standards:

- BS EN ISO 140-4:1998 "Acoustics – Measurement of sound insulation in buildings and of building elements – Part 4: Field measurements of airborne sound insulation between rooms"
- BS EN ISO 717-1:1997 "Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation"

Instrumentation

The following equipment was used for the measurements.

Table 2 – Equipment Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1404477	U42454	16 November 2024
Norsonic Pre Amplifier	1209	13720		
Norsonic ½" Microphone	1225	384519	42453	16 November 2024
Norsonic Sound Calibrator	1251	35378	U45452	16 November 2024
Opera Loudspeaker	510DX	L503003892	N/A	N/A
NTI Minirator	MR2	G2L-RAAGE-F2	N/A	N/A

The equipment was calibrated prior to and on completion of the testing. No calibration drift was observed.

Airborne Sound Insulation Test Method

The airborne sound insulation test method used was undertaken in general accordance with Airborne test procedure 2 as described in the Association of Noise Consultants (2018) *Practice Guidance for sound insulation testing in dwellings*.

The airborne sound insulation performance of the structures was determined by generating a broadband, random diffuse sound field in the source room and measuring the spatially averaged 1/3 octave band sound pressure levels in both the source and receive areas. The receive room levels were corrected for background noise in accordance with the procedure detailed in BS EN ISO 140-4 and then subtracted from the source levels to determine the level difference, *D*, over the frequency range 100-3150 Hz. These 1/3 octave band values were then standardised to a reference of 0.5 seconds using the measured reverberation time of the receive room.

For each test two separate source positions were used and spatially averaged noise levels within both the source and receive room were measured by means of a moving microphone over a sample period of 30 seconds for each source position. A single background noise level was measured in the receive room using the same procedure.

Reverberant decays were also recorded in the receive room using the interrupted noise method, with the sound source at a single position, to determine the reverberation times, *T*, over the same frequency range. Six decays in total were recorded at three different positions within the receive room and subsequently averaged.

The 1/3 octave band results were then compared with a standard curve, using the method described in BS EN ISO 717-1: 1997 to determine the single-figure descriptor of airborne sound insulation, the Weighted Standardised Level Difference, $D_{nT,w}$, and the spectrum adaptation term, C_{tr}.

Background Sound Levels

BS EN ISO 140-4:1998 and BS EN ISO 140 -7: 1998 expect the following correction to be made if the difference between the background noise and receive room noise levels are less then 10dB or more than or equal to 6dB in any frequency band:

$$L = 10\log(10^{L_R/10} - 10^{L_B/10})$$

Where
L is the adjusted signal level, in dB
L_R is the receive noise level, in dB
L_B is the background noise level, in dB

If the difference between the background and receive room noise levels are less than 6dB then the above calculation is replaced by a 1.3dB correction which is subtracted from the receive level. These values are considered the limit of measurement (i.e. limited by high background noise levels on site).

All efforts were made to reduce background noise in the receiving residential rooms as far as it was practical.

Within the bedroom and living room of Flat 1, background sound levels were dominated by external noise break-in from activity on Montague Place (i.e., people and sound from the carousel). Background noise levels were lower in the dressing room of Flat 1, but still mainly comprised external noise break-in.

An effort was made to minimise the effect of background noise, however in some cases background noise corrections have been made. Such corrections are indicated on the attached Figures 1-3. Where a correction is made for background sound levels, the actual performance of the structure is likely to be better than that measured and shown in the applicable graphs.

