

# *The Building Test Centre*

## *Fire Acoustics Structures*

**The Building Test Centre**  
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Report Number **BTC 21661A**

A laboratory sound absorption test to  
BS EN ISO 354:2003 on Gyptone Quattro 41 boards on  
a 200 mm deep Plenum.

Test Date: 4<sup>th</sup> February 2021

Report Issue Date: 9<sup>th</sup> February 2021

[www.btconline.co.uk](http://www.btconline.co.uk)

Customer: **British Gypsum**  
East Leake  
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Customer: **British Gypsum**

BTC 21661A: Page 1 of 14



0296

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### TABLE OF CONTENTS

<b>FOREWORD</b>	<b>3</b>
<b>REPORT AUTHORISATION</b>	<b>3</b>
<b>TEST REPORT AMENDMENTS</b>	<b>4</b>
<b>TEST CONSTRUCTION</b>	<b>5</b>
<b>TEST MATERIALS</b>	<b>8</b>
<b>TEST PROCEDURE</b>	<b>10</b>
<b>TEST RESULTS</b>	<b>11</b>
<b>LIMITATIONS</b>	<b>11</b>
<b>APPENDIX A - TEST DATA</b>	<b>12</b>
<b>APPENDIX B – LABORATORY DETAILS</b>	<b>14</b>

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### **FOREWORD**

The test sponsor was British Gypsum.

The test specimen was installed John Gwynne and Cameron Whitaker on the 2<sup>nd</sup> and 3<sup>rd</sup> February 2021.

The Building Test Centre played no role in the design or selection of the materials comprising the test specimen. This information is provided by British Gypsum.

### **REPORT AUTHORISATION**

Report Author



**Martin Lynch**  
MIOA  
Scientist

Authorised by



**James Stonell**  
MIOA  
Senior Scientist

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BTC 21661A: Page 3 of 14



0296

## TEST REPORT AMENDMENTS

Page	Amendments	Date

Report Amendments Author

**Name**  
*Role*

Amendments Authorised by

**Name**  
*Role*

### TEST CONSTRUCTION

A 3000 mm x 3600 mm x 200 mm (high) frame was constructed from 12.5 mm Gyproc SoundBloc screw fixed to 18 mm chipboard using pairs of 25mm British Gypsum drywall screws spaced at 300 mm centres. To achieve the full length, a section 400 mm long chipboard backing piece was secured to both ends of the frame using eight 35 mm British Gypsum drywall screws (4 each side).

The frame was then positioned on the test chamber floor.

45 mm deep x 45 mm wide x 3600 mm long planed softwood battens were screw fixed to the long edges of the frame at 600 mm centres using 60 mm British Gypsum Drywall Screws

45 mm deep x 45 mm wide x 3600 mm long planed softwood battens were positioned at 600 mm centres spanning the 3600 mm long direction of the test frame. The battens were screw fixed to the short edges of the frame work using 60 mm British Gypsum Drywall Screws.

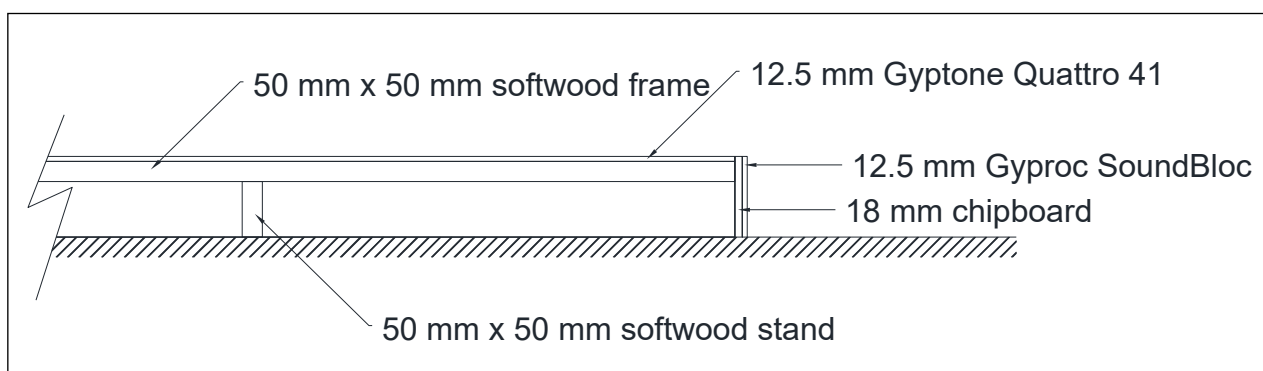
All of the planed softwood battens were installed 12.5 mm below the top edge of the frame, creating a 200 mm plenum depth below the exposed face of the board.

