



INVESTOR IN PEOPLE

Technical Report

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Project

**The Laboratory Determination of
the Airborne Sound Transmission of
Various External Wall Systems**

Prepared for

**Wetherby Building Systems Ltd
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Golborne
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By

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1.0 Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the sound reduction index of various external wall systems in accordance with BS EN ISO 140-3:1995.

From these measurements the required results have been derived and are presented in both tabular and graphic form in Test Certificates 6873 to 6878.

The results are given in 1/3rd octave bands over the frequency range 50Hz to 10kHz, which is beyond that required by the test standard. Measurements outside the standard frequency range are not UKAS accredited.



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2.0 Details of Measurements

2.1 Location

Sound Research Laboratories
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TH

2.2 Test Dates

23-28 November 2011

2.3 Instrumentation and Apparatus Used

Make	Description	Type
E D I	Microphone Multiplexer Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser	830
	Rotating Microphone Boom	231
Brüel & Kjaer	12mm Condenser Microphones	4166
	Windshields	UA0237
	Pre Amplifiers	2639, 2669C
	Microphone Calibrator	4231
	Omnipower Sound Source	4296
	Power Amplifier	2716
Larson Davis	12mm Condenser Microphone	2560
Celestion	Loudspeakers	100w
Douglas Curtis	Rotating Microphone Boom	
Brannan	Whirling Hygrometer	
TOA	Graphic Equalizer	E-1231
QSC Audio	Power Amplifier	RMX 1450

2.4 References

BS EN ISO 140-3:1995	Laboratory measurement of airborne sound insulation of building elements
BS EN ISO 717-1:1997	Rating of sound insulation in buildings and of building elements. Airborne Sound Insulation.

2.5 Personnel Present

Joe Ragdale	Wetherby Building Systems Ltd
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3.0 Description of Test

3.1 Description of Sample

Three wall systems were tested, see Drawings 1, 2 and 3 for details.

The base wall comprised 12.5mm plasterboard on one side of timber studs with 12mm plywood on the other side, This was tested alone without the insulation and WBS adhesive layers.

Wall System 1: Base wall plus WBS 110mm EPS insulation board.
Tested with WBS adhesive layer (render) 'wet' (30min after application) and 'dry' (15hrs after application).

Wall System 2: Base wall plus WBS 60mm phenolic insulation board.
Tested with render 'wet' (30min after application) only.

Wall System 3: Base wall plus WBS 110mm mineral fibre insulation board.
Tested with render 'wet' (30min after application) and 'dry' (2³/₄ days after application).

Sampling plan: Selected at random from those supplied.

Sample condition: New

Details supplied by: Wetherby Building Systems Ltd

Sample installed by: Wetherby Building Systems Ltd

3.2 Sample Delivery date

22 November 2011

3.3 Test Procedures

The sample was mounted/located and tested in accordance with the relevant standard. The method and procedure is described in Appendix 1. The measurement uncertainty is given in Appendix 2.