8-9 Montague Place, Worthing

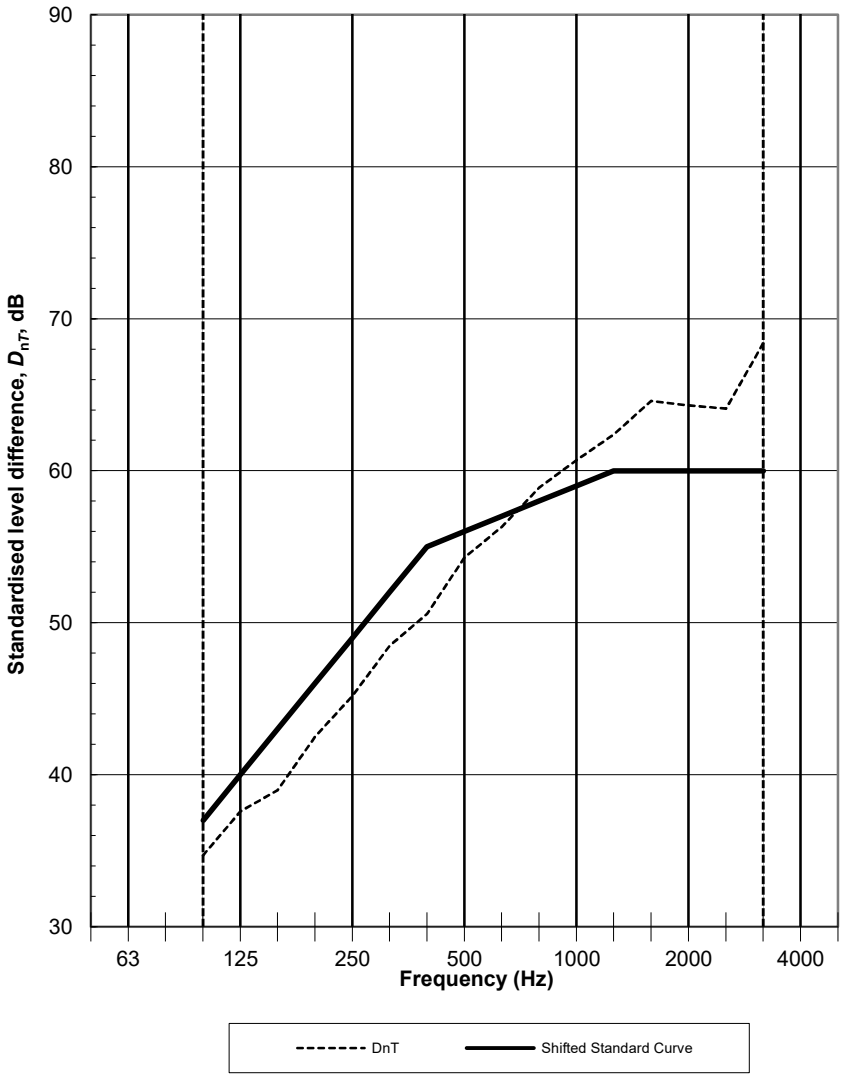
First Floor Commercial Space Open Plan Front of House Area to Flat 1 Bedroom

Standardised Level Difference According to ISO 140-4

Field Measurement of Airborne Sound Insulation Between Rooms

Construction Under Test: Separating Floor

Frequency f (Hz)	D_{nT} (dB)	
50		
63		
80		
100	34.7	
125	37.6	
160	39.0	
200	42.5	
250	45.2	
315	48.5	
400	50.6	
500	54.3	
630	56.3	
800	58.9	
1000	60.7	
1250	62.4	
1600	64.6	
2000	≥64.3	*
2500	≥64.1	*
3150	≥68.4	*
4000		
5000		



* Performance limited by background noise level

Rating according to BS EN ISO 717-1

$$D_{nT,w}\ (C;\ C_{tr}\quad 56\ (-2;\ -7)\ \text{dB}$$

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Test undertaken by: [redacted]

