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BRIEF FOR CONSULTANCY:

Prototype sound insulation testing of party wall in timber frame construction with Icynene® products installed inner leaves of external walls.

**TESTING OF TIMBER WALL
STRUCTURE WITH ICYNENE
PRODUCTS AT BPAC FACILITY**

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1.0 Introduction

- 1.1 The measurements of Icynene insulation system were conducted at the BPAC test facility, Glenrothes, Fife.
- 1.2 Within a restricted-access enclosed test facility, Hanger 17 at BPAC Ltd. (Glenrothes, Fife), a two-storey building was constructed. The building consisted of two apartment rooms on the ground floor and two rooms at the first floor. A schematic representation of the core test structure can be seen in Figure 1.

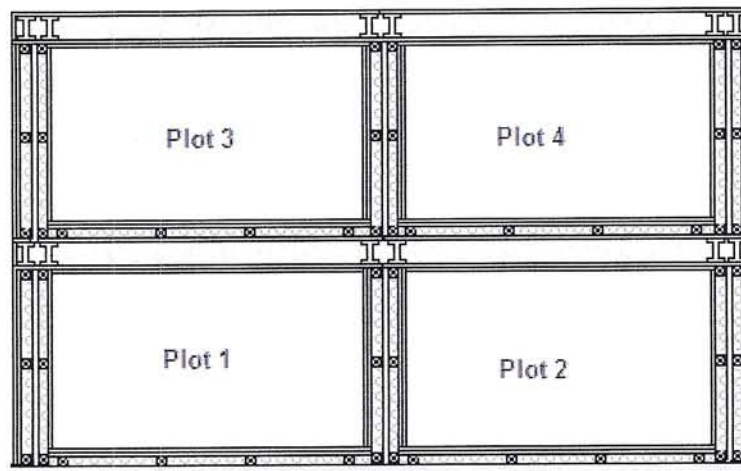


Figure 1. Test structure.

- 1.3 Sound insulation measurements were carried out on 18th of September, 2009 by Dr. Elena Prokofieva BSc, MSc, PhD, MIOA.

2.0 Sound Insulation Criteria

2.1 Sound insulation measurements have been performed in full compliance with procedures outlined in Approved Document Part E (ADE, applicable to England and Wales, E&W), the Building (Scotland) Regulations 2004, and BS EN ISO 140, as outlined in Section 5.0.

2.2 The test results are reported to in-situ (field) performance ratings as full flanking conditions were present. The minimum criteria recommended in the Scottish Technical Handbooks and ADE are reproduced in Tables 1a and 1b.

Table 1a. Recommended minimum sound insulation performance values for separating walls and floors given in the current Scottish Technical Handbook 5.0 'Noise', and Approved Document Part E (E&W).

	Scottish: Airborne Sound Insulation, $D_{nT,w}$ (dB)	England & Wales: Airborne Sound Insulation, $D_{nT,w} + C_{tr}$ (dB)
Separating Walls	53 (mean)	45
Party Floors	52 (mean)	45

Table 1b. Recommended maximum sound insulation performance values for separating floors given in the current Scottish Technical Handbook 5.0 'Noise', and Approved Document Part E (E&W).

	Scottish: Impact Sound Insulation, $L'_{nT,w}$ (dB)	England & Wales: Impact Sound Insulation, $L'_{nT,w}$ (dB)
Party Floors	61 (mean)	62

2.3 The airborne sound insulation rating is specified in terms of the weighted standardised level difference, $D_{nT,w}$. The correction weighting C_{tr} is added to the $D_{nT,w}$ result in the ADE (E&W) primarily to account for low frequency acoustic transmission. Both ratings provide an indication of the noise reduction achieved by a residential partition; a numerically higher rating indicates better airborne sound insulation.

2.4 The impact sound insulation rating is specified in terms of the weighted standardised level, $L'_{nT,w}$. A numerically lower rating indicates better impact sound insulation.

3.0 Test Programme

Separating wall

- 3.1 The sound insulation of the wall construction between the ground floor rooms was measured. Details of the locations and room characteristics are outlined in Table 2.

Table 2. Details of tested partition (wall)					
Source Room			Receiving Room		
Room	Room Volume (m ³)	Wall Area (m ²)	Room	Room Volume (m ³)	Wall Area (m ²)
Plot 2	43.4	9.0	Plot 1	43.4	9.0

- 3.2 The separating wall construction in the tested room was Robust Details E-WT-2 and consisted of two leaves of 95 mm timber frame wall with 9 mm sheeting board and 60 mm mineral wool across 50 mm clear cavity, finished with two layers of plasterboard with staggered joints each side.

Floor construction

- 3.3 The floor construction as tested was Robust Details E-FT-1 (only with 235 mm I-joists instead of 240 mm joists) and consisted of: 18 mm flooring board, gypsum based board, FFT-1 resilient battens with 25 mm mineral wool between battens, 15 mm floor decking board on top of 235 mm I-joists with 100 mm mineral wool quilt insulation between joists, finished with two layers of plasterboard on 16 mm resilient bars.

External walls

- 3.4 The external wall construction in the tested rooms consisted of two leaves of 95 mm timber frame wall with blown-in Icynene insulation between the 140 mm studs of inner leaf, 9 mm sheeting board, finished with one layer of plasterboard on room side.

4.0 Measurement Procedure

4.1 The measurement procedure conformed to the requirements of the Building (Scotland) Regulations 2004 and Approved Document E – Resistance to the Passage of Sound – 2003 (England and Wales).

4.2 The equipment and criteria used conformed to the requirements of Parts 4 (airborne) and 7 (impact) of BS EN ISO 140, “Measurement of sound insulation in buildings and of building elements”.

4.3 The following items of equipment were used during the measurement:

Equipment	Serial No.
Brüel & Kjær Modular Precision Sound Level Meter Type 2260 running Building Acoustics Module Type BZ7204	2399619
Brüel & Kjær Prepolarised Condenser Microphone Cartridge Type 4189	2386220
Brüel & Kjær Sound Level Calibrator Type 4231	2393980
JBL EON10 G2 Sound Source	15033
JBL EON10 G2 Sound Source	13150
Norsonic Tapping machine NOR-211A	31113

4.4 The sound level meter was calibrated before and after the measurements at the calibration level of 94 dB re 2×10^{-5} Pa at 1000 Hz; the recorded deviation in meter sensitivity was less than 0.1 dB.

4.5 The following airborne sound insulation measurement procedures were followed:

- L_1 1 spatially averaged 30 second source room SPL measurement
- L_2 1 spatially averaged 30 second receiver room SPL measurement
- T_2 6 receiver room reverberation time measurements (2 speaker positions)
- B_2 1 spatially averaged 30 second receiver room measurements

5.0 Results

5.1 The full airborne sound insulation results of the separating wall construction are given in Figure 1. The single figure sound insulation ratings calculated in accordance with BS EN ISO 717: 1997 are shown in Table 3.

Table 3. Results of wall sound insulation testing

Test Room 1	Test Room 2	Airborne $D_{nT,w} (+C_{tr})$ (dB)	
		Building (Scotland) Regulations 2004	Part E of Building Regulations 2003, E&W
Plot 2, G nd floor	Plot 1, G nd floor	59 (-10)	59(-10)

5.2 The results indicate that the sound insulation of the separating wall construction has complied with current regulatory standards outlined in Approved Document Part E (applicable to England and Wales) and in Building (Scotland) Regulations 2004. It would also comply with the proposed Section 5 for Scotland Standards in 2010, which requires min 56 dB $D_{nT,w}$.

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