4.0 Results

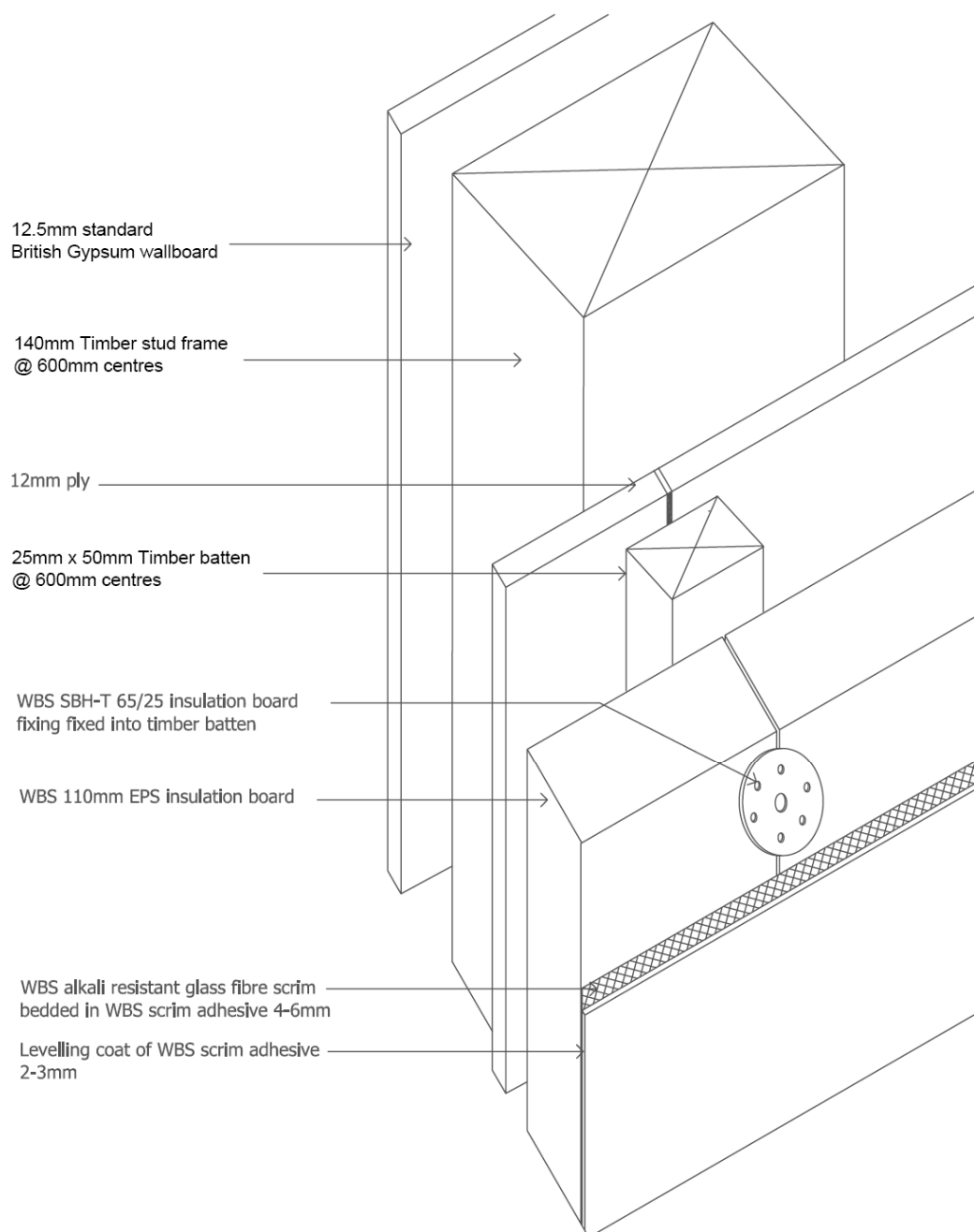
The results of the measurements and subsequent analysis are given in Test Certificates 6873 to 6878 and summarised below.

Results relate only to the items tested.

SRL Test No.	Description in Brief	Rw (C;C _{tr})
2	Base wall - no insulation	36 (-1;-5)
3	WBS 110mm EPS insulation (wet)	45 (-1;-7)
6	WBS 110mm EPS insulation (dry)	43 (-1;-6)
8	WBS 60mm phenolic insulation (wet)	45 (-2;-7)
9	WBS 110mm mineral fibre insulation (wet)	52 (-2;-7)
11	WBS 110mm mineral fibre insulation (dry)	51 (-2;-6)