45 mm x 45 mm x 137.5 mm high planed softwood battens were positioned on underside of the horizontal planed softwood battens at 1200 mm centres.

Gyptone Quattro 41 boards were positioned on top of the softwood profiles.

The edges between the Gyptone Quattro 41 board joints and the perimeter of the frame were sealed with acoustic tape.

The perimeter of the frame was sealed to the floor with acoustic sealant.

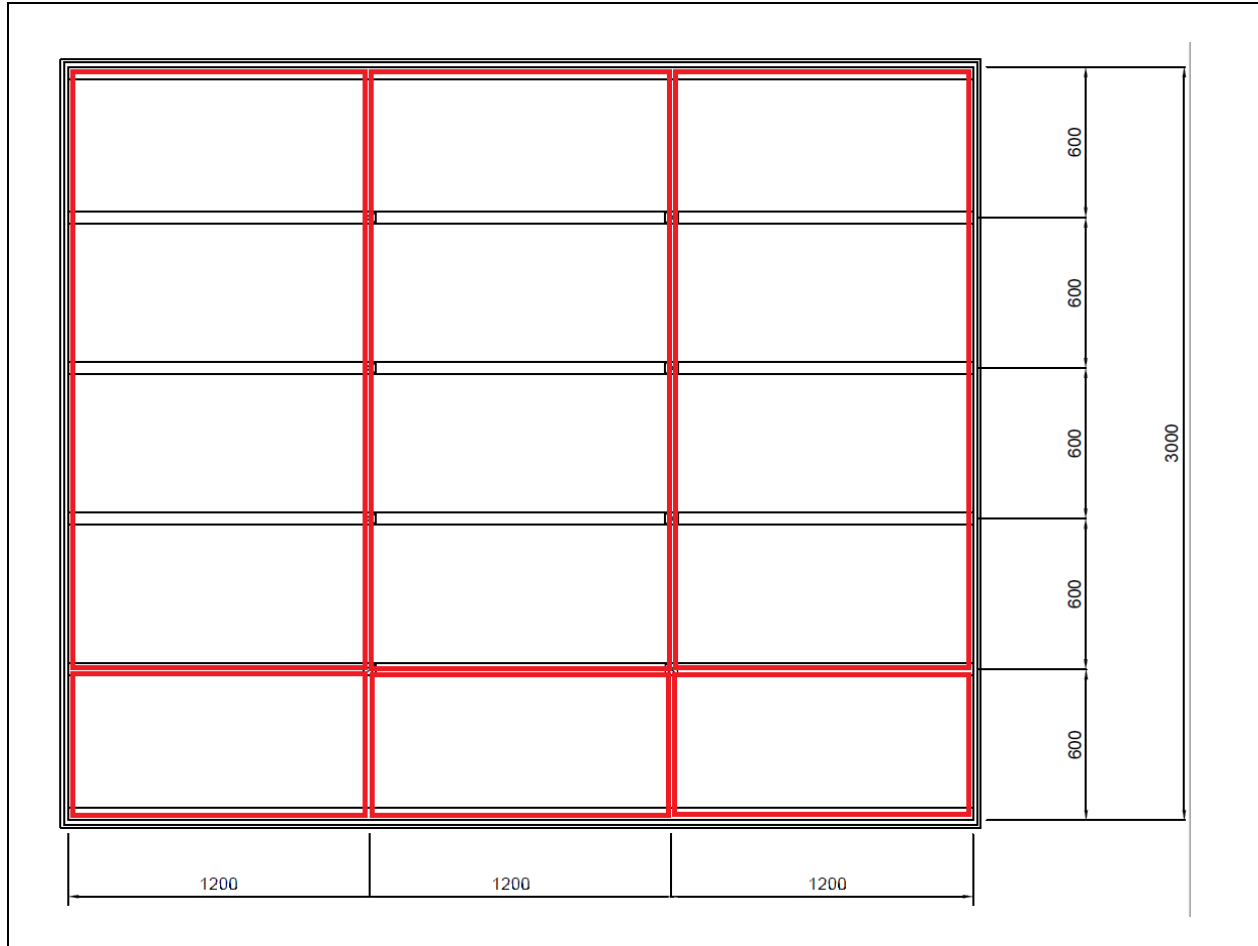


**Figure 1.** Cross section view through the test specimen.

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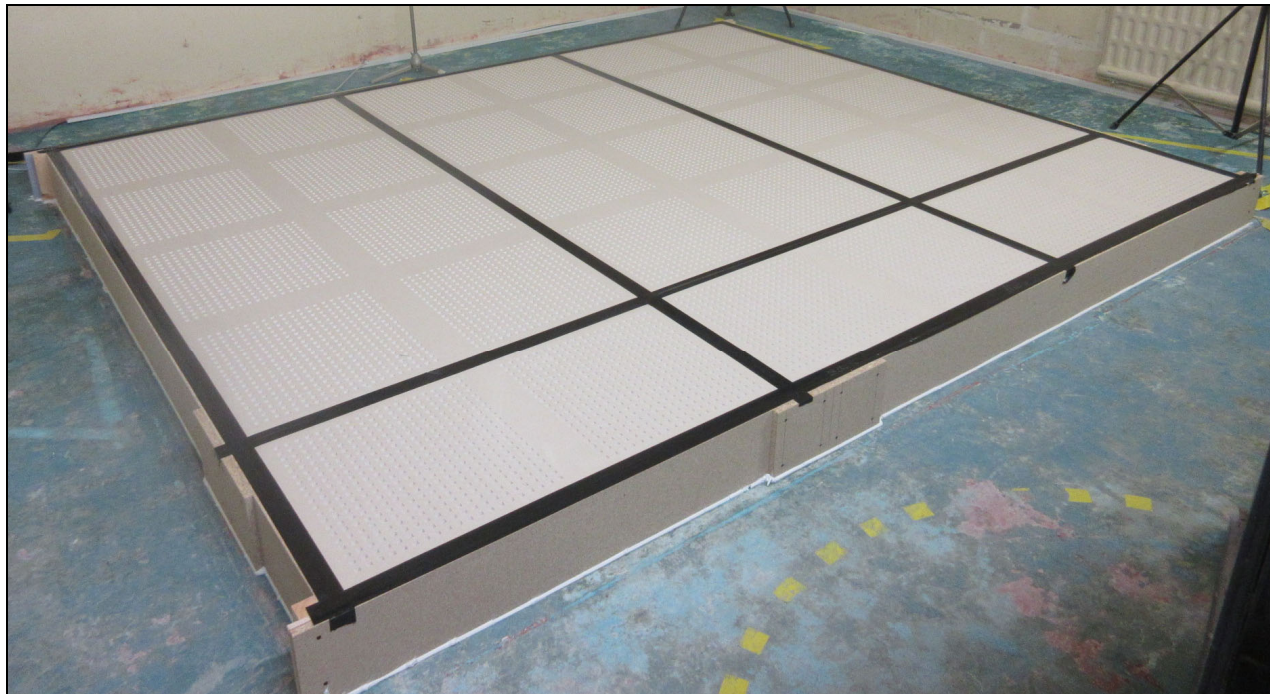


**Figure 2.** Plan view of the test frame layout.

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**Photograph 1.** Completed test specimen for R21661A.

*The descriptions of individual components making up the test specimen were provided by the customer and were checked for accuracy wherever possible.*

### **TEST MATERIALS**

#### **Plasterboard**

- i) Nominally 2400 mm (long) x 1200 mm (wide) x 12.5 mm (thick) Gyptone Quattro 41 manufactured by British Gypsum.

Average surface density: 8.0 kg/m<sup>2</sup>  
Average thickness: 12.4 mm  
Board Code: N/A

- ii) Nominally 2400 mm (long) x 1200 mm (wide) x 12.5 mm (thick) Gyproc SoundBloc manufactured by British Gypsum.

Average surface density: 11.5 kg/m<sup>2</sup>  
Average thickness: 12.3 mm  
Board Code: 16 358 20 09:09  
16 358 20 09:10  
16 358 20 09:10

The surface densities were calculated using the actual weight and size of a selection of the boards used in the test specimen.

