



**Report of Sound Insulation Testing  
at  
Fountain House  
Welwyn Garden City  
Hertfordshire**

**Report No:** DJB/6982/C  
**Date of Issue:** 26 April 2017  
**Property Type:** Dwellings to be formed by a material change of use

**Date of Test:** 13 April 2017

**ACOUSTICAL INVESTIGATION & RESEARCH ORGANISATION LTD**

Duxons Turn, Maylands Avenue, Hemel Hempstead, Herts, HP2 4SB Telephone: 01442 247146

AIRO is a UKAS accredited testing laboratory No. 0483 and measurements to British Standards BS EN ISO 140-4 & 7:1998 and BS EN ISO 717-1 & 2:1997 together with Approved Document E to The Building Regulations are included on our schedule of accreditation. UKAS is the United Kingdom Accreditation Service.

**Test Engineer:**

**Client:** GPL 2014 Ltd  
9 Bridewell Pace  
London  
EC4V 6AW

*D J Boaden*

**D J Boaden BSc MInstP MIOA  
Managing Consultant**

**Comparison with Approved Document E (2003) to The Building Regulations 2010 (ref 1)**

Test No.	Rooms	$D_{nT,w} + C_{tr}$ (dB)			$L'_{nT,w}$ (dB)		
		Measured	Required	Pass/Fail	Measured	Required	Pass/Fail
1 & 2	Extension Office Space, 2 <sup>nd</sup> Floor to Extension Office Space, 1 <sup>st</sup> Floor	43	≥ 43	<b>PASS</b>	49	≤ 64	<b>PASS</b>

**Equipment**

Type	Serial No.	Type	Serial No.
Norsonic 140 Sound Analyzer	1403123	Norsonic 1209 Microphone Pre-Amplifier	12703
Norsonic 140 Sound Analyzer	1403164	Norsonic 1209 Microphone Pre-Amplifier	12554
GRAS 40AE ½" Condenser Microphone	97969	B&K 4231 Sound Level Calibrator	1795485
GRAS 40AE ½" Condenser Microphone	97972	Norsonic 211A Tapping Machine	25175

The test procedures in Annex B of Approved Document E (2003) have been followed except as follows:

**Approved by:**

*D L Watts*

**Eur Ing D L Watts BEng CEng FIOA  
Principal Consultant**

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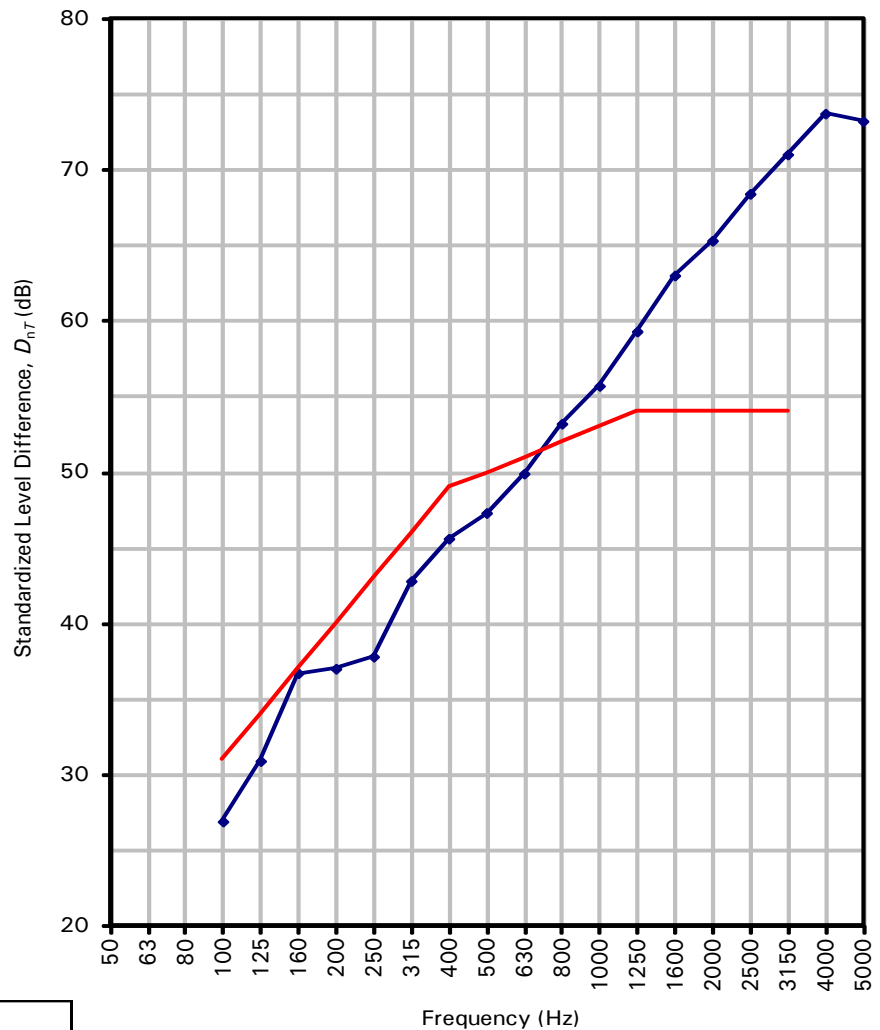
Date of Test: 13 April 2017