End of Text

Drawing 1



drawing. **Isometric system build up - EPS**

date, November 2011 drawn by, JR scale, nts revision, -

project ref. **SRL Acoustic Testing**

drawing no, **SRL-ACOUSTIC-01**

Wetherby Building Systems Ltd

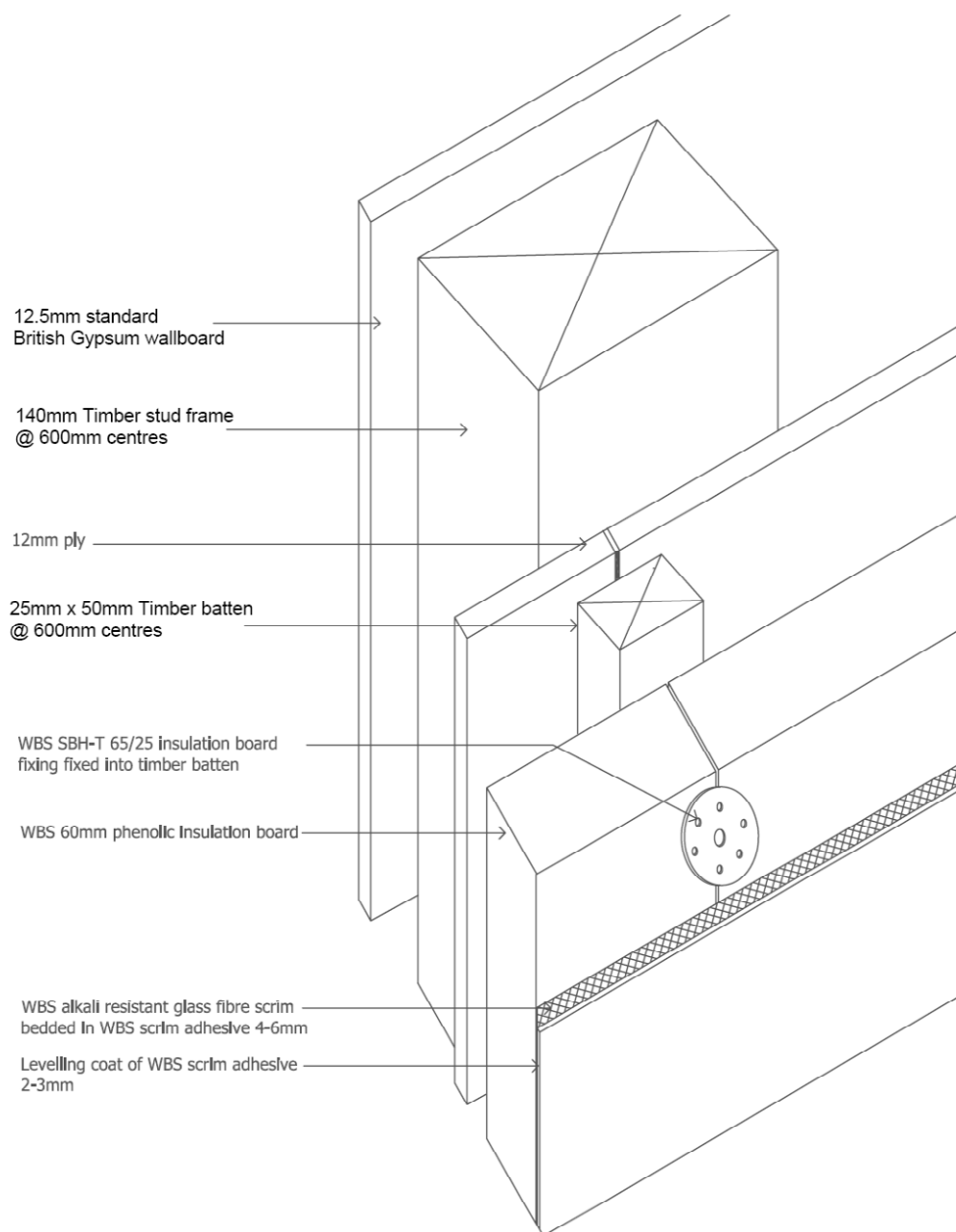


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Drawing 2