Material dimensions were supplied by British Gypsum.

#### **Timber Components**

- i) Nominally 2445 mm (long) x 1225 mm (wide) x 18 mm (thick) chipboard.

Average surface density: 11.1 kg/m<sup>2</sup>

- ii) Nominally 4505 mm (long) x 45 mm (wide) x 45 mm (thick) planed softwood.

Average density: 506.6 kg/m<sup>3</sup>

All timber components supplied by British Gypsum.

The surface densities were calculated using the actual weight and size of a selection of the boards used in the test specimen.

Material dimensions were supplied by British Gypsum.



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### Fasteners

- i) 25 mm British Gypsum drywall screws supplied by The Building Test Centre.
- ii) 35 mm British Gypsum drywall screws supplied by The Building Test Centre.
- iii) 60 mm British Gypsum drywall screws supplied by The Building Test Centre.

### Miscellaneous

- i) Gyproc Sealant supplied by The Building Test Centre.
- ii) Joint tape supplied by The Building Test Centre.

*Where measurements could not be taken and were provided by the customer or the manufacturer e.g. from material labelling, or where mass and dimension measurements were provided by the customer or the manufacturer e.g. customer has completed material dimension forms the results only apply to the sample as received.*

*All data and materials supplied by the customer or manufacturer are clearly identified.*

*Material information was sampled and recorded according to procedure AP070 vs. 1.1.*

## **TEST PROCEDURE**

Two omni-directional speakers were placed in diagonally opposite corners of an empty reverberation chamber. Broad-band pink noise and third-octave band filters in real time mode were used to make simultaneous measurements for all frequency bands. Using the test procedure identified in Appendix A of this report, 36 decay measurements were collected using a combination of six microphone locations and two loudspeaker positions for 3 repetitions. The reverberation times for each decay curve were arithmetically averaged. This procedure was repeated with the test specimen in place and a computer program calculated the absorption coefficient of the specimen.

## TEST RESULTS

Test Number	Description	Weighted sound absorption coefficient $\alpha_w$
R21661A	Gyptone Quattro 41 boards on a 200 mm deep Plenum.	0.60 Class C

For full data see Appendix A.

Test conducted in accordance with BS EN ISO 354:2003

Results rated in accordance with EN ISO 11654:1997

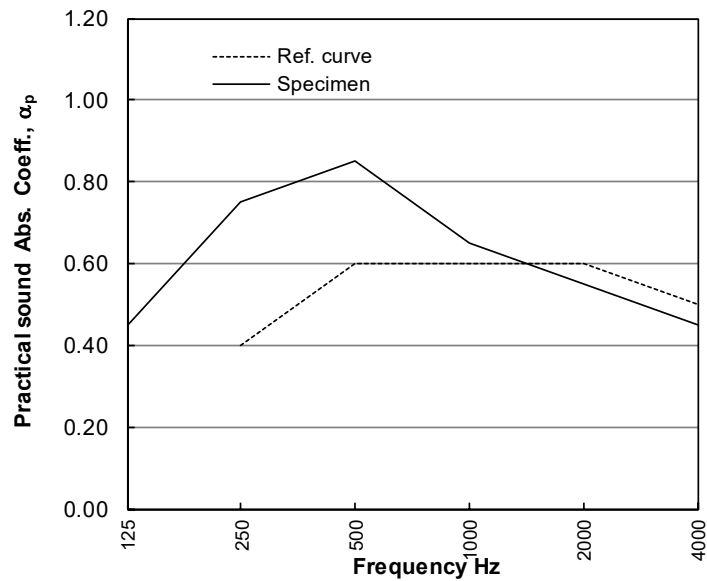
## LIMITATIONS

The results only relate to the behaviour of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential acoustic performance of the element in use.