### Test 1 – Airborne Sound Insulation across Separating Floor

Test No.	SOURCE ROOM		RECEIVE ROOM	
	Room	Vol. (m <sup>3</sup> )	Room	Vol. (m <sup>3</sup> )
1	Extension Office Space, 2 <sup>nd</sup> Floor	240	Extension Office Space, 1st Floor	240

Standardized Level Difference according to BS EN ISO 140-4:1998

Frequency (Hz)	$D_{nT}$ (dB)
50	
63	
80	
100	26.9
125	30.9
160	36.7
200	37.0
250	37.8
315	42.8
400	45.6
500	47.3
630	49.9
800	53.2
1000	55.7
1250	59.3
1600	63.0
2000	65.3
2500	68.4
3150	71.0
4000	73.7
5000	73.2
6300	
8000	
10000	



Rating according to BS EN ISO 717-1:1997	
$D_{nT,w} (C; C_{tr}) =$	50 (-1; -7) dB
$D_{nT,w} + C_{tr} =$	43 dB

—◆— Measured Standardized Level Difference,  $D_{nT}$  (dB)  
— Reference curve (BS EN ISO 717-1:1997)

$C_{50-3150}$ : --       $C_{50-5000}$ : --       $C_{100-5000}$ : 0 dB  
 $C_{tr,50-3150}$ : --       $C_{tr,50-5000}$ : --       $C_{tr,100-5000}$ : -7 dB