drawing. **Isometric system build up - Phenolic**

date, November 2011

drawn by, JR

scale, nts

revision, -

project ref. **SRL Acoustic Testing**

drawing no. **SRL-ACOUSTIC-02**

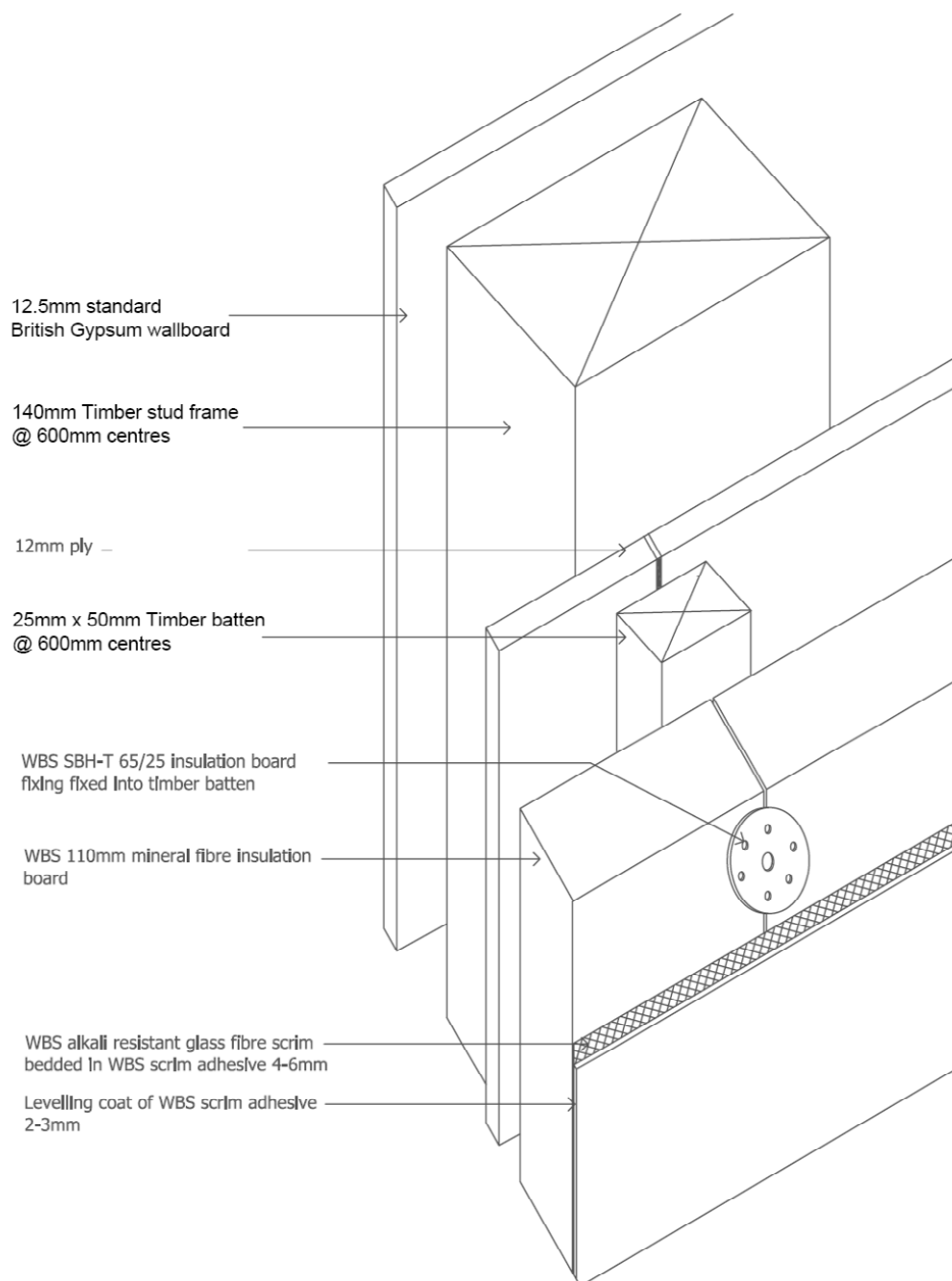
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Drawing 3