## APPENDIX A - TEST DATA

Test Code:
R21661A
Test Date:
04/02/2021

Freq, Hz	Ref. curve	Specimen
125		0.45
250	0.40	0.75
500	0.60	0.85
1000	0.60	0.65
2000	0.60	0.55
4000	0.50	0.45



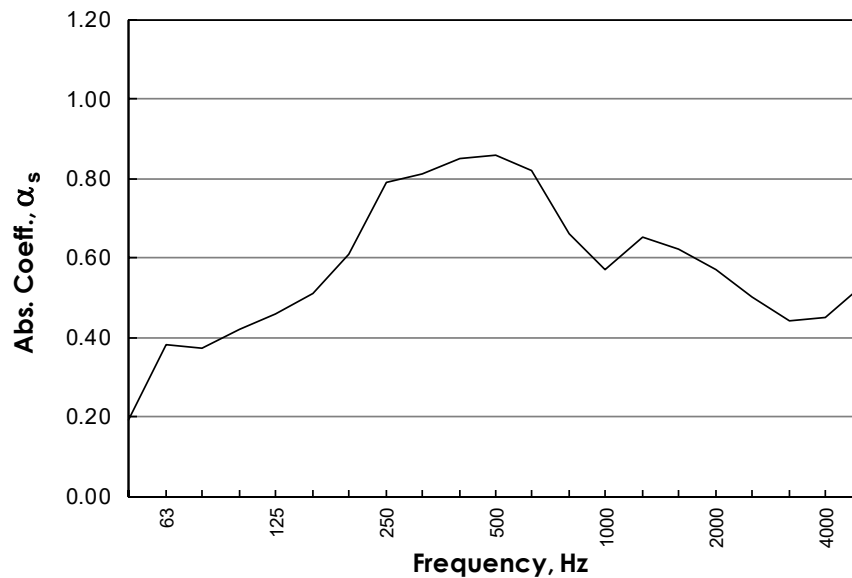
Rating and Sound absorption class according to

EN ISO 11654: 1997

$\alpha_\omega = 0.60$  (LM) Class = C

It is strongly recommended to use this single figure rating in combination with the complete sound absorption coefficient curve that can be obtained on request

Freq. Hz	$\alpha_s$
50	0.19
63	0.38
80	0.37
100	0.42
125	0.46
160	0.51
200	0.61
250	0.79
315	0.81
400	0.85
500	0.86
630	0.82
800	0.66
1 000	0.57
1 250	0.65
1 600	0.62
2 000	0.57
2 500	0.50
3 150	0.44
4 000	0.45
5 000	0.53
6 300	
8 000	
10 000	



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BTC 21661A: Page 12 of 14



0296

# LABORATORY SOUND ABSORPTION TEST - EN ISO 354:2003

Test Code: **R21661A**

Test Date: **04/02/2021**

			Empty	Specimen
Specimen Area, S:	<b>10.8</b>	m <sup>2</sup>	Temperature, deg.C:	<b>15.60</b> <b>16.20</b>
Room Volume, m <sup>3</sup> :	<b>196</b>	m <sup>3</sup>	Rel. Humidity, %RH:	<b>56.20</b> <b>58.90</b>
			Atm. Pressure, kPa:	<b>100.300</b> <b>100.200</b>
(Check environmental requirements - Table 2 of standard)				

Freq Hz	Plane Absorber					$\alpha_s$	$\alpha_{pi}$	U.D.
	Empty		Specimen					
	T30: Sec	T20: Sec	T30: Sec	T20: Sec				
50	25.70	24.51	10.03	9.39	0.19	0.30		
63	21.95	21.10	6.68	5.66	0.38			
80	16.36	15.65	5.90	5.24	0.37			
100	13.86	13.56	5.75	4.62	0.42	0.45		
125	13.01	12.76	4.53	4.27	0.46			
160	10.11	9.53	3.84	3.58	0.51			
200	9.23	9.06	3.32	3.16	0.61	0.75	-0.35	
250	9.80	9.70	2.75	2.69	0.79			
315	10.50	10.36	2.86	2.69	0.81			
400	10.36	10.21	2.58	2.59	0.85	0.85	-0.25	
500	9.69	9.64	2.54	2.52	0.86			
630	9.50	9.53	2.64	2.60	0.82			
800	9.12	9.16	2.98	3.01	0.66	0.65	-0.05	
1 000	8.58	8.64	3.18	3.22	0.57			
1 250	7.53	7.47	2.88	2.83	0.65			
1 600	6.36	6.43	2.78	2.75	0.62	0.55	0.05	
2 000	5.37	5.42	2.69	2.66	0.57			
2 500	4.64	4.57	2.62	2.61	0.50			
3 150	3.72	3.75	2.47	2.45	0.44	0.45	0.05	
4 000	2.90	2.84	2.03	2.03	0.45			
5 000	2.16	2.15	1.65	1.60	0.53			
6 300								
8 000								
10 000								

## Single Figure Rating

Total U. Dev.