Evaluation based on a result obtained by a field method

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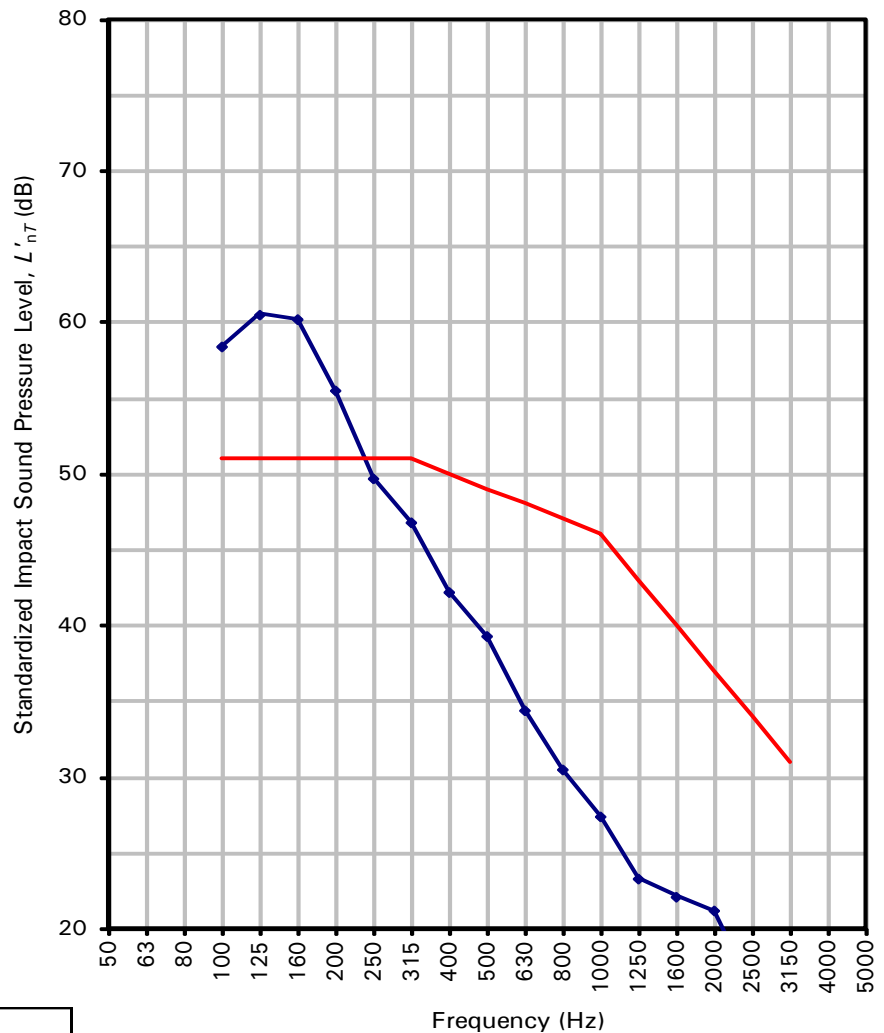
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### Test 2 – Impact Sound Transmission through Separating Floor

Test No.	SOURCE ROOM		RECEIVE ROOM	
	Room	Vol. (m <sup>3</sup> )	Room	Vol. (m <sup>3</sup> )
2	Extension Office Space, 2 <sup>nd</sup> Floor	240	Extension Office Space, 1st Floor	240

Standardized Impact Sound Pressure Level according to BS EN ISO 140-7:1998

Frequency (Hz)	$L'_{nT}$ (dB)
50	
63	
80	
100	58.4
125	60.5
160	60.2
200	55.5
250	49.7
315	46.8
400	42.2
500	39.3
630	34.4
800	≪ 30.5
1000	≪ 27.4
1250	23.3
1600	22.1
2000	21.2
2500	16.1
3150	≪ 11.2
4000	≪ 10.6
5000	≪ 8.4
6300	
8000	
10000	



Rating according to BS EN ISO 717-2:1997	
$L'_{nT,w} (C_1) =$	49 (1) dB
$L'_{nT,w} =$	<b>49 dB</b>

◆ Measured Standardized Impact Sound Pressure Level,  $L'_{nT}$  (dB)  
 — Reference curve (BS EN ISO 717-2:1997)

$C_1:$  1 dB       $C_{1,50-2500}:$  --

Evaluation based on a result obtained by a field method

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### **Construction Details**

The constructions in the area of the building tested are unclear.

#### **Separating Floor:**

The separating floor appeared to be of concrete construction with a raised access floor above and in-grid tile ceiling beneath. The raised access floor generally had a timber walking surface but also had metal surfaces where service runs were present. The underside of the ceiling was suspended via metal supports approximately 180 mm below the underside of the floor. The depth and mass per unit area of the concrete floor is unknown.

#### **External Wall:**

The external walls appeared to be of solid masonry construction. The mass per unit area of the wall is unknown.