drawing. **Isometric system build up - Mineral Fibre**

date, November 2011 drawn by, JR scale, nts revision, -

project ref. **SRL Acoustic Testing**

drawing no. **SRL-ACOUSTIC-03**

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Appendix 1

Test Procedure

Measurement of Sound Transmission in accordance with BS EN ISO 140-3 : 1995 - TP15

In the laboratory, airborne sound transmission is determined from the difference in sound pressure levels measured across a test sample installed between two reverberant rooms. The difference in measured sound pressure levels is corrected for the amount of absorption in the receiving room. The test is done under conditions which restrict the transmission of sound by paths other than directly through the sample. The source sound field is randomly incident on the sample.

The test sample forms the whole of a 3.9m wide x 2.9m high dividing wall between the two rectangular reverberant rooms, both of which are constructed from 215mm brick with reinforced concrete floors and roofs.

One of the rooms is used as the receiving room and has a volume of 50 cubic metres. It is isolated from the surrounding structure and the adjoining room by the use of resilient mountings and seals ensuring good acoustic isolation. The adjoining source room has a volume of 55 cubic metres.

Broad band noise is produced in the source room from an electronic generator, power amplifier and loudspeaker. The resulting sound pressure levels in both rooms are sampled using a microphone mounted on an oscillating boom and connected to a real time analyser. The signal is filtered into one third octave band widths, integrated and averaged. The value obtained at each frequency is known as the average sound pressure level for either the source or the receiving room. The change in level across the test sample is termed the sound pressure level difference, i.e.

$$D = L_1 - L_2$$

where

D is the equivalent Sound Pressure level difference in dB

L_1 is the equivalent Sound Pressure level in the source room in dB

L_2 is the equivalent Sound Pressure level in the receiving room in dB

The Sound Reduction Index (R), also known by the American terminology Sound Transmission Loss, is defined as the number of decibels by which sound energy randomly incident on the test sample is reduced in transmitting through it and is given by the formula:

$$R = D + 10 \log_{10} \frac{S}{A} \dots \text{in decibels}$$

where

S is the area of the sample

A is the total absorption in the receiving room

both dimensions being in consistent units

The Sound Reduction Index is an expression of the laboratory sound transmission performance of a particular element or construction. It is a function of the mass, thickness, sealing method of mounting etc., and is independent of the overall area of the sample.

However, when an example of this construction is installed on site, the sound insulation obtained will depend upon its surface area, as well as the absorption in the receiving room. The larger the area the greater the sound energy transmitted. Also, the overall sound insulation is affected by the sound transmission through other building elements, some of which may have an inferior performance to the sample tested. In practice, therefore, the potential sound reduction index of a construction is not fully realised on site. Furthermore, the sound reduction index of a particular sample of that construction can only be measured accurately in a laboratory, because only under such controlled conditions can the sound transmission path be limited to the sample under test.

R_w , C and C_{tr} have been calculated in accordance with the relevant section of BS EN ISO 717-1:1997 from the results of laboratory tests carried out in accordance with BS EN ISO 140-3:1995.

Appendix 2

Measurement Uncertainty BS EN ISO 140-3:1995 - TP15

The following values of uncertainty are based on a standard uncertainty multiplied by a coverage factor of $k = 2$, which provides a level of confidence of approximately 95%.

Frequency, Hz	Uncertainty, $\pm$ dB
100	2.6
125	2.4
160	2.1
200	2.1
250	1.5
315	1.5
400	1.2
500	1.2
630	1.0
800	1.0
1000	1.0
1250	1.0
1600	1.0
2000	1.0
2500	1.0
3150	1.0

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