**0.1**

EN ISO 11654: 1997

$\alpha_w =$  **0.60 (LM)**

It is strongly recommended to use this single figure rating in combination with the complete sound absorption coefficient curve that can be obtained on request

RT's > factor 1.5 apart

Procedure: ISO354/B - issue 1

Worksheet: 20354.XLS

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BTC 21661A: Page 13 of 14



0296

## APPENDIX B – LABORATORY DETAILS

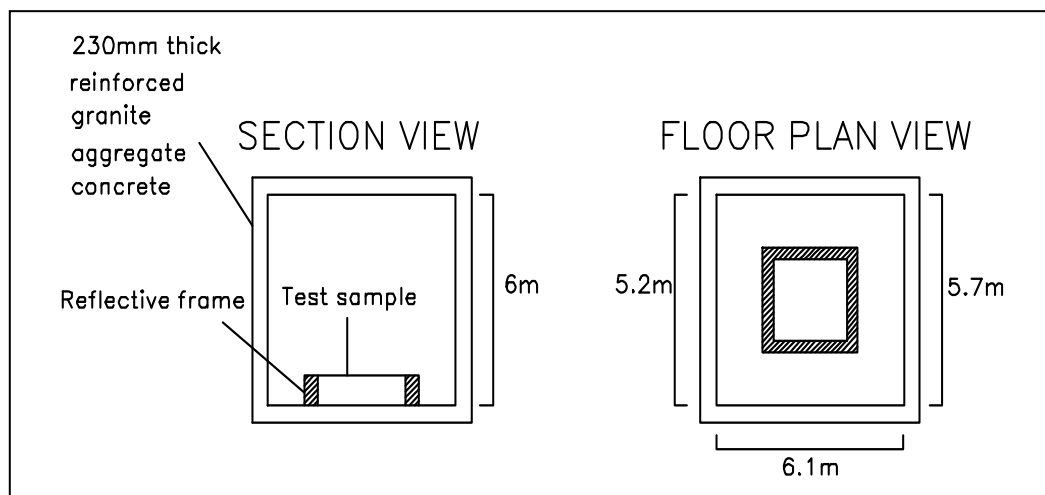
The test room with a volume of 196 m<sup>3</sup> and a surface area of 203 m<sup>2</sup> is treated with 16 perspex diffusers of approximately 1220 mm x 1220 mm dimensions positioned randomly throughout the room. The test specimen is of rectangular shape with an area between 10 and 12 m<sup>2</sup> placed in the test room so that no part of it is closer than 1m to any edge of the boundary of the room. The equivalent sound absorption area is determined by the measured reverberation times and used to calculate the absorption coefficients.

The repeatability of sound absorption coefficient ' $\alpha_s$ ' for low absorption,  $r_1$ , and high absorption,  $r_2$ , is calculated from 5 complete re-tests respectively RREPEAT1 -5 (12<sup>th</sup>-13<sup>th</sup> July 1994) & R1-5 (6<sup>th</sup> July 1991):

Freq Hz	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
$r_1$	.035	.064	.018	.018	.035	0	.018	0	.035	.028	.028	.021	.053	.066	.033	.048
$r_2$	.056	.077	.085	.068	.146	.106	.213	.205	.2	.116	.051	.218	.109	.068	.048	.06

The repeatability of measured reverberation times for low absorption (empty room),  $r_3$ , and high absorption,  $r_4$ , is calculated as the relative standard deviation of 36 decays of  $T_{20}$  (BS EN ISO 354:2003 Section 8.2.2). R13200AA & R13200LA respectively (23<sup>rd</sup> February 2004):

Freq Hz	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
$r_3$	.047	.042	.042	.037	.031	.027	.026	.026	.023	.020	.018	.017	.016	.015	.015	.015
$r_4$	.056	.058	.058	.055	.051	.052	.050	.049	.044	.040	.037	.033	.030	.027	.025	.023



Section and floor plan view of the test room.