Client: Feru Investments Ltd

Test Date: 26/07/2023

Project 10186

8-9 Montague Place, Worthing

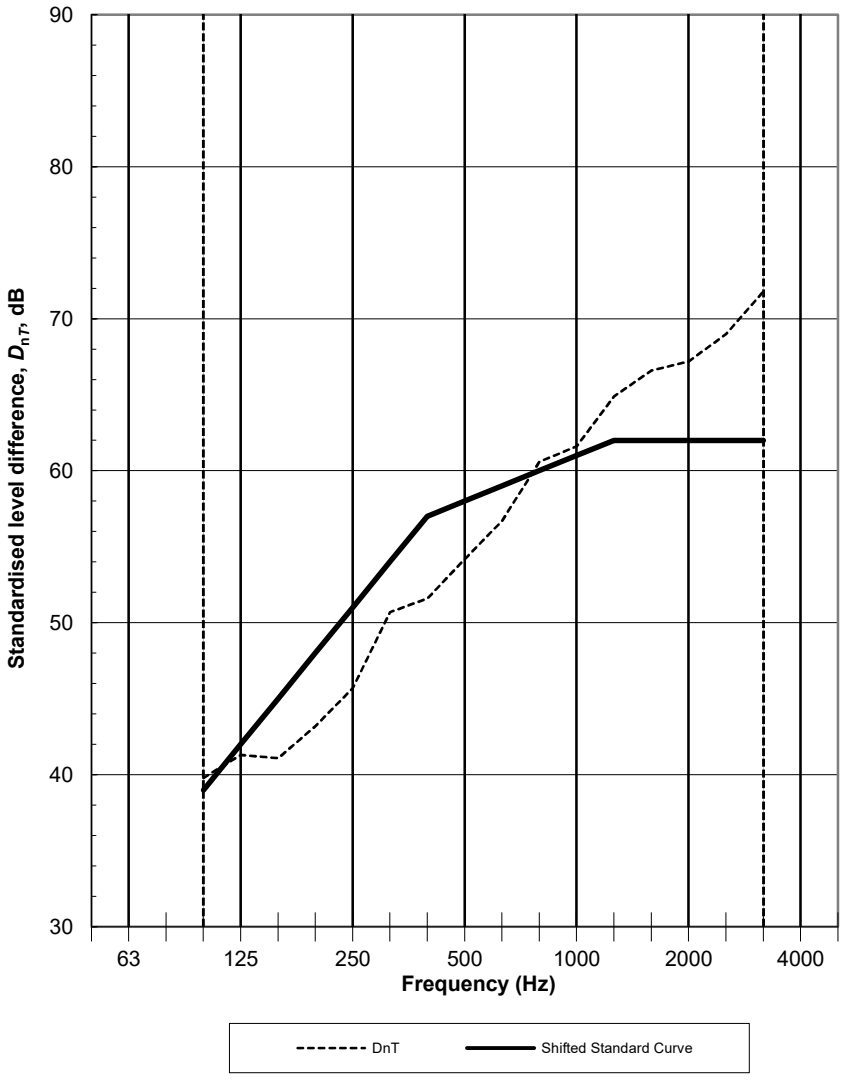
First Floor Commercial Space Open Plan Front of House Area to Flat 1 Dressing Room

Standardised Level Difference According to ISO 140-4

Field Measurement of Airborne Sound Insulation Between Rooms

Construction Under Test: Separating Floor

Frequency f (Hz)	D_{nT} (dB)	
50		
63		
80		
100	39.8	
125	41.3	
160	41.1	
200	43.2	
250	45.7	
315	50.7	
400	51.6	
500	54.2	
630	56.7	
800	60.6	
1000	61.6	
1250	64.9	
1600	66.6	
2000	≥67.2	*
2500	≥69.0	*
3150	≥71.8	*
4000		
5000		



* Performance limited by background noise level

Rating according to BS EN ISO 717-1

$$D_{nT,w}\ (C;\ C_{tr}\quad 58\ (-2;\ -6)\ \text{dB}$$

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Test undertaken by: [redacted]