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## Procedure

### Airborne Sound Insulation to BS EN ISO 140-4:1998

Airborne sound insulation measurements were performed according to a prescribed procedure that specifies that the sound generated in the source room shall be steady and have a continuous spectrum in the frequency bands of interest. Measurements of the sound levels were made in both source and receive rooms at the one-third octave intervals from 100 Hz to 5000 Hz as recommended in the Standard (ref 2). The measurements were made such as to obtain a spatial average of the sound pressure level in each room. Reverberation time measurements were made in the receive room following the procedures of British Standard BS EN 20354:1993 (ref 3).

The Standardized Level Difference ( $D_{nT}$ ) in decibels (dB) is calculated in each frequency band using the equation:

$$D_{nT} = L_1 - L_2 + 10 \lg \frac{T}{T_0} \quad \text{dB}$$

where

- $D_{nT}$  is the Standardized Level Difference (dB)
- $L_1$  is the average sound pressure level in the source room (dB)
- $L_2$  is the average sound pressure level in the receive room (dB)
- $T$  is the average reverberation time of the receive room (seconds)
- $T_0$  is the reference reverberation time of 0.5 seconds

The Weighted Standardized Level Difference ( $D_{nT,w}$ ) in decibels (dB) and the Spectrum Adaptation Terms ( $C$  and  $C_{tr}$ ), also in decibels, are calculated in accordance with BS EN ISO 717-1:1997 (ref 4) by comparison of the sixteen values of Standardized Level Difference from 100 Hz to 3150 Hz with the relevant reference curves.

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## Procedure

### Impact Sound Transmission to BS EN ISO 140-7:1998

A standard tapping machine fitted with steel hammers was used as the impact source. Measurements of the transmitted sound levels were made in the receive room at the one-third octave intervals from 100 Hz to 5000 Hz as recommended in the Standard (ref 2). The measurements were made such as to obtain a spatial average of the sound pressure level in the room. Reverberation time measurements were made in the receive room following the procedures of British Standard BS EN 20354:1993 (ref 3).

The Standardized Impact Sound Pressure Level ( $L'_{nT}$ ) in decibels (dB) is calculated in each frequency band using the equation:

$$L'_{nT} = L_i - 10 \lg \frac{T}{T_0} \quad \text{dB}$$

where

- $L'_{nT}$  is the Standardized Impact Sound Pressure Level (dB)
- $L_i$  is the average impact sound pressure level in the receive room (dB)
- $T$  is the average reverberation time of the receive room (seconds)
- $T_0$  is the reference reverberation time of 0.5 seconds

The Weighted Standardized Impact Sound Pressure Level ( $L'_{nT,w}$ ) in decibels (dB) and the Spectrum Adaptation Term ( $C_1$ ), also in decibels, are calculated in accordance with BS EN ISO 717-2:1997 (ref 4) by comparison of the sixteen values of Standardized Impact Sound Pressure Level from 100 Hz to 3150 Hz with the relevant reference curves.

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## References

1. The Building Regulations 2010

Approved Document E: Resistance to the passage of sound (2003 Edition incorporating 2004, 2010, 2013 and 2015 amendments)

E1 Protection against sound from other parts of the building and adjoining buildings

E2 Protection against sound within a dwelling-house etc

E3 Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

E4 Acoustic conditions in schools

2. British Standard BS EN ISO 140

Acoustics - Measurements of sound insulation in buildings and of building elements

BS EN ISO 140-4:1998

Field measurements of airborne sound insulation between rooms

BS EN ISO 140-7:1998

Field measurements of impact sound insulation of floors

3. British Standard BS EN 20354:1993

Acoustics - Measurement of sound absorption in a reverberation room

4. British Standard BS EN ISO 717

Acoustics - Rating of sound insulation in buildings and of building elements

BS EN ISO 717-1:1997

Airborne sound insulation

BS EN ISO 717-2:1997

Impact sound insulation