Client: Feru Investments Ltd

Test Date: 26/07/2023

Project 10186

8-9 Montague Place, Worthing

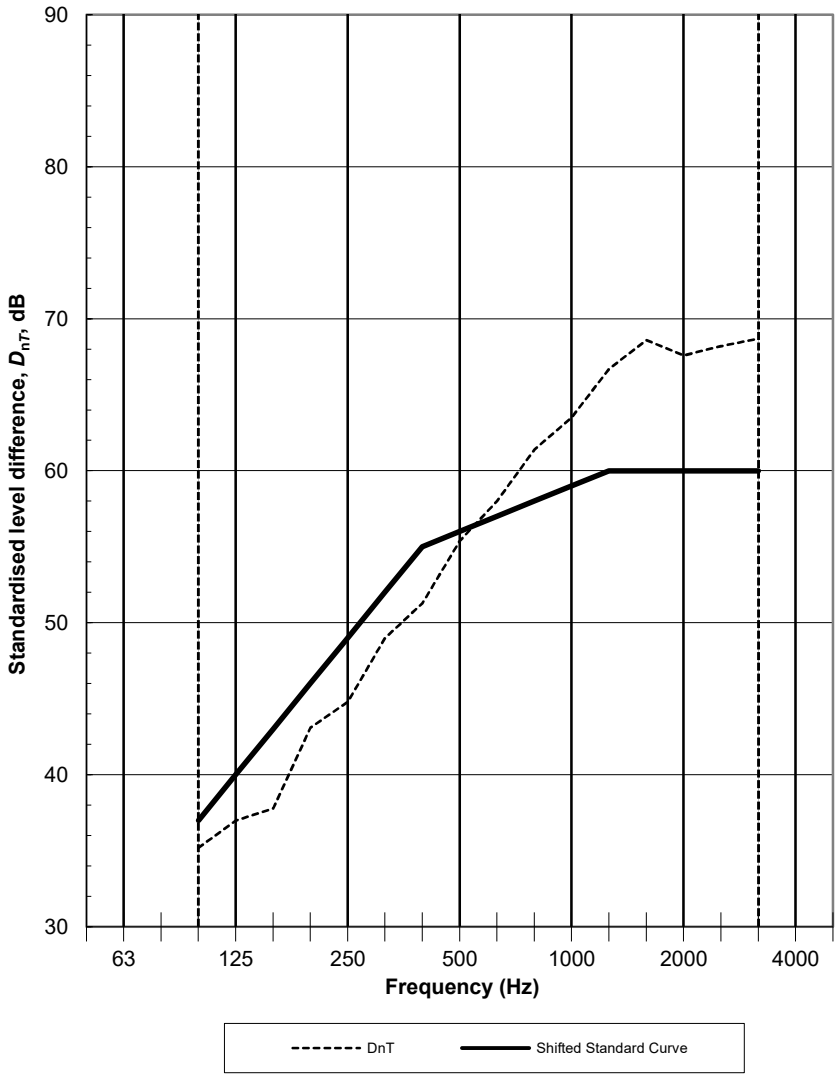
First Floor Commercial Space Open Plan Front of House Area to Flat 1 Living Room

Standardised Level Difference According to ISO 140-4

Field Measurement of Airborne Sound Insulation Between Rooms

Construction Under Test: Separating Floor

Frequency f (Hz)	D_{nT} (dB)	
50		
63		
80		
100	35.2	
125	37.0	
160	37.8	
200	43.1	
250	44.8	
315	49.0	
400	51.3	
500	55.4	
630	58.0	
800	61.4	
1000	63.5	
1250	≥66.7	*
1600	≥68.6	*
2000	≥67.6	*
2500	≥68.2	*
3150	≥68.7	*
4000		
5000		



* Performance limited by background noise level

Rating according to BS EN ISO 717-1

$$D_{nT,w}\ (C;\ C_{tr}\quad 56\ (-1;\ -7)\ \text{dB}$$

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Test undertaken by: [redacted]

Client: Feru Investments Ltd

Test Date: 26/07/2023

Project 10186